NBER WORKING PAPER SERIES

LABOR SUPPLY INCENTIVES AND DISINCENTIVES FOR THE DISABLED

Jonathan S. Leonard

Working Paper No. 1744

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
October 1985

I thank John Bound and Anne Hill for their comments. The research reported here is part of the NBER's research program in Labor Studies. Any opinions expressed are those of the author and not those of the National Bureau of Economic Research.

NBER Working Paper #1744
November 1985

Labor Supply Incentives and Disincentives for the Disabled

ABSTRACT

The past three decades have witnessed a large and puzzling decline in labor force participation by prime-age males, and a correspondingly large increase in Social Security disability beneficiary roles.

This paper reviews the analytical studies that have attempted to determine the causal links between disability, beneficiary status, and labor-force non-participation.

Although disability is often thought of as a purely medically determined condition with no labor supply responsiveness to economic factors, models of Social Security disability beneficiary status as an economic decision have had some success in explaining both the growth of the program and the decline in labor force participation. These studies have, however, produced a wide range of estimates of labor supply elasticity, in part because of the difficulty of the underlying econometric problem of estimating the response to two (or more) potential income streams, only one of which is usually observed for any individual.

Jonathan S. Leonard
Assistant Professor of Industrial Relations
School of Business
University of California
Berkeley, California 94720

What Are the Labor Supply Effects of the Social Security Disability Program

If one accepts the desirability of a federal program such as Social Security Disability (SSD) that provides income to the disabled, there are still a number of difficult questions to be faced concerning the design of such a program. Chief among these in recent debates has been the equity-efficiency tradeoff. Equity consideration may call for the state to provide some income to the disabled who become poor so that they may keep what is left of body and soul together. It is, however, generally not possible to perfectly differentiate those who cannot work from those who can. Indeed, whether out of desperation or out of choice, one can observe some individuals working while others with the same medical diagnosis do not.

The crux of the matter is that disability is not simply a medically defined condition, but depends rather on an array of surrounding psychological, sociological and economic factors. A person who perceives himself as disabled may thereby disable himself. A person who is perceived by others as disabled may thereby be disabled. And a person who finds greater economic returns to disability than to work may not struggle so hard to work. This need not be a question of fraud or dissembling, but merely of adapting to the given incentives. This paper will focus on estimates of how people have adapted their work and labor force decisions to the incentives embodied in the Social Security disability system.

The efficiency considerations come into play at two levels. As income is provided for the disabled, some who would have worked will no longer do so. In some cases the people taking advantage of disability income will not truly be disabled. Providing disability income to the able is not only an inefficient waste of resources, it also undermines the legitimacy of the program. While this case is clear-cut, the second is more difficult. Since

disability is not a medically defined yes-or-no state, but rather a continuum that depends on the economy and society as much as on the individual, a generous policy might expand the definition of disability and extend benefits to a greater proportion of the population. As it did so, however, we would find a decreasing proportion of people working, and so less income produced that could be redistributed. Hence the equity-efficiency tradeoff, which at base must always remain a value judgment. All that an economist can hope to do is provide those responsible for policy with some idea of the magnitude of the tradeoff. As the Social Security Disability program is liberalized in terms of eligibility and benefits, what do we expect to happen to the beneficiary rolls and to labor force participation?

There have now been a handful or two of studies on this question. The few studies agree on the direction but not the magnitude of the effect. It is safe to say that we have not developed as full an understanding or consensus on this question as on the related labor supply questions of the effect of the minimum wage, of unions, of social security retirement pensions, of income and payroll taxes, or of various other welfare programs. The studies have been of considerable use in drawing attention to the labor supply effects of Social Security Disability, pointing out the link between the growth of SSD beneficiary rolls and the decline of labor force participation rates, and in establishing some estimates of the range within which the true labor supply effect of social security disability is likely to fall.

Before delving into details, it should be recognized that the question itself presents a formidable technical challenge, and a simple answer does not immediately jump out of the cross-sectional data. There are essentially three methods of trying to determine the labor supply effects of SSD, depending on the nature of the data used -- time-series, cross-section or

longitudinal. We shall consider each in turn.

Consider the case in which the simple conception of disability apparently embodied in early SSD legislation is true: the disabled cannot work. Also, make the extreme assumption of perfect screening: those who can work cannot receive SSD. Now in a time-series analysis, we would expect to find no relation between SSD benefits per beneficiary and the number of beneficiaries, nor between the number of SSD beneficiaries and labor force non-participants. Under the assumptions that the disabled cannot work and the able cannot receive SSD benefits, there can be no labor supply effect. The disabled cannot work, so their labor supply is zero. The SSD program cannot reduce this. All the disabled are already out of the labor force. At the other end, the able cannot receive SSD benefits, so changes in SSD benefit levels cannot affect the beneficiary or labor force status of the able. These assumptions are simple and may appear naive, but they appear to have had a strong influence on policy until recent years. More importantly, they are in principle testable. In contrast to the more highly refined econometric tests based on cross-section and longitudinal data, the tests based on time-series have not become obscured in a methodological fog. This is not to say the time-series tests are methodologically perfect, but rather that they are more directly accessible and do not impose as much structure on the data.

The problem faced by those who would claim that SSD has no labor supply effects is to explain away Figure 1 and Table 1, reproduced from Parsons (1984). This is the most simple sort of analysis because it does not even begin to control for the other possible factors that may affect both SSD beneficiary rates and labor force participation rates. Correlation does not prove causation, but since 1957 the labor force participation rate of

45-54 year old males appears to fall as the proportion of these men on SSD beneficiary roles rises. If all SSD beneficiaries could not work, they would already be out of the labor force and we would expect no such relation. Moreover, this particular correlation deserves a bit more respect than do sunspots. We know that SSD beneficiaries, according to regulation, must be out of the labor force, so the rise in SSD beneficiaries could by itself explain much of the decline in labor force participation rates. While other factors may explain other parts of the decline in labor force participation rates, no one has shown the dominance of such factors. Moreover, the labor force nonparticipants report negligible liquidation of private assets, and receive little financial support from relatives. It is difficult to point to one other factor that has played as large a role as SSD in explaining the decline of labor force participation among prime age males.

A number of studies have pursued this type of time-series analysis, some also controlling for other variables. Among the first was Gastwirth (1972) who pointed to the connection between the mysterious drop in the labor force participation rate of prime age males and the corresponding increase in the proportion of men receiving disability benefits. As possible explanations of the increase in beneficiaries, he suggested (but did not test) the change in the disability laws which allowed people under age 50 to receive benefits, the 1965 amendment which changed the definition of disability from "permanent" to "expected to last 12 months," and increasing awareness of the program's existence. Using additional information on the labor force participation of the disabled who received no public assistance, Gastwirth considers that at most 78.3 percent of newly eligible beneficiaries would have previously been in the labor force. Using Nagi and Hadley's (1972) estimate that 45 percent of applicants for disability benefits have a

high work motivation, Gastworth assumes that at least 55 percent of newly eligible beneficiaries would previously have been in the labor force. After roughly bounding the labor supply effect in this manner, Gastworth concludes that "about half of the observed decline in male participation rates during the 1960's may have resulted from changes in the disability laws."

Gastwirth's upper bound is questioned by Swisher (1973), who argues that among the severely disabled 4 percent of the beneficiaries and 44 percent of the non-beneficiaries were in the labor force, so at most 40 percent of severely disabled new beneficiaries were likely to previously have been in the labor force. The difference between these two estimates may be taken as an indicator of the importance of disability definition and screening in affecting the labor supply effect of SSD.

The connection between SSD and labor force nonparticipation is reinforced by Siskind (1975). He shows, using simply cross-tabulations, that increases over time in SSD eligibility could help explain both the absolute decline in participation and the differentially more severe decline among black men.

