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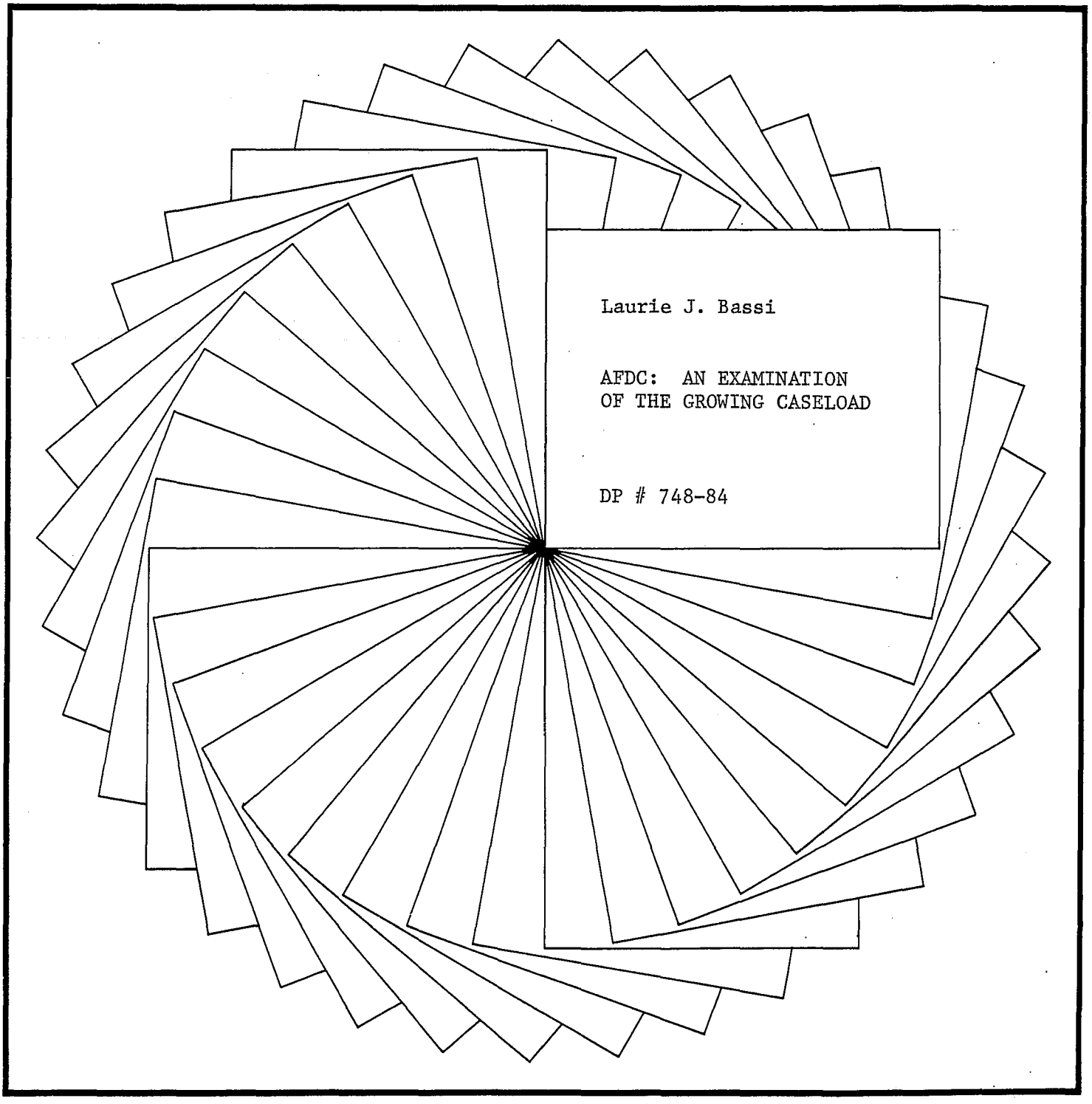

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AFDC: An Examination Of The Growing Caseload

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ABSTRACT

There has been a growing concern in recent years over the ever-increasing level of transfer payments in the United States. One of the programs that has been largely responsible for this concern among policy makers and the public alike is Aid to Families with Dependent Children (AFDC). During the 1970s the AFDC population grew over four times as fast as the general population, despite the fact that the real purchasing power of average monthly payments to recipients fell by 30 percent.

A number of factors could account for growing welfare dependence in the face of declining real benefit levels. Some of the most important factors to be considered are the changing demographics of the population, the economic climate, and the changing nature of the AFDC program itself. In addition to these factors, one hypothesis which has been offered to explain the growing caseload is an increasing willingness by workers to reduce their incomes in order to become eligible for AFDC benefits. Although such behavior violates the AFDC eligibility rules, it can presumably be camouflaged. This paper provides a consistent framework for analyzing the empirical significance of this hypothesis.

