CHAPTER IV

An Extension of the Basic Model

The foregoing chapters have shown that disability affects income not only through wages but also through the individual's labor supply. The final extension of this model incorporates the wage model into a simultaneous system including the standard labor supply equation with measures of disability added. With this system it is possible to separate the dual effects of disability into a wage rate effect and a labor supply effect.

The first sample was again stratified by race and cases with missing data on hours of work and other variables were eliminated. The only persons contained in the sample with zero hours of labor supplied are those who were unable to work due to their disability. The system of equations was estimated by Three Stage Least Squares (3SLS) and the results are reported in Regression Tables 15 and 16. The figures reported in parentheses are the absolute values of the asymptotic t ratios.

Whites

The results obtained in the simultaneous system analysis are consistent with those obtained in Chapter III. Qualitatively the wage equation results are the same as those in regression 2 (all whites, limitation hinders activity) with one exception: The coefficient on the disabled experience squared term changed sign. Neither result, however, was significant and the coefficient on disabled experience in regression 15 seems to pick up the magnitude of the change in the disabled

REGRESSIONS 15 AND 16

3SLS ESTIMATES OF WAGE AND HOURS SYSTEM

	15: WHITES		16: BLACKS	
	WAGE EQUATION	HOURS EQUATION	WAGE EQUATION	HOURS EQUATION
LN WAGE*	-	5.34431 (4.781)	-	4.83551 (3.599)
SCHOOL	0.06873 (5.373)	-0.45198 (3.561)	0.01768 (0.826)	-0.32488 (2.067)
EXPERIENCE	-0.20132 (6.360)	-0.20894 (3.050)	-0.11196 (1.434)	-0.04534 (0.450)
EXPERIENCE^2	0.00237 (5.754)	-	0.00106 (1.142)	-
DISABLED EXPERIENCE	-0.08335 (4.059)	-0.08267 (0.960)	-0.15916 (5.352)	0.14469 (1.033)
DISABLED EXPERIENCE^2	0.00001 (0.008)	-	0.00274 (3.565)	-
LIMIT 1 WALKING	-0.16342 (1.031)	0.56207 (0.467)	-0.84433 (3.457)	-4.97208 (2.419)
LIMIT 2 USING STAIRS	-0.59422 (3.900)	-1.33992 (1.021)	-0.88071 (3.087)	-3.34186 (1.426)
LIMIT 3 STANDING	-0.02102 (0.138)	-1.60723 (1.405)	-0.19513 (0.689)	-1.46433 (0.747)
LIMIT 4 SITTING	-0.34488 (2.077)	-1.12122 (0.857)	-0.37226 (1.108)	-0.74734 (0.329)
LIMIT 5 KNEELING	-0.01512 (0.102)	-2.94994 (2.671)	0.27707 (0.942)	-1.68562 (0.845)
LIMIT 6 LIFTING	-1.15767 (6.536)	-4.67808 (2.534)	-1.15475 (4.283)	-9.43835 (3.753)
LIMIT 7 CARRYING	-0.41120 (2.904)	-0.43749 (0.371)	0.04080 (0.148)	-0.96974 (0.524)

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REGRESSIONS 15 AND 16

(continued from preceding page)

	15: WHITES		16: BLACKS	
	WAGE EQUATION	HOURS EQUATION	WAGE EQUATION	HOURS EQUATION
LIMIT 8 REACHING	-0.19839 (1.111)	-3.49751 (2.606)	-0.03833 (0.118)	-1.47130 (0.665)
LIMIT 9 HANDLING	-0.54186 (2.485)	1.12007 (0.658)	0.17303 (0.523)	2.80816 (1.254)
LIMIT 10 SEEING	-0.22253 (1.159)	1.04420 (0.719)	-1.04381 (4.039)	-2.49076 (1.086)
LIMIT 11 HEARING	0.37024 (2.379)	2.15725 (1.769)	-0.20529 (0.691)	2.26387 (1.119)
LIMIT 12 DEAL W PEOPLE	-0.06789 (0.313)	-2.38797 (1.485)	0.32555 (0.689)	3.66051 (1.126)
LIMIT 13 OTHER	1.15829 (4.471)	6.04027 (2.624)	2.11307 (3.881)	-1.92490 (0.421)
NUMBER OF CHILDREN	-	-0.11038 (0.623)	-	0.19392 (0.994)
OTHER INCOME	-	-0.00013 (1.744)	-	-0.00010 (0.462)
WIFE'S INCOME	-	-0.00006 (0.628)	-	0.00008 (0.460)
MARITAL STATUS	0.18248 (0.614)	-0.16514 (0.074)	-0.06275 (0.164)	2.12128 (0.795)
CONSTANT	9.37095	23.26866	8.44097	16.30693
NUMBER OF OBSERVATIONS	1313	1313	442	442