These early studies simply compare increases in SSD beneficiary rolls with declines in labor force participation. The importance of economic factors in this relationship is examined more explicitly by Hambor (1975). In the context of economic decision making, one expects an increase in SSD applicants when there is a decline in alternative economic opportunities. This could explain Siskind's observation of a higher application rate among blacks, as well as Hambor's finding that the applicant rate increases when the unemployment rate increases. It is important to note that if all SSD applicants would have been out of the labor force in any case, there would be no reason to expect them to respond at all to unemployment rates. Yet

when the difficulty of finding a job increases, applications for SSD also increase.

The separate effects of macroeconomic cyclical fluctuations and of SSD program characteristics on SSD beneficiary levels and on labor force participation are estimated in time series regressions by Leonard (1979). In time series regressions of labor force participation rates on SSD beneficiary rates and cyclica indicators, labor force participation rates fall by 1.4 to 1.9 percentage points for each 1 percentage point increase in the beneficiary rate, even controlling for the business cycle effect.

In a separate set of time-series regressions of labor force participation rates on average SSD benefit levels average earnings, trend and business cycle indicators, Leonard finds that a $100 increase in average real monthly SSD benefits reduce non-white male labor force participation rates by 4 percentage points and white male labor force participation rates by 3 percentage points, controlling for cycle and trend.

It seems then that the fruitful question to ask is not whether the SSD program has affected labor supply, but rather how great a reduction in labor supply has the SSD program caused? The best estimates of this come from econometric analyses of cross-section data on individuals, but the best are not unflawed.

To develop an appreciation for the challenge faced by those who would estimate the labor supply effect of SSD in cross-section data, consider the following prototypical model:

$$LFP_i = f(W_i, NW_i, x_i)$$

where

W_i = The expected income if the i'th individual is in the labor force.

NW_i = The expected income if the individual is out of the labor force,

including expected SSD benefits.

x_i = A vector of other individual characteristics.

The essential problem in estimating such a function is that by definition W_i is unobservable for labor force non-participants and NW_i is unobservable for labor force participants. In other words, any sample at a point in time is composed of participants for whom we observe W_i but not NW_i, and non-participants for whom we observe NW_i but not W_i. Yet theory tells us that the participation decision will depend in part on W_i relative to NW_i. The econometric problem then is to develop adequate controls for W_i and for NW_i when they are not directly observed.

Parsons

The estimates of the labor supply effect of SSD that have perhaps drawn the most attention are those of Donald Parsons (1980a). Parsons assumes that an individual chooses to be out of the labor force if the expected utility of being in is less than that of being out. Labor force participation equations are estimated as a function of SSD benefits, welfare benefits, wages, a mortality index, age, and unemployment.

The estimates are based on a subsample of 3,219 men from the National Longitudinal Survey (NLS) who were 45 to 59 years old in 1966. There are a number of points that deserve attention concerning both the characteristics of this sample and the specification of the model. Wages for 1966 are used as a proxy for expected labor force earnings in explaining labor force participation during a survey week in 1969. Individuals without a reported 1966 wage are presumably eliminated from the sample, so as Parsons notes, individuals with long-term labor force absences will be under represented.

These are likely to include the most severely disabled who in turn might be less responsive to economic forces. If so, this will tend to bias upwards Parsons' estimate of responsiveness. However, most of the empirical evidence suggests the more disabled are also more responsive to potential SSD benefits. Also among the long-term non-participants will be long-term SSD beneficiaries, whose behavior may differ from more recent beneficiaries given changes in the rigor of program screening. Parsons also notes that the use of prior wage rates is a misspecification since expected labor force earnings are the appropriate variable in his model. In particular, for those whose health declined since 1966 (the 1969 disabled most likely to be in the sample), the 1966 wage will overestimate the real wage expected in 1969. Considering the chances that such a person becomes unemployed, earnings will be further overestimated. For those disabled people who are more likely to be out of the labor force, Parsons will report a wage that is too high. This by itself will lead to an underestimate of the response to expected earnings, but is partially controlled for by Parsons' mortality index.

A crucial problem faced by all studies of disability is constructing a measure of health and disability. It is possible that a prime-age male might seek to justify to himself or others being out of the labor force by exaggerating ill health or disability. In a clever approach to this problem, Parsons uses a variable that is presumably not subject to such self-serving distortion: death. Mortality subsequent to 1969 (1969-1976) is used as a proxy for 1969 health status. There may, however, be a cost to leaning on death. As Leonard (1976) earlier showed, there is substantial attrition in the NLS sample for reasons other than death, but which may be correlated with health. Presumably, individuals who disappeared from the NLS sample after 1969 but were not reported to have died were included in Parsons'

1969 sample with a mortality index of zero, which will bias toward zero the coefficient on the mortality index.

Parsons estimates probit equations for labor force participation as a function of the replacement ratio and other variables. The chief variable of interest is the replacement ratio, the ratio of monthly potential social security benefits to the 1966 hourly wage rate. The measurement problems surrounding potential SSD benefits are potentially severe, although much of this is due to the limitations inherent in the NLS data rather than to Parsons' handling of the data. First, one would like to know what income is expected conditional on being out of the labor force, but SSD and welfare benefits, even together with the mortality index, can only proxy for this expected income. Second, because of data limitations, Parsons constructs his measure of SSD benefits by using 1966 hourly wages as a measure of average monthly earnings. However, average monthly earnings actually depend on much more than hourly wages during one year. The actual benefit computation formula is quite complex. SSD benefits depend on family structure as well as on average monthly benefits. Since these other factors are not taken into account, Parsons' SSD benefits measure can only differ from his wage measure by non-linearity in the SSD benefit schedule: a relatively thin reed to depend on. The consequence, as Parsons notes, is that his wage and SSD benefit levels are highly correlated, forcing him to enter these variables in ratio form, but this ratio is purely a function of the wage and of the progressivity of the benefit schedule.

The schedule is progressive; benefits do not increase as rapidly as wages. So the replacement ratio, as measured by Parsons, should fall with wages. Parsons' result may then be interpreted as saying that low wage men are more likely to drop out of the labor force, and this is more likely

in case of ill health. Since there is, as near as I can tell, no variation in Parsons' replacement ratio conditional on a given wage, hypotheses concerning the effect of the replacement ratio cannot be differentiated from those concerning the wage. Again, part of this problem is unavoidable in the NLS data set since it does not include an earnings history that could be used to construct a better measure of average monthly earnings, and so of benefits. John Bound (1985) reports a replication of Parsons' specification using a sample of non-applicants from the 1972 Social Security Survey. Although some of these people may have dropped out of the labor force in anticipation of applying for SSD benefits, it is unlikely that a majority would do so. In other words, since the sample is restricted to people who have not applied for SSD, it is unlikely that much of their non-participation in the labor force could be explained by the SSD program. We would expect these non-applicants to be irresponsive to SSD program benefits. Yet Bound finds a .88 elasticity of labor force non-participation with respect to the replacement ratio among the sample of non-applicants. This raises the suspicion that the constrained replacement ratio is picking up the effect of other welfare programs or of low wages.

Parsons main finding is that the elasticity of non-participation with respect to the replacement ratio is 0.63, and varies greatly with the mortality index. Importantly, these cross-section estimates can in turn explain much of the decline in the labor force participation rates of 45-54 year old men, and differences between the decline in labor force participation among blacks and whites.

Haveman and Wolfe

In contrast to the large labor supply elasticity estimated by Parsons,

Leonard, Halpern and Hausman and others, Haveman and Wolfe (1984), and Haveman, Wolfe and Warlick (1984) estimate a relatively inelastic labor supply response to SSD benefits. This work has received most attention in the form of a comment in the Journal of Political Economy that first criticizes Parsons' methodology for a number of shortcomings, some mentioned above, and then presents estimates based on other specifications.

