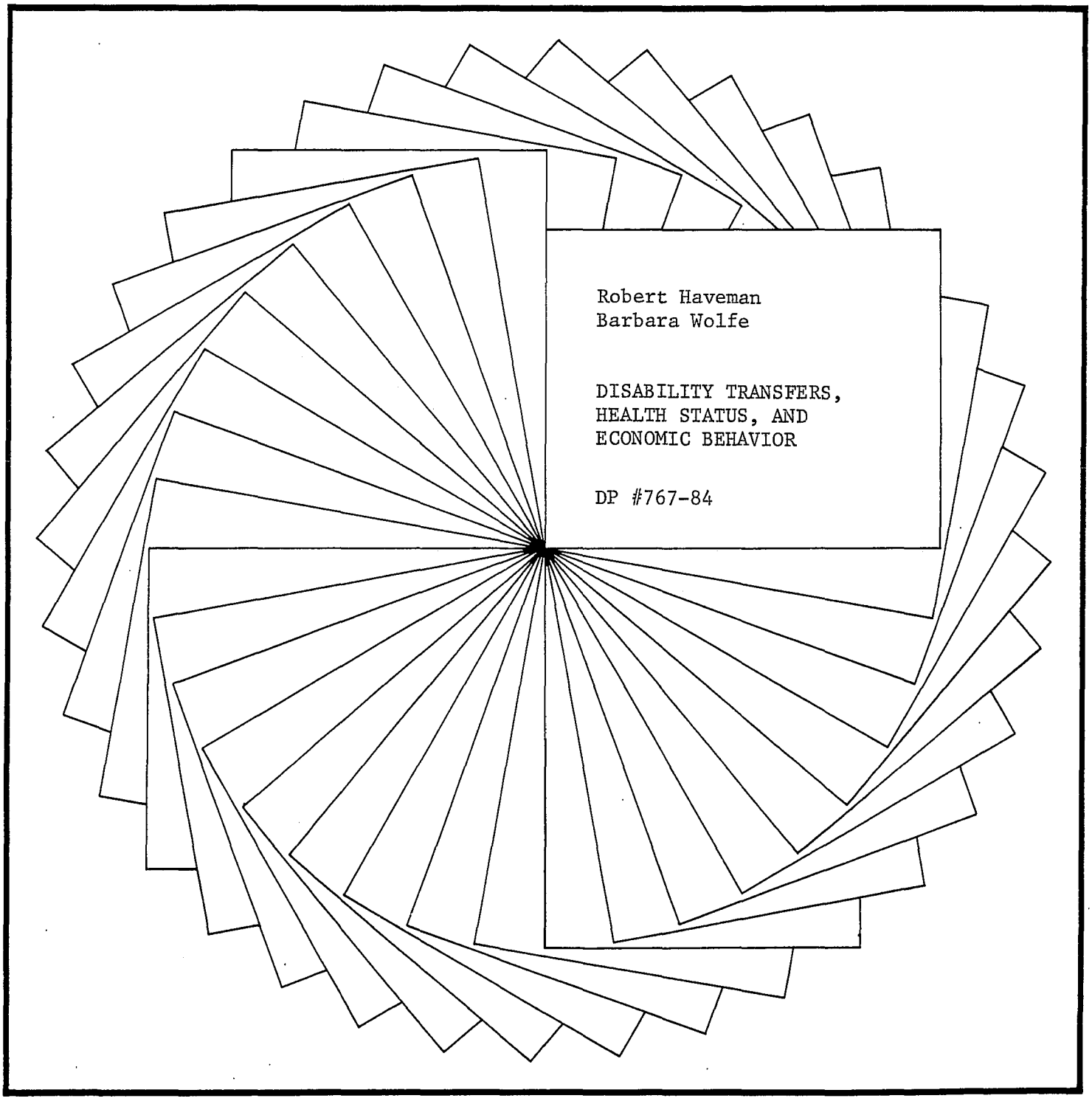
University of Wisconsin-Madison

IRP Discussion Papers



Institute for Research on Poverty
Discussion Paper #767-84

Disability Transfers, Health Status, and Economic Behavior

Robert H. Haveman
Professor of Economics
Institute for Research on Poverty
University of Wisconsin-Madison