experience squared term.

Most coefficients changed slightly in magnitude from the estimates in Chapter III. The rate of return to schooling for whites increased from about six percent in regression 2 to about seven percent in regression 15. The coefficients on the limitations changed in magnitude also, but there was no consistent pattern. For example, in the system of equations the coefficient on the walking limitation (limit 1) was about one third the magnitude of the same coefficient in regression 2. On the other hand, the coefficient on the sitting limitation (limit 4) was more than seven times as large in the system and gained statistical significance. As was the case in regression 2, the only positive coefficients on limitations were for hearing (limit 11) and "other" limitation (limit 13), both of which were statistically significant.

The second equation in the simultaneous system, the hours equation, yields results similar to those from past literature. The expected wage rate is the strongest determinant of labor supplied. For whites, a ten percent increase in the wage rate will increase the hours worked by half an hour per week.

Each year of schooling for whites was found, ceteris paribus, to decrease the number of hours worked per week by about half an hour. This result is reasonable given that those with higher educational attainment are more likely to be salaried employees, and will gain no increase in income by working overtime.

Increasing years of labor market experience are associated with a decrease in labor supplied for whites, a result expected from this older aged sample. As individuals near retirement age it is likely that many will slowly ease out of employment, especially as age begins to take a

toll on their overall health. The coefficient on disabled experience is of the same sign and, although not significant, is of smaller magnitude than the coefficient on non-disabled experience. Perhaps, as time passes and the individual acclimates himself to the handicap, he may be able to slow his withdrawal from the labor force and attempt to regain some of the hours lost due to disability. The impact of a year's time will therefore be smaller relative to non-disabled individuals.

The coefficient on each of the limitations indicates the direct impact the impairment has on the hours of work. For the most part these coefficients are negative, indicating a reduction in the hours worked, although several limitations have positive coefficients and appear to increase the hours of labor supplied. There is, however, a second effect of disability on the hours of work. Disability alters the wage rate and the wage rate directly affects the hours of work. In all but two cases the limitation reduced the wage rate, leading to a reduction in the labor supply. The net effect of the limitations is a reduction in hours of work, with two exceptions, hearing (limit 11) and "other" limitation (limit 13), which increase the hours of work 4.1 and 12.1 hours respectively.[1] The hours of work lost by whites due to disability range from .15 hours (nine minutes) for people who are hindered in sight (limit 10) to 10.9 hours for people who are hindered in lifting heavy weights (limit 6).

The coefficients on number of children and marital status are insignificantly negative for white individuals. The reduction in hours of work, holding wife's income and other income constant, may be attributable to an increase in home productivity of the male, or perhaps to different sets of tastes and preferences among married individuals.