Haveman and Wolfe's (H&W) estimates are based on a 741 person subsample of 45 to 62 year old men in the 1978 Michigan Panel Study of Income Dynamics (PSID). At this stage it becomes important whether one is asking what determines labor force withdrawal or what determines SSD application or beneficiary status. H&W seem to focus on the first question. This is important because it means they do not attempt to estimate the responsiveness of SSD applications to SSD benefits, but rather they estimate the labor force participation response to non-work income flows. As they note, done correctly this would be an onerously difficult task given the multiplicity and complexity of programs providing welfare and disability income, each with their own eligibility regulations and each with their own benefit calculations. Rather than attempt the difficult task of estimating separate responses to each welfare or disability program, H&W's approach is to estimate a single grouped response to a set of disability-related transfers including SSD, supplemental security income, veterans' disability benefits, other disability pensions, and for the disabled a share of other welfare and help from relatives. The cost of this procedure is that having lumped these disability transfers together, one cannot untangle their respective roles in explaining the results. In particular, these estimates do not tell us directly how people respond to the SSD program.

H&W's econometric model follows Lee (1979). As Haveman, Wolfe and

Warlick note (1984, p. 90), for this model to be identified some variable that determines labor market earnings or disability transfers must be excluded from the direct determinants of labor force participation. In addition, the errors in the income flow equations must be uncorrelated either with each other or with the participation equation error. While desirable in theory this is unlikely to obtain in practice, with unknown consequences.

The first step in H&W's method is to estimate a probit equation of labor force participation. Note that while the model implies that expected income in and out of the labor force should be included in such an estimate, they are excluded, apparently for reasons of econometric tractability. In addition, most of the remaining variables are insignificant. Those claiming severe long-term disability, aged 59-62, Protestants, the unmarried, and veterans are significantly less likely to be in the labor force. This equation is then used to correct for sample selection, following Heckman, in both earnings and disability income equations. In both cases these selectivity correction variables turn out to be insignificantly different from zero. One potential advantage of using the PSID is the possibility of using past earnings or wages in estimating potential earnings, but H&W do not use this information.

The final step is the estimation, again, of a probit equation for labor force participation; this time as a function of the imputed expected income flows. These results are reproduced in Table 3 from H&W. H&W find an elasticity of labor force participation with respect to disability income that ranges from -.021 in a replication of Parsons' specification down to -.0056 with the addition of dependent benefits, additional controls, selectivity corrections and eligibility adjustment. HW&W find an extremely non-linear response (Table 5) with much larger elasticities among the more disabled

and those with lower earnings. Note that the calculation of elasticities is not always transparent. This is a very useful result in that it cautions against the use of simple models to capture widely varying behavior and gives us some feel for the wide range of estimated responses that can be found in a single specification in a single sample. In particular, given the highly non-linear response, it is clear that the elasticity calculated at sample means (the result usually reported) need bear little relationship to the mean elasticity in the sample, or the mean elasticity of individuals on the margin of some hypothetical policy change.

The most highly visible of Haveman and Wolfe's work is presented in the form of a critique (1984) of Parsons' work. A substantial part of Parsons' response involves references to unpublished work by Leonard. There are two works by Leonard on this topic, one even more obscure than the other. The first (1976) uses the same data set as Parsons, the NLS, and finds that thirty percent of the variance in weeks out of the labor force in 1965 among men can be explained by variation in disability benefits, conditional on self-reported health, age and family characteristics. This study also demonstrates (p. 89) the importance of sample attrition bias in the NLS (and presumably in similar longitudinal samples as well). Only 15 percent of men who disappear from the NLS sample between 1965 and 1971 are known to have died by 1971. The remainder of the sample attriters tend to include more disability beneficiaries, more long-term non-participants and more phsyically impaired men than does the full 1965 cross-section. In other words, where disability shows its strongest effect, and where labor force participation is lowest, the sample is truncated, biasing toward zero the estimated impact of health on labor force participation on longitudinal samples. If these sample drop-outs are also among the most responsive to

SSD benefits -- which is open to question -- the estimated responsiveness to benefit levels will also be biased toward zero.

This early study is also of some use because it discards a number of other potential explanations of the decline in male, particularly black, labor force participation rates. The first set of these may be termed dislocation models. First, single men typically have lower labor force participation rates than do married men. But at least between 1940 and 1970 there has if anything been a reduction in the proportion of black men over the age 45 who are single (p. 14).

A second dislocation argument for blacks argues that the decline in agricultural employment could reduce reported labor force participation rates. However, the movement off the farms had been largely completed by 1960, whereas declines in labor force participation continued well beyond 1960 (p. 23). A third more general dislocation argument is that poor labor force participation among 50 years olds today is the tail end of poor attachment among 30 year olds twenty years ago. The empirical evidence does not support this argument. The recent declines are a recent phenomena affecting many age groups, and have not been explained by changes in marital status, structural unemployment, or some past decline in participation.

A second set of explanations uses family utility models to argue that the decline in the husband's labor force participation is merely the expected income effect from an exogenous increase in wives' labor force participation. However, marital status and wife's earnings have only a small and insignificant effect on male labor force participation. Moreover, the premise of the argument, that wives' labor force participation has increased, turns out not to be true for 45 to 54 year old non-white women between 1965 and

1974.

By examining and discarding a number of competing explanations for the decline in male labor force participation rates, this early study sets the stage for a more refined analysis of the impact of the SSD program on the labor force participation of prime age males. Leonard (1979) first calculates an upper bound on the possible labor supply effect. If all 45 to 54 year old male SSD beneficiaries would otherwise have been in the labor force then at most 66 percent of the 8.9 percentage point decline in non-white participation and 90 percent of the 3.7 percentage point decline in white participation from 1957 to 1975 could be attributed directly to the SSD program. These may, in fact, well not be true upper bounds since as Parsons points out, with a high and uncertain probability of rejection among applicants, one might expect more than one labor force drop-out for each resulting SSD beneficiary.

Using a sample of 1685 men aged 45 to 54 drawn from the 1972 Social Security Survey of Health and Work Characteristics, which had been merged with Social Security beneficiary records and earnings histories, Leonard estimated the labor supply effects of the SSD program. Note that this sample oversampled the disabled, so an elasticity calculated at the sample mean from a non-linear specification may be an overestimate.

The model is as follows:

(1) $SSDK = F(SSD, W, X) + e$

(2) $W = Zb + u$

where

SSDK = probability of being an SSD beneficiary,

SSD = expected SSD benefits,

W = expected labor market income

Z, X = vectors of individual background characteristics

u, e = error terms.

The major econometric problem is that a large proportion of the sample, the SSD beneficiaries in particular, are out of the labor force and have no observable current wage. One might want to impute wages for this group using a wage equation estimated for the subsample with observable wages, and correcting for sample selection bias following Heckman. This method requires estimating the probability of observing a positive wage, but in this application this is nearly equivalent to estimating the probability of not being an SSD beneficiary, which is what we are after in the first place. This approach, which does not arise in the original Heckman application because the probability of having an observable wage is not taken explicitly as a function of the expected wage, would require maximum likelihood estimation of a non-linear simultaneous system.

Since Leonard is willing to leave the coefficient on W in the beneficiary equation unidentified, he can avoid the simultaneity problem. As in indirect least squares, he replaces W by Zb + u as in equation 3.

(3) $$SSDK = F(SSD, Zb + u, X) + e$$

Note that the estimated coefficient on an element of Z, say Z_i, that is also an element of the vector Z, will be the sum of the coefficient on Z_i in equation 1 plus the product of the coefficient on W in equation 1 times the coefficient on Z_i in equation 2.

Expected SSD benefits are estimated as the product of de jure benefits given eligibility, times the probability of being eligible for benefits. Using a sample of recent applicants and assuming no sample selection bias, a third

equation estimates the probability of eligibility as a function of health and background characteristics. If applicants were more eligible than non-applicants in ways not controlled for in our eligibility equation, then the estimated coefficient on SSD would be biased toward zero in equation 3 because of overestimation of expected SSD benefits among non-applicants.

