LABOR SUPPLY, DISABILITY BENEFITS AND MENTAL ILLNESS

Susan Averett
Lafayette College

Richard Warner
Mental Health Center of Boulder County—Boulder, Colorado

Jani Little
University of Colorado

and

Peter Huxley
Manchester University

INTRODUCTION AND REVIEW OF PREVIOUS LITERATURE

Economists have been interested in the effects of various labor supply conditioned policies and programs for decades. For example, there is a substantial literature on the effect of welfare programs on female labor supply (see Moffitt [1992] for a review). Considerable work has also been done on the effect of income taxes on labor supply [Hausman, 1981; Triest, 1990]. In addition, researchers have explored various other tax and policy programs that impact labor supply, such as the child care tax credit [Averett, Peters and Waldman, 1997].

However, to date, little is known about the labor supply incentives of the Supplemental Security Income (SSI) and Social Security Disability Income (SSDI) programs, particularly among the mentally ill population. Scott [1992] does provide a careful analysis of SSI recipients who work and how work can be encouraged among this population, but he does not estimate a model of labor supply. Muller, Scott, and Bye [1996] model the labor force participation and earnings of SSI recipients, though they focus on all recipients, not just the mentally ill. They do not explicitly model the budget constraint facing SSI recipients.

Diagnosable psychiatric disorders are estimated to affect about 30 percent of the non-institutional U.S. population in any given year [Kessler et al., 1994]. Ettner, Frank

Susan Averett: Economics Department, Lafayette College, Easton, PA 18042 E-mail: Averetts@lafayette.edu
Richard Warner: Mental Health Center of Boulder County, 1333 Iris Ave., Boulder, CO 80304. E-mail: Dick_Warner@compuserve.com
Jani Little: Institute of Behavioral Science Data Analysis Center, University of Colorado, Boulder, CO 30309. E-mail: jani.little@colorado.edu
Peter Huxley: School of Psychiatry and Behavioural Sciences, Mathematics Building, University of Manchester, Oxford Road, Manchester M13 9PL, UK. E-mail: peter.huxley@man.ac.uk

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and Kessler [1997] examine employment, work hours and income among individuals diagnosed with psychiatric disorders and find that the presence of such disorders significantly decreases employment. In addition to the effects that the illness itself may have on one's ability to work, mentally ill people in the United States face economic disincentives to begin work or maximize their working hours since increased earnings trigger decreased benefits from entitlement programs such as SSDI and SSI. Consequently, the economic gains for people receiving entitlements who shift from unemployment to part-time employment may be small [Warner and Polak, 1995].

Employment of the mentally ill varies markedly among countries. For example, half of those with schizophrenia in Bologna are employed [Warner et al., 1998], compared to 15 percent of people with serious mental illness in the United States [Anthony et al., 1998] and 13 percent in Britain [Office of the National Statistics, 1995]. Warner [forthcoming] attributes much of this difference to disincentives in the national disability pension systems. Polak and Warner [1996] found that the income of part-time employed mentally ill subjects in Colorado was little more than that of unemployed subjects, largely because employment led to loss of SSI disability income and rent subsidy, resulting in a implicit tax of 64 percent on earned income. To address such problems, U.S. federal legislation has been proposed (HR464 and SB1054) which would increase the earnings disregard under SSDI from $500 to over $1050 a month [Arnold, 1998]. No such proposal has yet been made to adjust SSI policy.

The purpose of this research is to estimate a labor supply model that explicitly models the budget constraint facing mentally ill persons who are eligible for SSI benefits. The advantage of such a model is that it allows us to simulate proposed changes in the SSI program. Such simulations are of interest to policy makers since they may reveal disincentives/incentives to working inherent in this program. Understanding the features of the SSI program that can be manipulated to increase labor supply can relieve the need for government to provide benefits and may provide other non-pecuniary benefits to the employee such as higher self-esteem and increased independence which may aid in recovery from illness [Noble, 1998]. A criticism of the SSI and SSDI programs is that they create increased dependence and lack of motivation to work which can actually hamper efforts at rehabilitation [Estroff *et al.*, 1997]. Because we know little about the labor force behavior of this segment of the population, understanding the economic disincentives to work embodied in these programs is important. The innovation in this paper is to fully model the nonlinear budget constraint that the SSI program creates for those mentally ill persons who qualify for SSI benefits.[1]

