working paper
department
of economics

WAGES, INCOME AND HOURS OF WORK IN THE U.S. LABOR FORCE

by

Robert E. Hall

Number 62

August 1970

massachusetts
institute of
technology
50 memorial drive
cambridge, mass. 02139

WAGES, INCOME AND HOURS OF WORK IN THE U.S. LABOR FORCE

by

Robert E. Hall

Number 62 August 1970

This is a preliminary report on research supported by the Office of Economic Opportunity trhough a grant to the Brookings Institution. The author is grateful to Michael Boskin and Michael Hurd for advice and assistance, and to Thomas Moore for computer programming.

Contents

1. Introduction

This paper presents the results of an empirical study of hours of work in the labor force of the United States. The main goal of this research is to obtain better knowledge of the pattern of work effort by wage and income classes within broad demographic groups in the labor force. We pay particular attention to the hypothesis that some groups in the labor force are sufficiently sensitive to changes in their incomes and wages that a plan for supplementing their incomes might have a substantial impact on their hours of work. Opponents of the negative income tax have argued, for example, that the income effect of its subsidy element and the substitution effect of its implicit tax element might combine to cause a serious reduction in work effort. Our results suggest that certain groups in the labor force (notably wives and people of retirement age) show enough sensitivity to wages and income to justify this concern, but other groups tend to be relatively insensitive. In brief, our results can be summarized as follows:

1) Husbands of both races in the central age group, 20 through 59, tend to work roughly full time on the average, and have weak wage and income effects. Even the relatively unusual individual with a low wage and high outside income tends to work almost full time.

2) Black husbands tend to work somewhat less than white husbands with the same wage and income. The difference is most pronounced in the lowest income groups.

3) Husbands of retirement age, 60 and over, show substantial variation in hours of work, related systematically to wages and income in the expected way.

4) Wives in all age groups are quite sensitive to wages and income. Black wives work substantially more than white wives.

5) Single individuals do not have a systematic tendency to work longer hours with higher wages. Some groups show evidence of backward-bending labor supply curves.

6) Adult sons and daughters and other relatives do not seem to respond to the incomes of the families in which they reside. Their wage response is roughly the same as that of single individuals.

7) Teenagers who are not in school work remarkably little and do not have a strong positive response to wages.

8) Race and sex differences are conspicuous for husbands and wives and are almost absent for other groups.

Our main emphasis is on the proper measurement of the economic quantities relevant to the study of labor supply, rather than on the fitting of supply equations derived from an underlying parametric specification of preferences for consumption and leisure. In fact, an important intermediate step in this work is simply the cross-tabulation of average hours of work by the characteristics of individuals and their families, and by their wages and incomes. Even without further restriction, the resulting tables provide useful information for some major groups in the labor force. For teenagers and other smaller groups, averaging methods are used to reduce the influence of random fluctuations. The general approach of the research seems to be successful because of the size and richness of the body of data on which it rests.

The data are taken from the Survey of Economic Opportunity for 1967, a file of data on individuals collected by the Bureau of the Census and compiled by the Brookings Institution and the Office of Economic Opportunity. The SEO is basically an augmented version of the Current Population Survey. The augmentations are crucial, however, for this kind of study. First, data on hours and wages were collected from most respondents for the week before the survey in March 1967. One of the main obstacles to the use of data from the CPS is the lack of a reliable measure of wages. The availability of information on wages also made it possible to construct estimates of hours of work in 1966, by dividing wage income by the wage. Again, there is no reliable measure of annual hours of work in the CPS, and most investigators have adopted the rather unsatisfactory assumption that hours of work in the week before the survey were typical of all the weeks worked in the previous year. Second, half of the SEO sample is drawn from specially selected non-white poverty areas. As a result, whites and blacks (who are distinguished from other non-whites) are approximately equally represented, and comparisons between races are greatly facilitated. Third, extra data on income and assets are available, so that by a series of imputations a reasonably comprehensive measure of income can be constructed.

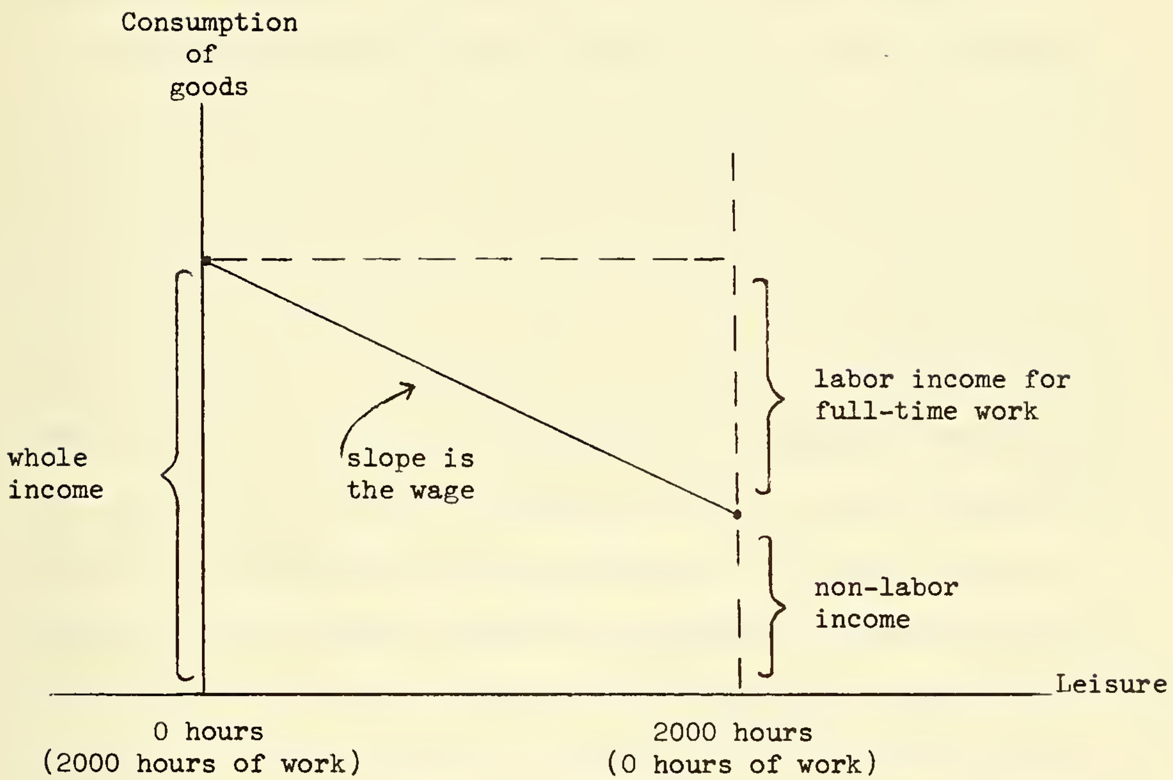
The study embodies a somewhat unconventional approach to the definition of the economic determinants of labor supply. The usual labor supply function for an individual is written in terms of his wage and his income from sources other than his own labor. With this convention, the response to an increase in the wage has two conflicting components -- a substitution effect tending to increase hours of work and an income effect tending to reduce hours. The pure substitution effect can be inferred from these responses by an appropriate Hicksian income compensation, but the formulation is still somewhat awkward. A more general view is that the labor supply function of an individual can be written in terms of any two variables that uniquely define his budget constraint.[1] The variables we have chosen are the slope of the budget constraint (the wage), and its intercept with a vertical line corresponding to full-time work. The latter quantity is what we will call whole income. It is the amount the individual can spend on goods if he works full time. The advantage of this way of writing the labor supply function is that for full time workers, the pure substitution effect is exactly the effect of changing the wage while holding whole income constant. The Hicksian income compensation is built in to the labor supply function when it is written as a function of whole income. For individuals who work less than full time, the income compensation of our labor supply function overstates the Hicksian compensation. As long as leisure is not an inferior good, the substitution and income effects of wage changes have the same sign in our supply function. Holding

---

[1] For simplicity we assume that the individual consumes only leisure and one good. As long as the relative prices of the various consumption goods are the same for all people in the sample, this treatment is rigorous.

Figure 1-1

Parameters of an Individual's
Budget Constraint



whole income constant, we should observe increasing (or, at least, non-decreasing) hours of work as we increase the wage for any individual, as long as he does not work more than full time.

So far we have discussed the case of an isolated individual. In fact, most of the people in the sample live in families, where decisions about hours of work are made jointly by the members of the family. For a family with two adult members, say a husband and wife, we identify three items that enter family preferences: goods, leisure of the husband, and the leisure of the wife. The family budget constraint now requires three parameters to describe it completely, two wages to describe its slope, and one income to locate its position away from the origin. Once again, we use a measure of whole income, defined as the amount of goods the family could consume if both its members worked full time. Again, the response of either member to an increase in his or her wage, with whole income held constant, is at least fully compensated for the income effect, and should always be positive.

An additional complication arises in the case of a family: the wife's wage enters the husband's labor supply function, and *vice versa*. In a conventional family labor supply model where the income variable is non-labor income, the wife's wage has two influences on her husbands supply of labor, a substitution effect of uncertain sign and a presumably negative income effect. The presence of the wife's wage in the husband's supply function is mandatory, even if the substitution effect is zero, owing to the potential strength of the income effect. With our approach, on the other hand, the income effect is exactly compensated by the use of whole income, provided the wife actually works full time. To impose the hypothesis that the cross-substitution effect is zero, that is, that the leisure of the husband and leisure of the wife are neither substitutes nor complements, we simply exclude the wife's wage from the husband's supply function, and vice versa. The result is a saving in parameters that is quite important in a study of this sort that uses a very unrestrictive functional form. The substantive advantage of using whole income rather than non-labor income is that it permits the exclusion of the wages of other family members from the supply equation of each member.

One apparent difficulty with this approach is that wives, in general, do not work full time. Our procedure seems to overcompensate for the income effect of an increase in the wife's wage by assuming that she works full time when in fact she may work half time or not at all. The problem here is one of the correct interpretation of the notion of work. In our simple theory, hours of work are the hours of the year not spent enjoying leisure. For wives, this means that hours of work include hours spent caring for children and keeping house. With work measured to include work at home, most wives do work full time, and our income compensation is calculated correctly. This is not the end of the problem, however. Hours of work as measured in our data include only those hours spent outside the home. The wife's supply function for outside work has two components, one having to do with her demand for leisure and the other having to do with the substitution of other inputs (appliances, babysitters, and so forth) for her own services in the home. It is reasonable to suppose that both of these can be written in terms of the wife's wage and family whole income, and our results, showing a high wage elasticity of hours of work for wives, should be interpreted in this light.

The same qualification should be offered for husbands, although it is probably less important. Most husbands have important duties at home, and may substitute other inputs for their own services if the financial attraction of outside work increases.

The practical measurement of the variables discussed above -- wages and family whole income -- is the topic of the bulk of this paper. The problem of measurement cannot be divorced from the problem of the choice of estimation method, so that discussion must necessarily deal with some technical econometric issues. Abstracting from income effects, we will begin by considering the simplified cross section labor supply equation,

$$(1.1) \qquad L_i = \beta_0 + \beta_1 w_i + u_i \quad ,$$

where L_i is hours of work for individual i, w_i is his wage, and u_i is a random disturbance. Two complications arise in estimating the parameters of this equation. First, as in any structural equation, the disturbance may be correlated with the right-hand variable. For example, individuals who are offered an unusually high wage may supply fewer hours of work than those who receive the same wage routinely. The resulting negative correlation of w_i and u_i makes the estimation problem formally analogous to that of estimating the consumption function from cross-section data. In general, it is known that the estimate of the slope coefficient will be biased downward if the ordinary least squares estimator is used. The negative correlation of w_i and u_i will be compounded, and the bias increased, if there are, in addition, pure errors of measurement in the data on wages. Since both these sources of negative correlation are likely to exist, it is essential to consider estimators other than least squares in studying labor supply.

The second difficulty is peculiar to the study of labor supply; the wage, w_i, is not observed for individuals who decide not to enter the labor force. Omitting the data for these individuals would probably cause a downward bias in the estimated wage response, since the omitted observations are likely to have negative disturbances.

The natural solution to the first of these problems is an instrumental variables estimator. As we shall see, an estimator of this sort is available as a by-product of our proposed solution to the second problem. Suppose we add a second equation to the labor supply system expressing the hypothesis that the wage received by an individual depends on certain observable personal characteristics -- age, sex, education, experience, and so forth -- plus a random disturbance[1]

$$w_i = \alpha_0 + \alpha_1 x_{i1} + \ldots + \alpha_N x_{iN} + v_i \quad . \tag{1.2}$$

$x_{i1} \ldots x_{iN}$ are measurements of the characteristics of individual i; some or all of them may be dummy variables. The application of ordinary least squares to this yields an equation that can be used to calculate an imputed wage for individuals who are not working and for whom a direct wage measurement is not available.[2] The imputed wage is

$$\hat{w}_i = \hat{\alpha}_0 + \hat{\alpha}_1 x_{i1} + \ldots + \hat{\alpha}_N x_{iN} \quad , \tag{1.3}$$

---

[1]Our actual work uses log w_i as the left-hand variable, but the point is the same.

[2]Much the same approach is used by Edward Kalachek and Frederic Raines in a paper for the Commission on Income Maintenance, [2].

where $\hat{\alpha}_0, \ldots, \hat{\alpha}_N$ are the least squares estimates.

In the simple case where w_i and u_i are uncorrelated, ordinary least squares is the appropriate estimator for the structural equation,(1.1),except for the problem that data on wages are missing for some individuals. In this case, the imputed wage can be used in place of the actual wage in a least squares regression. For non-workers, the structural equation becomes[1]

$$(1.4) \qquad L_i = \beta_0 + \beta_1 (\hat{w}_i + v_i) + u_i$$

$$= \beta_0 + \beta_1 \hat{w}_i + z_i \qquad ,$$

where z_i is defined as $u_i + \beta_1 v_i$. Since we have implicitly assumed that u_i and v_i are uncorrelated, the variance of z_i is greater than the variance of u_i, and the appropriate estimator is weighted least squares, with lower weights for observations incorporating the imputed wage.

In the more likely case of negative correlation between w_i and u_i (whether as a characteristic of the labor supply function or because of errors in measuring w_i), the actual wage, w_i, can no longer be included in a least squares regression even when it is available,

[1]In this discussion, we assume that $\hat{w}_i$ is calculated using the true parameters $\alpha_0 \ldots \alpha_N$ rather than the estimates $\hat{\alpha}_0 \ldots \hat{\alpha}_N$. In the practical case where only the estimates are available, the situation is more complicated, but all of our conclusions are valid in the limit as the number of observations becomes large.

without giving rise to bias. Then the obvious instrumental variables estimator involves the use of least squares on the second-stage version of the structural equation,(1.4),for all observations. Although this estimator is consistent, it has a higher variance than the least squares estimator, exactly because z_i has a higher variance than u_i. The choice between the two estimators depends on our prior beliefs about the degree of correlation between w_i and u_i.

For either of the estimators for the labor supply equation just mentioned, the regression of wages on personal characteristics is a necessary first stage. Section 2 of this paper is devoted to discussion of an empirical investigation along these lines. Although the basic motivation for this work is to prepare to estimate labor supply equations, the results are not without interest by themselves.

Measurement of family whole income proceeds by adding non-labor income to the sum of the contribution of each family member to the labor component of whole income. The latter is measured as 2000 hours (or fewer for certain individuals) times the wage rate imputed by the equation of Section 2. The logic of this method of calculating whole income is essentially the same as that for using the imputed wage in place of the actual wage.

Section 4 of the paper discusses the adjustment of wages and whole income to take account of the federal income tax. Section 5 discusses the measurement of hours of work and presents a statistical justification for the use of labor income divided by the imputed wage as a measure of hours.

Finally, Section 6 presents the empirical results in summary and in detail, and gives the results of statistical tests of certain hypotheses. Section 7 interprets these results in terms of the labor supply equations they imply.

2. The Wage Equation

Previous studies of the relation between wages and the characteristics of individuals have focussed on the estimation of an earnings function rather than a wage function. That is, the left-hand variable has been annual earnings rather than the hourly wage.[1] An earnings function is, in effect, a kind of reduced form of the labor supply system. Results from earnings functions are not directly relevant

[1] Research in this area has been reviewed recently by Griliches [1] and Mincer [3].

for our purposes.[1] Previous investigators have been hampered by the lack of data on hourly earnings, and have been forced to adapt their analysis to data on annual earnings, with only fragmentary data on annual hours of work.

The body of data used in the present study is richer in this respect. The SEO reports hourly wage rates (calculated as an average over one week) and a variety of personal characteristics for individuals who worked during the survey week in 1967. Included in our wage study are 8,970 individuals aged 14 or over, living in one of the 12 largest Standard Metropolitan Statistical Areas (SMSA's), and employed at a wage or salary-earning job. The following characteristics were selected for study: sex, race, years of education, residence at age 16, union membership, and health. The composition of the SEO sample is given in Appendix 2.

---

[1]Nor, for that matter, are they appropriate for some of the uses to which they are put. For example, in measuring in the return to education, it is whole income (the hourly wage times the total number of hours available for work or leisure) that should be studied, not labor income.

The choice of functional form in a study of this kind is a difficult one. As a tentative choice, we have adopted the following analysis of variance regression model:

$$(2.1)\qquad \log w_{i,j,k,\ell,m,n,p,q,r} = \kappa_{i,j} + \delta_{i,j,k} + \theta_{i,j,\ell} + \lambda_{i,j,m} + \phi_{i,j,n} + \eta_{i,j,q} + \mu_{i,j,r}$$

where

$i = 1,2$	for white and black
$j = 1,2$	for male and female
$k = 1, \ldots, 9$	for age groups
$\ell = 1, \ldots, 9$	for years of education groups
$m = 1, \ldots, 12$	for SMSA's
$n = 1,2$	for U.S. and foreign residence at age 16
$q = 1,2$	for non-member or member of a union
$r = 1,2$	for no health effect on work or some effect

A full set of interactions is permitted between race, sex, and each of the other characteristics. Within each race-sex group, the effects of the characteristics are assumed to be independent -- the age pattern of wages does not vary over education levels, for example. This is an unduly strong restriction, and future work will attempt to relax it within the limitations of the data. Computationally, the present procedure involves separate regressions for each race-sex group, with dummy variables for each of the other characteristics.

The regression results are given in Table 2-1. The coefficients are the logs of the multiplicative effects of the associated characteristics. For each characteristic, one group was selected as the reference group and its log coefficient constrained to be zero. The other effects are measured relative to the reference group.