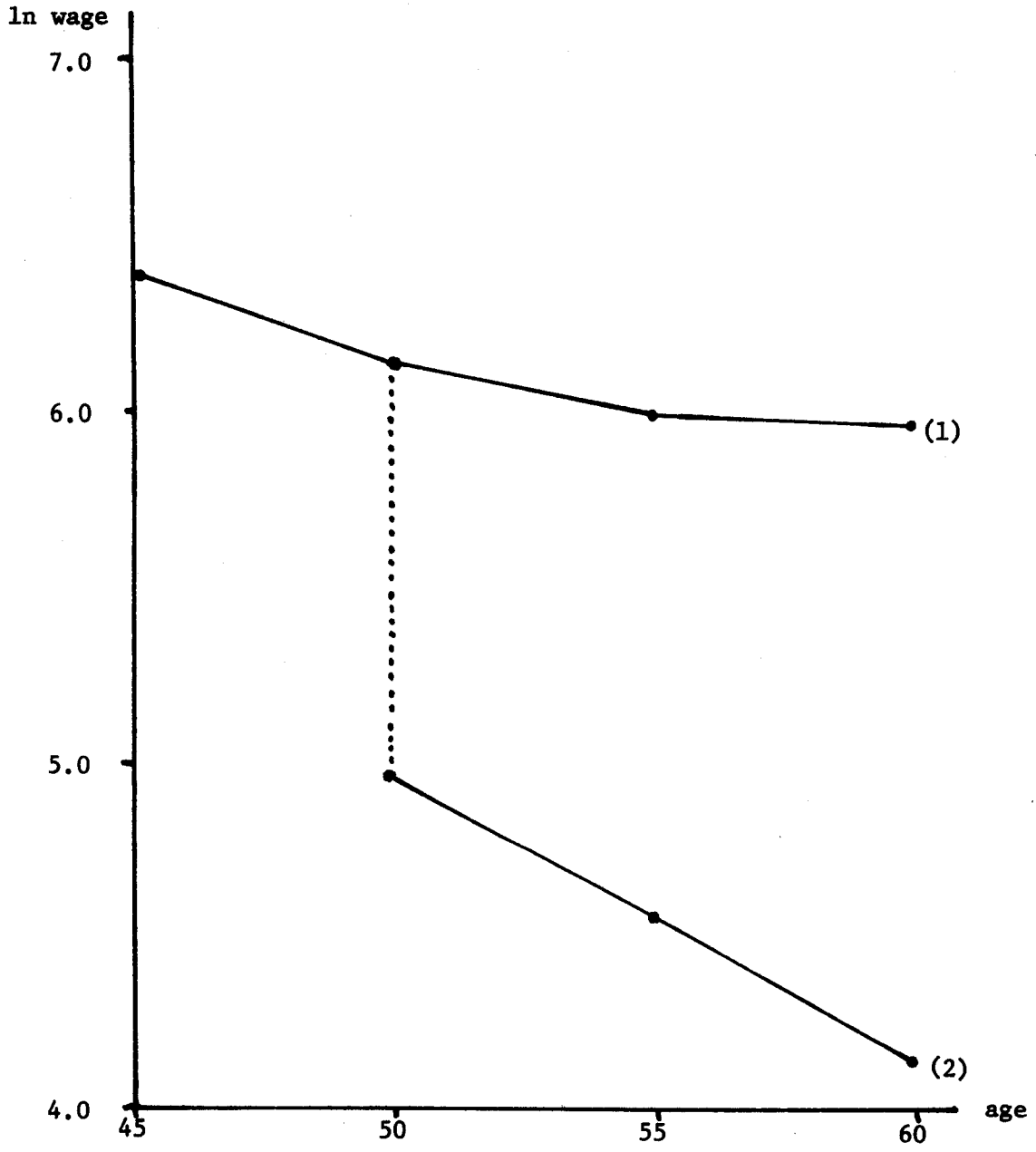
Finally, other income and wife's income both reduce the white male's labor supply. Although neither coefficient is statistically significant, it appears that both the earnings of the wife and income from 'other' sources are substitutes for wages.

It is possible to estimate the total effect of a disabling condition on income by employing both the hour and the wage equation. Consider a 45 year old married white male whose wife is not employed, who has two children and other income of $2,000, and who becomes unable to lift heavy weights (limit 6) at age 50. Graph 3 illustrates the effect of the disability on the logarithm of the wage rate. The result is similar to that found in Chapter III; there is an immediate drop in the wage rate, followed by a gradual parting of the profiles due to differences in investment. Graph 4 incorporates both the expected hours of employment and the wage rate to construct a profile of weekly earnings by age. At age 45 the worker faces a wage rate of $5.99 and works 46.2 hours for an income of $276.84 per week. At age 50 the disability occurs and the profiles depart. The disabled individual now earns $1.45 per hour and works 33 hours per week whereas had he not become disabled, he would have earned $4.62 per hour and worked almost 44 hours. The loss amounts to $154.13 per week, or 76.3 percent of his weekly potential earnings. After five years of disability the absolute loss in weekly earnings is $139.43, which represents approximately 83 percent of the individual's expected non-disabled earnings. By age 60, 89 percent of the expected earnings are lost. The relative gap between disabled and non-disabled incomes is widening, and had the individuals been located to the left of the peak in the age - earnings profile the absolute gap would be expected to be widening also.