The data-set includes the respondents' claimed knowledge of a Social Security program that pays disability benefits. We can take this knowledge as either endogenous or exogenous. If we impute positive SSD benefits even to those who claim to be ignorant of the program, then equation 3 can be thought of in two ways. Either we have made the restrictive assumption that everyone knows about the program, or, we are estimating the joint probability of knowing about and applying for the program. Alternatively, if positive expected benefits are imputed only for those who know of the program, then knowledge of the program is taken as exogenous, and we have a classical control group with which to test the effect of SSD benefits on labor force participation.

Past wage is used to help infer current expected wage. The data set includes the Social Security Earnings Record, which reports annual earnings up to the maximum amount that is subject to Social Security taxes. Leonard selects the most recent set of positive past annual earnings and corrects for quarter worked and inflation. The specification includes a binary independent variable set to one if the past wage was at the taxable ceiling, to correct for the truncation of this variable. To correct for health and disability status a set of 27 binary independent variables for specific health conditions is included.

Leonard finds that the Social Secrurity Disability program has had a large and significant effect in reducing labor supply. The elasticity of labor supply in response to expected SSD benefits is found to be .35 in the

results discussed below. Estimation of the model supports the hypothesis that labor force participation falls because more men become SSD beneficiaries when expected SSD benefits rise relative to wage income.

The key variable, SSD benefits, is imputed in two steps. De jure benefits are calculated as a deterministic function of past wage history and number of dependents. The correlation between the calculation of de jure benefits and actual benefits received by beneficiaries is .81, since exact data on the date of disability determination is unavailable. To impute expected SSD benefits the calculated de jure benefits are multiplied by the probability of being eligible, which is estimated using a sample of recent applicants. This process is subject to criticism since the errors in the eligibility and beneficiary equations may be correlated. Eligibility for SSD benefits is determined by State agencies in a subjective process that takes account of age, education, occupation, and the degree of disability. Legally, total disability expected to last at least one year is the prerequisite. 90 percent of the recipients in the sample report themselves totally disabled, as do 68 percent of the non-recipients who are out of the labor force. For a sample of 45 to 54-year old men who applied for SSD between 1966 and 1972, health condition is obviously a prime determinant of eligibility. Another major factor is having established disability insurance coverage by having worked the required number of quarters in Social Security covered employment. So far the provisions of the law seem to be borne out in actual practice. According to the law race should not affect eligibility. That being non-white significantly decreases eligibility is either evidence of sample selection bias or measurement error, or else reflects the de facto application of the law.

Leonard finds that a $180 increase in year benefits will increase the proportion of SSD beneficiaries in the population by 1 percentage point.

This is equivalent to an elasticity of .35, a substantial response among men who are usually considered incapable of working. This specification can be interpreted as estimating the joint probability of knowing about and applying for SSD benefits, and may underestimate the true response since positive expected benefits are imputed to those who claim to be ignorant of the program. The same 1 percentage point increase in the proportion of beneficiaries is produced by a $105 increase in mean yearly benefits when the sample is limited to those who claim to know of the SSD program. This corresponds to an elasticity of .44. This estimate is unbiased if knowledge of the program is taken to be exogenous. Spreading knowledge of the SSD program is taken to be exogenous. Spreading knowledge of the SSD program does not by itself seem to be a sufficient explanation for the growth in the beneficiary rolls. Even when the sample is limited to those who know of the program, those with higher expected benefits are more likely to be beneficiaries.

Similarly, the more one expects to be able to earn the less likely one is to be beneficiary. As past wage reaches the ceiling on Social Security taxable earnings, the probability of being a beneficiary approximates zero. The elasticity of beneficiary status with respect to having wages that surpass the ceiling is -19.4. Below the ceiling the probability of becoming a beneficiary drops by 1 percentage point with a 12 percent increase in the level of past monthly wages. The sharply decreased probability of becoming a beneficiary when past wages are at or above the ceiling may reflect the fact that a disabled white-collar worker can often continue working while an identically disabled blue-collar worker cannot due to the physical demands of the job. The negative coefficient on years of schooling is taken as further evidence of the same effect.

The color of one's skin makes little difference. A higher proportion of black than white males are in the SSD program, not because blacks have a greater predilection for this program, but rather because blacks face poorer job opportunities and are in poorer health. If the economic position of blacks comes into line with that of whites, we expect equal proportions of blacks and whites to be beneficiaries.

These results indicate that the growth in the proportion of SSD beneficiaries among prime age males has been due to the liberalization of eligibility requirements, and to the increase in benefit levels relative to potential earnings. Declining job opportunities seem to be a plausible explanation for the program's accelerating growth during the 1970's, but not for the 1960's. Given the increases in real incomes and real per-capita health expenditures it seems implausible ot attribute the increasing proportion of beneficiaries in a given age group to deteriorating heatlh.

Do these estimated cross-section responses correspond to the observed changes over time? Half of the increase in the proportion of SSD beneficiaries can be accounted for by applying the cross-section coefficients to time-series data. This in turn can explain about half of the decline in LFPR, using previously described time-series regressions. Between 1957 and 1975 the average monthly benefit of new 45 to 54-year old beneficiaries rose from $94 to $148 in real 1972 dollars. The real average monthly earnings of production workers increased from $374 to $437 during the same period. The percentage of all male workers with annual earnings below the taxable ceiling fell from 41.3 to 23.8. Over this period there have been seven jumps in the ceiling, so the annual percentage above the ceiling has not dropped smoothly. Changes in other variables have been negligible. For example, the percentage married-spouse-present inched up from 83.9 to

84.3.

Multiplying the changes over time in wages and benefits by the estimated coefficients implies a 1.8 percentage point increase in beneficiaries, more than half of the historical 3.5 percentage point increase for men of both races.

Over time increases in beneficiaries have been matched more than one for one by decreases in labor force participants. Since a 1.8 percentage point increase in beneficiaries was calculated, applying cross-section coefficients to time-series changes, and since participation was estimated to drop by more than 1 point when the percentage of SSD beneficiaries increases by 1 point, these results imply at least a 1.8 percentage point decrease in labor force participation. The actual decline from 1957 to 1975 was 4.2 points for men of all races, so Leonard concludes that the growth of expected benefits relative to potential earnings can explain nearly half of the puzzling decline in LFPR.

While all econometric work is subject to criticism, and others have since estimated both considerably larger and smaller effects, the basic result is that the growth of the SSD program has caused a significant part of the decline in LFPR remains strong, in my judgment, even if one discards all of the cross-section evidence and simply focuses on the time series. The proportion of beneficiaries and of labor force non-participants have both increased.' We know that beneficiaries must be non-participants, and we have no other compelling explanation of the increase in non-participants.

Leonard also notes that the phenomenon of a falling LFPR in response to a disability insurance program does not appear to be unique to the U.S. In Canada, the LFPR of 45 to 54-year old men fell 2.3 percentage points in

the 7 years (Statistics Canada, 1972-1979), following the inclusion of disability insurance in the Canada and Quebec Pension plans in 1970. Perhaps the most outstanding example of this sort is in the Netherlands, where disability insurance has reached crisis proportions. By 1977, 23 percent of all insured 50 to 54-year olds, 31 percent of the 55 to 59-year olds, and 42 percent of the 60 to 64-year olds were beneficiaries of the Dutch Disability Security Act (Hans Emanuel, p. 10). Social insurance programs for disability seem to have reduced LFPR among prime age males in the Netherlands and Canada, as well as in the U.S. Other explanations of the decline in LFPR in the U.S. do not appear to be consistent with the data. In cross-section regressions, veteran status increases the probability of being out of the labor force, but the percentage of veterans among 45 to 54-year olds has been declining since the 1960's as the bulk of World War II veterans passed through this age group. It should also be noted that both Government employees' disability and private disability insurance programs reported unusual growth during the 1970's, contributing to the decline in LFPR.

The SSD program has acted as an escape hatch out of the labor force for disabled men. The more generous the benefits and the poorer labor market conditions, the more attractive the escape hatch. Reducing unemployment, improving rehabilitation efforts among the partially disabled, and recent legislation to extend Social Security hospital insurance and supplemental medical insurance to the disabled in the labor force would all be humane ways of helping these men to continue productive lives.