Barbara L. Wolfe
Professor of Economics and Preventive Medicine
Institute for Research on Poverty
University of Wisconsin-Madison

December 1984

Abstract

Both policy debate and research have focused on the linkage between the availability and generosity of public disability benefits and the reduction in the work effort of older men. That linkage is the subject of this paper. First, quantitative research in the area is reviewed and the differences in the results are examined. Results differ owing to differences in (1) model specification, (2) the definitions of income opportunities in various options, (3) data bases, and especially (4) the definition of disability or health status that is employed. The effect of the last difference--definition of impairment--is tested, using both self-reported disability and an unobserved variable-structural model estimate of "true" disability. A two-stage probit analysis estimates the effects of disability transfer benefits on labor supply.

Estimates using both disability status measures indicate that disability benefits have a statistically significant effect on the work status choice, but the response to increased transfer benefits is small and is concentrated among older, disabled men who have low expected earnings. However, because the estimated response using the self-reported indicator is somewhat greater than that using the index of true disability, endogeneity exists when self-reported disability status is used in studies of labor-supply response, although the extent of bias in estimated results is not large.

Disability Transfers, Health Status, and Economic Behavior

An important postwar demographic and economic phenomenon is the significant reduction in the labor force participation rate of older men in many Western industrialized countries. For example, the proportion of U.S. males 45-59 in the labor force fell from 96 to 88.5 percent from 1959 to 1980. As Table 1 indicates, decreases of this magnitude are not unique. While the pattern of the 1968-1978 decreases varies across countries, there is a clear and general tendency for older men of working age to seek alternatives to work.

Numerous hypotheses have been suggested to explain this pattern. Labor market opportunities have deteriorated over this period for older workers owing to lagging economic growth and an influx of younger workers; the incidence of work-related impairments may have increased; more working spouses reduce the need for husbands to contribute to household income; tastes for work may have deteriorated; or the availability and generosity of income transfer benefits may have attracted an increasing number of potential beneficiaries out of the work force. It has also been suggested that the public sector, industry, and individual interests have coincided in the judgment that disability pension programs form a desirable vehicle for enabling older, less-productive workers to retire from the work force without deliberate layoffs targeted on them, and without stigma.

The time series evidence in Table 1 gives credence to this last hypothesis. The rates of increase in the number of recipients of disability income transfers (column 2) are truly impressive for several of

Table 1

Patterns of Decreases in Older Male Labor Force Participation Rates and Disability Program Growth, 1960s to 1970s, by Country

	Percentage Change in Ratio of Older to Prime-age Worker Participation Rates 1960s to 1970s[a]	Annual Rate of Growth of Disability Program Recipients, 1968-1978	Annual Rate of Real Disability Program Expenditures, 1968-1978
France	-7.4%	-1.3%	-1.3%
Italy	-15.5	8.1	12.7
Netherlands	-14.8	11.3	18.6
Sweden	-9.5	5.2	11.7
United Kingdom	-.2	2.0	.5
United States	-12.5	7.0	6.3
West Germany	-15.4	2.5	5.3

[a]In general, the age range for older male workers is 45-65. However, data for some of the countries include older workers somewhat outside this age range. Prime age refers generally to ages 18-45.

the countries. The Netherlands stands out with an average rate of growth in recipients of over 11 percent. Over this period, the number of recipients increased from about 200,000 to nearly 600,000. Italy and the United States have somewhat lower, though still substantial, rates of beneficiary growth, especially in the presence of population growth rates of 1-3 percent. This growth in the number of recipients is reflected in the growth rate of real expenditures on these programs, shown in column 3.