GRAPH 3

LINEAR APPROXIMATION OF WAGE PROFILE (IN LOGS)

(White married male with 10 years of school becoming hindered at lifting (limit 6) at age 50)



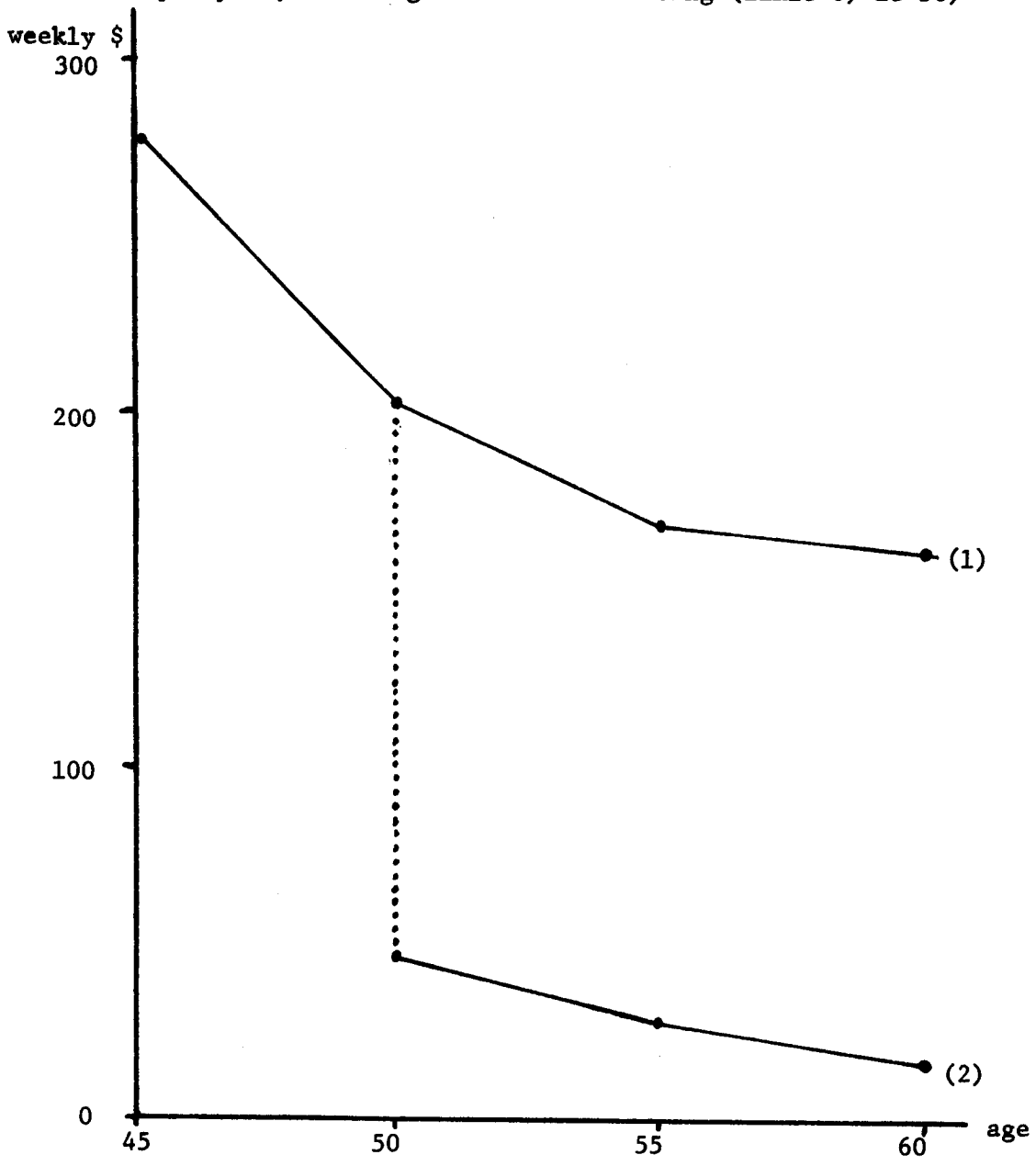
(1) non-disabled

(2) disabled

GRAPH 4

LINEAR APPROXIMATION OF EARNINGS PROFILE

(White married male, 10 years of school, 2 children, and a wife who doesn't work, and has $2000 other income per year, becoming hindered at lifting (limit 6) at 50)



(1) Non-disabled

(2) Disabled

Blacks

The Three Stage Least Squares estimates for the wage - hours system for blacks are reported in Regression Table 16. The results for the wage equation as estimated in the simultaneous system differ somewhat from the results reported in Chapter III. The differences occur mainly in the magnitudes of the coefficients and not in the qualitative implications, although the coefficients of several limitations did change sign. These changes, however, are probably attributable to changes in the sample. Sample I originally contained 881 observations for blacks, although after eliminating observations for missing data in the variables required for the labor supply equation, the sample fell by 50 percent to 422 observations.

The rate of return to schooling for blacks declined from a statistically significant four percent in regression 7 (all blacks, limitation hinders activity) to an insignificant two percent in the simultaneous system. The coefficients on the experience terms for non-disabled black individuals were insignificant in both cases and differed only slightly, with the decline in earnings being smaller for the wage equation estimated in the system. The experience profile for disabled experience remained significant and the coefficients on both terms were virtually unchanged.

The coefficients on the limitations of kneeling (limit 5), handling (limit 9) and dealing with people (limit 12) changed in sign from negative to positive, and the coefficient on sitting (limit 4) changed in sign from positive to negative. None of the above coefficients had any statistical significance in either equation and the changes are probably due to the difference in the samples. The other limitations maintained