Slade

Evidence of a strong work disincentive for older men under the SSD

program has also been found by Slade (1984). Using a sample of men aged 58-63 from the 1969 Longitudinal Retirement History Survey, Slade estimates the elasticity of nonparticipation with respect to potential SSD benefits to be .81, and an even larger .90 when the sample is limited to those with self-reported health limitations. For nonparticipants, wages were imported from a wage equation using a sample selection correction. Potential SSD benefits were calculated using an earnings history. The replacement ratio, the ratio of potential benefits to potential earnings has a negative and significant coefficient in probit equations for labor force participation. Slade's estimated elasticity of nonparticipation with respect to the replacement ratio is .81, larger than Leonard's, and Haveman and Wolfe's, and Parsons' (1980a) .63, but lower than Parsons' (1980b) 1.8. Surprisingly, Slade also finds that the interaction effect of SSD benefits with self-reported health is small. Slade has imputed high potential SSD benefits to the perfectly healthy who are in the labor force and who presumably can expect to receive little if any actual SSD benefits, which would tend to bias his estimated response toward zero, making the substantial positive response to finds even more remarkable. Since his data set includes an earnings history, the collinearity problem should be reduced, but estimates are only presented in the constrained replacement ratio form.

Rejected Applicants

An original approach to the question of the labor supply effects of SSD is to ask what happens to rejected applicants. These studies report average behavior, and so are not directly comparable to the previously discused estimates of marginal behavior. In 1980, Lando (1982) reports that 32 percent of applicants were rejected for lack of insured status, and another 46.1 percent failed medical screening. Both rates had risen since

1970. Both types of rejections offer insights into the screening efficiency and labor supply effects of SSD.

In an early study, Treitel (1976) used internal Social Security Administration records, of a type unavailable to outsider researchers, to follow up male applicants initially denied benefits in 1967. Of the rejected applicants, 39.7 percent did not work at all in the four subsequent years, while 24.1 percent worked for 12 or more of the 16 quarters. By 1973, 13.8 percent of these men had died, and 16.1 percent had reached retirement age. On the other hand, 36.2 percent reported social security earnings the previous year.

In preliminary work, John Bound (1985) has pursued this line of analysis, using the 1972 Survey of Disabled and Non-Disabled Adults, and the 1978 Survey of Disability and Work. Bound limits his sample to men between the ages of 25 and 61 who had sufficient earnings history to qualify for SSD. The rejections should then be on medical grounds, and the rejected applicants are presumed to be in relatively good health compared to beneficiaries. Despite the fact that to qualify for SSD most applicants must have a history of working, Bound reports that only about half of the rejected applicants were working at the time of the surveys, and only two-thirds worked at some time during the previous year. Earnings for those who did work were on average less than half those of the able-bodied. Nearly all rejected applicants suffered a drop in real earnings, averaging about a third for those with any positive earnings at all.

These important findings paint a different picture of the labor supply effects of SSD, one that should cause us to hesitate before accepting the results of more methodologically complex studies. If the screening process rejected only those who could work, we would expect the proportion of rejected applicants working to be similar to that of similar non-applicants.

The inference drawn from estimates of large labor supply effects is that screening is imperfect. Many type I errors are made, labeling applicants disabled even though they can work. The inference drawn from the experience of rejected applicants is that many type II errors are also made, labeling applicants as non-disabled even though they cannot work. Neither finding need contradict the other, and both indicate the difficulties of screening entry into the SSD program.

In 1978 4.25 percent of men between the ages of 45 and 54 were on SSD, and Bound finds that 41 percent of rejected applicants in that age range were in the labor force. Bound then connects the type I and type II errors by arguing that medically rejected applicants are likely to be in better health than are beneficiaries, so at most 41 percent of beneficiaries would be expected to work in the absence of SSD. Using Bound's bound, the SSD program can account for 1.75 percent of the 45 to 54 year old men who would not otherwise have been out of the labor force, much below other estimates.

This type of calculation depends, of course, on the assumption that program stringency has not changed greatly over time. It will tend to underestimate labor supply effects if program stringency had increased over time. In this case beneficiaries from earlier applicant vintages might be more capable of work than later rejected applicants. This approach also leaves as a puzzle why beneficiary rolls have been increasing and labor force participation rates falling. Perhaps information about the program has been spreading, or the stigma of applying has been reduced, so we have been approaching the steady state beneficiary rate without any change in the underlying true disability rate.

Other Studies

Two early studies report a substantial impact of ill health on earnings and labor force participation. Both Luft (1975) and Scheffler (1974) find this result, but do not connect it directly with disability benefit programs. Treitel (1979) notes the curious fact that the recovery rate among SSD recipients has not increased even though the average age has declined. He finds in a logit regression that high ratios of benefits to predisability earnings significantly reduces the probability of recovery, holding health, occupation and other background variables constant, and argues that the SSD program appears to function as an early retirement program for older middle-aged persons with severe medical impairments.

Risk Aversion

The importance of uncertainty in influencing application for SSD benefits has also been stressed in recent preliminary work by Halpern and Hausman (1984). They note that while the program has grown, it is still selective with only 26 percent receiving SSD benefits in 1972 among the 7.7 million adults between the ages of 20 and 64 who claimed they were either unable to work at all or unable to work regularly. Some disabled are not eligible for benefits, others may be deterred because they expect their application for benefits to be rejected. According to Lando, Farley and Brown (1982), the Social Security Amendments of 1977 may have played a role in reducing the number of applicants accepted, which in turn may have been instrumental in reducing the number of applicants. Disabled worker awards reached a peak in 1975 and fell subsequently. The decrease in total awards since 1975 has been brought about by lower acceptance rates at both the initial application and reconsideration stage, and has been accom-

panied by increasing appeals through the administrative law judge system. For example, initial allowances as a percent of initial determinations fell from 51 percent in 1966 to 39.9 percent in 1975 to 21.9 percent in 1980 (Lando et al., 1983, p. 7).

An increasing number of people whose initial applications were rejected have appealed these decisions, so that by 1980, 35.7 percent of all successful applicants achieved their awards after initial rejection (Lando, et al., p. 7). There are two important points here. First, even with a stable policy it would be quite difficult for a marginally disabled individual to predict with great accuracy his chances of receiving SSD benefits were he to apply. Given the multi-stage nature of the determination and appeals process and the paucity of detailed information on the characteristics of those accepted or rejected at each stage, it is no easy task for an econometrician to estimate these probabilities. Second, policy has not been stable, complicating the estimation problem. There is uncertainty then both about one's chances under any given regime as well as uncertainty about which regime currently reigns. Both forms of uncertainty are likely to affect potential applicants. This is particulary true when it is costly to apply, as it would be under the regulation that applicants be out of the labor force for five months, and then typically wait three months for an initial determination.

A more stringent determination program does appear to have reduced applications. As the initial allowance rate has fallen, the number of applications per 100,000 insured workers has fallen from a peak of 1,656 in 1974 to 1,173 in 1981 (Lando, et al., p. 5). Halpern and Hausman extend the typical binary choice model of disability beneficiary status to include risk aversion on the part of potential applicants facing uncertainties of the determination process. This allows Halpern and Hausman to separate out

two determinants of the applications that were typically mixed together in previous studies: (1) the level of benefits relative to wages; and (2) the expected probability of beng allowed onto the beneficiary rolls. Their study also differentiates the application decision from the determination process. Halpern and Hausman find that "the probabilty of acceptance has a significant, but not a particularly large effect, on the probability of application. Potential applicants seem more sensitive to the benefit level than to the probability of acceptance" (p. 6). In particular, their cross-section estimates in a risk-neutral model of a .16 elasticity of applicants with respect to probability of acceptance is enough to account for most of the fall in applications between 1975 and 1981. On the other hand, they find a far stronger elasticity of applications with respect to benefits equal to 1. In other words, a 20 percent decline in benefits per beneficiary leads to a 20 percent decline in applicatons. The end result of a highly refined model embodying advanced econometric technique to allow for risk aversion and uncertainty is that "the applications decision is a good deal more sensitive to benefit levels than to the probability of acceptance" (p. 41). While these are preliminary results from an ongoing study, and so are subject to revision, they do show evidence of a substantial labor supply response to changes in SSD benefits.