The implications of these results are more easily seen by converting the log coefficients to actual wage levels. In Table 2-2 we give hourly wages for various age groups, holding other characteristics constant. These are estimates of the pure age effect on wages. They are stated in terms of the reference group of New York residents with 12 years of education, but exactly the same pattern of wage variation over age would appear if the results were stated in terms of the wages of any other SMSA-education group. This is a consequence of the assumption of independence.

The results in Table 2-2 show striking variations in the age pattern of wages in the different sex-race groups. Whatever the validity of the assumption of independence of the effects of other characteristics, it is clear that the effects of sex, race, and age are

Table 2-1

Regression Results for the Wage Equation

Characteristic	Sex-race Group			
	Male		Female	
	White	Black	White	Black
Constant	1.152 (.025)	.897 (.027)	.820 (.037)	.710 (.028)
Age				
14-15	-.972 (.091)	-.722 (.099)	-.429 (.121)	.028 (.254)
16-17	-.762 (.056)	-.517 (.060)	-.264 (.094)	-.164 (.063)
18-19	-.532 (.046)	-.316 (.042)	-.315 (.054)	-.156 (.045)
20-24	-.263 (.030)	-.092 (.030)	-.094 (.041)	-.066 (.030)
25-34	.000 --	.000 --	.000 --	.000 --
35-44	.118 (.023)	.075 (.022)	.026 (.038)	.013 (.025)
45-54	.162 (.024)	.080 (.023)	.036 (.037)	-.012 (.026)
55-64	.143 (.027)	-.022 (.029)	.015 (.043)	-.105 (.032)
65+	-.075 (.058)	-.097 (.066)	-.201 (.082)	-.205 (.065)

Table 2-1 (continued)

	Male		Female	
	White	Black	White	Black
Years of Education				
0-3	-.380 (.060)	-.187 (.041)	-.252 (.106)	-.358 (.060)
4-6	-.281 (.040)	-.152 (.030)	-.305 (.070)	-.245 (.037)
7-9	-.190 (.024)	-.122 (.023)	-.235 (.037)	-.240 (.024)
10-11	-.092 (.026)	-.093 (.023)	-.131 (.038)	-.177 (.024)
12	.000 --	.000 --	.000 --	.000 --
13-14	.098 (.028)	.106 (.032)	.117 (.038)	.179 (.031)
15	.132 (.050)	.176 (.065)	.154 (.076)	.289 (.086)
16	.385 (.032)	.253 (.051)	.314 (.046)	.541 (.047)
17-20	.320 (.033)	.600 (.062)	.429 (.058)	.780 (.055)

Table 2-1(continued)

	Male		Female	
	White	Black	White	Black
SMSA				
Baltimore	-.094 (.045)	-.079 (.032)	-.047 (.067)	-.224 (.034)
Chicago	-.025 (.029)	.019 (.031)	.014 (.041)	.029 (.034)
Cleveland	-.138 (.046)	.020 (.044)	-.169 (.076)	-.034 (.049)
Detroit	.086 (.034)	.085 (.033)	-.006 (.052)	-.035 (.036)
Houston	-.004 (.049)	-.237 (.037)	-.147 (.075)	-.406 (.039)
Los Angeles	.021 (.024)	.096 (.031)	.042 (.035)	.031 (.033)
New York	.000 --	.000 --	.000 --	.000 --
Philadelphia	-.004 (.032)	-.021 (.034)	-.048 (.050)	-.078 (.036)
Pittsburgh	-.084 (.042)	-.055 (.074)	-.015 (.066)	-.335 (.085)
St. Louis	-.005 (.051)	-.191 (.049)	-.076 (.070)	-.209 (.049)
San Francisco	.099 (.030)	.183 (.039)	.043 (.042)	.085 (.042)
Washington, D.C.	.053 (.037)	.004 (.028)	.082 (.052)	-.046 (.029)

Table 2-1 (concluded)

	Male		Female	
	White	Black	White	Black
Residence at Age 16				
U.S.	.000 --	.000 --	.000 --	.000 --
Foreign	-.146 (.029)	-.032 (.073)	-.094 (.043)	.004 (.074)
Union Membership				
Non-member	.000 --	.000 --	.000 --	.000 --
Member	.082 (.019)	.157 (.017)	.133 (.033)	.068 (.023)
Health				
No effect on work	.000 --	.000 --	.000 --	.000 --
Some effect	-.105 (.031)	-.108 (.029)	-.079 (.048)	-.053 (.029)
Standard error of the regression	.435	.360	.487	.356
Sum of squared residuals	576.049	280.065	427.397	231.776

Table 2-2

Hourly Wages by Age

Age	Male		Female	
	White	Black	White	Black
14-15	$1.20	1.19	1.48	2.09
16-17	1.48	1.46	1.74	1.73
18-19	1.86	1.79	1.66	1.74
20-24	2.43	2.24	2.07	1.90
25-34	3.16	2.45	2.27	2.03
35-44	3.56	2.64	2.33	2.06
45-54	3.72	2.65	2.35	2.01
55-64	3.65	2.40	2.31	1.83
65+	2.93	2.22	1.86	1.66

Explanation: Estimated wages in New York for individuals with 12 years of education. Calculated from Table 2-1 far from independent. The use of single dummies for sex and race would give a seriously distorted view of the differentials in wages by sex and race. For men, the disadvantage suffered by black workers first becomes apparent in the 20-24 age group, and becomes much larger in the groups dominated by heads of families, from ages 25 to 64. The differential by race (which might be loosely described as a measure of the direct and indirect effects of racial discrimination) is least serious for young workers and most serious for older workers. It should be noted that the differential could be more serious in every age group if a different SMSA were chosen for reference. For example, in Houston, wages of black workers are almost 25 percent lower than those of white workers, relative to the situation in New York. This can be seen by comparing the SMSA effects in Table 2-3, below.

Except for teenagers from age 14 to 17, the differential between white females and white males is larger than the differential by race among men. The striking characteristic of the age pattern of wages for women of both races is the failure of wages to rise with age after the early twenties. This is especially pronounced for black females. The proportional differential between white and black females

Table 2-3

Hourly Wages by Metropolitan Area

SMSA	Male		Female	
	White	Black	White	Black
Baltimore	$2.88	2.26	2.17	1.63
Chicago	3.08	2.50	2.30	2.09
Cleveland	2.76	2.50	1.92	2.00
Detroit	3.45	2.67	2.26	1.96
Houston	3.15	1.93	1.96	1.36
Los Angeles	3.23	2.70	2.37	2.10
New York	3.16	2.45	2.27	2.03
Philadelphia	3.15	2.40	2.16	1.88
Pittsburgh	2.91	2.32	2.24	1.46
St. Louis	3.15	2.03	2.10	1.65
San Francisco	3.49	2.94	2.37	2.22
Washington D.C.	3.34	2.46	2.46	1.94

Explanation: Estimated wages for individuals aged 25 to 34 years with 12 years of education. Calculated from Table 2-1.

is substantially smaller than that between white and black males, indicating that black females do not suffer fully from the combined effects of being black (as measured by the differential for males) and of being female (as measured by the differential for whites).

In Table 2-3 we give a recalculation of the results by geographic areas, corrected for geographic variation in other determinants. Variation in wages among metropolitan areas is substantial for all sex-race groups. For white males, wages in the best-paying metropolitan area (San Francisco) are more than 25 percent higher than in the worst-paying (Cleveland). For black males the variation is even greater -- San Francisco is again the highest-paying--but a southern city, Houston, is the lowest. The results seem to suggest that the south's reputation for paying low wages is based mainly on the treatment of blacks; white males are above the New York wage level in St. Louis and Washington, D.C. and just below it in Baltimore and Houston, while black males are below the New York level in all four southern and border cities. The evidence is inconclusive on this point both because the sample does not include a city in the deep south and because union membership, one of the personal characteristics whose influence is adjusted for here, is much less common in the south.

Outside of the south, there is no apparent systematic variation in the race differential for males. For example, the two cities in California, Los Angeles and San Francisco, have very different proportions of black residents, yet their proportional wage differentials are practically identical.

In Table 24 we present a similar calculation of wages by years of education, adjusted for other characteristics. For whites of both sexes, the results show the expected upward trend with increasing years of education, except for the male group with graduate education, which is probably heavily weighted with school teachers. The return to completing college is remarkably high for white males. It should be recognized that to the extent that unmeasured personal characteristics are positively correlated with years of education, these results overstate the actual return to additional education. The remarkable feature of these results is the small increase in wages associated with increased education for black males. Among other causes, this may be related to the lower quality of education received by blacks, although this is not confirmed by the estimates for black females.

Table 2-4

Hourly Wages by Years of Education

Years of Education	Male		Female	
	White	Black	White	Black
0-3	$2.16	2.03	1.77	1.42
4-6	2.39	2.11	1.67	1.59
7-9	2.62	2.17	1.80	1.60
10-11	2.89	2.23	1.99	1.70
12	3.16	2.45	2.27	2.03
13-14	3.49	2.73	2.55	2.43
15	3.61	2.92	2.65	2.72
16	4.65	3.16	3.11	3.50
17-20	4.36	4.47	3.49	4.44

Explanation: Estimated wage in New York for individuals aged 25 to 34 years. Calculated from Table 2-1.

Finally, three remaining characteristics are included at the end of Table 2-1. The first is residence at age 16; foreign residence is associated with 15 percent lower wages for white males and 9 percent lower wages for white females. For blacks, the effect is negligible and statistically insignificant, in accordance with the expectation that the main cost of foreign residence is difficulty with English, and the probability that the small number of blacks of foreign origin came from English-speaking countries. The second characteristic is union membership, which has a substantial positive effect on wages, especially for black males and white females. The union effect is not nearly as large as that found by previous investigators using similar data from the 1960 census. This may be a result of the greater disaggregation of the present sutdy (especially by geographical area, not possible with the 1960 data), or because of the tendency for the union differential to shrink during expansionary periods like 1967. Finally, the third characteristic is personal health. Men who report that problems with their health interfered with their work receive wages 10 percent lower than otherwise; the similar effect for women is between 4 and 7 percent. Of course, the main effect of poor health is probably not so much a reduction in wages as a reduction in hours of work, in many cases to zero.

Although the coefficients of the first-stage regression just presented are almost without exception entirely reasonable, there is still a great deal of variance around the regression model. The standard errors of the four regressions are all between .35 and .50, indicating that the average error in imputing wages on the basis of personal characteristics is between 35 and 50 percent. The warning given in the preliminary section -- that the consistent estimator of the wage elasticity of labor supply, based on imputed rather than observed wages, has a higher variance than the ordinary least squares estimator -- needs to be taken very seriously with the wage equation presented in this section.

3. The Calculation of Whole Income

The whole income of a family is defined as its total non-wage income plus the dollar value of the time of each of its members. In this section we discuss the measurement of these two components of whole income from the SEO data. The following section discusses modifications of these figures to take account of the Federal income tax.

The SEO presents data on family income according to the definitions used in the Current Population Survey. For our purposes we use only the category of unearned income, comprising rental income, interest and dividends, pensions, social security, and other non-wage income. Several adjustments must be made to the reported total of these for our purposes: (i) the imputed value of durable goods must be added; (ii) the treatment of interest receipts and expenditures must be put on a consistent basis; (iii) the interest component of business income must be added.

(i) The value of three kinds of durables are reported in the SEO: owner-occupied homes, other real estate, and automobiles. For most families, these probably account for the greater part of the total value of durable goods, but for poorer families, the omission of the value of clothing and furniture is significant. Imputed income from durables was calculated as 6 percent of the value of real estate plus 12 percent of the value of automobiles, less rental income.

(ii) The CPS definitions treat interest receipts as income but interest payments as part of expenditure. We converted to a net interest income basis by subtracting an estimate of interest payments, calculated as 6 percent of the value of mortgages plus 12 percent of the value of automobile loans plus 15 percent of the value of installment and other credit. For real estate and automobiles this has the effect of reducing the previous imputation to one on the owner's equity, rather than on the total value.

(iii) The interest component of business and farm income was estimated as 33 percent of total business and farm income for each family. Since families with substantial amounts of income from this source were excluded from the study, refinement of this calculation did not seem warranted.

The annual value of each individual's time was calculated as the product of his hourly wage, imputed by the method of section 2, and the number of hours available for work. For most adults a full work year of 2,000 hours was assumed. Individuals in school were assumed to have 500 hours available. Individuals reporting physical disabilities that prevented work or limited their amount of work were assigned potential hours of work between 0 and 2,000 hours according to a formula that took account of the nature and length of the disability.

4. The Federal Income Tax

In principle, we need to take account of all taxes imposed on individual or family income, especially those having rates that vary according to income. Much the most important such tax, however, is the federal personal income tax, and this is the only tax explicitly incorporated in the present study.

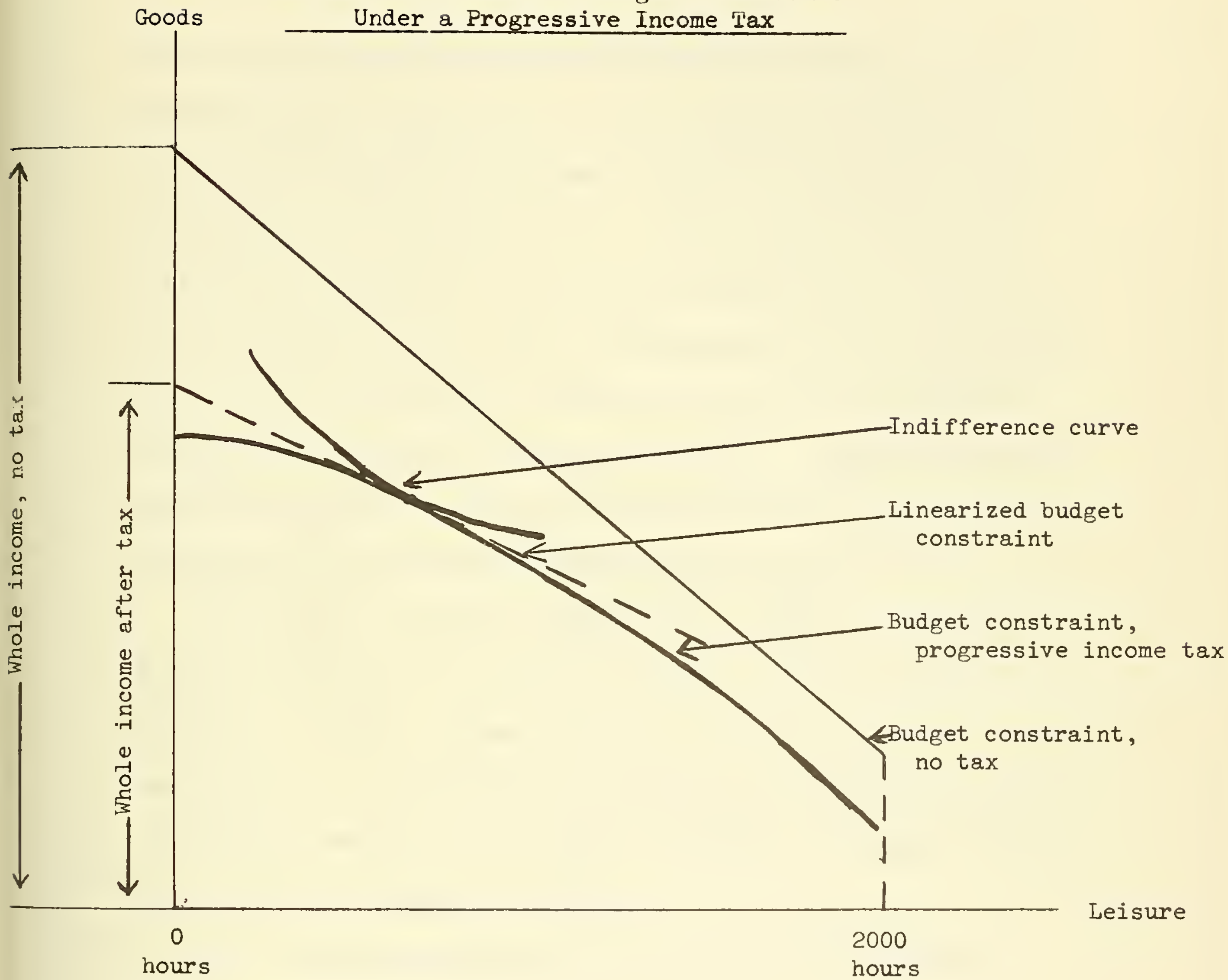
The logic of our approach to the income tax can best be seen in the case of a single individual. We have discussed the behavior of an individual in terms of two parameters of his budget constraint, its slope, as measured by his wage, and its vertical intercept, whole income. Our plan is to develop a method for treating an individual facing an income tax in terms of the same parameters, adjusted for the effect of the tax. The new slope will be the wage after tax, and the new vertical intercept will be whole income after tax. The only obstacle to this treatment is that, under a progressive tax, the slope of the new budget constraint (the wage after tax) is not constant, but declines with increasing hours of work. The after-tax constraint is not a straight line, but is a curve with its concave side toward the origin. Previously we have taken advantage of the fact that any straight-line budget constraint can be described fully in terms of its slope and its vertical intercept. Curving budget constraints do not seem to lend themselves to such an easy characterization.

Our approach, shown in Figure 4-1, is to replace the true, curving budget constraint facing an individual subject to a progressive income tax with a straight line that is tangent to the true constraint at the point of his actual consumption of leisure and goods. We define the individual's whole income after tax as the vertical intercept of this tangent and his wage after tax as the slope of the tangent; the latter is the wage before tax multiflied by one minus the marginal income tax rate at the individual's actual taxable income. The justification for these definitions is the following: Any individual whose indifference curves have the normal curvature (convex to the origin) will behave in the same way whether he faces the curving budget constraint of a progressive tax or a straight-line constraint, provided the latter is tangent to the former at his point of actual consumption under the former. There is no element of approximation in this procedure.

The tangent budget constraint can be thought of as the result of replacing the progressive income tax with a proportional tax on wage income plus a lump-sum tax. In fact, this is the way that the wage rate and whole income are adjusted for the effect of the tax in our empirical work. First, the actual amount of tax and the marginal tax rate are estimated for each individual by a method described below. Second, each individual's imputed wage is adjusted downward by multiplying by one minus the marginal tax rate.