Both policy debate and research have focused on the similarity in the patterns of growth in the percentage of the older-worker group not in the labor market and the percentage receiving disability transfer benefits. It has been widely asserted that the generosity and availability of income transfers--in particular, disability income transfers--has acounted for the decline in the labor force participation of older men. However, similar time series patterns do not establish causality.

In this paper, we will focus on the linkage between the availability and generosity of public disability benefits and the reduction in the work effort of older men. We will, in Section I, briefly review the research that has attempted to quantify the strength of this linkage. The estimates from this research have been widely divergent, stemming in part from differences in data but primarily from differences in (1) the specification of the models and (2) the measurement of health status. These differences are discussed in Section II. The crucial role of the health status measure is emphasized, and the variety of points of view regarding the effects of using self-reported health measures in estimating the effect of disability transfers on labor supply is indicated. Section III tests these conflicting views by measuring the effects of

disability transfer benefits on labor supply using both self-reported disability and an unobserved variable-structural model estimate of "true" disability in a two-stage probit analysis. Section IV concludes.

I. RESEARCH ON THE LABOR SUPPLY RESPONSE TO DISABILITY TRANSFERS

In recent years, there has been substantial research on the work effort (labor supply) response to income transfer programs (see Danziger, Haveman, and Plotnick, 1981). Some of this work has attempted to measure the income and substitution elasticities associated with changes in net wage rates or unearned income generated by income transfers; these elasticities have then been used to estimate the work effort response to specific proposals.[1]

Other studies have directly addressed the work effort responses to actual transfer programs. Much of this work has focused on the retirement decision, and the effect on that decision of the benefit structure and work-limitations rules of social insurance retirement pensions (see Burkhauser, 1980; Gordon and Blinder, 1980).

Only a limited number of studies examine the labor supply effects of disability-related transfers, in particular the Social Security Disability Insurance (SSDI) program in the United States. The most important of these studies are discussed here, with emphasis on those which attempt to explain the work effort (or work vs. retirement) choices of <u>older workers</u>, focusing on the combined roles of <u>disability status</u> and the nature and availability of <u>disability-related income transfers</u>. Studies with these emphases are not numerous. In this review and cri-

tique, the following issues are stressed: (1) the reliablity of the disability status indicator; (2) the modeling of expected transfer and labor market income in an economic choice framework; (3) the extent to which the estimated values reflect the actual causal process; and (4) issues of specification and selectivity bias. Four studies directly analyze the choice between work and retirement of older workers. Three studies, those by Parsons, Leonard, and Slade, are reviewed here before we turn to our own estimates.

The Parsons (1980a; 1980b) study is an explicit work-status (labor force participation) choice model in which the individual rationally compares the expected values of being in and being out of the labor force. The former value is captured by one's expected wage; the latter by the expected value of the disability benefits and other transfers that one can receive if not working. Because "true" health status determines the probability of receiving disability benefits, it too is a determinant of the labor force participation decision.

Parsons employs a probit version of a discrete choice econometric model in which labor force participation (a 0-1 dummy variable) is dependent upon available social insurance disability benefits relative to the individual's wage rate, an index of health status (the mortality of individuals in periods after the period of measurement), the availability of welfare benefits in the individual's place of residence, and the individual's age and unemployment experience.

The data are observations on 3219 males ages 48-62 in 1969; the dependent variable is the labor force status of these men in 1969. The 1966 values of the primary variables are used to reduce censoring

problems, although men without a reported wage rate in that year are excluded. The level of available disability benefits was estimated from values of the individual's wage using a statutory formula. The health status index is a weighted average of mortality dummy variables based on whether the individual died in each of the subsequent seven years. The results are consistent with the model: expected Disability Insurance benefits and welfare benefits (both normalized by the expected wage) and unemployment variables are statistically significant, as is the mortality (disability) variable. Moreover, the disincentive effects of expected transfer benefits increase with decreases in health status.