Halpern and Hausman also echo an important methodological problem first pointed out by Leonard (1978). It is a difficult problem that has yet to be fully resolved. The problem is that "the appropriate probit equation to correct for any sample selection bias (in the wage equation) is a reduced form equation for the probability of applying for DI. This equation, however, is a reduced form of the structural utility model which is estimated so that efficient estimation would require simultaneous estimation of the entire

wage and utility model" (p. 30). It is worth noting that such a simultaneous estimation has apparently not yet been attempted.

The SSD program is administered at the state level, but federally funded, leaving the states considerable discretion and questionable incentive to police entry into the program or to review the current disability status of beneficiaries, save that explicitly mandated or budgeted for by the Federal Government. There are significant and substantial variations across states in the SSD application and beneficiary rates (Bound (1977), Lando (1979)), part of which is correlated with cross-state variation in unemployment rates, sex and race.

Marvel (1982) finds that the variation in applicant rates across states can be explained not only by variation in health status, but also by variation in SSD benefit and income levels. Marvel also reports mixed evidence of the effect of program stringency on applicant rates. The denial rate has an insignificant impact on application rates in 1976 and 1977 cross-sections, but a significant and substantial effect once unobserved state specific variables are first differenced out. In other words, the states that increased denial rates the most also experienced the greatest decline in application rates. Marvel concludes that "an important subset of potential DI beneficiaries reach a decision whether or not to apply for benefit states based on their economc circumstances and the probability of being certified as incapable of working" (p. 411), and suggests that benefits might be scaled "both with respect to severity of impairment and actual labor market earnings" (p. 412) to reduce the problem of attracting questionable applicants.

Parsons (1984b) rigorously models the SSD screening process, which may be thought of in terms of Bayesian decision making and reducing type

I and type II errors. Extending Marvel's analysis of cross-state variation, Parsons estimates the elasticity of application rates with respect to the denial rate is -0.15 in the first year and -0.39 cumulatively after two years. In other words, a 10 percent increase in denial rates produces a 4 percent decrease in application rates after two years. Potential applicants respond not only to benefit levels but also to the stringency of the screening program. Parsons reaches the important conclusion that imperfect screening is costly to both the donor and the disabled. Transfers intended for the severely disabled are diverted to others when screening is imperfect and aggregate expenditures on the disabled may well be limited by inefficient screening -- another version of Okun's leaky bucket. Parsons' conclusion is an important one for policy. "The recent controversy over the attempt to periodically re-examine those disability recipients most likely to have recovered work capability suggests that political limitations as well as economic and technological ones exist on the screening decision. Nonetheless it seems apparent that the combination of these limitations has had profound negative effects on the efficiency and level of social insurance for the disabled" (p. 39).

What Have We Learned

1. Methodological: Humility Before the Unobservable

For all their other differences, all the economic models of the labor force participation decision agree that the expected incomes in and out of the labor force are, in theory, important variables. In practice, the studies differ mostly on how these expected incomes are imputed. The central unavoidable problem is that we cannot observe the wages of those

who are out of the labor force or the SSD benefits and other non-labor income of those who are in the labor force. We can make noble attempts to estimate what a labor force participant would earn were he to enter the labor force, and what income a worker would receive were he to drop out of the labor force, but by their very nature such estimates extrapolate beyond what is observed and so are subject to more than the usual level of error. While one may easily have reservations about the details of any particular technique, the general approaches taken to this problem have been of high quality. Differences among the estimates are in large part a measure of the difficulty of the problem.

2. Substance

All of the studies agree that disability transfer programs lead to some reducton in labor supply. Disability is then not a purely medically determined condition, but one that is conditioned by economic and other factors. A more generous disability transfer program will tend to draw some people out of the labor force. The most compelling evidence of the labor supply effect of the SSD program is perhaps also the simplest, for each older male added to the beneficiary roles over the last 25 years, roughly two men have dropped out of the labor force. More complicated studies of the elasticity of labor force non-participation with respect to SSD benefits have produed a range of estimates, summarized in Table 2, which are comparable to the labor supply effects of other sources of non-labor income (see Danzinger et al., 1981). The elasticity of non-participation with respect to the replacement rate has been estimated by Parsons to be from 1.8 (1966) to 0.63 (1969). At the 8.8 percent non-participation rate observed for 45 to 54 year old men in 1977, Haveman and Wolfe's (1984)

estimate of the elasticity of non-participation with respect to disability transfers range from 0.21 to 0.06. Leonard's (1979) estimate of the elasticity of SSD beneficiary states with respect to SSD benefits is 0.35. Efforts by Halpern and Hausman to split this response up indicate that people have been more responsive to the dollar amount of benefits than to the probability of a successful application, although Marvel and Parsons' tests across states suggest that increased stringency in screening has reduced applicant rates.

Suggestions for Future Research

Most of the recent studies of the labor market effects of the SSD program have focused on 45 to 54 year old men. While some of the most interesting behavior has occurred among this group, we know relatively little about the response of women or of younger men.

The studies discussed above focus on the decision to apply for SSD benefits, or the decision to drop out of the labor force. The cost of an SSD program depends not only on the number of beneficiaries but also on their duration on the rolls (keeping in mind the transfer of the older disabled to retirement rolls). Until recently, departure from SSD and re-employment were rare, but little research has been done on the duration of beneficiary status. A natural analogy is to the hazard rate models of unemployment insurance duration, in particular to a model with beneficiary duration determined by the competing risks of death and recovery (see Katz, 1985).

The SSD program itself provides a variety of benefits. The separate effects of the medical insurance component are likely to differ in important ways from the "cash" component, and merit further study.

The SSD program is only one of a number of disability transfer programs. We know relatively little about the direct effects of such related programs as veterans and federal disability, state temporary disability and private disability insurance, or about the interactions of these disability programs with Workmen's Compensation, welfare, rehabilitation programs, affirmative action for the disabled or work redesign programs. Some of these other programs are discussed in other papers in this series, but the interconnections are not yet well understood. The administration of SSD merits further research, in particular the incentives created for appeal during the adjudication process.

At a crude level, the policy options are to change benefit formulas or to change program eligibility and screening. Most of the research to date has focused on replacement rates. Most of the recent policy initiatives and political controversy has concerned the screening process. While benefit schedules could be adjusted to minimize the disincentive to work, the issue of replacement rates would probably be of little importance if the screening process could be improved to keep out undeserving beneficiaries and keep in the deserving.

Figure 1

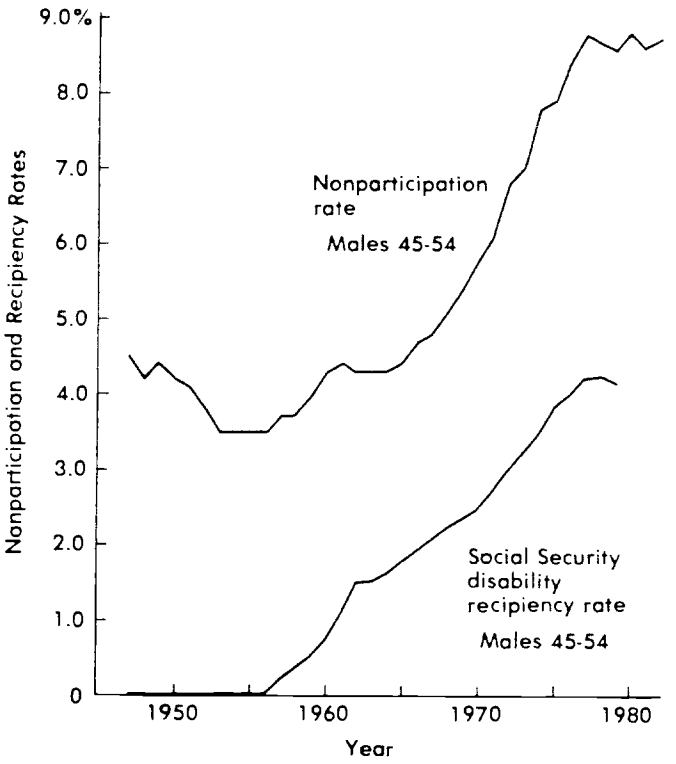

FIG. 1.—Nonparticipation in the labor force and social security disability recipiency, males 45–54, 1947–82. Sources: See the Appendix.