Figure 4-1

Actual and Linearized Budget Constraints
Under a Progressive Income Tax



Third, the lump-sum component of the tax is calculated as the difference between the actual amount of tax paid and the amount that would have been paid if only wage earnings had been taxed but proportionally at the marginal rate. Finally, family whole income after tax is calculated as the sum of potential labor income for each family member (the product of the wage after tax and potential hours) plus family non-wage income less the sum of the lump-sum components of the income tax for each member. This procedure automatically accounts for the fact that some (but by no means all) components of non-wage income are subject to the income tax.

The data in the SEO are adequate for a rough calculation of income tax liability for each individual.[1] The only important component of taxable income omitted altogether is income from capital gains. Information about deductible expenditures, however, is generally lacking, as is complete information on support necessary to assign dependents correctly.

The following assumptions were made in calculating tax liability and tax rates:

1. All married couples living together file jointly
2. Any person with dependents but not filing jointly files as a head of household

---

[1] The author is indebted to Benjamin Okner for advice in this part of the work.

3. All taxpayers use the standard deduction formula
4. Anyone with taxable income over $600 is self-supporting; all other individuals are dependents of their parents or of the head of the family
5. All taxable non-wage income is income of the head of the family, except taxable pension income, which is distributed equally among all family members aged 65 or over.

With these assumptions, we calculated net taxable income for each individual, and looked up his tax liability and marginal tax rate in the tables for the 1966 Federal income tax.

5. The Measurement of Hours of Work

A problem encountered in almost any study of annual hours of work is that a single survey cannot measure individual hours of work over a period as long as a year. No person can recall with any usable accuracy how many hours he has worked in the past year unless he has an unusually regular schedule. As a result, we need to find an indirect approach that makes use of the limited data available to estimate hours of work. In this section we discuss the statistical properties of the natural estimate obtained by dividing annual wage income by our imputed wage rate. We then go on to discuss the difficulties in taking account of unemployment and time spent searching for work in the measurement of total hours of work effort.

We can write down the following system of equations to describe the estimation problem:

$$L_i = F_i + u_i \tag{5.1}$$

$$Y_i = w_i L_i \tag{5.2}$$

$$w_i = \hat{w}_i + v_i \tag{5.3}$$

The first equation is the structural equation for hours worked; F_i is its deterministic part. The second equation is an identity linking wage income, Y_i, the actual wage, w_i, and hours of work. The third equation gives the relation between the actual wage and the imputed wage, $\hat{w}_i$. The actual wage and hours of work are unobserved, so we need to restate the system in terms of an equation involving only the observable quantities Y_i and $\hat{w}_i$ and a random disturbance. An algebraic manipulation gives

$$(5.4) \qquad \frac{Y_i}{\hat{w}_i} = F_i + \nu_i$$

That is, imputed hours of work, $Y_i/\hat{w}_i$, can be written as the sum of the deterministic part of the structural equation and a disturbance, ν_i. The latter is given by

$$(5.5) \qquad \nu_i = u_i + \frac{F_i}{\hat{w}_i} v_i + \frac{1}{\hat{w}_i} u_i v_i$$

If u and v are uncorrelated, and have variances σ_u^2 and σ_v^2 respectively, the variance of ν_i is

$$(5.6) \qquad V(\nu_i) = \frac{\sigma_u^2 \sigma_v^2}{\hat{w}_i^2} \left(\frac{\hat{w}_i^2}{\sigma_v^2} + \frac{F_i^2}{\sigma_u^2} + 1 \right).$$

That is, the variance of the portmanteau disturbance ν_i depends on the inverses of the squared coefficients of variation of w_i and H_i. The variance differs for different observations, and in principle weighted least squares is the appropriate estimator for the parameters of F_i. For the regression results presented later in this paper, however, the ordinary least squares estimator is used. The important point of this discussion is that the use of imputed hours, $Y_i/\hat{w}_i$, as the left-hand variable in the second-stage regression is econometrically defensible, in that equation (5.4) is a true regression function with an additive error.

By no means are all of the obstacles to the satisfactory measurement of hours of work purely statistical. One of the most serious difficulties is in the treatment of time spent searching for work. Since our imputed wage, $\hat{w}$, is estimated on the basis of the wages received by individuals for their hours of actual work, neither it nor the measure of imputed annual hours of work derived from it take account of the time required to find a job. In labor markets that are substantially out of equilibrium on the side of excess supply, this could result in a serious underestimation of the total hours of work (including job search) for groups in the labor force experiencing high rates of unemployment. If hours spent looking for work could be measured directly, this figure could be added to our measure of hours at work to get a more comprehensive measure of labor supply. Even with data vastly more detailed than those available it would be almost impossible to separate hours spent looking for work from those spent enjoying leisure. At its present stage, our work does not include any adjustment for periods of unemployment in measuring the amount of labor supplied by an individual. Fortunately, the year we study, 1966, was one of extraordinarily high employment[1], so the amount of excessive search time induced by excess supply is probably fairly small.

---

[1]The unemployment rate averaged 3.8 percent over the year.

6. Results

Individuals meeting the following criteria were included in the sample:

1. Resident in one of the 12 large metropolitan areas identified in the SEO.
2. Not in school in 1966.
3. No disability in 1966 that limited the amount of work the individual could perform.
4. Not in a family with total self-employment income over $1000 in 1966.
5. Not in a family receiving public assistance.
6. Not a male head of family without a wife.
7. Either white or black.
8. Aged 14 years or older.

All but the last three of these restrictions are substantive. The first limits the sample to a relatively homogeneous urban population for whom precise geographical information is available. The second eliminates the difficulty that hours spent attending school voluntarily should be treated in the same way as hours spent working, but hours in school cannot be measured. It also eliminates 14, 15 and 16 year olds who are subject to a variety of restrictions on their hours of work because of compulsory school attendance. The third restriction is necessary because of the tremendous variety of physical and mental disabilities reported in the data. Hours of work of disabled individuals is properly the subject of a separate study. The fourth restriction is a consequence of the difficulty in separating the capital and labor components of proprietary income, and in allocating the labor component among members of the family. The fifth restriction is in many ways the most serious; it resulted in the exclusion of about 900 families. Again, the study of hours of work of members of families receiving public assistance is a separate project in itself.

The variables used in the analysis are defined as follows:

(i) Annual hours of work. Estimated by dividing annual earnings by the imputed wage. See section 5.

(ii) Position in family. The following seven categories were used:

1. Husband, wife present
2. Wife, husband present
3. Female head of family
4. Son or other male relative, not head of family
5. Daughter or other female relative, not head of family
6. Single man
7. Single woman

(iii) Race, white or black

(iv) Age. The following three categories were used:

1. 14 through 19 years
2. 20 through 59 years
3. 60 years and older

(v) Number of adults (individuals 14 years or older) in family, according to the following four categories:

1. 1 adult
2. 2 adults
3. 3 or 4 adults
4. 5 or more adults

(vi) Children in family. The following categories were used:

1. No children
2. Children of pre-school age only (6 years or younger in March 1967)
3. Children of school age (7 through 13 years) only
4. Children of both ages

(vii) Whole income per adult. Whole income after tax was calculated as described in sections 3 and 4, divided by the number of adults in the family and deflated by the price index given in Appendix 3. The following categories were defined:

1. Less than $3000 per year
2. $3000 or more, but less than $3750
3. $3750 to $4500
4. $4500 to $5500
5. $5500 or more

(viii) Hourly wage. The imputed hourly wage was calculated from the regression equation of section 2, adjusted for the federal income tax as described in section 4, and also deflated by the price index of Appendix 3. The following categories were defined:

1. less than $1.50 per hour
2. $1.50 or more, but less than $1.75
3. $1.75 to $2.00
4. $2.00 to $2.50
5. $2.50 to $3.00
6. $3.00 or more

The reduction of income and wages to categorical variables permits the use of unrestrictive analysis of variance functional specifications that are nonetheless linear in their parameters. For example, by classifying the wage into six categories, we approximate the wage effect by a step function with six steps, each determined by a separate parameter. We avoid the unduly restrictive linear specification implied by the use of the wage itself in a linear regression. This is particularly important in specifying a regression where the left-hand variable, hours of work, is subject to a constraint on its variation -- it cannot become negative.

The argument given in Section 1 in favor of the use of imputed rather than actual wages was presented in terms of the linear regression function that we have just ruled out. In Appendix 1 we discuss the problem of applying the instrumental variables estimator to a structural equation containing a step-function specification. Our results show that a slight blurring of the estimated coefficients will take place in general, but that there will not be any systematic bias in the overall estimates of the wage or income effects. The blurring will be least serious if the coefficients change smoothly from one step to the next.

The first step in the study of hours of work was the preparation of an exhaustive cross-tabulation of average hours of work by all seven characteristics. This is the least restrictive regression model possible -- it permits the wage and income effects to depend on each other and on all five demographic characteristics. The result is a set of several hundred tables, one for each group defined by position in the family, age, race, number of adults in the family, and age of children. In each table, there is a row for each income class and a column for each wage class. Reading across a row, we find the effects of variations in the wage rate on the hours of work of individuals in families in a single whole income class. Since the wages of the individuals themselves enters the calculation of the whole incomes of their families, individuals in the high wage classes toward the right of the tables live in families with less income from other sources than the families of the individuals in the lower wage groups toward the left. This is the Hicksian income compensation discussed in the introduction. It permits us to read the pure substitution effects of wage changes directly from the tables.

Since there are more than ten times as many cells in these tables as there are individuals in the sample, most of the cells in most of the tables are empty. The tables for very small and very large families and other smaller groups are so sparsely filled that they give very little information. For other groups, the unrestricted tabulations are of some interest. Some of the better-populated tables are reproduced in Table 6-1. In each cell we give the average annual hours of work, the standard error of the average,[1] the participation rate, defined as the proportion of the individuals in the cell who worked 40 or more hours in 1966, and the number of individuals, N, in the cell.

The table for white husbands, aged 20 to 59, with wives and pre-school children, illustrates some of the strengths and weaknesses of this kind of study. Classifying by demographic characteristics

---

[1]Defined as $\sqrt{\frac{1}{N(N-1)} \sum_{i=1}^{N} (H_i-\bar{H})^2}$, where N is the number of observations in the cell, $H_1, \ldots, H_N$ are the various observations on hours, and $\bar{H} = \frac{1}{N}\sum_{i=1}^{N} H_i$.

Table 6-1

Unrestricted Cross-Tabulations
Annual Hours of Work by
Income and Wage

Husbands, white, aged 20 to 59, 2 adults and preschool children in family							
Annual whole income per adult		Hourly wage					
		$0.00 to $1.50	$1.50 to $1.75	$1.75 to $2.00	$2.00 to $2.50	$2.50 to $3.00	$3.00 and up
$0 to $3000	Mean Std. Err. Part. Rate Number	1705 (1148) 1.00 3	3446 (312) 1.00 3	2949 (729) 1.00 3	2067 (714) 1.00 2	3040 (406) 1.00 5	0
$3000 to $3750	Mean Std. Err. Part. Rate Number	0	0	2299 (154) 1.00 19	2291 (174) 1.00 28	2619 (640) 1.00 2	2073 (463) 1.00 2
$3750 to $4500	Mean Std. Err. Part. Rate Number	0	1	1643 (711) 1.00 3	2220 (102) 1.00 62	2223 (78) 1.00 74	1993 (282) 1.00 10
$4500 to $5500	Mean Std. Err. Part. Rate Number	0	0	0	1030 (267) 1.00 6	2052 (58) 1.00 89	2210 (70) 1.00 97
$5500 and up	Mean Std. Err. Part. Rate Number	0	0	0	0	1780 (290) 1.00 5	1880 (50) .99 92

Table 6-1

(continued)

Single men, black, aged 20 through 59							
Annual whole income		Hourly wage					
		$0.00 to $1.50	$1.50to $1.75	$1.75 to $2.00	$2.00 to $2.50	$2.50 to $3.00	$3.00 and up
$0 to $3000	Mean Std. Err. Part. Rate Number	0	0	1	0	0	0
$3000 $3750	Mean Std. Err. Part. Rate Number	2475 (45) 1.00 2	1486 (186) 1.00 13	1	0	0	0
$3750 to $4500	Mean Std. Err. Part. Rate Number	0	1	1623 (78) 1.00 37	1212 (153) .95 19	0	0
$4500 to $5500	Mean Std. Err. Part. Rate Number	0	0	1203 (314) .83 6	1547 (72) .97 98	926 (153) 1.00 10	0
$5500 and up	Mean Std. Err. Part. Rate Number	0	0	0	1824 (192) 1.00 18	1655 (102) 1.00 50	1405 (186) .94 16

Table 6-1

(continued)

Wives, white, aged 20 through 59, school-age children only							
Annual whole income per adult		Hourly wage					
		$0.00 to $1.50	$1.50 to $1.75	$1.75 to $2.00	$2.00 to $2.50	$2.50 to $3.00	$3.00 and up
$0 to $3000	Mean Std. Err. Part. Rate Number	1	0	0	0	0	0
$3000 to $3750	Mean Std. Err. Part. Rate Number	172 (121) .15 13	3 (3) .00 5	264 (264) .33 3	1	0	0
$3750 to $4500	Mean Std. Err. Part. Rate Number	105 (57) .25 12	91 (66) .11 18	543 (251) .42 12	1	0	0
$4500 to $5500	Mean Std. Err. Part. Rate Number	0 (0) .00 3	114 (41) .25 36	138 (42) .22 76	398 (158) .57 14	1	0
$5500 and up	Mean Std. Err. Part. Rate Number	0 (0) .00 2	3 (3) .00 13	113 (49) .14 51	229 (98) .19 31	256 (212) .22 9	683 (544) .67 3

Table 6-1

(continued)

Husbands, white, aged 60 and above, 2 adults and no children in family							
Annual whole income per adult		Hourly wage					
		$0.00 to $1.50	$1.50 to $1.75	$1.75 to $2.00	$2.00 to $2.50	$2.50 to $3.00	$3.00 and up
$0 to $3000	Mean Std. Err. Part. Rate Number	 1	2998 (502) 1.00 3	2310 (648) 1.00 4	 1	1955 (94) 1.00 4	 0
$3000 to $3750	Mean Std. Err. Part. Rate Number	2948 (1052) 1.00 2	1204 (952) .50 4	1611 (507) .60 10	1727 (425) .73 11	2844 (678) 1.00 5	 0
$3750 to $4500	Mean Std. Err. Part. Rate Number	593 (593) .50 2	718 (373) .42 12	1691 (310) .71 17	1060 (213) .58 24	1892 (139) 1.00 13	1970 (357) 1.00 5
$4500 to $5500	Mean Std. Err. Part. Rate Number	 1	675 (675) .20 5	221 (122) .14 29	367 (95) .40 45	1585 (207) .84 25	1931 (185) .95 19
$5500 and up	Mean Std. Err. Part. Rate Number	0 (0) .00 2	170 (170) .13 8	716 (347) .24 17	133 (64) .17 48	463 (169) .30 33	1121 (138) .74 46

Table 6-1

(continued)

Sons and other male relatives, white, aged 20 through 59, 3 or 4 adults and no children in family							
Annual whole income per adult		Hourly wage					
		$0.00 to $1.50	$1.50 to $1.75	$1.75 to $2.00	$2.00 to $2.50	$2.50 to $3.00	$3.00 and up
$0 to $3000	Mean Std. Err. Part. Rate Number	 0	 1	1933 (18) 1.00 2	1584 (376) 1.00 3	1651 (195) 1.00 3	1547 (104) 1.00 2
$3000 to $3750	Mean Std. Err. Part. Rate Number	 0	725 (335) .67 6	1948 (171) 1.00 6	1287 (249) 1.00 4	1365 (126) 1.00 4	 0
$3750 to $4500	Mean Std. Err. Part. Rate Number	 0	1052 (137) 1.00 2	 1	1033 (267) .90 10	1227 (274) .88 8	511 (295) .67 3
$4500 to $5500	Mean Std. Err. Part. Rate Number	 0	 0	1723 (350) 1.00 3	1540 (183) 1.00 20	1511 (136) 1.00 20	1049 (195) 1.00 5
$5500 and up	Mean Std. Err. Part. Rate Number	 0	 0	 0	 1	1927 (309) 1.00 6	1010 (152) .86 14

greatly reduces the variation in income and wages.[1] Most members of this highly favored group are in the top three wage and income groups. Further, there is a strong tendency for the observations to fall mainly in the cells along the diagonal of the table -- husbands with high wages have families with large whole incomes. The principal explanation is simply that the husband's wage income is the dominant component of family whole income. The tendency is accentuated by the fact that well-paid men tend to have wives with higher imputed wages, and also tend to have more property income. These are the remaining important components of whole income. In spite of this difficulty, a great deal can be learned from the comparison of adjacent cells when both have reasonably large numbers of observations. The three such comparisons that can be made in this table in the horizontal direction suggest that the substitution effect of wage changes cannot be very strong for this group. In the second income group, hours decline by 8 per year between the third and fourth wage groups. For the third income group, there is an increase of 3 hours per year between the

[1]If we classified by all of the characteristics used in the wage regression of section 2 (used to calculate imputed wages here), there would be no variation in wages and almost none in whole income within each table. This illustrates the order condition for identification -- there must be some variables in the first stage regression that are not in the second stage. Wage and income effects can be identified only if there is something causing them to vary that does not have an independent effect on labor supply. In our study age, education, location, residence at age 16, union membership, and health are sources of such variation.

fourth and fifth wage groups. Only in the fourth income group is there evidence of a noticable positive effect -- between the fifth and sixth wage groups hours rise by 158 per year or approximately one month at 40 hours per week. The evidence in favor of a negative income effect is considerably stronger. In the fourth wage group, hours drop by 71 between the second and third income groups; in the fifth wage group by 171 hours between the third and fourth income groups, and in the sixth wage group by 330 hours between the fourth and fifth income groups.

The results for single people suffer even more from the close association between wages and whole income. The second part of Table 6-1 gives the results for black single men. The wage and income effects that can be discerned from the comparison of adjacent cells are generally of the wrong sign. Reading down the diagonal from the cell in the second wage and second income group, we can see that the perverse wage and income effects cancel, and individuals tend to work 1500 to 1600 hours per year whatever their wage. There is very little evidence of a positive response of hours of work to higher wages.

The results for wives with school-age children, shown in the next page of Table 6-1, suffer much less from correlation between wages and income. The cells below the diagonal are well-populated because many women live in families with a higher whole income per adult than they would have if all members of the family had the same wage as the wife. The table shows that wives generally work rather little, but those with higher wages work substantially more than those with lower wages in the same whole income group. Within a wage group, those with higher incomes work much less than those with lower incomes. These results seem to confirm the general belief that wives are quite sensitive to economic variables in their decisions about working.