The issue addressed by Leonard (1979) involves the same question asked by Parsons: Do increases in social insurance disability benefits increase the probability of any given worker leaving the labor force? To answer the question, Leonard fits a regression equation to data on men aged 45-54, in which the probability of beneficiary status is a function of expected disability benefits, expected earnings, and background characteristics representing taste differences. Because the actual wage is not observed in the case of SSDI recipients, Leonard uses a vector of background characteristics (including predisability wages) to proxy for the expected wage. Expected disability benefits are measured as the product of statutory benefits if eligible and the probability of being eligible, in which the latter probability is estimated from health and background characteristics of a sample of recent applicants. Expected earnings are estimated from earnings history data on each individual. Disability status is captured by numerous dummy variables indi cating the presence of specific health conditions. The data used are a sample of men aged 45-54 who were not last employed by the government.

Leonard finds that the health conditions and race are significant determinants of the probability of being eligible for disability benefits conditional on being an applicant. In estimating the probability of being a recipient if eligible, Leonard finds that expected benefits are significantly and positively related to the probability of recipiency and the expected wage is significantly and negatively related to it. He estimates an elasticity of the probability of beneficiary status to annual disability benefits of .35.

Slade (1982) also investigated the labor supply response to SSDI. Using a sample of men aged 58-63 in the 1969 Retirement History Survey (RHS), he estimated a structural labor force participation choice model using probit analysis. Again, utility maximization was assumed, and the individual was viewed as choosing between expected earned income (measured by the individual's 1969 wage rate) and potential monthly benefits from the SSDI program (imputed from the individual's earnings record). Inclusion of potential retirement benefits for those eligible (the 62-63 age group) reflects a third potential choice for this age group.

The estimated elasticity for all men, calculated at the mean, is -.023; for only married men, it is -.026. These estimates are smaller than those of Parsons and Leonard, and neither estimate is statistically significant at the 5 percent level.

II. CRITIQUE OF DISABILITY-LABOR SUPPLY STUDIES

The studies of Parsons, Leonard, and Slade have a number of methodological and data limitations. First, the measurement of expected disability income is a problem in all of the studies. The transfer benefit measure used includes only the individual benefit amount from one program

and, hence, proxies for the full potential cash and in-kind benefits available, including those to dependents. This will result in an underestimate of benefits and consequently an upward bias in the coefficient. In 1980, SSDI benefits were only 32.3 percent of total U.S. federal disability transfer benefits (excluding Medicare and Medicaid). Moreover, private pensions are not included in any of the analyses, again leading to overstatement of the coefficient on SSDI benefits. And, selectivity problems affect the estimation of imputed benefits. (See Haveman and Wolfe, 1984b.)

A second problem is the treatment of eligibility in the Parsons and Slade studies. Both authors impute primary SSDI benefits to all older males, implicitly assuming that each individual is either eligible for SSDI benefits or can make himself eligible at zero cost. Hence, the imputed value of disability transfer income exceeds the true expected value, biasing downward the coefficient on SSDI benefits. While Leonard does model eligibility, the measure which he develops is primarily a health status index rather than a measure of benefit eligibility.

A third problem area is model specification. Since modeling the work status decision is an imperfect science, the equations estimated in all of the studies are somewhat arbitrary and results may be quite sensitive to the actual specification. Important variables may have been omitted, and to the extent that they are correlated with the included variables, lead to biased estimates. Moreover, because all of the variables included in the first step of Leonard's model (determining eligibility) are also included in the second equation on recipiency, the model may not be identified. In Slade's model, the inclusion of potential monthly

retirement benefits for those aged 62-63 may create a collinearity problem between retirement benefits and disability benefits, as both are based on past earnings history. This may again lead to biased estimates of the role of disability benefits. The policy variable in Parsons's study is a replacement ratio whose numerator (the potential value of primary monthly SSDI benefits) is a monotonic function of the denominator wage rate. Hence, his results may suggest that high wages raise participation rather than that high benefits reduce participation.

Fourth, problems involving sample selectivity affect both Parsons's and Leonard's estimates. Some observations in Parsons's example do not have an observed wage rate. Similarly, Leonard estimates his probability-of-eligibility equation only over those who have applied for benefits. In neither case were appropriate corrections for selectivity employed.