The framework is estimated using data from the Michigan Panel Study of Income Dynamics (PSID), in combination with estimated effective AFDC tax rates by state. The results of the estimation do provide some support of the hypothesis that "voluntary" welfare dependence has been increasing. Within a consistent framework, estimated compensated labor supply elasticities have increased over the time period under consideration. In other words, within the group of individuals who are eligible for the program, welfare dependence has increased over time, ceteris paribus. At the same time, the pool of

individuals who are demographically eligible for the program has also increased. Unfortunately, the estimates produced here are not sufficiently refined to provide a clear sorting out of these two distinct phenomena. We are only in a position to say that both factors appear to have been at work.

Perhaps the most serious qualification that needs to be considered in weighing the significance of these results is that the estimator used here is likely to overestimate compensated labor supply elasticities. The basic finding — that the estimates of labor supply elasticity have increased over time -- is, however, not to be easily dismissed.

AFDC: An Examination Of The Growing Caseload

There has been a growing concern in recent years over the ever-increasing level of transfer payments in the United States. One of the programs that has been largely reponsible for this concern among policy makers and the public alike is Aid to Families with Dependent Children (AFDC). In 1970 approximately 2.5 million families received AFDC, and total expenditures under the program were $4.6 billion. By 1980 over 3.8 million families were recipients and expenditures had risen to $14.2 billion. During the 1970s the AFDC population grew over four times as fast as the general population, despite the fact that the real purchasing power of average monthly payments to recipients fell by 30 percent.

These statistics present a very confusing picture. The most basic economic theory predicts that, holding all other relevant factors constant, a reduction in real benefit levels should result in a decline -- not an increase -- in the number of recipients. Clearly, other relevant factors have not been constant. Perhaps the most important factors that have changed are the demographics of the population, the economic climate, and the nature of the AFDC program itself.

Over the past decade, the average age of the population has fallen -- meaning that there are now more young women who are likely to have small children. At the same time, with rising rates of divorce and childbirth out of wedlock, these women have become increasingly likely to be single heads of households. Since only low-income families who are headed by a single parent are eligible for AFDC, these combined changes have resulted in an increase in the percentage of the population that is demographically eligible for the program. Another factor which may have caused an increase in AFDC dependence is rising medical costs, since some recipients may attempt to maintain their eligibility solely for the purpose of maintaining eligibility for Medicaid.

Macroeconomic conditions which influence individuals' earned income (and, therefore, their AFDC eligibility) have also fluctuated substantially over the course of the decade. In addition, the parameters that determine the level of AFDC payments for which a family is eligible have changed considerably.

In addition to this combination of factors, one hypothesis which has been offered to explain the growing caseload is an increasing willingness by workers to reduce their incomes in order to become eligible for AFDC benefits. Although such behavior violates the AFDC eligibility rules, it can presumably be camouflaged. To the extent that individuals have reduced their work effort in order to make themselves eligible (or maintain their eligibility) for AFDC, the program could be said to in a sense have "created" poverty rather than alleviated it. The purpose of this paper is to provide a consistent framework for analyzing the empirical significance of this hypothesis. The methodology described in Section I enables us to disentangle the mechanistic receipt of AFDC (benefits normally received because of eligibility) from the induced receipt of AFDC (payments resulting from voluntary reduction of labor supply). Section II describes the data that were used in the analysis. Section III presents the empirical results, and the final section provides a summary.

I. A METHODOLOGY FOR ESTIMATING THE DETERMINANTS OF WELFARE DEPENDENCE

The AFDC program can be characterized by four basic parameters. The first is the guarantee level, which is the level of benefits received by a family with no outside income. The second is the level of earnings allowed before AFDC benefits are reduced. The other parameters are implicit tax rates on earned and unearned income. In this context, tax rates measure the

reduction in AFDC benefits which result from a change in income - either earned or unearned. To be more explicit, AFDC benefits can be calculated from equation (1) below[1]:

$$(1) \qquad B = G_a - tWH - rU$$

where

B = AFDC benefits
G_a = the basic guarantee (which varies with family size)
t = the tax rate on earned income
W = hourly wage rate
H = hours worked
r = the tax rate on unearned income
U = unearned income.

Since the AFDC program is run by the states as opposed to the federal government, most of these parameters vary dramatically from state to state. These wide variations, in essence, create a natural experiment which enables us to isolate the effect of changes in the generosity of the program (income effects) from changes in tax rates (substitution effects).