Husbands of retirement age are similarly responsive to wages and income, as shown in the next page of Table 6-1. Here, large numbers of individuals appear below the diagonal because they receive income from sources other than work, including income from property, pensions, and so forth.[1]

The last part of Table 6-1 presents results for the rather heterogeneous group of adult sons and other male relatives living in families of which they are not the head. These individuals seem to work substantially less than full time, but it is difficult to discern any systematic differences by wage or income groups. In the more detailed discussion that follows, we will suggest that

---

[1]We treat social security benefits as non-labor income, but do not take account of the implicit tax on wages imposed by the system. Work in progress will attempt to incorporate the tax.

part of the difficulty may arise from the fact that whole income per adult in the complete family may not be the appropriate measure of income for individuals who are not well integrated in the family.

Most of the tables produced in the first phase of the study are subject to random fluctuations that make them difficult to interpret. The logical way to overcome this problem is to use a procedure for averaging the results for related groups. For example, in the case of husbands, we would like to calculate a set of wage effects that represent the average over husbands with children of various ages and with different numbers of relatives living with them. The natural way to carry out this kind of averaging is by estimating the parameters of a regression function in which the effects of some variables are independent of those of others. That is, by excluding interactions, we can interpret the regression coefficients as averages for the corresponding effects. The advantage of this method over the more direct method of calculating marginal effects by summing the rows and columns of the tables is that it takes proper account of the unequal numbers of individuals in the cells.

The extreme application of this method assumes that all effects are independent. Then, for example, the wage effects are averaged over all demographic and income groups. The resulting regression gives a compact summary of the whole study, although a many important differences are obscured. The summary regression is presented in Table 6-2. The reference group in this regression consists of white husbands, aged 20 to 59, with no extra adults and no children, having between \$3750 and \$4500 in whole income per adult (i.e., a family whole income of \$7500 to \$9000 per year) and earning a wage of \$1.75 to \$2.00 per hour, after taxes. The coefficients in the regression measure departures associated with characteristics different from those of the reference group. According to these results, husbands of both races work 1809 hours per year on the average, about 45 weeks at 40 hours per week. As the more detailed results show, the summary regression conceals an important difference between black and white husbands, exactly because of the assumption that the race and sex effects are independent.

No other members of the typical family work as many hours as the husband. Wives work slightly less than half time (884 hours per year) if they have no children, and even less with children. A woman who is the head of her family works about two-thirds time (1406 hours per year) if there is another adult in the family, and works slightly more than a husband if she is the only adult in the family (1825 hours per year). Single men and single women work about three quarters time (1503 and 1434 hours per year, respectively, taking account of the fact that families consisting of single individuals have one rather than two adults). Sons, daughters, and other relatives work 1254 and 1273 hours per year, respectively, if they live in families with only

Table 6-2

Summary Regression

Characteristic	Range or Value	Coefficient and Standard error
Constant	--	1809 (32)
Position in family	Husband	0 -
	Wife	-925 (26)
	Female head	-403 (41)
	Single man	-725 (84)
	Single woman	-794 (85)
	Son or other male relative	-555 (38)
	Daughter or other female relative	-536 (37)
Race	White	0 -
	Black	-3 (17)
Age	14 to 19	-292 (44)
	20 to 59	0 -
	60 and up	-730 (23)

Table 6-2

(continued)

Characteristic	Range or Value	Coefficient and Standard error
Number of adults	1	419 (76)
	2	0 -
	3 or 4	-86 (19)
	5 or more	-174 (35)
Children	None	0 -
	Pre-school age only	-213 (23)
	School age only	-80 (23)
	Both	-207 (23)
Whole income per adult	0 to $3000	233 (26)
	$3000 to $3750	187 (22)
	$3750 to $4500	0 -
	$4500 to $5500	-142 (22)
	$5500 and up	-323 (27)

Table 6-2

(concluded)

Characteristic	Range or Value	Coefficient and Standard error
Imputed hourly wage	\$0.00 to \$1.50	-191 (27)
	\$1.50 to \$1.75	-136 (26)
	\$1.75 to \$2.00	0 -
	\$2.00 to \$2.50	205 (25)
	\$2.50 to \$3.00	361 (30)
	\$3.00 and up	443 (34)

Standard error: 815 hours per year

Number of observations: 12,937

Sum of squared residuals: $.857882 \times 10^{10}$

one other adult (the head), and even less if there are more adults.

The summary results show that there is essentially no difference between the hours of work of blacks and those of whites when averaged in this way. After taking account of the demographic and economic differences between the whites and the blacks in the sample, there is almost no pure race difference. Not only is the estimated difference of three hours per year very small itself, but its standard error of 17 hours per year indicates that the estimate is statistically precise.

The age effects shown in Table 6-2 suggest that teenagers work about 300 hours less per year than individuals aged 20 to 59 with similar characteristics. Most of this time is probably spent in looking for work rather than in enjoying leisure, since teenagers are much more likely than older workers to be new entrants to the labor force. On the other hand, individuals of retirement age work 730 hours less per year.

The presence of additional adults seems to reduce the hours of work of each member of the family. Since the income of the family is measured per adult, the income effects of extra adults are correctly incorporated in the overall income effects only if there is, roughly speaking, constant returns to scale in the family. Our finding of slightly negative effects of increased number of adults might be interpreted as evidence of increasing returns to scale, although our detailed results cast some doubt on that interpretation.

The presence of children, especially those of pre-school age, is associated with a reduction in hours of work. Here the assumption of independence of effects breaks down completely -- the reduction is actually restricted to wives, where it is substantially larger than these results suggest. Husbands, on the other hand, work somewhat longer hours if they have children.

After adjustment for the demographic effects discussed so far, there is evidence of substantial income and wage effects in the summary results. For individuals in the same wage group, those living in families in the lowest income class work 556 hours per year more than those in families in the highest group. The availability of income from sources other than the individual's work, generally from property or from the work of other members of the family, discourages work on the part of the individual. On the other hand, within the same income class, individuals in the highest wage group work 634 hours per year more than those in the lowest wage group. In general, the better qualified individuals in an income group work longer hours. However, as we have seen in the unrestricted cross-tabulations and will see again in the detailed regressions, the income and wage effects vary enormously by age and family position. Most of the response to wages found in the summary results is contributed by wives and workers of retirement age. The summary results should not be interpreted as evidence of strong wage effects in every group in the labor force.

Our next step is to present detailed regression results for various groups in the labor force. The logic of these regressions is the same as that for the summary regression -- to smooth the results by imposing conditions of independence of certain effects -- but our application of this principle is less ruthless than previously. We allow a full set of interactions between sex, race and family position and all of the economic and other demographic characteristics. That is, separate regressions are presented for each group defined by sex, race, and family position, except in the case of teenagers, who are separated by race and sex only. For each group, we have chosen a specification that permits certain interactions (for example, between the age and wage effects) and excludes other interactions. In particular, we have assumed that the income and wage effects are independent in every group. Since this assumption is at best an approximation valid over a restricted range of incomes and wages, we have eliminated all families whose whole incomes exceed $5500 per adult per year and all individuals whose imputed wage exceeds $3.00 per hour. The latter exclusion is particularly important for white husbands.

Results for the detailed regressions appear in Table 6-3. Each box contains a regression coefficient and its standard error. Coefficients that are normalized at zero have a dash in place of the

Table 6-3

Detailed Regressions for

Annual Hours of Work

A. Husbands, White

Constant 2024
(74)

Age	Whole Income			
	0 to 3000	3000 to 3750	3750 to 4500	4500 to 5500
20 to 59	447 (158)	131 (93)	0 -	-212 (74)
60 and up	-502 (212)	-411 (162)	-887 (135)	-1593 (122)

Age	Wage				
	$0.00 to $1.50	$1.50 to $1.75	$1.75 to $2.00	$2.00 to $2.50	$2.50 to $3.00
20 to 59	-209 (403)	-54 (279)	83 (127)	0 -	62 (65)
60 and up	-177 (284)	-234 (174)	18 (126)	0 -	967 (127)

Table 6-3
(continued)

Number of adults	Whole Income			
	0 to 3000	3000 to 3750	3750 to 4500	4500 to 5500
2	0 -	0 -	0 -	0 -
3 or 4	-418 (168)	32 (107)	-84 (97)	78 (129)
5 or more	-781 (215)	-281 (203)	-100 (307)	112 (495)

Children			
None	Preschool only	School age only	Both
0 -	122 (67)	232 (79)	262 (76)

Standard error: 852 hours per year

Number of observations: 1397

Sum of squared residuals: $.993442 \times 10^9$

Table 6-3
(continued)

B. Husbands, Black				
Constant 1775 (49)				
Age	Whole Income			
	0 to 3000	3000 to 3750	3750 to 4500	4500 to 5500
20 to 59	171 (79)	60 (55)	0 -	-105 (74)
60 and up	55 (132)	57 (134)	-600 (130)	-812 (157)

Age	Wage				
	$0.00 to $1.50	$1.50 to $1.75	$1.75 to $2.00	$2.00 to $2.50	$2.50 to $3.00
20 to 59	611 (390)	-121 (119)	-55 (60)	0 -	-162 (44)
60 and up	-1093 (152)	-928 (136)	-773 (132)	0 -	93 (254)

Table 6-3
(continued)

Number of adults	Whole Income			
	0 to 3000	3000 to 3750	3750 to 4500	4500 to 5500
2	0 -	0 -	0 -	0 -
3 or 4	64 (81)	95 (70)	64 (89)	-22 (173)
5 or more	42 (104)	570 (163)	211 (475)	-

Children			
None	Preschool only	School age only	Both
0 -	72 (50)	179 (54)	224 (50)

Standard error: 668 hours per year

Number of observations: 1504

Sum of squared residuals: $.660367 \times 10^9$

Table 6-3
(continued)

C. Wives, White					
Constant 1050 (61)					
Age	Whole Income				
	0 to 3000	3000 to 3750	3750 to 4500	4500 to 5500	
20 to 59	266 (106)	336 (69)	0 -	-181 (49)	
60 and up	-159 (204)	-209 (218)	-509 (170)	-521 (160)	
Age	Wage				
	$0.00 to $1.50	$1.50 to $1.75	$1.75 to $2.00	$2.00 to $2.50	$2.50 to $3.00
20 to 59	-647 (77)	-303 (64)	0 -	515 (69)	504 (125)
60 and up	-473 (155)	-170 (191)	0 -	616 (266)	470 (522)

Table 6-3
(continued)

Number of adults	Whole Income			
	0 to 3000	3000 to 3750	3750 to 4500	4500 to 5500
2	0 -	0 -	0 -	0 -
3 or 4	-253 (115)	-425 (74)	-245 (58)	-202 (61)
5 or more	-372 (143)	-609 (121)	-459 (168)	-223 (270)

Children	Wage				
	$0.00 to $1.50	$1.50 to $1.75	$1.75 to $2.00	$2.00 to $2.50	$2.50 to $3.00
None	0 -	0 -	0 -	0 -	0 -
Preschool only	-243 (101)	-455 (74)	-594 (73)	-754 (116)	11 (422)
School age only	13 (121)	-118 (77)	-467 (75)	-594 (93)	-27 (251)
Both	-286 (119)	-486 (85)	-663 (77)	-939 (132)	-534 (371)

Standard error: 701 hours per year

Number of observations: 2251

Sum of squared residuals: $.108634 \times 10^{10}$

Table 6-3
(continued)

D. Wives, Black					
Constant 1402 (121)					
Age	Whole Income				
	0 to 3000	3000 to 3750	3750 to 4500	4500 to 5500	
20 to 59	299 (94)	253 (69)	0 -	-387 (87)	
60 and up	-989 (907)	-945 (908)	-1402 (879)	-1572 (914)	
Age	Wage				
	$0.00 to $1.50	$1.50 to $1.75	$1.75 to $2.00	$2.00 to $2.50	$2.50 to $3.00
20 to 59	-630 (126)	-310 (138)	0 -	-189 (241)	416 (265)
60 and up	217 (886)	387 (912)	0 -	265 (1019)	-250 (1252)

Table 6-3
(continued)

Number of adults	Whole Income			
	0 to 3000	3000 to 3750	3750 to 4500	4500 to 5500
2	0 -	0 -	0 -	0 -
3 or 4	-154 (100)	-71 (90)	-	264 (205)
5 or more	-319 (130)	-423 (168)	629 (397)	-

Children	Wage				
	$0.00 to $1.50	$1.50 to $1.75	$1.75 to $2.00	$2.00 to $2.50	$2.50 to $3.00
None	0 -	0 -	0 -	0 -	0 -
Preschool only	-447 (92)	-418 (112)	-366 (182)	-347 (291)	-773 (458)
School age only	-177 (93)	-235 (132)	-252 (209)	158 (297)	-223 (345)
Both	-322 (84)	-556 (114)	-489 (189)	-734 (279)	-1695 (915)

Standard error: 871 hours per year

Number of observations: 1560

Sum of squared residuals: $.115549 \times 10^{10}$

Table 6-3
(continued)

E. Female Heads of Families, White

Constant 1540
(221)

Whole Income			
0 to 3000	3000 to 3750	3750 to 4500	4500 to 5500
295 (270)	0 -	-123 (237)	-25 (274)

Wage				
$0.00 to $1.50	$1.50 to $1.75	$1.75 to $2.00	$2.00 to $2.50	$2.50 to $3.00
442 (513)	-451 (278)	0 -	124 (210)	835 (542)

Number of Adults			
1	2	3 or 4	5 or more
-	0 -	-189 (193)	-500 (522)

Children			
None	Preschool only	School age only	Both
0 -	-363 (435)	-316 (233)	-817 (415)

Standard error: 972 hours per year

Number of observations: 123

Sum of squared residuals: $.103877 \times 10^9$

Table 6-3
(continued)

F. Female Heads of Families, Black

Constant 1547
(192)

Whole Income			
0 to 3000	3000 to 3750	3750 to 4500	4500 to 5500
233 (130)	0 -	-183 (190)	511 (320)

Wage				
$0.00 to $1.50	$1.50 to $1.75	$1.75 to $2.00	$2.00 to $2.50	$2.50 to $3.00
138 (169)	-259 (170)	0 -	32 (27)	289 (324)

Number of Adults			
1	2	3 or 4	5 or more
-1295 (892)	0 -	9 (117)	20 (257)

Children			
None	Preschool only	School age only	Both
0 -	-623 (230)	-316 (138)	-662 (189)

Standard error: 860 hours per year

Number of observations: 259

Sum of squared residuals: $.181391 \times 10^9$

Table 6-3
(continued)

G. Single Men, White
(Income and Wage Effects)

Constant 1975
(224)

Age	Income			
	0 to 3000	3000 to 3750	3750 to 4500	4500 to 5500
20 to 59	1059 (855)	0 -	0 -	938 (255)
60 and up	-	173 (705)	-1303 (559)	-1765 (322)

Age	Wage				
	$0.00 to $1.50	$1.50 to $1.75	$1.75 to $2.00	$2.00 to $2.50	$2.50 to $3.00
20 to 50	-2168 (940)	-648 (405)	0 -	-1007 (271)	-2096 (412)
60 and up	2094 (912)	-42 (402)	0 -	764 (333)	396 (790)

Standard error: 755 hours per year

Number of observations: 87

Sum of squared residuals: $.416247 \times 10^8$

Table 6-3
(continued)

A. Single Men, White (Income effects for 60 and above only)					
Constant 2263 (225)					
Income (for individuals aged 60 and above)					
0 to 3000	3000 to 3750	3750 to 4500	4500 to 5500		
-	-116 (753)	-159 (594)	-2053 (336)		
Age	Wage				
	\$0.00 to \$1.50	\$1.50 to \$1.75	\$1.75 to \$2.00	\$2.00 to \$2.50	\$2.50 to \$3.00
20 to 59	-1397 (464)	-936 (427)	0 -	-671 (274)	-1430 (380)
60 and up	2094 (980)	-42 (432)	0 -	764 (358)	396 (849)

Standard error: 811 hours per year

Number of observations: 87

Table 6-3
(continued)

I. Single Men, Black
(Income and Wage Effects)

Constant 1541
(111)

Age	Income			
	0 to 3000	3000 to 3750	3750 to 4500	4500 to 5500
20 to 59	-622 (723)	-206 (518)	0 -	151 (156)
60 and up	-	729 (337)	-322 (232)	-551 (245)

Age	Wage				
	$0.00 to $1.50	$1.50 to $1.75	$1.75 to $2.00	$2.00 to $2.50	$2.50 to $3.00
20 to 59	1140 (723)	142 (518)	0 -	-175 (167)	-766 (284)
60 and up	-881 (329)	-945 (248)	0 -	523 (270)	-

Standard error: 715 hours per year

Number of observations: 253

Sum of squared residuals: $.122132 \times 10^9$

Table 6-3
(continued)

J. Single Men, Black (Income effects for ages 60 and above only)
Constant 1543 (106)

Income (for individuals aged 60 and over)			
0 to 3000	3000 to 3750	3750 to 4500	4500 to 5500
-	727 (335)	-324 (230)	-553 (243)

Age	Wage				
	$0.00 to $1.50	$1.50 to $1.75	$1.75 to $2.00	$2.00 to $2.50	$2.50 to $3.00
20 to 59	932 (515)	-51 (218)	0 -	-50 (125)	-617 (249)
60 and up	-881 (328)	-945 (247)	0 -	523 (269)	-

Standard error: 713 hours per year

Number of observations: 253

Table 6-3
(continued)

K. Single Women, White (Income effects for ages 60 and over only)					
Constant 1858 (109)					
Income (for individuals aged 60 and over)					
0 to 3000	3000 to 3750	3750 to 4500	4500 to 5500		
-1193 (306)	-1202 (237)	-1270 (211)	-1305 (212)		
Age	Wage				
	$0.00 to $1.50	$1.50 to $1.75	$1.75 to $2.00	$2.00 to $2.50	$2.50 to $3.00
20 to 59	-480 (309)	-354 (183)	0 -	-370 (138)	-894 (292)
60 and up	-299 (183)	51 (211)	0 -	677 (359)	-

Standard error: 765 hours per year

Number of observations: 411

Table 6-3
(continued)

L. Single Women, Black
(Income effects for ages 60 and over only)

Constant 1373
(140)