reproduced from Parsons, 1984a

TABLE 1

PROBIT ESTIMATES OF THE LABOR FORCE PARTICIPATION OF MEN AGED 48–62
(Data for 1969 in Parsons; for 1977 in H-W Estimates)

	Parsons (1)	H-W Replication (2)	Column 2 Specification with Split Replacement Rate (3)	Column 2 plus Inclusion of Dependent Benefits and Additional Controls§ (4)	Column 2 plus Selectivity Correction (5)	Column 3 with Eligibility Adjustment (6)	Column 3 plus Selectivity Correction Eligibility Adjustment, and Additional Controls (7)
Constant	5.626	6.094	5.954	6.137	5.673	5.889	5.83
	(10.94)*	(4.97)	(4.42)	(4.79)	(5.53)	(4.68)	(5.20)
Price variables:							
SSB/W	−.00542	−.00626	...	...	−.0032	...	...
	(−2.48)	(−1.59)			(−.85)		
SSBD/W	...	...	...	−.0017	...	...	...
				(−.43)			
SSB	...	...	−.0007	...	...	...	...
			(−.41)				
PSSB	...	...	...	...	...	−.0024	−.0012
						(−.87)	(−.48)
W	...	...	.022	...	...	.022	−.019
			(.57)			(.78)	(−.67)
WEL/W	−.00278	.00260	...	.020	.0014	...	...
	(−1.97)	(1.72)		(1.28)	(1.13)		
WEL	...	...	.0003	...	...	.0004	−.0001
			(.87)			(1.00)	(−.31)
UR	−.835	−.457	−.498	−.364	−.178	−.524	−.1858
	(−3.13)	(−.73)	(−.79)	(−.31)	(−.31)	(−.83)	(−.01)
Demographic variables:							
Age	−.0639	−.0683	−.0700	−.0700	−.0643	−.073	−.0701
	(−7.15)	(−3.09)	(−3.18)	(−3.03)	(−3.47)	(−3.25)	(−3.51)
Disability status†	−.944	−2.008	−2.017	−2.080	−2.331	−2.621	−2.54
	(−8.21)	(−9.88)	(−9.89)	(−13.78)	(−13.46)	(−3.32)	(−4.99)
Elasticity of labor force participation with respect to social security benefits	−.030‡	−.0205	−.0147	−.0069	−.0177	−.0067	−.0056
−2 × log likelihood ratio	1,301	143.6	141.0	141.5	264.0	141.6	272.0
N	3,219	741	741	741	796	741	796

*Asymptotic normal test statistic reported in parentheses.
†The constructed subsequent mortality index for Parsons; index of extent of reported disability for H-W.
‡Parsons reports an elasticity of nonparticipation of .63, which is equal to the participation elasticity of −.030.
§The additional control variables added are: (1) a dummy variable where not married, no children = 1; (2) a dummy variable where married, no children = 1; (3) other household income; and (4) a dummy where long-term occupation is manager or professional = 1. The coefficients and *t*-values for these variables in the col. 3 specification are, respectively, −3.46 (−1.07), ... (...), −.032 (−1.76); .151 (0.05). These coefficients and asymptotic *t*-values remain stable throughout the remaining runs reported.

reproduced from Haveman and Wolfe, 1984

DATA SERIES FOR FIGURE 1

Year (1)	Labor Force Nonparticipation Rate of Males 45–54 (%) (2)	Social Security Disability Rate of Males 45–54 (%)* (3)
1947	4.5	.00
1948	4.2	.00
1949	4.4	.00
1950	4.2	.00
1951	4.1	.00
1952	3.8	.00
1953	3.5	.00
1954	3.5	.00
1955	3.5	.00
1956	3.5	.00
1957	3.7	.23
1958	3.7	.36
1959	4.0	.51
1960	4.3	.76
1961	4.4	1.13
1962	4.3	1.54
1963	4.3	1.54
1964	4.3	1.63
1965	4.4	1.79
1966	4.7	1.96
1967	4.8	2.11
1968	5.1	2.25
1969	5.4	2.37
1970	5.8	2.51
1971	6.1	2.75
1972	6.8	3.03
1973	7.0	3.27
1974	7.8	3.50
1975	7.9	3.84
1976	8.4	4.03
1977	8.8	4.23
1978	8.7	4.25
1979	8.6	4.17
1980	8.8	N.A.
1981	8.6	N.A.
1982	8.7	N.A.

SOURCES.—Participation Rate and Population by Age, *Handbook of Labor Statistics 1980*, *Employment and Training Report of the President 1982*, Disabled by Age, Sex, *Social Security Bulletin, Annual Statistical Supplement*, 1981

*The ratio of male disability recipients 45–54 years of age to the number of males 45–54 years of age.

reproduced from Parsons, 1984a

TABLE 2

LABOR SUPPLY EFFECTS OF SOCIAL SECURITY DISABILITY

Study	Data Set	Sample Size	Sample Analyzed	Results
Parsons (1980a)	National Longitudinal Survey	3219	48-62 year old men in 1969	elasticity of labor force non-participation = .63
Haveman & Wolfe (1984)	Panel Study of Income Dynamics	741	45-62 year old men in 1978	elasticity of labor force non-participation = .06 to .21
Slade (1984)	Longitudinal Retirement History Survey	5403	58-63 year old men in 1969	elasticity of labor force non-participation = .81
Leonard (1979)	Social Security Survey of Health & Work Conditions	1685	45-54 year old men in 1972	elasticity of beneficiary status = .35

REFERENCES

Anderson, Kathryn H., and Burkhauser, Richard V. "The Effect of Actual Mortality Experience with a Retirement Decision Model." Working Paper no. 83-W08, Vanderbilt University, 1983.

Berkowitz, Monroe, and Dean, David. "Medical Care Costs of Disabled Persons." Mimeographed. Department of Economics, Rutgers University, June 1980.

_____. "An Evaluation of the Structure and Functions of Disability Programs." Mimeographed. Bureau of Economic Research, Rutgers University, June 1975.

Berkowitz, Monroe, and Rubin, Jeffrey. "The Costs of Disability: Estimates of Program Expenditures for Disability, 1969-1975." Mimeographed. Bureau of Economic Research, Rutgers University, August 1977.

Berkowitz, M., W.G. Johnson, and E.H. Murphy. Public Policy Toward Disability. New York: Praeger Publishers, Inc., 1976.

Bound, John. "Variation in Social Security Disability Beneficiary Rates and Labor Force Participation across States," unpublished paper, Harvard University, 1977.

Bound, John. "The Health and Earnings of Rejected Disability Insurance Applicants," unpublished papr, Harvard University, 1985.

Burkhauser, Richard V., and Robert H. Haveman. Disability and Work: The Economics of American Policy. Baltimore: The Johns Hopkins Press, 1982.

Chirikos, Thomas N., and Gilbert Nestel. "Impairment and Labor Market Outcomes: A Cross-sectional and Longitudinal Analysis." In Herbert S. Parnes (ed.) Work and Retirement: A Longitudinal Study of Men. Cambridge, MA: M.I.T. Press, 1981.

Danzinger, Sheldon, Robert Haveman and Robert Plotnick. "How Income Transfers Affect Work, Savings and the Income Distribution," Journal of Economic Literature, September 1981, 19, 975-1028.

Deutermann, William. "Another Look at Working Men Who are not in the Labor Force," Monthly Labor Review, June 1977, 100, 9-14.