For the purpose of isolating the labor supply effect of the program, it is useful to focus on the implicit gross earnings tax rate, t. Fortunately, gross earnings tax rates vary widely across states, even though net earnings tax rates have been constant across states at a rate of two-thirds since the 1967 amendment to the Social Security Act.[2] Variation in the gross earnings tax rates results from the fact that allowable deductions for work-related expenses vary tremendously across states.[3] There is also considerable variation across states in the actual tax rate on unearned income, r, even though the rate is legislatively set at 100%.[4]

If all of these variables are known or can be estimated, it is then possible to estimate the "break-even income," that level of earned income above which benefits are zero. By setting B in equation (1) equal to zero,

the break-even level of income is then

(2) $WH_1 = (G_a - rU)/t$

which will be denoted as E, for notational simplicity.[5]

If the logarithm of earned income is normally distributed with mean μ and standard deviation σ, the fraction of families eligible for benefits, P, is:

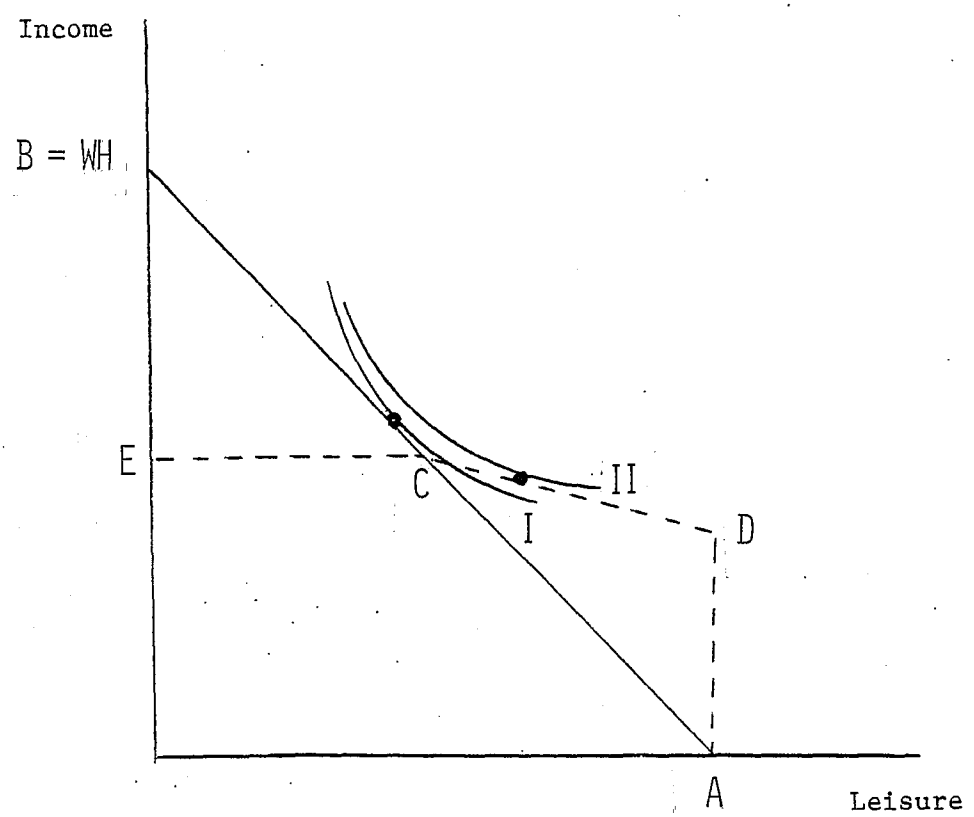
(3) $P = N\ [\log\ (E - \mu)/\sigma]$

where N indicates the value of the cumulative standardized normal distribution.[6] Equation (3) is a purely mechanical predictor of participation -- telling us that families with earned income below the break-even would receive a subsidy, and families with earned income above that level would be ineligible.[7]

One of the purposes of the analysis, however, is to determine the extent to which family members adjust their labor supply in order to become eligible for AFDC. By lowering their hours of work, families who are slightly above the break-even income can lower their income enough to be eligible for the program. To the extent that the families value the additional leisure more highly than the lost income, they will be better off after they have lowered their hours of work. This effect is shown graphically in Figure 1, which represents the family's indifference curves between leisure and income.

In this income/leisure graph, hours of work are measured from right to left along the abscissa. The absolute value of the slope of the budget constraint in the absence of a welfare program is simply the wage rate, W. With a welfare program, the budget constraint is BCD. The distance AD represents the basic guarantee, and the absolute value of the slope of segment CD is W(1-t).

Figure 1



Clearly, in the absence of welfare stigma, any family earning less than the break-even income, E, will increase utility by accepting welfare. Other families with income above the break-even income can also increase utility by reducing their work effort (and increasing leisure) in order to become eligible for welfare payments. An example of this type of utility-maximizing behavior would be demonstrated by a movement from indifference curve I to II.