their respective signs, with the only significant positive coefficient being that on "other" limitation (limit 13).

The coefficient on marital status also changed sign, although in neither case was the coefficient statistically significant.

The second equation, the hours equation, finds that the wage rate is the strongest determinant of labor supply for blacks. A ten percent increase in the wage rate will increase the hours of work by slightly less than one half hour per week. A one hour increase in the weekly hours of work may be induced by raising the wage rate for blacks by 23 percent.

Each year of schooling decreased the labor supply of blacks by about .3 hours per week. Past labor market experience appears to reduce the hours of work slightly but the effect is not significant. The positive coefficient on disabled experience indicates that the longer a black individual has been disabled the more hours he will spend in the labor force. This effect points to the individual healing, acclimating himself to his handicap, or perhaps changing to a job where the limitation is not as great or has less influence upon the performance of required duties.

The coefficients on the limitations in the hours equation are, for the most part, negative and range from an increase in hours of work of 3.5 hours for the dealing with people limitation (limit 12) to a reduction in hours of work of 9.5 hours for the lifting limitation (limit 6). Only the limitations of handling (limit 9), hearing (limit 11) and dealing with people (limit 12) directly increase the hours of work. Considering the net labor supply effect of the wage rate effect and the direct hours change due to the 13 limitations, net increases in the hours of

work occur for the following limitations [2]: handling (limit 9), hearing (limit 11), dealing with people (limit 12) and "other" limitation (limit 13).