Income
(for individuals aged 60 and over)

0 to 3000	3000 to 3750	3750 to 4500	4500 to 5500
297 (533)	-210 (512)	-513 (516)	-807 (524)

Age	Wage				
	$0.00 to $1.50	$1.50 to $1.75	$1.75 to $2.00	$2.00 to $2.50	$2.50 to $3.00
20 to 59	212 (158)	104 (181)	0 -	163 (242)	-
60 and up	-525 (487)	-714 (556)	0 -	-318 (960)	-

Standard error:

Number of observations: 312

Table 6-3
(continued)

M. Sons and Other Male Relatives, White				
Constant 1927 (223)				
Age	Whole Income			
	0 to 3000	3000 to 3750	3750 to 4500	4500 to 5500
20 to 59	75 (201)	-31 (171)	0 -	67 (152)
60 and up	-1161 (449)	-2152 (642)	-1568 (342)	-1722 (313)

Age	Wage				
	$0.00 to $1.50	$1.50 to $1.75	$1.75 to $2.00	$2.00 to $2.50	$2.50 to $3.00
20 to 59	423 (575)	-645 (236)	0 -	-429 (182)	-372 (180)
60 and up	-205 (792)	644 (472)	0 -	224 (304)	640 (461)

Table 6-3
(continued)

Number of Adults		
2	3 or 4	5 or more
0 -	-140 (161)	-119 (205)

Children			
None	Preschool only	School age only	Both
0 -	631 (387)	-265 (169)	16 (245)

Standard error: 740 hours per year

Number of observations: 204

Sum of squared residuals: $.100102 \times 10^9$

Table 6-3
(continued)

N. Sons and Other Male Relatives, Black				
Constant 1454 (173)				

Age	Whole Income			
	0 to 3000	3000 to 3750	3750 to 4500	4500 to 5500
20 to 59	-82 (144)	-148 (141)	0 -	-11 (218)
60 and up	-601 (698)	-878 (392)	-607 (418)	-1422 (588)

Age	Wage				
	$0.00 to $1.50	$1.50 to $1.75	$1.75 to $2.00	$2.00 to $2.50	$2.50 to $3.00
20 to 59	286 (513)	-272 (211)	0 -	-178 (122)	-567 (176)
60 and up	-	-667 (548)	0 -	102 (453)	-

Table 6-3
(continued)

Number of Adults		
2	3 or 4	5 or more
0 -	301 (140)	127 (166)

Children			
None	Preschool only	School age only	Both
0 -	20 (232)	-327 (162)	-97 (195)

Standard error: 705 hours per year

Number of observations: 213

Sum of squared residuals: $.965331 \times 10^8$

Table 6-3
(continued)

P. Daughters and Other Female Relatives, White				
Constant 1418 (163)				
Age	Whole Income			
	0 to 3000	3000 to 3750	3750 to 4500	4500 to 5500
20 to 59	-215 (197)	95 (140)	0 -	19 (133)
60 and up	-501 (423)	-88 (371)	-453 (343)	-467 (354)

Age	Wage				
	$0.00 to $1.50	$1.50 to $1.75	$1.75 to $2.00	$2.00 to $2.50	$2.50 to $3.00
20 to 59	-571 (232)	-90 (161)	0 -	-85 (119)	44 (301)
60 and up	-992 (328)	-586 (367)	0 -	197 (504)	-

Table 6-3
(continued)

Number of Adults		
2	3 or 4	5 or more
0 -	85 (130)	82 (163)

Children			
None	Preschool only	School age only	Both
0 -	-593 (218)	-199 (134)	-333 (198)

Standard error: 750 hours per year

Number of observations: 331

Sum of squared residuals: $.174886 \times 10^9$

Table 6-3
(continued)

Q. Daughters and Other Female Relatives, Black				
Constant: 1199 (187)				
Age	Whole Income			
	0 to 3000	3000 to 3750	3750 to 4500	4500 to 5500
20 to 59	-133 (171)	-57 (166)	0 -	-152 (287)
60 and up	-899 (690)	-857 (715)	-940 (731)	-1241 (687)

Age	Wage				
	$0.00 to $1.50	$1.50 to $1.75	$1.75 to $2.00	$2.00 to $2.50	$2.50 to $3.00
20 to 59	279 (159)	393 (166)	0 -	122 (227)	779 (451)
60 and up	9 (673)	246 (765)	0 -	-	171 (1076)

Table 6-3
(continued)

Number of Adults		
2	3 or 4	5 or more
0 -	-128 (127)	-73 (161)

Children			
None	Preschool only	School age only	Both
0 -	-251 (193)	-61 (139)	-293 (172)

Standard error: 845 hours per year

Number of observations: 323

Sum of squared residuals: $.216395 \times 10^9$

Table 6-3
(continued)

R. Male Teenagers, White			
Constant 926 (219)			

Whole Income			
0 to 3000	3000 to 3750	3750 to 4500	4500 to 5500
-4 (236)	6 (206)	0 -	131 (268)

Wage				
\$0.00 to \$1.50	\$1.50 to \$1.75	\$1.75 to \$2.00	\$2.00 to \$2.50	\$2.50 to \$3.00
0 -	303 (198)	-74 (268)	220 (302)	-

Position in family	Children			
	None	Preschool only	School age only	Both
Husband	1080 (630)	1326 (878)	-	-
Single	253 (335)	-	-	-
Relative	0 -	-255 (292)	-251 (196)	-143 (239)

Standard error: 839

Number of observations: 128

Sum of squared residuals: $.787490 \times 10^8$

Table 6-3
(continued)

S. Male Teenagers, Black			
Constant 941 (179)			
Whole Income			
0 to 3000	3000 to 3750	3750 to 4500	4500 to 5500
-373 (171)	-86 (178)	0 -	57 (229)

Wage				
$0.00 to $1.50	$1.50 to $1.75	$1.75 to $2.00	$2.00 to $2.50	$2.50 to $3.00
0 -	-59 (142)	130 (190)	245 (235)	-

Position in family	Children			
	None	Preschool only	School age only	Both
Husband	-	1190 (367)	-	-
Single	891 (335)	-	-	-
Relative	0 -	365 (212)	123 (156)	220 (164)

Standard error: 774 hours per year

Number of observations: 174

Sum of squared residuals: $.970015 \times 10^8$

Table 6-3
(continued)

T. Female Teenagers, White				
Constant 969 (212)				
Whole Income				
0 to 3000	3000 to 3750	3750 to 4500	4500 to 5500	
-80 (242)	-138 (209)	0 -	-248 (349)	
Wage				
$0.00 to $1.50	$1.50 to $1.75	$1.75 to $2.00	$2.00 to $2.50	$2.50 to $3.00
0 -	360 (194)	918 (409)	45 (577)	-
Position in family	Children			
	None	Preschool only	School age only	Both
Wife	-29 (269)	-600 (246)	-	-
Single	1076 (623)	-	-	-
Relative	0 -	-436 (316)	317 (233)	-167 (302)

Standard error: 834 hours per year

Number of observations: 119

Sum of squared residuals: $.736713 \times 10^8$

Table 6-3
(continued)

U. Female Teenagers, Black

Constant 543
(202)

Whole Income			
0 to 3000	3000 to 3750	3750 to 4500	4500 to 5500
35 (196)	125 (190)	0 -	-319 (289)

Wage				
$0.00 to $1.50	$1.50 to $1.75	$1.75 to $2.00	$2.00 to $2.50	$2.50 to $3.00
0 -	-157 (159)	407 (279)	335 (369)	-138 (841)

Position in family	Children			
	None	Preschool only	School age only	Both
Wife	-388 (346)	-309 (191)	-	-688 (790)
Single	203 (411)	-	-	-
Relative	0 -	295 (198)	285 (169)	140 (208)

Standard error: 773 hours per year

Number of observations: 179

Sum of squared residuals: $.978969 \times 10^{8}$

Table 6-4

F-Statistics for the Hypothesis
of No Differences Between
Races

Family Position	F-Statistic	Degrees of Freedom		Critical F, 5 % Level
		Numerator	Denominator	
Husbands	7.27	26	2848	1.50
Wives	5.53	37	3735	1.36
Female Heads of families	0.55	13	355	1.73
Single men	2.99	14	312	1.70
Single women	1.67	14	694	1.70
Male relatives	1.40	19	377	1.59
Female relatives	1.36	19	614	1.59
Male teenagers	1.06	12	277	1.75
Female teenagers	2.25	13	270	1.73

Table 6-5

F-Statistics for the Hypothesis of No Wage Effects

family position, age	White				Black			
	F-Statistic	Num. d.f.	Denom. d.f.	Critical F, 5% level	F-Statistic	Num. d.f.	Denom. d.f.	Critical F, 5% level
Husbands, 20 to 59	0.41	4	1370	2.37	4.17	4	1478	2.37
Husbands, 60 and up	19.93	4	1370	2.37	20.94	4	1478	2.37
Wives, 20 to 59	21.93	16	2212	1.65	5.63	15	1523	1.67
Wives, 60 and up		4	2212	2.37	0.16	4	1523	2.37
Female heads of families, 20 to 59	1.88	4	110	2.45	2.74	4	245	2.37
Men, single, 20 to 59	9.07	3	73	2.76	2.78	4	239	2.37
Men, single, 60 and up	3.03	4	73	2.53	9.90	4	239	2.37
Women, single, 20 to 59	5.76	4	396	2.37	0.39	3	298	2.60
Women, single, 60 and up	5.14	3	396	2.60	0.57	3	298	2.60
Male relatives, 20 to 59	2.77	4	183	2.37	2.87	4	194	2.37
Male relatives, 60 and up	0.78	4	183	2.37	0.98	2	194	3.00
Female relatives, 20 to 59	1.58	4	311	2.37	1.95	4	303	2.37
Female relatives, 60 and up	6.30	3	311	2.60	0.09	3	303	2.60
Male teenagers	1.00	3	115	2.68	0.68	3	162	2.60
Female teenagers	2.42	3	106	2.68	1.21	4	164	2.37

standard error, and coefficients that could not be estimated because of lack of data are replaced by a dash. In discussing the results, we will refer occasionally to Table 6-4, which presents results for statistical tests comparing blacks and whites of the same sex and family position, and to Table 6-5, which presents the results of tests of the null hypothesis that there are no wage effects.

Our first results are for husbands. The specification for this group permits interactions between income and age effects, between wage and age effects, and between the effects of income and the number of adults in the family. It also has independent effects for the presence and age of children. Results for white husbands are given in Table 6-3A. These results for all members of the group confirm the impression given by the cross-tabulation of the subset of the group of age 20 to 59 having two adults and children of pre-school age only given previously in Table 6-1 -- income and wage effects are present and have the expected sign, but they are not very strong. The hypothesis that wage effects are absent for the 20-59 age group cannot be rejected. The evidence on this point is fairly good, in that the standard errors for the wage effects in the third and fifth wage groups are small (very few white husbands appear in the first two groups). For husbands of retirement age, the income and wage effects are much stronger. A man of 60 or over, earning \$2.00 to \$2.50 per hour after taxes, with a wife but no children living with him, works 1613 hours per year (essentially full time) if the whole income of his family is $6000 to $7500 per year, but only 431 hours per year if the whole income is $9000 to $11000. The wage effects are equally strong; the hypothesis of their absense is overwhelmingly rejected,with an F-statistic of 19.9.

The presence of additional adults in the family reduces the hours of work of the husband in all but the highest income group. Our discussion of this observation anticipates the results of Table 6-3B showing exactly the opposite effect for black husbands. We have suggested previously that our use of whole income per adult overstates the true income correction for extra adults if there are increasing returns to scale in running a family. The main difficulty with this explanation is that it does nothing to rationalize our finding of opposite effects for the two races. Part of the differential by race might be explained as follows: There is evidence in the results for relatives that they are not really included in the family decision-making process. If so, the inclusion of the income of low-paid relatives would tend to cause the husband to be classified in too low an income group. In accord with our results, this effect would be strongest in the lowest income group. Moreover, white husbands are more likely than black husbands to be much better paid than their relatives, as our results of Section 2 demonstrate.

The bias on this account would be substantially stronger for whites than for blacks, suggesting at least part of the explanation of the different effects by race.

For both races, the presence of children of school age has a larger stimulus to their father's hours of work than does the presence of children of pre-school age. This suggests that older children are more expensive but require less of their fathers' time.

Results for black husbands are presented in Table 6-3B. The striking feature of these results is that black husbands seem to work substantially fewer hours per year than do white husbands. In the reference group, blacks work 249 hours per year less than whites, more than six weeks less at 40 hours per week. This difference is not just a statistical fluctuation -- the hypothesis that blacks and whites have the same coefficients in every cell is rejected decisively. The higher unemployment rate suffered by blacks explains only a fraction of the difference. As we will show later, black wives work longer hours than do white wives, and in fact almost exactly counterbalance the shorter hours of their husbands. For this reason, no aggregate difference between the races appeared in the summary regression.

Income effects are present for black husbands in the 20 to 59 age group, but are only about half as strong as are those for white husbands. As a result, the difference between the hours of work of whites and blacks is largest in the lowest income group and smallest in the highest group. The wage effects for the 20 to 59 age group are relatively small and of the expected sign in the second, third and fourth wage groups, but the effect in the highest group is negative with a sufficiently small standard error to rule out the possibility that it is a random fluctuation (the perverse effect in the first group probably is random, on the other hand). There is no obvious explanation for this peculiar finding.

Black husbands of retirement age show a sensitivity to income and wages that is comparable to that of white husbands, although they generally work several hundred hours per year less than whites in similar circumstances.

Results for wives are presented in Tables 6-3C and 6-3D. The specification for this group is the same as for husbands except that interactions are permitted between the wage effects and the effects of the presence and age of children. White wives in the reference group without children work almost exactly half time (1050 hours per year). Black wives in the same income-wage group work almost 9 weeks per year more (1402 hours per year), not a great deal less than their husbands work. The income effects for white wives are roughly the same as for their husbands, and for black wives are considerably stronger than for their husbands.

Black and white wives show approximately the same negative response in hours of work to the presence of additional adults in the family. For wives with children one might expect that extra adults would stimulate hours of work by helping with the care of the children. However, in families with both children and extra adults, the latter are predominantly teenagers who are still in school and are unavailable most of the day.

Our discussion of the effects of wages and the presence of children will be carried out in terms of the figures in Table 6-6, which were calculated by adding the constant, the wage effects for the 20 to 59 age group and the wage effects for each age-of-children group, all taken from Tables 6-3C and 6-3D. Thus Table 6-6 gives the estimated hours of work for wives aged 20 to 59 in families with no extra adults and with whole incomes of \$7500 to \$9000 per year. Black wives work longer hours in almost every cell, and the null hypothesis that wives of the two races have the same coefficients is rejected very strongly. The presence of children reduces hours of work in almost every race-wage group. There do not seem to be important differences in the wage effects by age of children or by race, although of course the general level is higher if the only children are of school age. For both races, the overall wage effects are

Table 6-6

Hours of Work for Wives
by Wage Group and
Age of Children

	Children	Wage				
		$0.00 to $1.50	$1.50 to $1.75	$1.75 to $2.00	$2.00 to $2.50	$2.50 to $3.00
Black	None	772	1092	1402	1313	1818
	Pre-school only	325	674	1036	966	1045
	School age only	595	857	1150	1471	1595
	Both	450	536	913	579	123
White	None	403	986	1050	1565	1554
	Pre-school only	160	531	456	811	1565
	School age only	416	868	583	971	1527
	Both	117	500	387	626	1020

strongly positive, and the hypotheses of no wage effects are clearly rejected in both cases.[1]

Our next results, shown in Tables 6-3E and 6-3F, are for women who are heads of their families. These results are seriously incomplete because of the exclusion of families receiving public assistance; very few women with young children and low incomes remain in the sample after this exclusion. The remarkable feature of the results is the similarity between the hours of work of female heads and of wives, after taking account of differences in incomes. White female heads in the reference group with one extra adult and no children work 1540 hours per year, compared to 1386 hours per year for wives in the same income group. For blacks, female heads work slightly less, 1547 hours per year, than do comparable wives, 1655 hours per year. For both races, the pattern of negative income effects and positive wage effects found for wives is repeated, although the effects are subject to a great deal more sampling variation, so that the hypothesis of no wage effects is barely rejected for blacks and falls short of rejection for whites. In contrast to our finding for wives, there is no apparent tendency for blacks to work longer hours than whites; the null hypothesis that female heads of families of both races have the same coefficients is nowhere near rejected.

---

[1]The null hypothesis is that all of the wage-age coefficients are zero for the 20-59 age group, and all of the wage effects are the same within each age-of-children group.

Our results for single individuals, presented in Tables 6-3G through 6-3L, suffer in most cases from an inability to separate income and wage effects in the 20 to 59 age group where almost all income is from earnings. Our original specification had independent effects for income and wages separately for the two age groups. Results for this specification are given for men in Tables 6-3G and 6-3I. These results are sufficiently implausible (income effects are positive and wage effects negative) to force a retreat to a specification that excludes income effects for the younger age group. This specification, used for both men and women, requires a rather different interpretation of the wage effects -- they include the income as well as the substitution effects of wage changes. The wage effects trace out the conventional labor supply curve. For men in the 20 to 59 age group, Tables 6-3H and 6-3J suggest rather strongly that the labor supply curves for both races bend backward, at least for higher wage groups. White single men in the third wage group work slightly more than full time (2263 hours per year), but in the highest wage group they work less than half time (833 hours per year). Whites in the lowest wage group also work less than half time. Black single men work substantially less in the third wage group (1543 hours per year) but slightly more in the highest wage group (926 hours per year), and substantially more in the lowest wage group (2475 hours per year). The hypothesis that the two races have the same coefficients is rejected. In all four age-race groups for single men, the hypothesis of no wage effects is rejected. Income and wage effects for men of retirement age are similar to those found for husbands.

Results for single women are presented in Tables 6-3K and 6-3L. White single women in the 20 to 59 age group are remarkably similar to white single men, showing the same positive response to wages in the lower wage groups and a negative response in the higher groups. In all wage groups except the third, white women work roughly the same number of hours as men. The hypothesis of no wage effects for white single women is clearly rejected. Black single women, on the other hand, show very little variation in hours of work by wage groups, and the hypothesis of no wage effects cannot be rejected. They tend to work about three-quarters time in every wage group.