CONCEPTUAL FRAMEWORK AND DESCRIPTION OF THE SSI PROGRAM

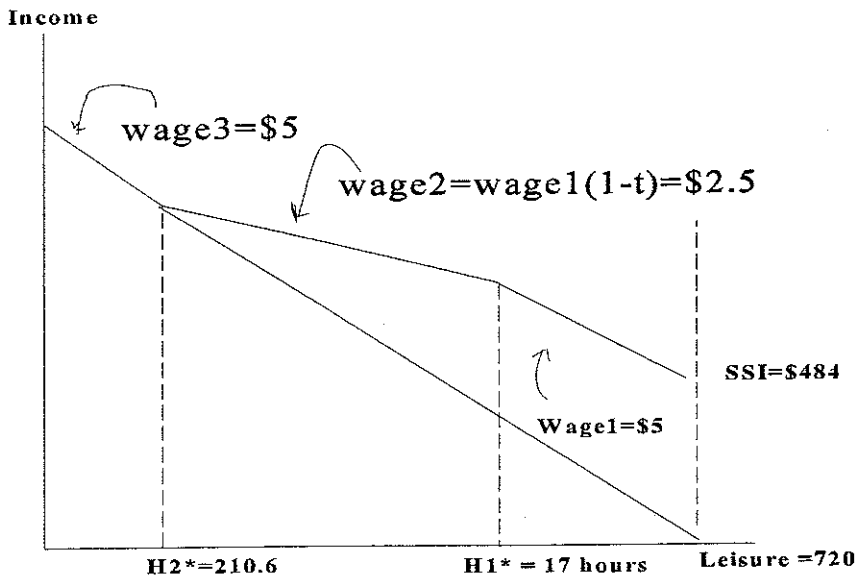
Our goal is to estimate a labor supply model that explicitly accounts for the structure of the SSI program. SSI is a federally-administered disability program based on financial need and the presence of a disability expected to last 12 months or more. Medicaid coverage is included. The SSI program is labor supply conditioned, meaning that as one begins to work, benefits are eventually reduced to zero. The basic SSI

check is the same nationwide. However, several states supplement the basic check. For the time period covered in our data set, (1996-1997), the basic SSI check was $470 in 1996 and $484 in 1997 for a single individual and $705 in 1996 and $726 in 1997 for a married couple. Individuals in our sample did not live in a state that supplements the basic check. Individuals can have up to $65 of earned income plus $20 nonearned (or a total of $85 earned, if no nonearned income) per month. After that level, $1 is subtracted for every $2 earned from the basic SSI check until the SSI check is reduced to zero. In other words, each additional dollar of earnings in excess of $65 ($85 if no nonearned income) is taxed at 50 percent. Economists term this an implicit tax on earnings. For purposes of calculating nonearned income, all sources of nonearned income are counted including SSDI, veterans benefits, Aid to Families with Dependent Children, AND, and other sources of nonearned income. Any nonearned income in excess of $20 in a month reduces the amount of the SSI check dollar for dollar. There is no trial work period. The above earnings allowance formula goes into effect immediately and continues indefinitely until the formula reduces the SSI check to zero. Eligibility continues as long as the disability remains. Medicaid continues, regardless of whether the check has been reduced to zero because of earnings, as long as ongoing medical care is needed for the disability condition, the person cannot afford to purchase equivalent care on their own, and they are using Medicaid at least once every twelve months.