Finally, since disability insurance pensions are conditioned on total and permanent disability, it is essential that a reliable measure of true disability or health status be included in the estimation of the response of the work/retirement choice of older workers to income flows from work and from disability-related transfers. All of these studies use different measures of disability, and all have serious limitations.

No ideal measure of health or disability status exists in available micro-data. Self-reported health is the most readily available, but is plagued with concerns of subjectivity and potential endogeneity with actual success in the labor market (as, say, proxied by the expected wage rate). Anderson and Burkhauser (1984) have indicated that this endogeneity may bias downward the estimated effect of expected earnings

(relative to expected disability transfers) in labor supply studies. (See also Chirikos and Nestel, 1981.) Others, however, have suggested that self-reported measures may, in fact, better capture aspects of overall true health status than medical information (Maddox and Douglass, 1973). And Fuchs (1982) has found that self-reported health five years prior to an observed work status has much the same measured effect as does contemporaneous self-reported health, indicating that endogeneity is not a serious problem in using health self-reports.

Constructed variables relying on mortality after the period of observation have been used to avoid the endogeneity problem (Parsons, 1980a and 1980b; Anderson and Burkhauser, 1984). However, this measure has no obvious tie to work limitations or to those nonfatal health problems that limit work but are generally unrelated to mortality (Wolfe and Haveman, 1983). Finally, while detailed information on speci fic health conditions is available (Leonard, 1979; and Slade, 1982), these are difficult to work with and to interpret without information on the physical and mental requirements of an individual's normal occupa tion.

III. SELF-REPORTED AND "TRUE" HEALTH STATUS IN MODELING THE LABOR SUPPLY EFFECTS OF DISABILITY TRANSFERS

In this section, we present a model of the labor supply response to disability transfers which corrects many of the specification problems of the prior studies.[2] This model is then used to test the appropriateness of using self-reported health measures in labor supply studies. Results using such a measure are compared to those based on a measure estimated from a latent-variable structural model.

In our model of the work status choice of individuals, we assume that people choose between labor force participation and disability transfer recipiency on the basis of expectations regarding the level of economic well-being that would be afforded in each status. The income flows associated with each option determine the well-being experienced in each option, together with other sources of utility such as time spent in leisure and the stigma cost associated with public transfer recipiency.

Utility in the market work option is

$$U_L = U_L(LE + N, \bar{H}),$$

where LE is the income flow in the labor market option, N is nontransfer, nonwage income, and H is the hours of market work. In analogous fashion,

$$U_D = U_D(DT + N, 0)$$

is the utility in the disability transfer option, where DT is the income flow in the disability transfer option, and H=0. The partial derivatives of both functions with respect to H are negative and with respect to income are positive.

We approximate the utility functions by assuming that they are linear in their arguments. Hence the utility-maximizing individual follows the decision function

$$(1) \quad I^* = U_L(LE + N, H) - U_D(DT + N, 0)$$

$$\cong \alpha(LE + N) - \gamma\,(DT + N) + \underline{\omega}'\underline{X} + V$$

where $\underline{X}$, is a vector of parameters of the utility function and V is a random error term with a zero mean measuring tastes and other unobserved variables and α, γ, and ω are parameters to be estiamted. Given this rule,

$$(2) \qquad I = \begin{cases} 1 \text{ if } I^* > 0 \\ 0 \text{ if } I^* \leq 0, \end{cases}$$

where 1 represents the labor market option and 0 represents the disability transfer option.

Because LE and DT are observed for those who have made the respective labor market and disability transfer choices, we need to determine LE for those with I=0 and DT for those with I=1. Estimates of these values are based upon reduced-form regression equations with appropriate corrections for selectivity bias (Haveman and Wolfe, 1984a).