Our next results, in Tables 6-3M, 6-3N, 6-3P and 6-3Q, are for the heterogeneous group of adult relatives who are not heads of the families in which they live. This group includes grown sons and daughters living with their parents, parents living with their sons or daughters, and brothers, sisters, aunts, uncles, cousins, grandparents, and grandsons and granddaughters of the heads of the families. In this group the wages of individuals are not closely associated with the incomes of the families in which they live, so there is no econometric obstacle to separating the wage and income effects.

What we find in all four sex-race groups, however, are very weak income effects and wage effects that resemble those for single individuals in that they are frequently negative rather than positive. We have already mentioned a conjecture that would explain this peculiar finding: relatives may not be sufficiently integrated in the families with thom they reside to show much sensitivity to the families' incomes. If so, and the role of relatives is more like that of paying boarders, then the proper measure of income for these regressions is the whole income of the individual, not that of the family. Exclusion of the proper measure of income has the same effect as in the case of single individuals -- the wage effects include both the substitution effects and the competing income effects, and may be negative rather than positive. This conjecture could be tested by including the whole income of individuals in the regressions, but unfortunately data on non-wage income are collected at the level of the family and cannot be allocated reliably among its members.

The results for relatives are sufficiently similar to those for single individuals that detailed discussion is not required. Comparison of all four race-sex groups in all of the wage categories suggests that there are no substantial differences between them in the overall level of hours of work; most individuals work about 1500 hours per year. The test for differences between races do not contradict this conclusion. The presence of children in the family is associated with a substantial reduction in the hours of work of female relatives, presumably because they help care for the children without a formal arrangement for receiving wages.

Our last results are for teenagers, Tables 6-3R, 6-3S, 6-3T and 6-3U. They are grouped together by age rather than by family position because teenagers seem to have characteristics in the labor market very different from similar individuals only a few years older. Our results for teenagers are necessarily fragmentary because of the exclusion of all those who attended school at any time in 1966.

For teenagers, as for relatives, income effects are absent or of the wrong sign. The estimates of the wage effects are rather irregular, but only white women show an unmistakably positive response to higher wages. The striking feature of the results is how little teenagers work when they are living with their parents, as most are. White males work less than half time (926 hours per year) if there are no children 13 years or younger in their families, and even less if there are children. Black males living with their parents work slightly longer (941 hours per year) without children, and even more if there are children. White females also work just under half time (969 hours per year), but they work considerably less if their parents also have children of pre-school age. Black females work only about one quarter time (543 hours per year) when no children are present, but work longer than white females when there are preschool children.

Emancipated teenagers living as single individuals tend to work more than those living with their parents especially black males and white females, who work essentially full time. For men, marriage is associated with at least full time work, while for women, it is associated with a drop in hours of work.

7. Labor Supply Functions

Underlying our results of section 6 is the basic hypothesis that individuals are essentially identical except for the characteristics that we measure. In order to interpret the wage coefficients in our regressions as the substitution effects appropriate for predicting the response of a particular individual to a change in his wage, we must assume that the observations on the hours of work of low and high-wage workers that determine the coefficients were obtained from individuals with identical preferences. The need for this assumption is the fundamental limitation of research with data from a cross section. The results of the study are not without interest if the assumption fails. We have, in fact, been careful to phrase our interpretations of the results in such a way that they do not always depend on the validity of the assumption. The statement that among single individuals, those with high wages work about as many hours as those with low wages, for example, is not the same as the statement that the wage elasticity of single workers is approximately zero. The first statement is roughly verified by our results, but the second is a questionable inference from them.

With this warning, we will present a summary of our results in terms of the labor supply functions they imply under the assumptions that preferences for leisure are not systematically related to wage rates in our sample population. In Figures 7-1A to 7-1HH we present labor supply curves for the various demographic groups in the study. These curves are calculated by linear interpolation of the wage and income effects of Table 6-3. For each group except single individuals, the supply curves are drawn. One, labeled <u>compensated</u>, incorporates the income compensation discussed in the introduction. As the wage increases, other sources of income decrease to maintain the same level of whole income. The other, labeled <u>uncompensated</u>, holds the sources of income constant; it is the conventional labor supply curve. As the wage increases, whole income increases. The theory of the consumer suggests that the compensated supply curve will always slope upward, and that the uncompensated curve will probably be steeper. These expectations are generally fulfilled in our results.

Representative values were chosen for the level of whole income used in calculating the compensated curve and for the level of other income used in calculating the uncompensated curve. These values, together with the wage where the two curves intersect, appear in Table 7-1.

Table 7-1

Levels of Income for Figure 7-1

Group	Whole Income per Adult	Other Income per Adult	Wage at Intersection
Husbands	4000	2000	2.00
Wives	4000	2500	1.50
Female heads of families	3000	1000	1.50
Single individuals, 20-59	----	0	----
Single individuals, 60+	4500	500	2.00
Relatives	3500	2000	1.50
Teenagers	3500	2000	1.50

Figure 7-1

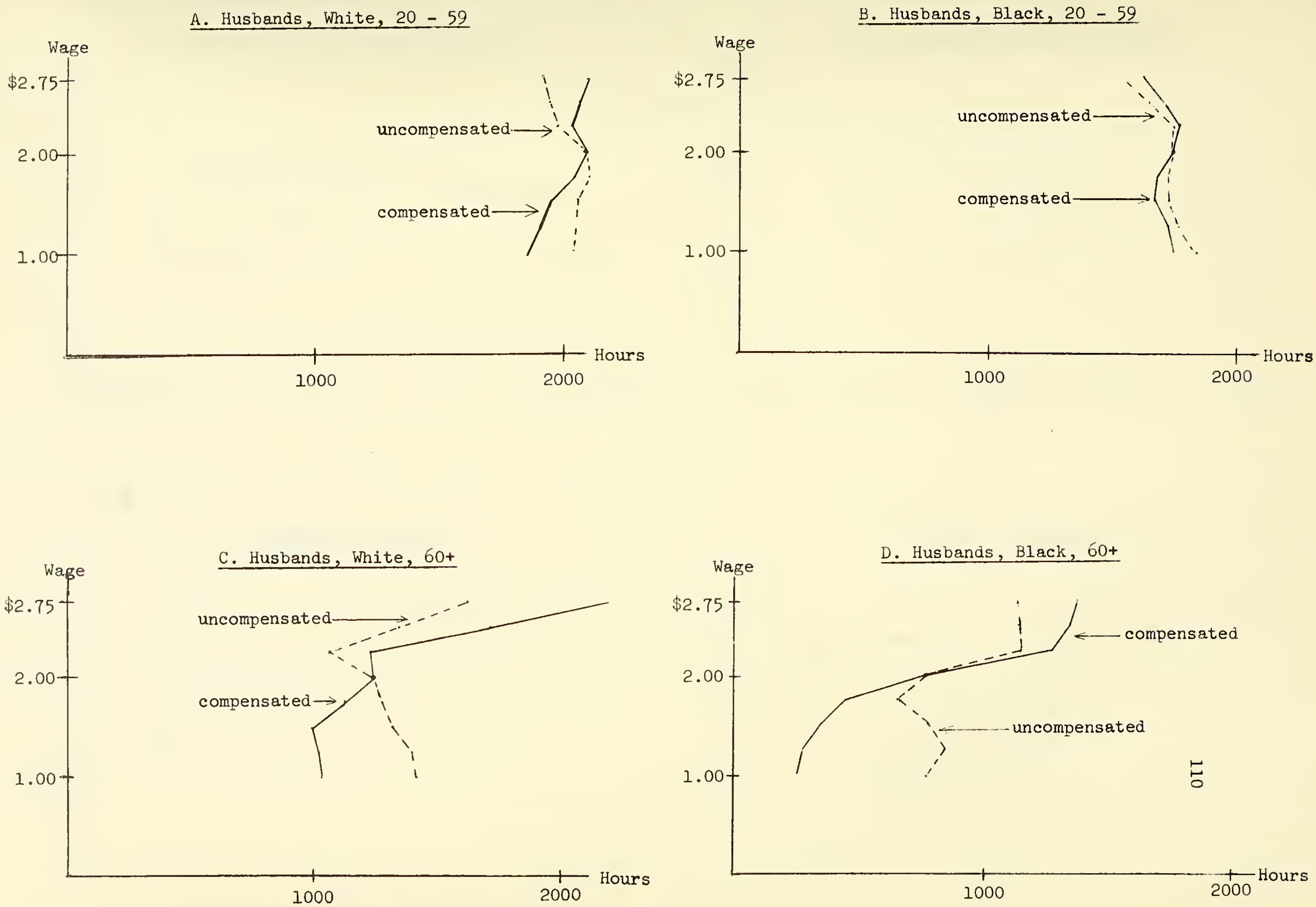

A. Husbands, White, 20 - 59
Wage
$2.75
2.00
1.00
uncompensated
compensated
1000
2000
Hours
B. Husbands, Black, 20 - 59
Wage
$2.75
2.00
1.00
uncompensated
compensated
1000
2000
Hours
C. Husbands, White, 60+
Wage
$2.75
2.00
1.00
uncompensated
compensated
1000
2000
Hours
D. Husbands, Black, 60+
Wage
$2.75
2.00
1.00
compensated
uncompensated
1000
2000
Hours

Figure 7-1 (con'd)

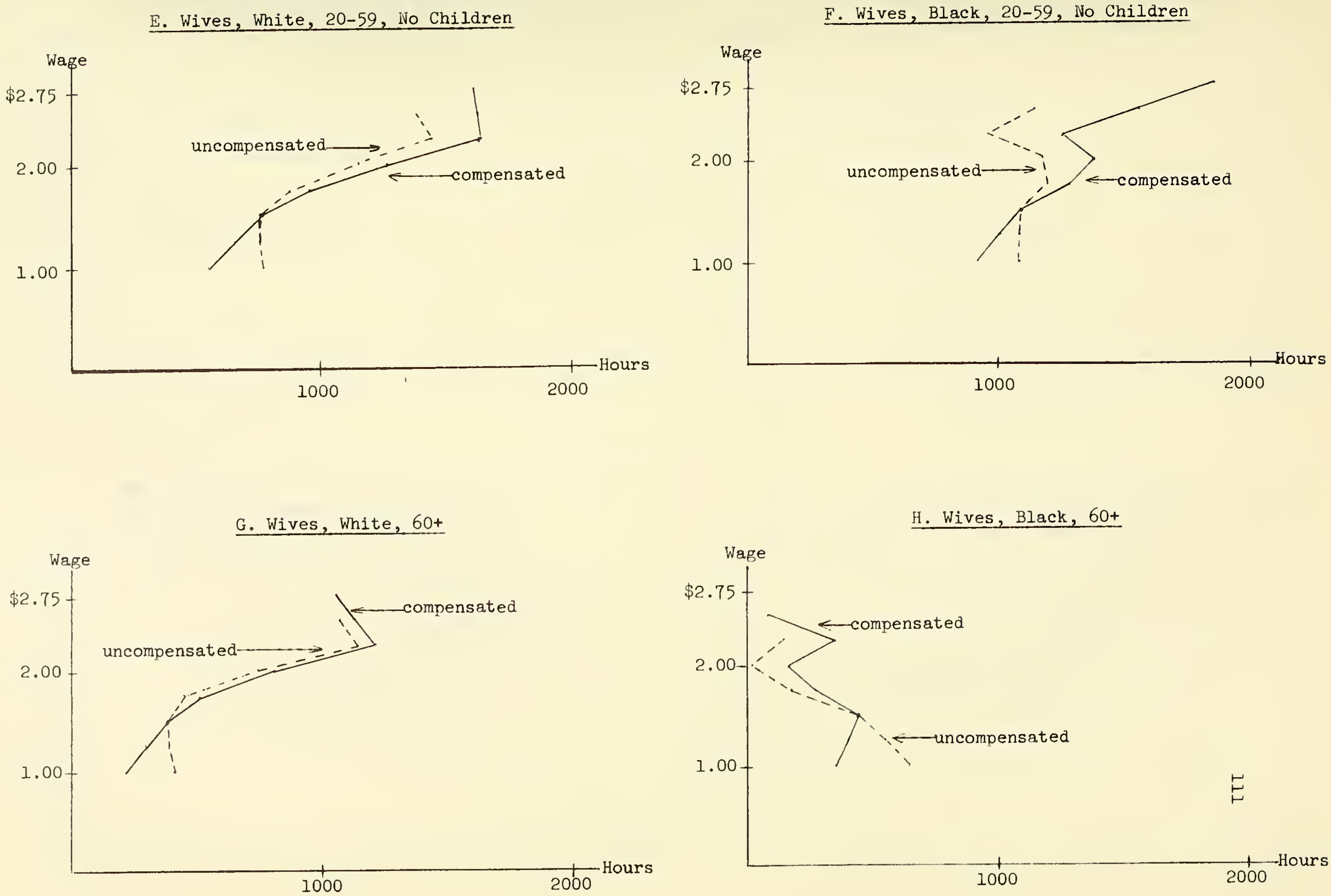
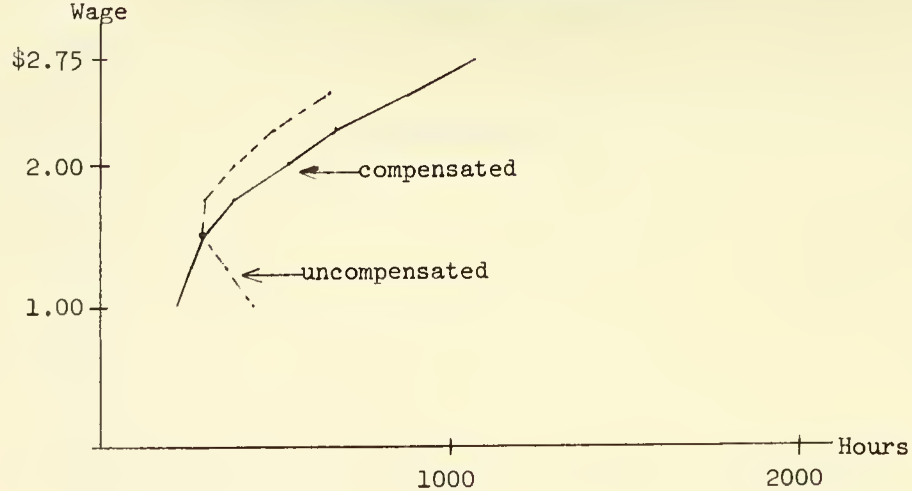
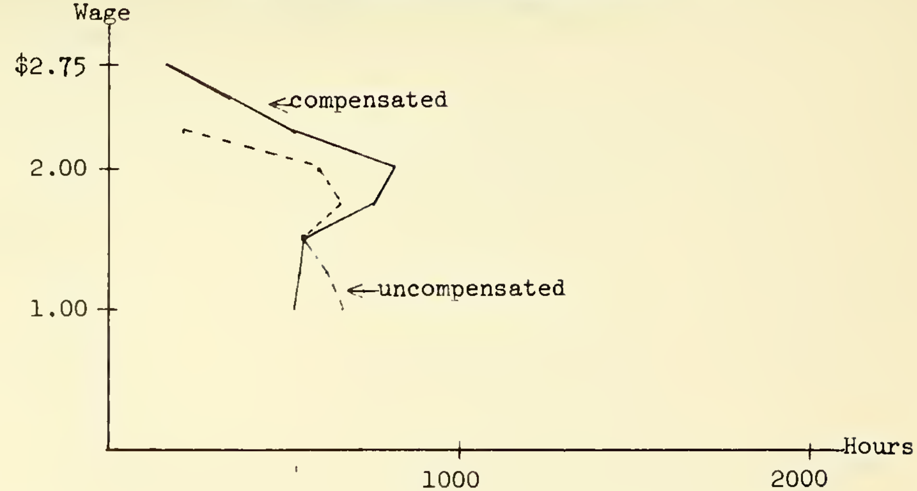


Figure 7-1 (con'd)

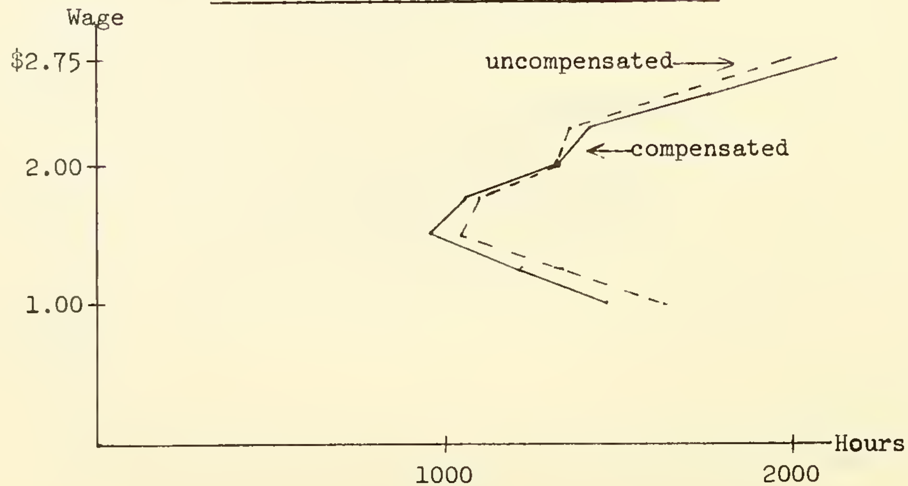
I. Wives, White, 20-59, Pre-School and School-Age Children