The SSI program creates a nonlinear budget constraint for recipients which is similar in structure to that created by the Social Security system. Figure 1 depicts this constraint for a hypothetical individual using the standard labor/leisure framework under the assumption that approximately 720 hours are available in a month for either work or leisure (leisure is measured left to right and hours of work are measured right to left). The individual depicted in Figure 1 is assumed to be single and to have no nonearned income. If this individual does not work, he would receive the basic SSI check ($484 in 1997). Because this individual has no nonearned income, he can work until $85 is earned; this level of hours of work is denoted as H1* on the graph and occurs at 17 hours per month assuming a wage rate of $5 per hour. This is called the earnings disregard. In other words, this person can work 17 hours per month and still receive the full SSI check. Work hours in excess of 17 will reduce the SSI check by 50 cents for each additional dollar earned until benefits from SSI are exhausted, which would occur at 210.6 hours of work (H2* on the graph), which corresponds to a breakeven level of earnings of $1053.

More generally, an individual with $20 or less of nonearned income who chooses not to work at all would receive the full SSI check. This individual may decide to work while on SSI. If nonearned income is less than or equal to $20 the first $65 ($85-nonearned) income is exempt from the implicit 50 percent tax on earnings. Thus, the individual can work H1* at a given wage, call it wage1. The number of hours would be equal to (85-nonearned)/wage1. For every hour worked after H1*, the SSI check is reduced by $1 for every $2 earned. The individual has exhausted his SSI benefits (i.e. reached the breakeven point) at H2* on Figure 1. Beyond this number of hours of work he is no longer eligible for benefits and the SSI check is reduced to zero. At this point, the wage reverts back to wage1. The number of hours associated with the breakeven point can be calculated using the following formula: ((SSI/t)-SSI)/(wage1(1-

FIGURE 1
Monthly SSI Budget Constraint for Hypothetical Individual with No Nonearned Income and and Hourly Wage of $5 (Implicit Tax Rate Is 50 Percent)



t))+85/wage1 where SSI is the basic SSI check, t is the implicit tax rate (t=.5), and wage1 is hourly earnings. In Figure 1, this occurs at 210.6 hours worked per month.

The budget constraint created is nonconvex with three segments (measured right to left) and two interior kink points. It is nonconvex in that after benefits have been exhausted, the recipient reverts back to the previous wage. In other words, wage3=wage1 on Figure 1 and wage3 is greater than wage2. Because of the nonlinearities in the budget constraint it is no longer possible to estimate the labor supply function using ordinary least squares regression (OLS) with the wage and nonearned income as regressors. The wage is now a function of hours worked and is therefore endogenous. Moffitt [1986] demonstrates how to use the method of nonlinear budget set estimation to estimate the parameters of a labor supply function in this case. We use this method to estimate our labor supply function.[2]

DATA

We use a unique sample of 205 randomly selected individuals who have been diagnosed with schizophrenia, schizoaffective disorder, bipolar disorder, or major depression with psychotic features (psychotic depression). Their psychopathology was independently rated. They were interviewed in the fall and winter of 1996-97. Sample members were aged 18 to 50 years when interviewed and all were enrolled in a community mental health center. All patients who qualified for disability support were enrolled in the appropriate benefit program. The patients were all residents of Boulder County, Colorado.

TABLE 1
Sample Means
(Standard Deviations in Parentheses)

Variable Name	Sample of Those Working	Full Sample
Age (years)	37.884	38.307
	(8.839)	(8.120)
Education (years)	13.938	13.375
	(1.934)	(2.320)
Weekly Hours of Work	17.562	
	(11.845)	
Weekly Earnings from Work	104.188	
	(107.444)	
Hourly Wage Rate	5.737	
	(4.524)	
Monthly SSI Payments	32.431	176.185
	(44.353)	(207.209)
Monthly SSDI payments	225.828	269.639
	(282.879)	(322.167)
Monthly Unearned Income[a]	287.078	338.473
	(335.049)	(385.987)
Male = 1	.531	.512
Nonwhite=1	.049	.067
Working = 1	1.00	.312
Lives with Partner = 1	0.16	0.24
Married = 1	0.078	.107
Widowed, divorced, separated = 1	.188	.259
Children = 1	.281	.385
Receives Rent Subsidy = 1	.453	.463
Percent Receiving SSDI	.422	.502
Percent Receiving SSI	.406	.527
Schizophrenia/Schizoaffective Disorder = 1	.438	.468
Sample Size	64	205

a. Nonearned income includes all sources except labor market earnings and SSI payments.