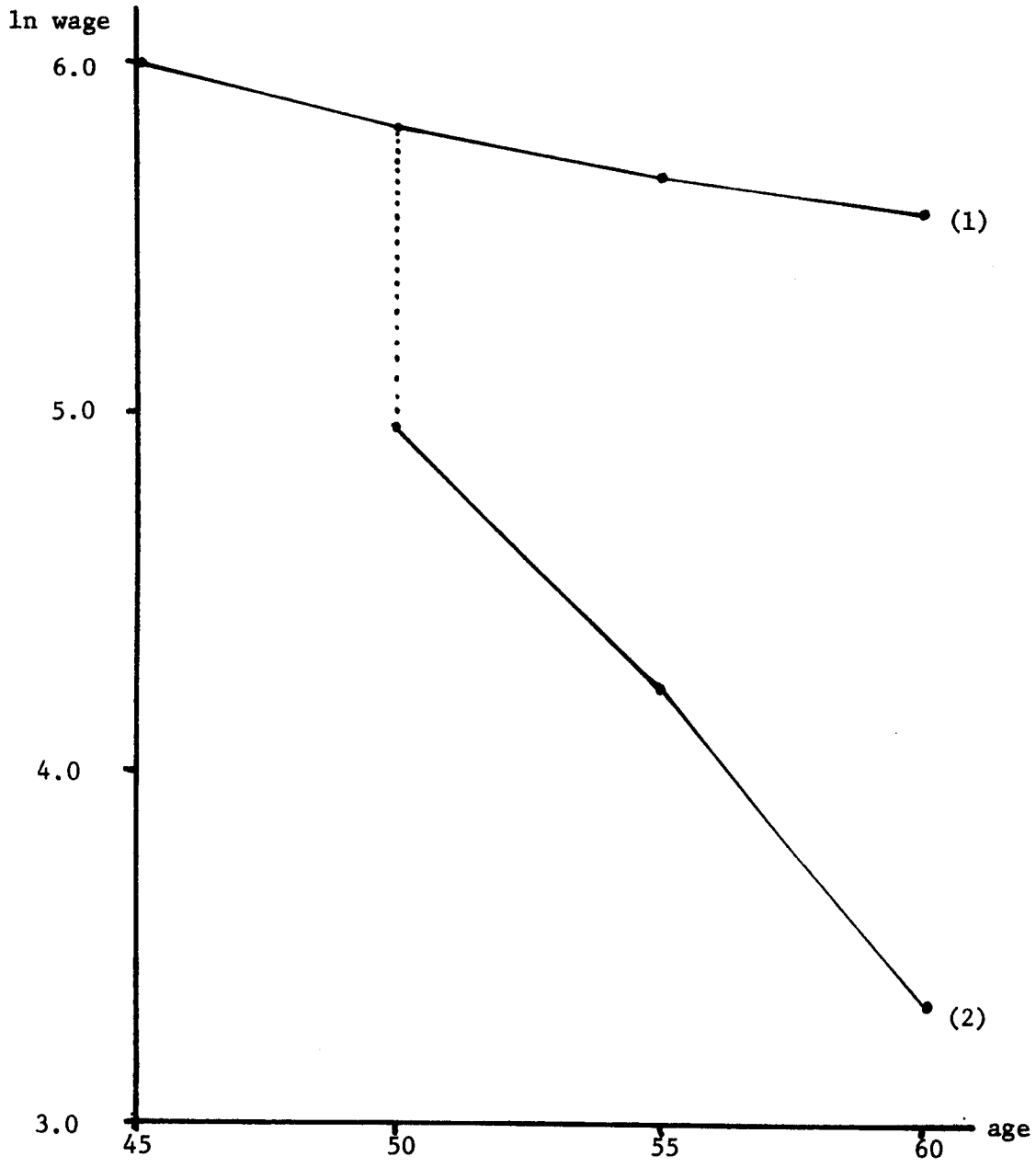
Black married males, ceteris paribus, work two hours more per week than those who are not married. Each child results in one fifth of an hour of additional work each week. The labor supplies of a husband and his wife appear to be complements; the hours of work of the husband increase with the wife's earnings. This result may reflect a sorting process where 'quality' husbands attract 'quality' wives with quality being measured in terms of earning capacity. Outside sources of income are substitutes for the husband's wage income. The husband's hours of work are reduced as 'other' income increases.