The resulting model is a simultaneous equation system and is written as

$$(3) \qquad LE_j = \underline{\beta}_1'\underline{Z}_j + \varepsilon_{1j} \qquad \text{iff } I_j^* > 0$$

$$(4) \qquad DT_j = \underline{\beta}_2'\underline{Z}_j + \varepsilon_{2j} \qquad \text{iff } I_j^* \leq 0,$$

with β_1 and β_2 reduced-form coefficients to be estimated, and ε_{1j} and ε_{2j} the error terms on the corresponding equations. The decision equation associated with this model is

$$(5) \qquad I_j^* = (\alpha\underline{\beta}_1 - \gamma\beta_2)' \underline{Z}_j + (\alpha\varepsilon_{1j} - \gamma\varepsilon_{2j}) + \underline{\omega}'\underline{X}_j + V_j$$

$$= \underline{\beta}_3' \,'\underline{Z}_j + \underline{\omega}'X_j + \varepsilon_{3j},$$

where $\underline{\beta}_3 = (\alpha\underline{\beta}_1 - \gamma\underline{\beta}_2)$

$$\varepsilon_{3j} = \frac{1}{\sigma^{*2}} (V_j - \alpha\varepsilon_{1j} - \gamma\varepsilon_{2j})$$

$$\sigma^{*2} = E(V_j - \alpha\varepsilon_{1j} - \gamma\varepsilon_{2j})^2.$$

This model is an example of a "switching regression" that has been discussed by Heckman (1974; 1979) and Lee (1979). We have chosen to derive estimates from the two-stage probit procedure because the estimates from full maximum-likelihood procedures rest on the availability of good initial estimates in highly nonlinear models. Our two-stage probit procedure utilizes modified least squares in the first stage and probit maximum likelihood in the second. The income estimates used in the final stage are conditional estimates.

We report two versions of the model distinguished only by different measures of disability status. The first version relies on longitudinal information on self-reported disability, including the extent of disability. Two self-reported disability variables are used: percentage of full capacity that the individual is currently sacrificing because of disability, and an indicator of the duration of severe disablement over the prior ten years with larger weights placed on recent incidence. The second uses a "true" disability measure obtained as an unobservable in a separate latent variable structural model (LISREL) estimation (Jöreskog and Sorbom, 1978). The index treats individual disability status as an unobservable characteristic, but one which is both causally related to a variety of exogenous characteristics of an individual and correlated with a variety of observed indicators of statuses and behaviors believed to be associated with true limitations on functioning in

the labor force. The causal factors include socioeconomic characteristics of the individual, family income, personal habits, and occupational requirements and characteristics of the individual's normal occupation. The indicators include interviewer-assessed severity of disability, self-reported general health conditions, specific health problems, medical care utilization, mobility, strength, and percentage of weighted occupation for which the person is qualified based on a comparison of individual capabilities with requirements of each occupation (Haveman and Wolfe, 1984c).

Each model is estimated for men aged 45-62 in 1978, using data from the Michigan Panel Study of Income Dynamics (PSID). The panel character of the data allows construction of variables related to past earnings, occupational mobility, and the duration of disability status. It contains rich information on individual demographic characteristics, labor force status, and individual and family income flows by source.[3]

The labor market option in each version is defined as either having earned income or unemployment benefits greater than zero and no disability-related transfers, or having disability transfers greater than zero but earnings in excess of $3360. The disability-transfer-recipient option is defined as having disability transfers greater than zero and earnings less than $3360.

In estimating the model, we first fit reduced-form probit equations over the observations in the full sample to predict the probability of being in the labor market or disability-transfer-recipiency groups. The variables in these reduced-form probit equations reflect those demand and supply-side characteristics of both the labor market and the disability transfer "market" that are likely to affect the presence of an individual

in either group, including measures of disability status. Hence, the determinants of both the probability of success in gaining employment and in meeting disability-transfer-program-eligibility criteria are included. Also included are factors related to the income flows in each state. A reduced-form specification is used to avoid simultaneous-equation bias arising from the omission of any important variables in the alternative structural equation model.