Our sample is not representative of the entire mentally ill population eligible for SSI benefits. However, our econometric procedure requires information on benefit receipt, state of residence, earnings and hours of work. This information, as well as information on mental illness is not always available in the large national data sets typically used to study labor supply issues. Although our results are not readily generalizable to the mentally ill population as a whole, our method provides the necessary structure to begin understanding how the SSI program affects recipients' labor supply.

ESTIMATION RESULTS

Table 1 presents the means from our sample for both the full sample and the subsample that works. The average age is 38 years and average level of education is 13.4 years. Slightly more than one half of the sample is male. About a third of the sample members are working, a much lower percentage than the national labor force

participation rate. Those who do work report working an average of 17.5 hours per week. As we would expect, those who do work are less likely to receive SSI or SSDI, have lower nonearned income and have slightly more education. About half the sample collects SSI, half collects SSDI and 18.5 percent get benefits from both SSI and SSDI. Forty-six percent of the sample report receiving a rent subsidy. We incorporate the rent subsidy into our budget constraint since it lowers SSI earnings an average of 30 percent. Because the data set is small, we checked very carefully for outliers particularly in hours of work. Outliers do not appear to be an issue in this data.

In order to implement the nonlinear budget constraint method described earlier we must have an observed hourly wage for each sample member. However, nearly two-thirds of our sample members do not work. Therefore, following others who have used the nonlinear budget set method [Averett et al. 1997; Triest, 1990] we impute a wage for nonworkers using Heckman's sample selection correction to correct for any bias that may result from using a sample of workers to impute a wage to nonworkers [Heckman, 1979].[3]

In Table 2 we present the parameter estimates from the nonlinear budget set model of weekly hours of work.[4] For comparison purposes, we also present estimates from a Tobit model of labor supply which does not take into account the nonlinear nature of the budget constraint.[5] The results generally are as expected. Weekly nonearned income yields the expected negative effect on weekly hours worked. Married sample members work more, though those with children work less. Those with schizophrenia or schizoaffective disorder work fewer hours per week than those with bipolar disorder or psychotic depression. Interestingly, the hourly wage rate is not statistically different from zero. This may be a result of having to predict wages for nearly two-thirds of the sample, which may have resulted in imprecise estimates of the wage rate. It may also indicate that non-economic factors drive the labor force behavior of this group.

We also undertook some sensitivity testing to ascertain the robustness of our results. We first limited our analysis to just those receiving SSI payments and then to just those with schizophrenia. Each of these subsamples yielded the same general pattern of results, although the coefficient on the wage rate was significantly different from zero for the subsample of individuals with schizophrenia.

SIMULATIONS

Our estimation procedure lends itself nicely to simulating the labor supply response to changes in the budget constraint resulting from changes in the SSI program. In our case, the two features of the program that are likely to impact the decision to work are the implicit tax rate and the amount of earnings which are disregarded in the calculation of the benefits. We follow the method outlined in Moffitt [1984] to simulate changes in hours worked.

Our simulation results are presented in Table 3 and provide some surprising insights into the factors that serve as work disincentives. For example, we find that reducing the implicit tax rate from 50 percent to 25 percent would actually reduce hours of work, albeit by less than one percent per week. Increasing the earnings

TABLE 2
OLS and Nonlinear Budget Constraint Estimates of Hours of Weekly Hours of Work

Variable Name	Tobit Estimates of Weekly Hours of Work Coefficient	Nonlinear Budget Set Method Estimates of Weekly Hours of Work Coefficient
Constant	−5.347	16.568[b]
	(14.132)	(7.449)
Hourly Wage Rate	.747	.269
	(.198)	(.281)
Weekly Unearned Income	-.039	-.130[c]
(including SSDI but not SSI)	(.027)	(.225)
Married = 1	-4.479	5.964[a]
	(7.752)	(4.692)
Male = 1	-.771	-.417
	(4.648)	(2.786)
Nonwhite = 1	0.027	-3.569
	(9.158)	(6.425)
Children = 1	-11.191[b]	-5.138[a]
	(5.436)	(3.162)
Schizophrenia/	-8.022	-3.171
Schizoaffective disorder = 1	(4.741)	(2.836)
Log-Likehood Function	-365.038	-294.606