The system of equations can be employed to predict earnings differentials between disabled and non-disabled blacks. Consider, for example, a 45 year old black married male with seven years of schooling, whose wife is not employed, who has two children and outside income of $1,000 per year, and who becomes disabled at age 50 and can no longer walk (limit 1). The logarithmic wage rate profile is shown in Graph 5. Combining the wage rate profile and the predicted hours of work yields the age - earnings profile depicted in Graph 6. The individual has, at 45 years of age, a wage rate of $4.05 per hour and works about 42 hours for a weekly income of $169.83 . At age 50, the individual would expect a wage of $3.34 per hour, and he supplies only 32 hours of work. His weekly income has been reduced to $45.47, a loss of $90.37 or 67 percent of his potential income. By age 60 the difference between disabled and non-disabled income has increased to $93.75 or 90 percent of the individual's potential income.

GRAPH 5

LINEAR APPROXIMATION OF WAGE PROFILE (IN LOGS)

(Black married male with 7 years of school becoming hindered at working (limit 1) at age 50)



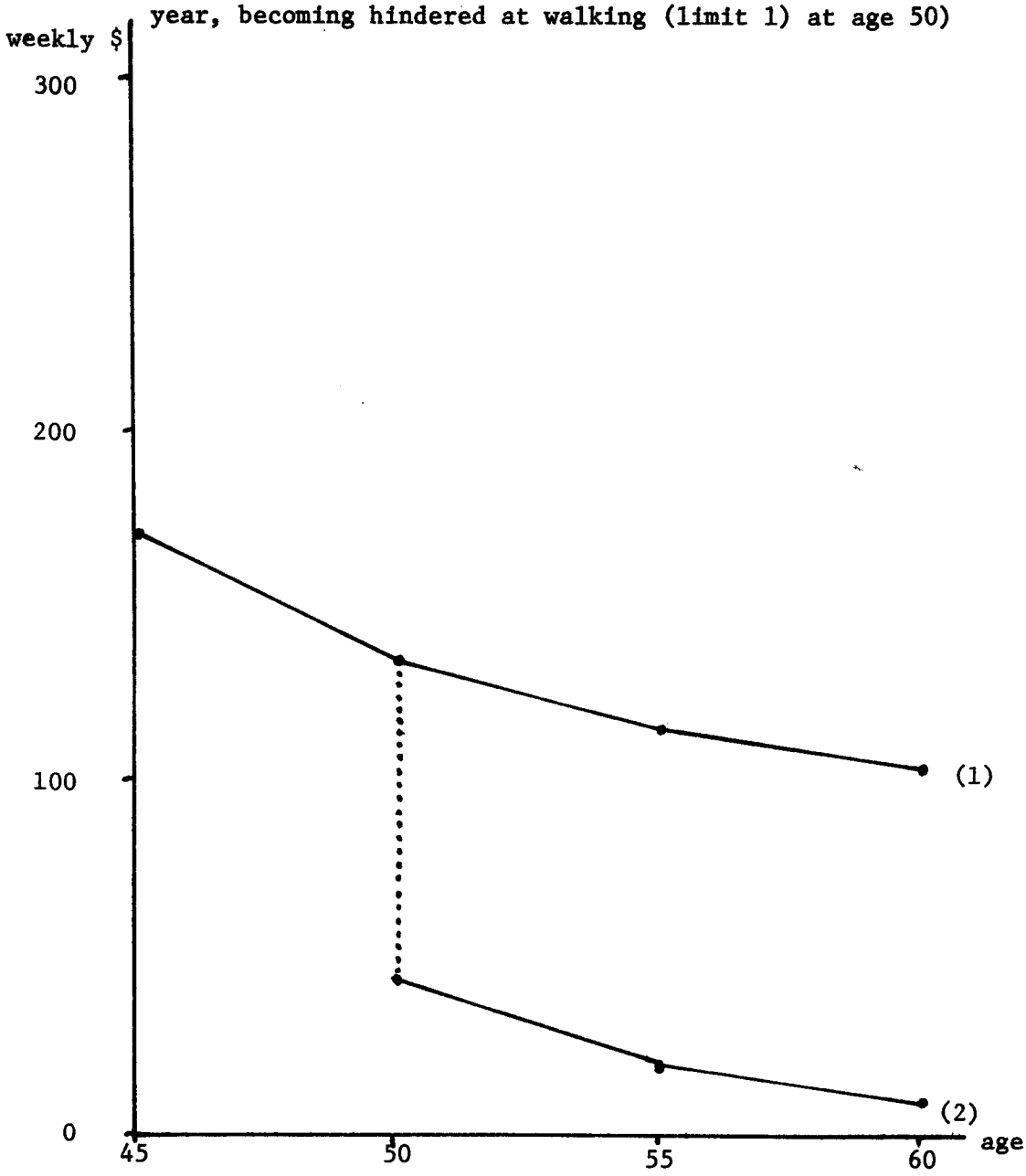
(1) Non-disabled

(2) Disabled

GRAPH 6

LINEAR APPROXIMATION OF EARNINGS PROFILE

(Black married male, 7 years of school, 2 children, and a wife who doesn't work and has $1000 other income per year, becoming hindered at walking (limit 1) at age 50)



(1) Non-disabled

(2) Disabled

Black - White Comparisons

There are several differences in the estimates according to race. First, as was previously noted in Chapter III, the rate of return to schooling for blacks is substantially lower than that for whites. In the present analysis whites receive a seven percent rate of return to schooling while blacks receive only a two percent rate of return. Also, in the wage function, the coefficients on marital status differed in sign by race although neither coefficient was significant. Whites received a positive return to marriage, while marriage reduced the wage rate for blacks.

In the hours of work equation, the elasticity of labor supply with respect to the wage rate appears to be somewhat lower for blacks than for whites. The elasticity of labor supply, evaluated at the average weekly hours for each race, is .124 for whites and .121 for blacks. The impact of schooling on the hours of work is much smaller for blacks than for whites with each year of schooling reducing work hours for blacks at a rate which is only 60 percent of the reduction for whites.