The second-step OLS equations predict the expected income flows in each option and include as an independent variable the inverse Mills ratio selectivity correction term obtained from the first-step probit estimate. In each model, the results show that (1) the extent of current disability has a negative effect on labor market income and (2) race, age, region, prior earnings and education have some influence on the expected disability income flow, which suggests that eligibility determination reflects vocational opportunities.

Step three is the final probit, which contains the two expected income terms and a set of six variables included in the first-stage probit equation, but not in the OLS income regressions. In both versions of the model, a small but significant response to expected income in the disability transfer option is observed. Table 2 presents the results for both of the models. The elasticity of labor force participation with respect to disability transfer income ranges from -.0003 (t-statistic -7.6) using self-reported disability status to -.0002 (-4.0) using disability status measured as a latent variable. In each case, the response is much smaller than those of the other studies discussed above. Even more important, the similarity in the estimated response to disability transfer generosity across the models suggests the robustness of earlier

Table 2

Final Stage Probit Estimates of the Determinants of Work Status Choice (asymtotic t-statistic)

Item	Model 1[a]		Model 2[a]	
Expected labor market income (LE)	0.45	(10.7)	0.50	(9.0)
Expected disability-transfer recipiency income (DT)	-0.49	(-7.6)	-0.32	(-4.0)
Elasticity wrt LE	.001		.0005	
Elasticity wrt DT	-.0005		-.0002	
Two times log-likelihood function	596		618	

[a]Both models also include a set of six variables included in the first-stage probit equation but not included in the income regressions. These variables are Protestant (0, 1), Catholic (0, 1), Jewish (0, 1), decreasing occupational status (0, 1) disability incidence in usual industry, and unemployment rate. The mean of the dependent variable is 0.872; $\sigma = 0.33$.

models suggests the robustness of earlier estimates based on self-reported health status.

The decline in the coefficient, elasticity, and significance of the disability-transfer-income variable in moving from model 1 to model 2 indicates that the self-reported variable is, to some extent, endogenous in the labor force participation decision. However, the extent of bias from using self-reported indicators of individual characteristics does not appear substantial.

Using both models, we derived elasticities for subgroups of the population to gain insight into which groups are most responsive to changes in disability income. We find that persons with low earnings, those more disabled, and those older are more responsive to increases in generosity. This result implies that disability transfer programs are "targeted efficient," with little direct loss in national output.

IV. CONCLUSION

From these studies, we have found consistent evidence of a statistically significant effect of disability benefits on the work status choice. The response to increased transfer benefits, however, is small and is concentrated among older, disabled men who have low expected earnings.[4] Therefore, a policy of reducing disability transfers, with the objective of increasing labor supply and total output, is unlikely to be successful, in and of itself, in reducing the demand for disability transfers. Other policy changes, such as tightened eligibility requirements, are likely to be necessary to secure marked reductions in the growth of disability rolls. Such discretionary rule changes, however,

may result in bureaucratic arbitrariness and potential horizontal inequities, while simultaneously working hardships on those unable to work but denied benefits. Because the response to reduced expected benefits is concentrated among those with low earnings capacity and few alternative sources of income support, benefit cuts per se can be expected to impose substantial economic hardship without offsetting efficiency gains.

The test reported in this paper also sheds light on the controversy regarding the extent to which self-reported indicators of health or disability status are endogenous with actual work decisions and, hence, inappropriate for use in studies designed to estimate the determinants of work effort choices. Our index of true disability is significantly purged of self-reports of disability status. When it is used in our two-stage probit model, the coefficient on the disability transfer income variable decreases to .33, relative to the .4 coefficient when a self-reported disability measure is used; the elasticity at the mean decreases from -.0003 to -.0002. While this indicates the presence of endogeneity, the relatively small change implies the magnitude of bias is not large. These results increase our confidence in the finding that the response to increased generosity and/or leniency of transfer benefits is quantitatively small.

Notes

[1]See, for example, the early labor supply studies in Cain and Watts (1973). More recent studies include Masters and Garfinkel (1977) and a survey and critique of recent work, by Heckman, Macurdy, and Killingsworth (1979).