Standard errors appear in parentheses.
a. Significant at the 10 percent level; b. Significant at the 5 percent level; c. Significant at the 1 percent level. N = 205

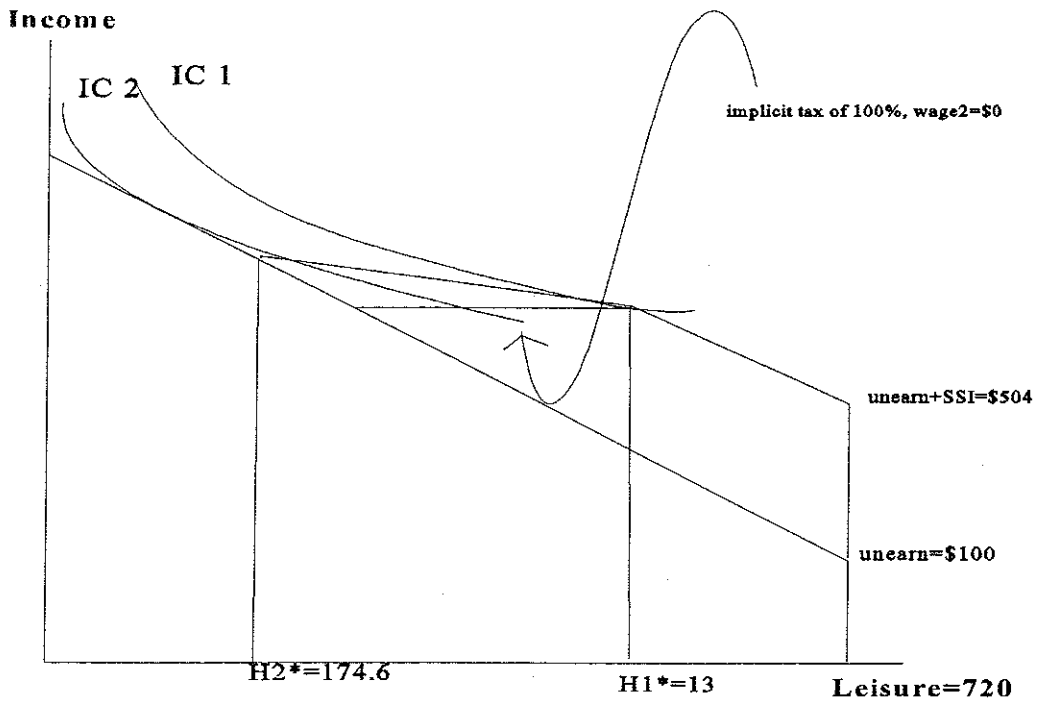
disregard by 100 percent has a modest work incentive, increasing hours by 2.9 percent per week. Providing the employee with a $2 per hour wage subsidy raises hours by just over 5 percent, a larger increase than the other two. Removing the employee portion of the rent subsidy increases hours modestly (1.7 percent). Surprisingly, a 100 percent implicit tax rate creates a large work incentive of 8.6 percent increase, this effect is dampened somewhat by increasing the earnings disregard to $200.