Dixon, R.G., Jr. Social Security Disability and Mass Justice: A Problem in Welfare Adjudication. New York: Praeger Publishers, 1973.

Emmanual, Hans. "Factors behind the Growth in the Number of Disability Benefits in the Netherlands," unpublished paper, 1979.

Franklin, Paula A. "Impact of Disability on the Family Structure," Social Security Bull, May 1977, 40, 3-18.

Franklin, Paula. "Impact of Substantial Gainful Activity Level on Disabled Beneficiary Work Patterns," Social Security Bulletin, August 1976, pp. 20-29.

Frolich, Philip. "Income of the Newly Disabled: Survey of Recently Disabled Adults," Social Security Bulletin, September 1975, pp. 3-18.

Gallichio, Sal, and Barry Bye. Consistency of Initial Disability Decisions among and within States, U.S. Department of Health and Human Services, Social Security Administration, Office of Policy, Office of Research and Statistics, Staff Paper no. 39, Publication no. 13-11869, July 1980.

Garrad, J. "Impairment and Disability: Their Measurement, Pevalence and Psychological Cost." In Impairment, Disability, and Handicap, ed. Dennis Lees and Stella Shaw. London: Heineman, 1974.

Gastwirth, Joseph, L. "On the Decline of Male Labor Force Participation," Monthly Labor Rev., October 1972, 95, 44-46.

Griliches, Zvi, B. Hall and J. Hausman. "Missing Data and Self-Selection in Large Panels," Annales de l'Insee, April 1978, 30.

Halpern, Janice, and Jerry Hausman. "Choice under Uncertainty: A Model of Applications for the Social Security Disability Insurance Program," unpublished paper, March 1984.

Haveman, Robert H., and Barbara Wolfe. "The Decline in Labor Force Participation: Comment," Journal of Political Economy, June 1984, 92:3, 532-541.

Haveman, Robert H., and Barbara L. Wolfe. "Disability Transfers and Early Retirement: A Causal Relationship?" J. Public Econ., 1984.

Haveman, Robert H., Barbara Wolfe and Jennifer Warlick. "Disability Transfers, Early Retirement, and Retrenchment." In Henry Aaron and G. Burtless (eds.), Retirement and Economic Behavior. Washington, DC: Brookings, 1984.

Hambor, John C. Unemployment and Disability: An Economic Analysis with Time Series Data, U.S. Department of Health, Education, and Welfare, Social Security Administration, Office of Research and Statistics, Staff Paper no. 20, January 1975.

Heckman, James J. "The Common Structure of Statistical Models of Truncation, Sample Selection and Limited Dependent Variables and a Simple Estimator for such Models," Annals Econ. and Soc. Measurment, Fall 1976, 5, 475-92.

Johnson, William, Paul Cullinan and William Curington. "The Adequacy of Workers' Compensation Benefits," Syracuse University, The Maxwell School, Health Studies Program no. 33, February 1978.

Katz, Lawrence. "A Competing Risks Model of Unemployment Duration." Unpublished paper, University of California, Berkeley, 1985.

Lando, Mordechai, Aline Farley and Mary Brown. "Recent Trends in the Social Security Disability Insurance Program," Social Security Bulletin,

August 1982, 45:8, 3-14.

Lando, Mordechai E., and Timothy R. Hopkins. "Modeling Applications for Disability Insurance," Conference Paper for the American Economic Association Meetings, December 1977.

Lando, Mordechai E., and Aaron Krute. "Disability Insurance: Program Issues and Research," Social Security Bulletin, October 1976, 3-17.

Lando, Mordechai, and Aaron Krute. "The Growth in Observed Disability Incidence Rates 1967-1974." Unpublished paper.

Lando, Mordechai. "Prevalence of Work Disability by State, 1976," Social Security Bull., May 1979, 42, 41-44.

Lando, Mordechai E., Malcolm B. Coate and Ruth Kraus. "Disability Benefit Applications and the Economy," Social Security Bull., October 1979, 42, 3-10.

Lee, Lung Fei. "Identification and Estimation in Binary Choice Models with Limited (Censored) Dependent Variables," Econometrica, 1979, 47, 977-96.

Leonard, Jonathan S. "On the Decline in the Labor Force Participation Rates of Older Black Males." Unpublished thesis, Harvard College, March 1976.

Leonard, Jonathan S. "The Social Disability Program and Labor Force Participation," National Bureau of Economic Research Paper 392, 1979.

Luft, Harold. Poverty and Health, Cambridge: Ballinger Publishing, 1978.

Luft, Harold. "The Impact of Poor Health on Earnings." Review of Economics and Statistics, February 1975, 57, 43-57.

Marvel, Howard P. "An Economic Analysis of the Operation of Social Security Disability Insurance," J. Human Resources, Summer 1982, 17, 393-412.

Meer, C.W. Social Security Disability Insurance: The Problems of Unexpected Growth. Washington, D.C.: American Enterprise Institute, 1979.

Muller, L. Scott. "Receipt of Multiple Benefits by Disabled Worker Beneficiaries." U.S. Department of Health, Education, and Welfare, Social Security Administration, Office of Research and Statistics, Office of Policy, Working Paper Series no. 15, May 1980.

Nagi, Saad, and L. Hadley. "Disability Behavior, Income Change and Motivation to Work," Industrial and Labor Relations Review, January 1972.

Nagi, Saad. "The Concept and Measurement of Disability." In Disability Policies and Government Policies, ed. E. Berkowitz. New York: Praeger Publishers, 1979.

Oi, Walter. "The Impact of Disability on Full Income," Conference Paper for the American Economic Asociation Meetings, August 1978.

Parsons, Donald O. "The Decline in Male Labor Force Participation," J.P.E., February 1980, 88, 117-34 (a).

Parsons, Donald O. "Racial Trends in Male Labor Force Participation," A.E.R., December 1980, 70, 911-20 (b).

Parsons, Donald O. "The Male Labour Force Participation Decision: Health, Reported Health, and Economic Incentives," Economica, Feburary 1982, 49, 81-91 (a).

Parsons, Donald O. "A Time Series Analysis of Male Labor Force Participation and Social Security Disability Recipiency." Mimeographed. Columbus: Ohio State Univ., 1982 (b).

Parsons, Donald O. "Male Labor Force Participation and Disability Recipiency: A Cross-State Analysis," mimeographed. Columbus: Ohio State Univ., 1982 (c).

Parsons, Donald O. "Disability Insurance and Male Labor Force Participation: A Response to Haveman and Wolfe," Journal of Political Economy, June 1984a, 92:3, 542-549.

Parsons, Donald O. "Social Insurance with Imperfect State Verification: Income Insurance for the Disabled," unpublished paper, Ohio State University, July 1984b.

Scheffler, Richard M. and George Iden. "The Effect of Disability on Labor Supply." Industrial and Labor Relations Review, October 1974, 28, 122-132.

Siskind, Frederic B. "Labor Force Participation of Men, 25-54, by Race," Monthly Labor Rev., July 1975, 98, 40-42.

Slade, Frederic P. "Older Men: Disability Insurance and the Incentive to Work," Industrial Relations, Spring 1984, 23:2, 260-269.

Swisher, Idella G. "The Disabled and the Decline in Men's Labor Force Participation," Monthly Labor Review, November 1973, 96, 53.

Treitel, Ralph. "Effects of Financing Disabled-Beneficiary Rehabilitation," Social Security Bulletin, November 1975, 16-18.

Treitel, Ralph. "Disability Claimants Who Contest Denials and Win Reversals through Hearings," U.S. Department of Health, Education, and Welfare, Social Security Administration, Office of Research and Statistics, Office of Policy, Working Paper Series no. 3, February 1979.

Treitel, R. "Disability Beneficiary Recovery," Social Security Office of Research and Statistics Working paper #2, 1979.

Worrall, John D. "A Benefit-Cost Analysis of the Vocational Rehabilitation Program," Journal of Human Resources, Spring 1978, 285-98.