[2]For a fuller description of this model and its estimation, see Haveman and Wolfe (1984a).

[3]The LISREL estimation was first run on 10,000 working-age individuals on the 1978 Social Security Survey of the Disabled. The causal factors from that estimation were matched to equivalent variables in the PSID and then the coefficients from the original LISREL estimate were used to impute disability status observations on the PSID.

[4]The large responses found by Parsons and Leonard are biased upward in part because (1) only one program rather than the full set of potential income sources is included in these studies and (2) Parsons's replacement rate is likely to be dominated by the wage rate denominator rather than the expected disability benefit numerator. (See Haveman and Wolfe, 1984b.)

References

Anderson, K. H., and Burkhauser, R. V. 1984. The importance of the measure of health: an empirical estimate of the labor supply of older men, Economic Letters, forthcoming.

Burkhauser, R. V. 1980. The early acceptance of social security: an asset maximization approach, Industrial and Labor Relations Review, 33(4), 484-492.

Cain, G. G., and Watts, H., eds. 1973. Income Maintenance and Labor Supply. Chicago: Markham.

Chirokos, T. N., and Nestel, G. 1981. Impairment and labor market outcomes: a cross-sectional and longitudinal analysis, in Work and Retirement, ed. H. Parnes. Cambridge, Mass.: MIT.

Danziger, S., Haveman, R., and Plotnick, R. 1981. How income transfers affect work, savings, and the income distribution, Journal of Economic Literature, 19(3), 975-1028.

Fuchs, V. R. 1982. Self-employment and labor force participation of older males, Journal of Human Resources, 17(3), 339-357.

Gordon, R., and Blinder, A. S. 1980. Market wages, reservation wages, and retirement decisions, Journal of Public Economics, 14(2), 277-308.

Haveman, R. H., and Wolfe, B. L. 1984a. Disability transfers and early retirement: a causal relationship?, Journal of Public Economics, 24, 47-66.

_____. 1984b. The decline in male labor force participation: comment, Journal of Political Economy, 92(3), 532-541.

_____. 1984c. Disability an an unobservable; estimates from a structural model, Institute for Research on Poverty, University of Wisconsin-Madison, mimeo.

Heckman, J. 1974. Shadow prices, market wages and labor supply, Econometrica, 42(4), 679-694.

_____. 1979. Sample selection bias as a specification error, Econometrica, 47(1), 153-161.

Heckman, J., Macurdy, T., and Killingsworth, M. 1979. Recent theoretical and empirical studies of labor supply: A partial survey. Paper presented at conference on the labor market, Magdalen College, Oxford University.

Jöreskog, K. G., and Sorbom, D. 1978. Estimation of Linear Structural Equation Systems by Maximum Likelihood Methods: A Fortran IV Program. Chicago: International Educational Service.

Lee, L. F. 1979. Identification and estimation in binary choice models with limited (censored) dependent variables, Econometrica, 47(4), 977-976.

Leonard, J. 1979. The social security disability program and labor force participation, National Bureau of Economic Research, Working Paper No. 392, Cambridge, Mass.

Maddox, G., and Douglass, E. 1973. Self-assessment of health: a longitudinal study of elderly subjects, Journal of Health and Social Behavior, 14, 87-93.

Masters, S., and Garfinkel, I. 1977. Estimating the Labor Supply Effects of Income Maintenance Alternatives. New York: Academic Press.

Parsons, D. 1980a. The decline in male labor force participation, Journal of Political Economy, 88(1), 117-134.

_____. 1980b. Racial trends in male labor force participation, American Economic Review, 70(5), 911-920.

Slade, F. P. 1982. Labor supply under disability insurance, National Bureau of Economic Research, Working Paper No. 860, Cambridge, Mass.

Wolfe, B., and Hqaveman, R. 1983. Time allocation, market work, and changes in female health, American Economic Review, 73(2), 134-139.