It is somewhat surprising to find that increasing the implicit tax on earnings serves as a work incentive, although theoretically it is possible since changing the implicit tax rate creates both an income effect and a substitution effect. Raising the implicit tax lowers the breakeven level of earnings and reduces the slope of the second segment of the budget constraint illustrated in Figure 1. As illustrated in Figure 2, a 100 percent implicit tax reduces that slope to zero. An individual with relatively flat indifference curves (i.e. indifference curves that indicate a preference for income rather than leisure) may find that the highest indifference curve he can now reach with the implicit tax is one where work hours are increased, particularly if he is already working some positive number of hours each week. This is shown in Figure 2 as the move from indifference curve 1 (labeled IC 1), where the individual maximizes utility along the second segment of the budget constraint to indifference curve 2 (la-

TABLE 3
Result from Policy Simulations

Policy Change	Percent Change in Weekly Hours of Work
1. Decrease implicit tax to 25 percent	-0.7
2. Increase earnings disregard by 100 percent	2.9
3. Provide a $2 per hour wage subsidy	5.4
4. Remove employee portion of rent subsidy	1.7
5. Raise implicit tax to 100%	8.6
6. Raise implicit tax to 100% and raise earnings disregard to $200	7.5

FIGURE 2
Monthly SSI Budget Constraint for Hypothetical Individual with $100 of Nonearned Income per Month and and Hourly Wage of $5 (Implicit Tax Rate Is 100 Percent)



beled IC 2), where utility is now maximized along the third segment of the budget constraint. An examination of the frequency distribution of hours of work for the sample reveals that 36 percent of those who work report working 20 or more hours per week. These individuals may have relatively flat indifference curves and higher wages, making it more likely that they maximize utility by not being on SSI.

Of course, one aspect that this model cannot account for is that SSI benefits are accompanied by Medicaid benefits which an individual may lose if he works so many hours that he does not qualify for SSI and earns enough money to pay his medical bills. If receipt of medical benefits is a concern among this population, then our results may overstate the increase in work hours that may occur. This suggests that our results should be used as an upper bound estimate on the likely change in hours of work that might result from these policy changes. Also, remember that the wage coefficient is statistically not different from zero; thus individuals in the sample are not very responsive to wage changes. Even the hours changes indicated from the simulations are quite small, less than 10 percent, and some of our simulations featured quite large changes in the SSI program (e.g. from a 50 percent to a 100 percent implicit tax rate). Simulations were also performed for the subsamples mentioned earlier with very similar results.

CONCLUSIONS AND IMPLICATIONS FOR PUBLIC POLICY

In this paper we build and estimate a structural labor supply model that explicitly models the budget constraint faced by mentally ill individuals eligible for SSI benefits. We use a unique data set of mentally ill individuals who are eligible for disability benefits. This research extends previous work in this area by considering the budget constraint created by the SSI program. Our results shed some light on how the labor force behavior of this group may be affected by disability programs, though we caution that because of the small sample size and the limited geographic sampling region, our results should not be generalized.

The empirical results are intriguing. The labor supply of the individuals in the sample is not responsive to wage changes, indicating that it is non-economic factors that drive the labor supply decisions of this group. The simulations indicate two possible avenues for change in the SSI program that could increase hours of work among members of our sample, albeit by rather modest amounts. The first is to subsidize wages of the mentally ill. The second is to consider raising the implicit tax rate on earnings. The next step in this research is to test our model on a larger, more generalizable sample of individuals. One of the primary contributions of this work is that it demonstrates how to model these types of programs, and our approach provides a crucial framework for future research in this area.

NOTES

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1. We make no attempt to model SSDI since in most cases it requires a set amount of prior labor force participation. In addition, the SSDI check, in contrast to SSI, is never reduced because of earnings; the recipient receives the whole amount or nothing at all. After a trial work period and an extended

period of eligibility, the first month in which earnings exceed $500 triggers the termination of SSDI. We do include SSDI income in our measure of nonearned income since that is what is done when determining SSI eligibility.

2. The full estimation procedure is detailed in an appendix available upon request from the first author.
3. Unfortunately, the predictive power of this equation is low. This may be due to the relatively small sample size and the fact that we have to predict wages for nearly two-thirds of the sample. However, it is also possible that this is a fairly heterogenous group, making wage estimation particularly difficult. Ideally, one would study men and women separately; due to small sample sizes we do not have that luxury.
4. In our data the dependent variable is weekly hours of work, so the SSI payments have all been translated from monthly to weekly for estimation purposes
5. Tobit, rather than OLS is used due to the large number of individuals who report zero hours of work.

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