The coefficient on experience is negative for both blacks and whites, and although neither is significant, the magnitude is substantially larger for whites than for blacks. For each year in the labor force whites work one fifth of an hour less each week while blacks reduce their labor supply by only one twentieth of an hour. Part of this differential may be due to differences in the level of schooling which gives whites fewer years of potential labor market experience. Perhaps whites retire earlier due to the presence of extra asset income or better retirement plans.

Disabled experience has the opposite effect on hours of work

for whites as it does for blacks. Whites continue to withdraw from the labor force, although at a slower rate than had they not been disabled. Blacks, on the other hand, increase the hours of work slightly as time disabled passes. This result may be due to faster acclimation to a disability by blacks, or due to inferior insurance policies for blacks which require them to continue working for a longer period of time.

Whites who were married or had children worked fewer hours than single individuals and those with no children. Conversely, blacks who were married or had children worked more hours than those who were unmarried or childless. The wage rate for blacks is, on the average, smaller than that of whites and supporting a family may necessitate the extra hours in the labor force for black individuals.

The final differential exists in the effect of the wife's earnings on the hours of labor supplied by the husband. Whites decrease their hours in the labor force as the wife's income increases, whereas blacks increase their hours worked under this condition.

Conclusion

The simultaneous model of wages and hours permits the analysis of the loss of income, not merely the analysis of wage loss. Disability was shown to reduce the hours of labor supplied, as well as the wage rate. The reduction in hours of labor supplied occurs for two reasons. First, there is a direct effect of the disabling condition on the hours worked; secondly, the disability reduces the wage rate which in turn, reduces the labor supplied. The effects combine to cause the relative earnings differential between disabled and non-disabled individuals to increase as time passes.

While the wage equation results were qualitatively similar to those

in Chapter III, the hours equation produced some noteworthy results. The amount of time disabled was found to have the opposite effect on whites as it did on blacks. As time disabled passed whites were found to continue to withdraw from the labor force while blacks increased their hours of work. In addition, the aging effect is more dramatic for whites than for blacks. Whites reduce their hours of labor supplied at a faster rate for each year of experience than do blacks.

FOOTNOTES TO CHAPTER IV

1) The reader is directed to Table 8 in Chapter 5 for a summary of wage, hour and income effects of the individual limitations.

2) The reader is directed to Table 8 in Chapter 5 for a summary of wage, hour and income effects of the individual limitations.