J. Wives, Black, 20-59, Pre-School and School-Age Children



K. Female Heads of Families, White, School-Age Children



L. Female Heads of Families, Black, School-Age Children

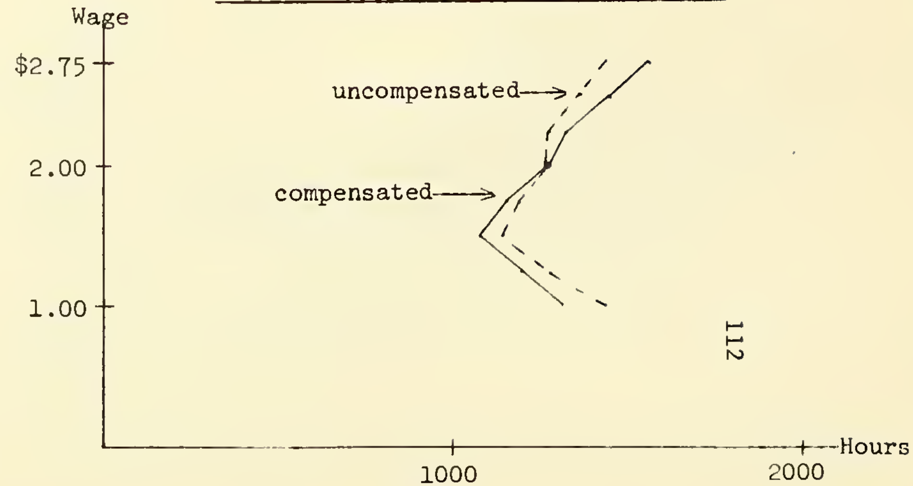
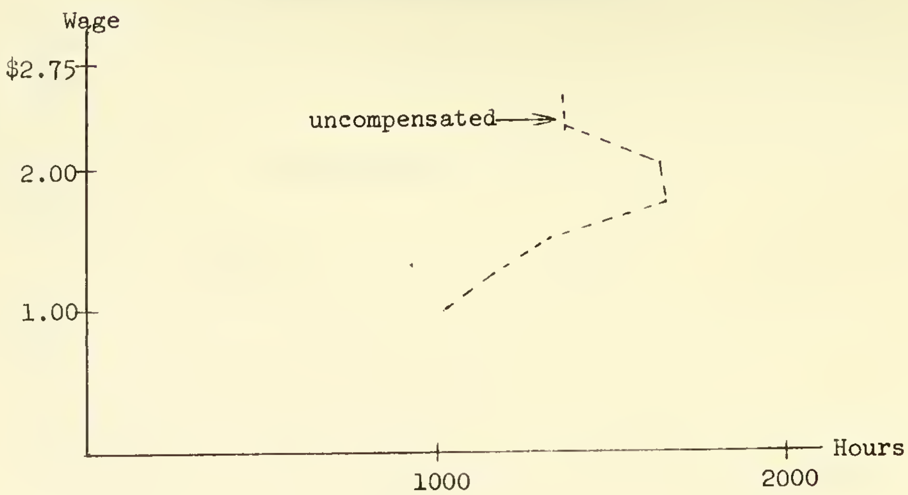
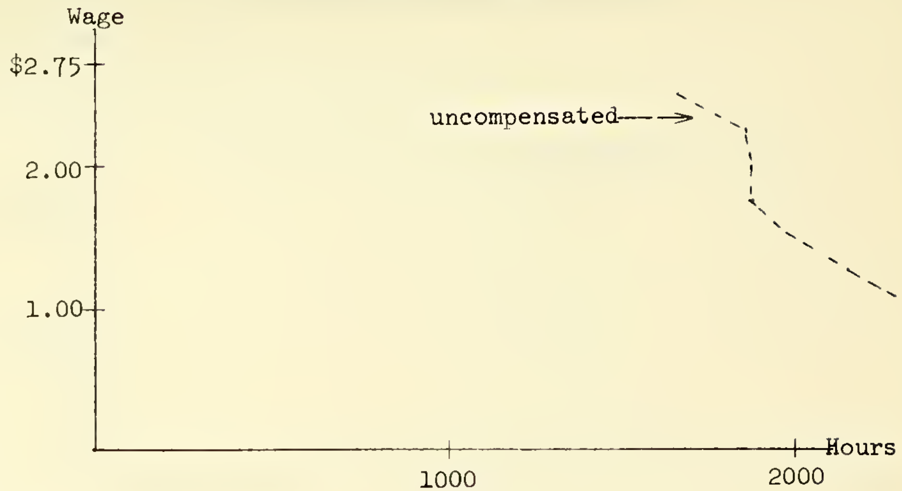


Figure 7-1 (con'd)

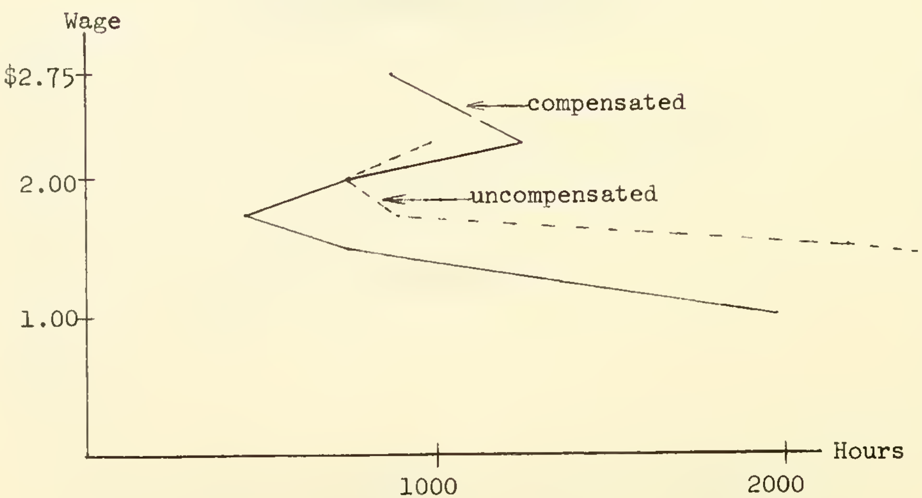
M. Single Men, White, 20-59



N. Single Men, Black, 20-59



P. Single Men, White, 60+



Q. Single Men, Black, 60+

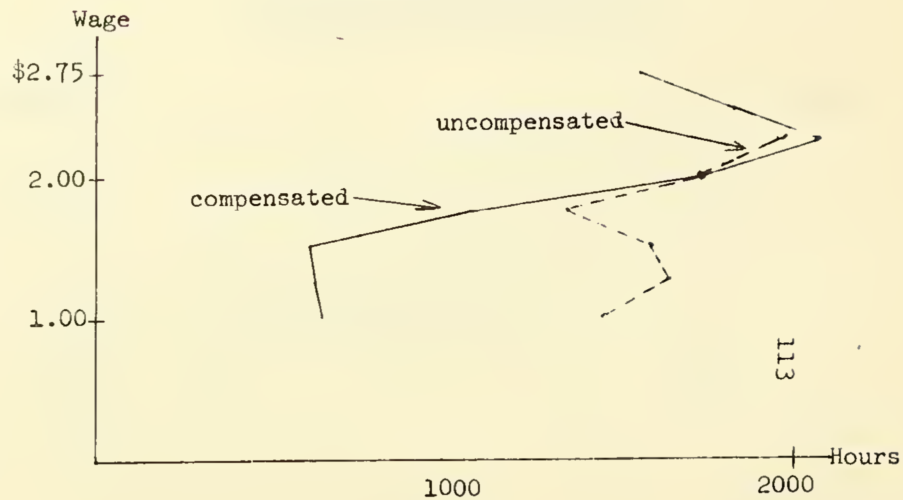
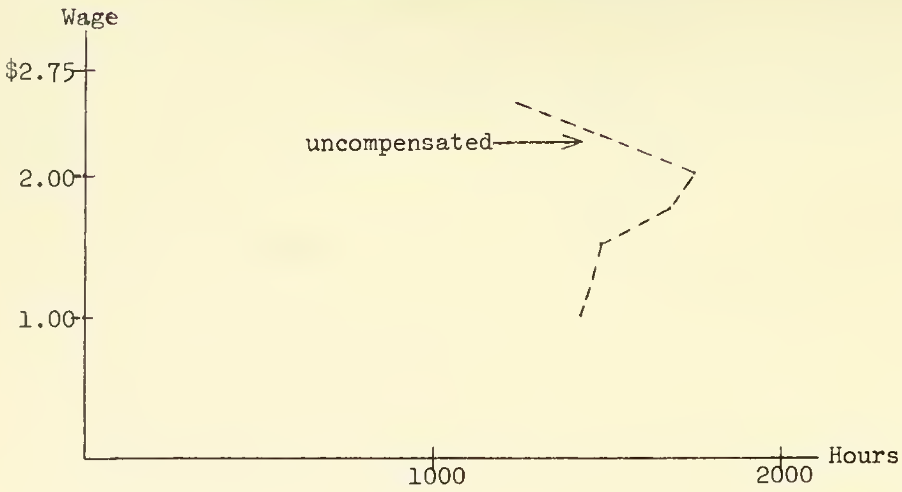
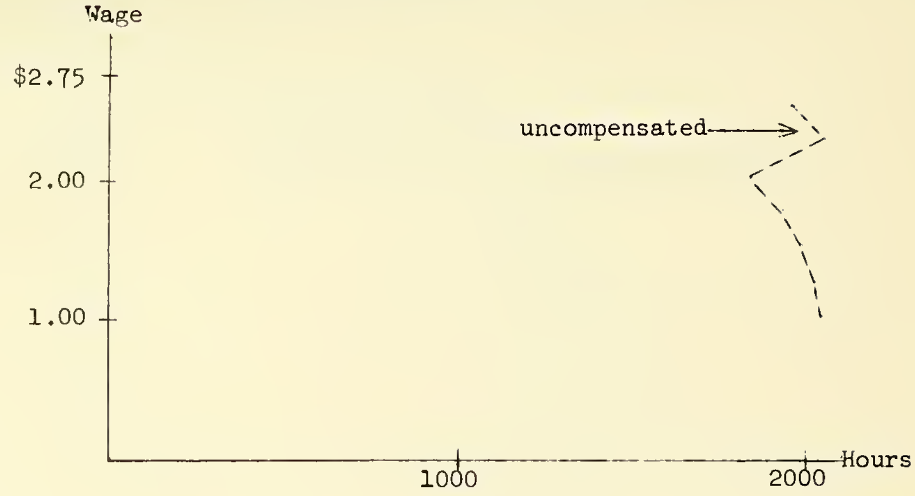


Figure 7-1 (con'd)

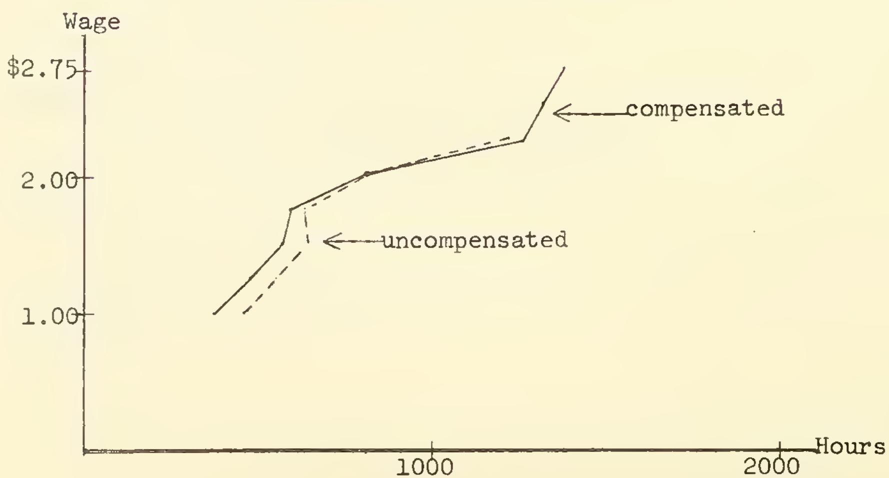
R. Single Women, White, 20-59



S. Single Women, Black, 20-59



T. Single Women, White, 60+



U. Single Women, Black, 60+

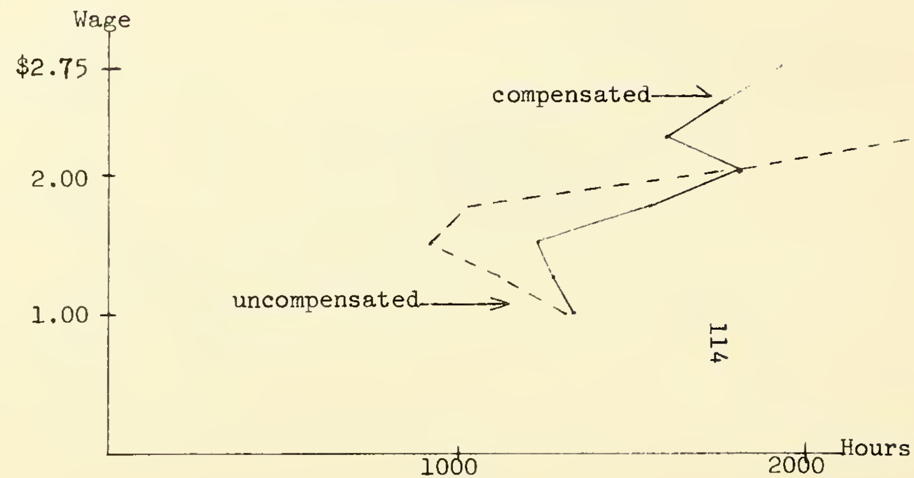
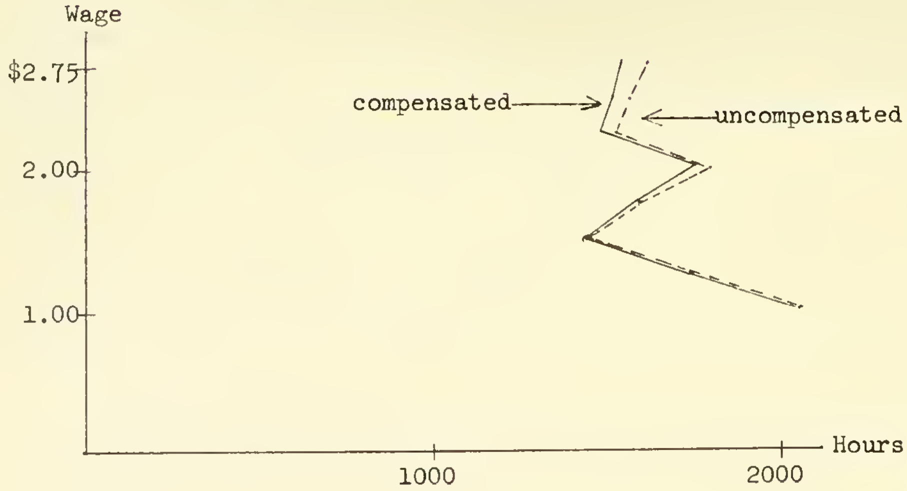
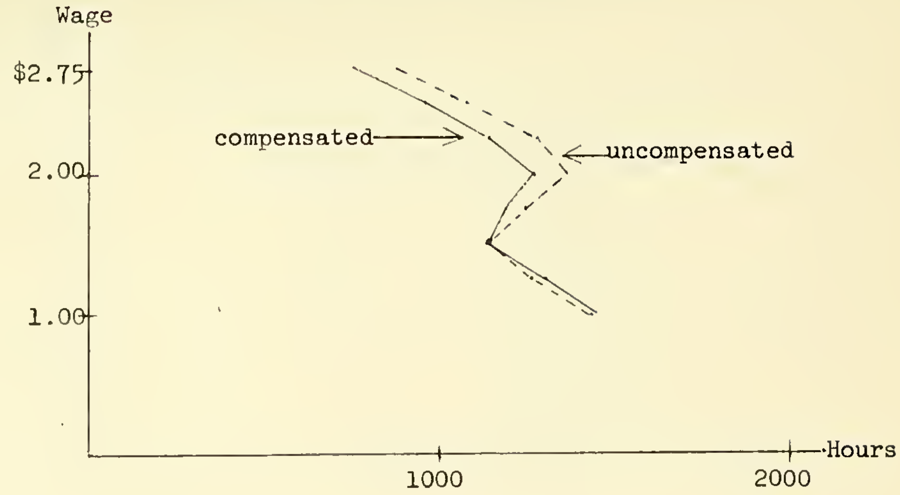


Figure 7-1 (con'd)

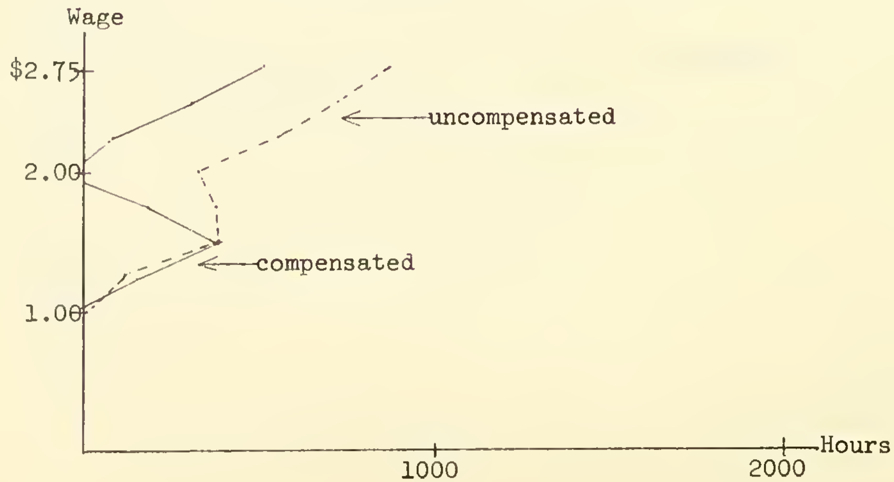
V. Male Relatives, White, 20-59



W. Male Relatives, Black, 20-59



X. Male Relatives, White, 60+



Y. Male Relatives, Black, 60+

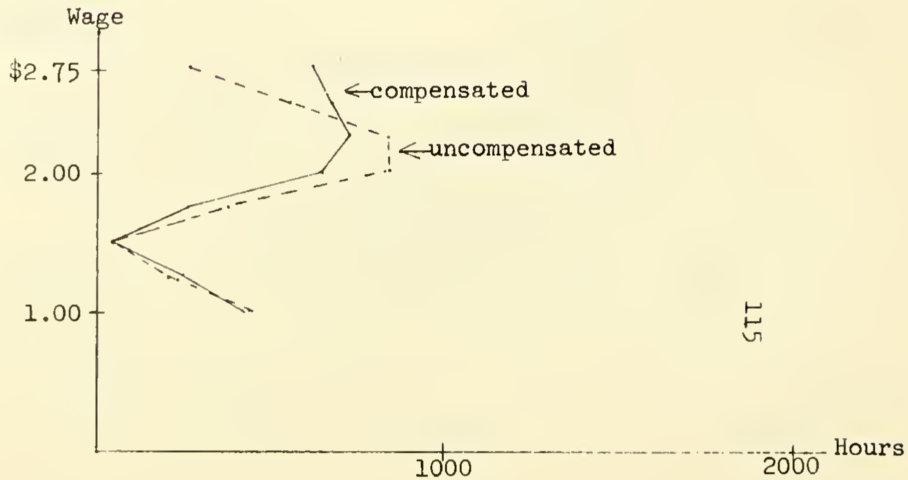
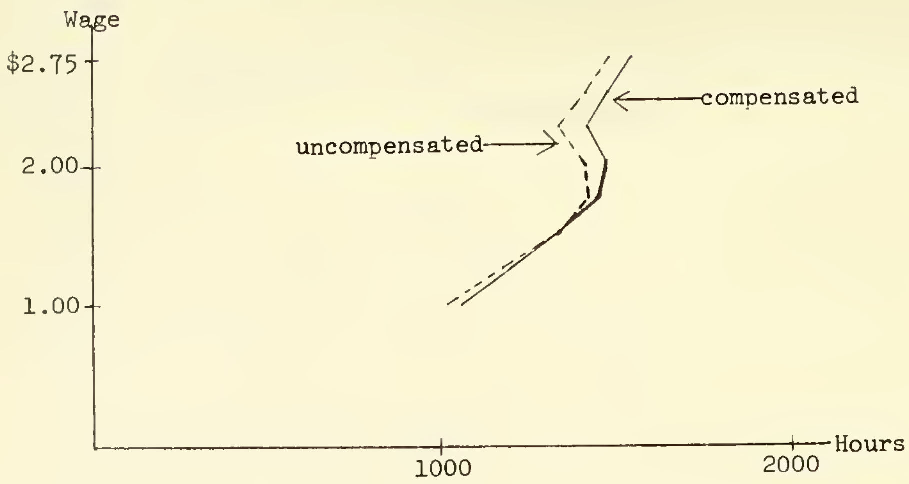
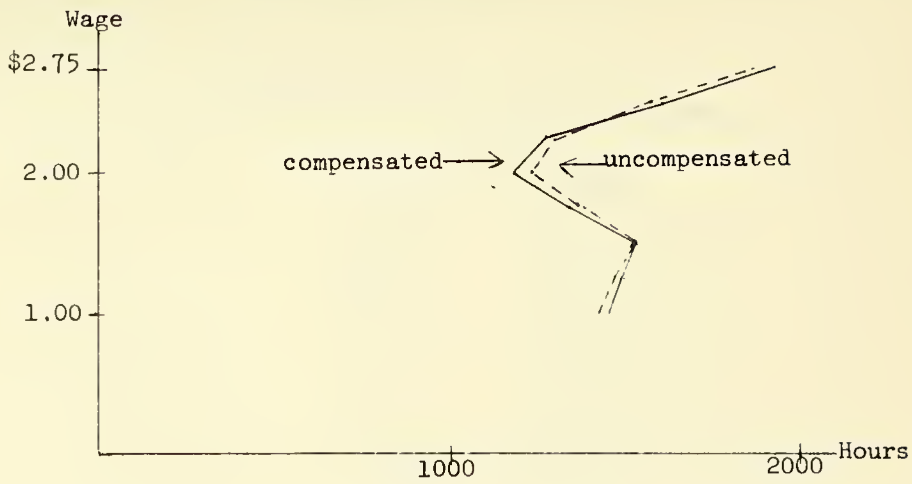


Figure 7-1 (con'd)

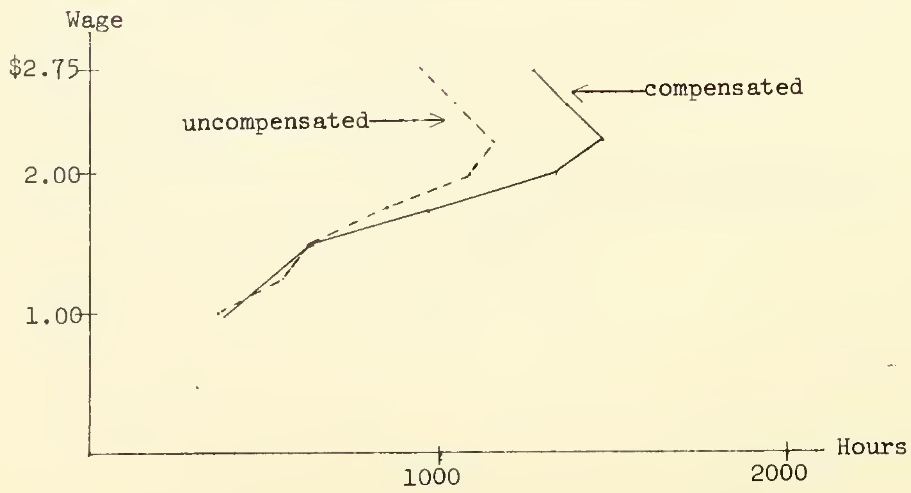
AA. Female Relatives, White, 20-59



BB. Female Relatives, Black, 20-59



CC. Female Relatives, White, 60+



DD. Female Relatives, Black, 60+

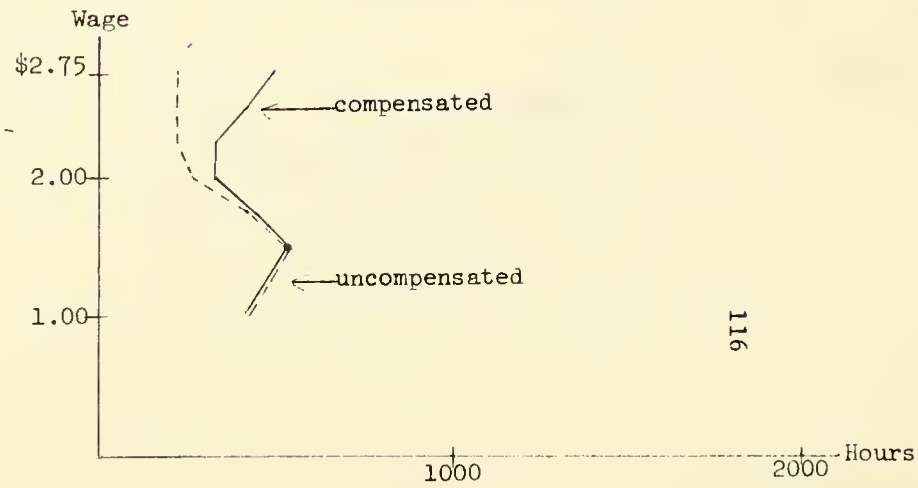
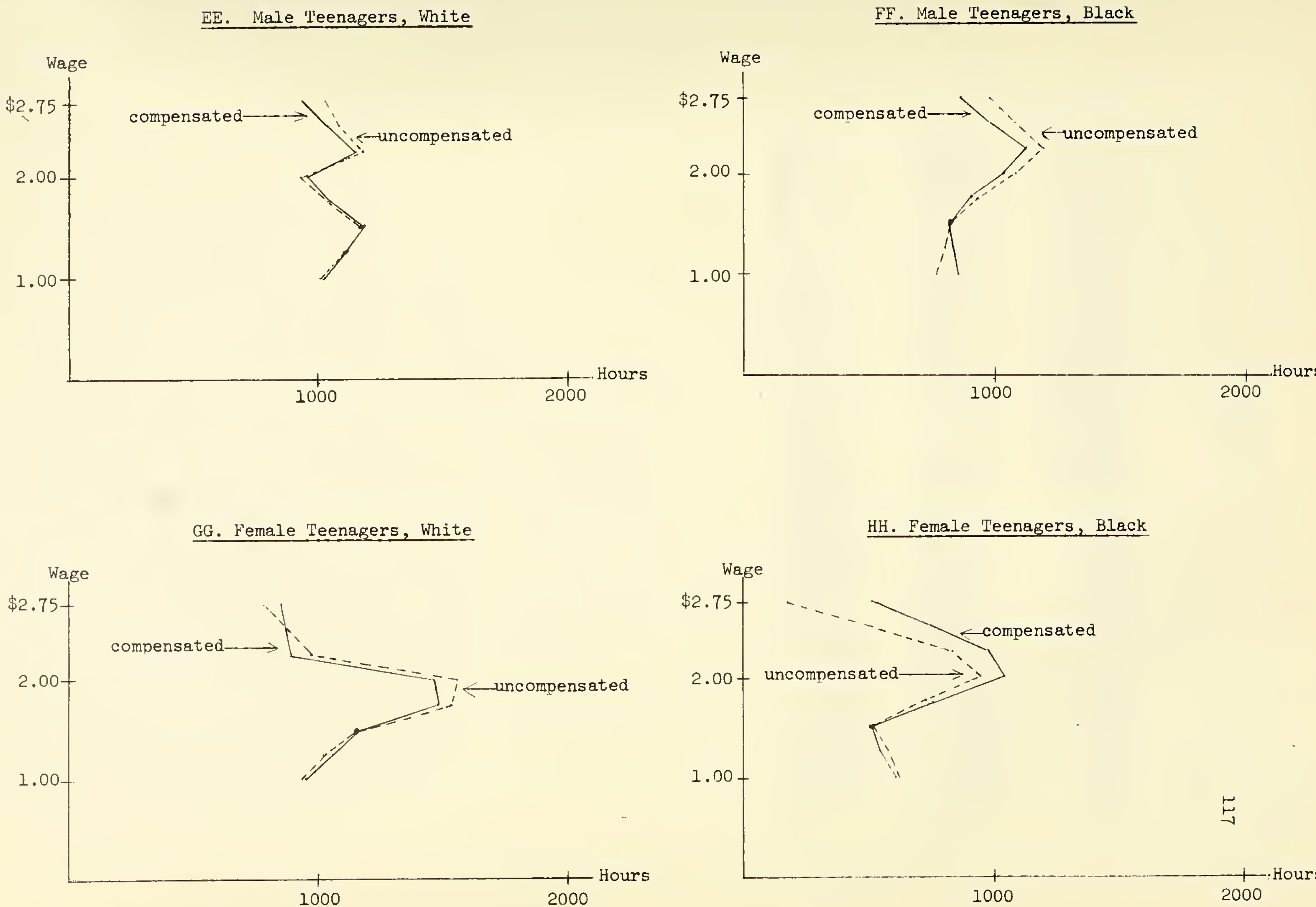


Figure 7-1 (con'd)



REFERENCES

[1] Z. Griliches, "Notes on the Role of Education in Production Functions and Growth Accounting", Report 6839, CMSBE, University of Chicago, September 1968.

[2] E. Kalachek and F. Raines, "Labor Supply of Lower Income Workers and the Negative Income Tax", Department of Economics, Washington University (St. Louis), November 1969.

[3] J. Mincer, "Distribution of Labor Incomes: A Survey with Special Reference to the Human Capital Approach", <u>Journal of Economic Literature</u>, <u>7</u>: 1-26, March 1970.

Appendix 1

Application of the Instrumental Variables Estimator to Equations that are not Linear in the Right-Hand Variables

Ordinary least squares equips us to estimate the parameters, $\beta_1, \ldots, \beta_N$ of the regression function

$$(A1.1) \qquad E(y|x) = \sum_{j=1}^{N} \beta_j f_j(x) \qquad ,$$

where $E(y|x)$ is the expected value of some left-hand variable, y, conditional on one or more right-hand variables, x, and $f_j(\cdot)$ are known but not necessarily linear functions. Our problem is to estimate the parameters of the structural labor supply equation,

$$(A1.2) \qquad L = \sum_{j=1}^{N} \beta_j f_j(w) + u \qquad .$$

We have fitted values from a first stage wage regression,

$$(A1.3) \qquad \hat{w} = w + v \qquad ,$$

where the residuals, v, and the structural disturbances, u, have the properties $E(v|\hat{w}) = 0$, and $E(u|\hat{w}) = 0$. We ask: what is the relation between the regression function $E(L|\hat{w})$ and the deterministic part of the structural equation? A basic result of econometric theory holds that they are identical if the functions $f_j(\cdot)$ are constant or linear. We are concerned with extension to the case of nonlinear functions, and in particular with the case of step function approximations of an arbitrary function.

Written in terms of $\hat{w}$, the structural equation is

$$(A1.4) \qquad L = \sum_{j=1}^{N} \beta_j f_j(\hat{w} - v) + u \quad ,$$

so the regression function is

$$(A1.5) \qquad E(L|\hat{w}) = \sum_{j=1}^{N} \beta_j E(f_j(\hat{w} - v)|\hat{w}) + E(u|\hat{w})$$

$$= \sum_{j=1}^{N} \beta_j g_j(\hat{w})$$

where

$$(A1.6) \qquad g_j(\hat{w}) = \int_{-\infty}^{\infty} f_j(\hat{w} - v)\, p(v)\, dv \quad .$$

That is, the regression function is a linear combination of functions of $\hat{w}$, each of which is a weighted average of the corresponding function of w in the structural equation, with the average taken over values of w centered at $\hat{w}$ and the weights given by the density of v. The standard result is a special case of this; if $f_j(w) = w$,

$$\text{(A1.7)} \qquad g_j(\hat{w}) = \hat{w}\int_{-\infty}^{\infty} p(v)dv - \int_{-\infty}^{\infty} vp(v)dv = \hat{w} = f_j(\hat{w})$$

If f_j is not linear, however, g_j is not identical to it. Simple extension of the instrumental variables estimator to the nonlinear case is impossible.

Since the functions $f_j(\cdot)$ are known and the density function p(v) can be estimated in the first stage regression, there is no obstacle in principle to calculating the functions $g_j(\hat{w})$ and estimating the parameters β_j by ordinary least squares. However, this extra complication may be unnecessary in some cases. The case of particular interest to us is the step function specification,

$$\text{(A1.8)} \qquad \begin{aligned} f_j(w) &= 1 \qquad w_{j-1} < w \leq w_j \quad , \qquad j = -\infty,\ldots, 0,\ldots, +\infty \\ &= 0 \qquad w \leq w_{j-1} \text{ or } w > w_j \\ w_j &= \bar{w}j \end{aligned}$$

(For the moment we let j range over all negative and positive integers to avoid the complications caused by end effects.) Under some circumstances, the uncorrected regression function $\sum_{j=-\infty}^{\infty} \beta_j f_j(\hat{w})$ is a good approximation to the corrected function $\sum_{j=-\infty}^{\infty} \beta_j g_j(\hat{w})$. These circumstances are: (i) the density p(v) is symmetric about zero, and (ii) the β_j coefficients lie along a straight line (i.e., $\beta_j = k_0 + k_1 w_j$). In fact, as we will show, they are equal for a value of $\hat{w}$ at the center of one of the intervals:

$$\text{(A1.9)} \qquad \hat{w} = \frac{w_{j*-1} + w_{j*}}{2}$$

Then

$$\text{(A1.10)} \qquad \sum \beta_j f_j(\hat{w}) = k_0 \sum f_j(\hat{w}) + k_1 \sum w_j f_j(\hat{w})$$

$$= k_0 + k_1 w_{j*}$$

On the other hand,

$$\text{(A1.11)} \qquad \sum \beta_j g_j(\hat{w}) = k_0 \sum g_j(\hat{w}) = k \sum w_j g_j(\hat{w})$$

$$= k_0 + k_1 \bar{w} \sum j p_j$$

where

$$\text{(A1.12)} \qquad p_j = P(\hat{w}-w_{j-1}) - P(\hat{w}-w_j)$$

and P is the cdf of v. Now p_j is the distribution of an integervalued random variable distributed symmetrically about j^*, so its expectation is j^*. Substituting j^* for $\sum jp_j$ in (A1.11), we can see that it equals (A1.10), as asserted.

We conclude from this calculation that if end effects are not too serious, if the values of $\hat{w}$ are distributed more or less evenly in each interval, and if the coefficients lie approximately along a straight line within the range of variation of the error, v, then the use of the uncorrected rather than the corrected regression equation will provide a satisfactory approximation.

Appendix 2

Table A2-1

Wage-earners in the SEO Sample

Characteristics	Number of Individuals			
	Male		Female	
	White	Black	White	Black
Total	3082	2194	1836	1858
Age				
14-15	25	14	19	2
16-17	74	40	33	36
18-19	105	85	115	77
20-24	288	204	284	210
25-34	739	563	303	412
35-44	664	526	357	456
45-54	669	462	417	410
55-64	431	260	246	210
65+	87	40	62	45
Years of Education				
0-3	58	102	23	43
4-6	153	234	58	133
7-9	578	560	289	405
10-11	452	446	248	351
12	932	556	744	622
13-14	343	168	213	176
15	84	33	44	18
16	249	57	135	64
17-20	233	38	82	46

Table A2-1 (concluded)

	Male		Female	
	White	Black	White	Black
SMSA				
Baltimore	105	210	59	185
Chicago	297	241	191	185
Cleveland	102	88	45	64
Detroit	204	213	107	153
Houston	88	140	47	119
Los Angeles	563	249	322	191
New York	838	329	533	314
Philadelphia	239	181	116	154
Pittsburgh	123	26	62	19
St. Louis	80	67	54	65
San Francisco	274	119	191	96
Washington, D.C.	169	331	109	313
Residence at Age 16				
U.S.	2796	2168	1671	1833
Foreign	286	26	165	25
Weeks of Work in 1966				
27 or more	2856	2029	1537	1566
26 or less	226	165	299	292
Union Membership				
Non-member	2123	1369	1548	1564
Member	959	825	288	294
Health				
No effect on work	2773	1986	1658	1632
Some effect	309	208	178	226

Table A2-2

Composition of the Sample
for the Study of
Hours of Work

Characteristic	Range or Value	Number of Individuals
Total	-	12,937
Position in family	Husband	4499
	Wife	4512
	Female head	553
	Single man	703
	Single woman	949
	Son or other male relative	786
	Daughter or other female realtive	935
Race	White	7709
	Black	5228
Age	14 to 19	640
	20 to 59	10068
	60 and up	2229

Table A2-2
(concluded)

Number of adults	1	1817
	2	6361
	3 or 4	3927
	5 or more	832
Children	None	7365
	Pre-school age only	1980
	School age only	1851
	Both	1741
Whole income per adult	0 to 3000	2079
	3000 to 3750	2818
	3750 to 4500	3186
	4500 to 5500	2888
	5500 and up	1966
Imputed hourly wage	$0.00 to $1.50	2731
	$1.50 to $1.75	1971
	$1.75 to $2.00	2075
	$2.00 to $2.50	2633
	$2.50 to $3.00	1848
	$3.00 and up	1679

Appendix 3

Price Level in the 12 Metropolitan Areas in the SEO

Metropolitan Area	Price Level
Baltimore	94
Chicago	104
Cleveland	103
Detroit	99
Houston	93
Los Angeles	102
New York	109
Philadelphia	100
Pittsburgh	97
St. Louis	101
San Francisco	107
Washington, D.C.	101

Source: Bureau of Labor Statistics, Three Standards of Living, Spring 1967, Bulletin 1570-5, Table 3, p. 35, 4th column.