A useful tool for examining the empirical significance of this type of "voluntary" welfare dependence is the expenditure function. Using the properties of the expenditure function, it can be shown that families will choose to receive AFDC benefits if [8]

$$(4) \quad B > -\tfrac{1}{2} \cdot \frac{\partial H}{\partial W} (tW)^2$$

where $\frac{\partial H}{\partial W}$, the utility-constant derivative of the labor supply function, is always non-negative. Ashenfelter recently used this relationship to predict participation in the negative income tax experiments. The discussion which follows closely parallels that of Ashenfelter's, with appropriate modifications made for adaptation to the AFDC program.

Noting that the compensated elasticity of labor supply, ε, is equal to $\frac{\partial H}{\partial W} \cdot \frac{W}{H}$, and making use of equation (1), it follows that families will choose to participate provided that:

$$(5) \quad G_a - tWH - rU > \frac{-\varepsilon t^2 WH}{2} .$$

Equation (5) can then be used to solve for the "opting-in level of income" which is given in equation (6).

$$(6) \quad WH = (G_a - rU)/t(1 - \frac{\varepsilon t}{2}) = E(1 - \frac{\varepsilon t}{2})^{-1} \quad .$$

Note that if the compensated elasticity of labor supply, ε, is equal to zero, the opting-in level of income is simply equal to the break-even level. But if $\varepsilon > 0$ the opting-in level exceeds the break-even level. For reasonable (i.e., small) values of ε and t, the logarithm of equation (6) can be written as:

$$(7) \quad \log (wH^o) \simeq \log E + .5\varepsilon t.$$

From equation (7) we can then determine the probability that a family will choose to participate in the program to be:[9]

$$(8) \quad P = N \left[\frac{(\log wH^o - \mu)}{\sigma}\right].$$

Substituting (7) into (8) leaves us with

$$(9) \quad P = N \left[\frac{(\log E + .5\varepsilon t - \mu)}{\sigma}\right].$$

Equation (9) enables us to very neatly sort out the behavioral from the mechanical components of AFDC recipiency. From equation (3) we know that the mechanical component of recipiency is $N \frac{[\log (E - \mu)]}{\sigma}$. This is the level of welfare dependence that would prevail if labor supply (hours of work) was exogenously determined (i.e., $\varepsilon = 0$). The difference between equations (9) and (3) is the dependence that is induced by a change in labor supply behavior.

If we allow the mean of the earned income distribution to vary across individuals with a vector of variables X_i, the analysis can be generalized to enable an examination of the importance of the economic environment and the demographic composition of the population in determining AFDC participation

rates. This can be done by letting $\mu = X_i\beta$ where β is a vector of coefficients.

The analysis lends itself to easy estimation. Let the first m families be AFDC recipients and the remaining n families be nonrecipients. The log likelihood of any observed sample is:

$$(10) \quad L = \sum_{i=1}^{m} \log N_i + \sum_{i=m+1}^{n} \log (1 - N_i)$$

where $N_i = N\,[(\ln((G_{ai} - r_iU_i)/t_i) + .5\epsilon t_i - X_i\beta)/\sigma]$. This is simply a probit and consequently lends itself to standard computing routines. An additional advantage of this approach is that the coefficient on the break-even level of income is simply an estimate of $1/\hat{\sigma}$. Consequently, the coefficients ϵ and β can be identified as a simple multiple of $1/\hat{\sigma}$.

Generalizing the Analysis to Allow For Food Stamp Receipt

In addition to AFDC, another major assistance program for the welfare population is the Food Stamp program. Since Food Stamp benefits are also reduced as earnings increase, explicit consideration of these benefits is needed in order to accurately estimate the tax rate on earnings (and therefore, the labor supply response) for AFDC recipients who also receive Food Stamps.[10]

Calculation of Food Stamp benefits is extremely complicated. For instance, in 1979 the calculation of Food Stamp benefits, which we will denote by FS, was determined by the following formula:

$$(11)\quad FS = \begin{cases} \text{Max } [M_f,\ G_f - .3Y_n] & \text{if } Y_n \leq Y^* \text{ and } WH + B + U \leq 1.3Y^* \\ 0 & \text{if } Y_n > Y^* \text{ or } WH + B + U > 1.3Y^* \end{cases}$$

$$Y_n = \text{Max } [0,\ WH + B + U - (.18WH + D + S)]$$
$$S = \text{Min } [115,\ \text{Max } (0,\ R - .5Y_n)]$$

where Y_n = "net Food Stamp income"
Y^* = the official poverty line
W = hourly wage rate
H = hours worked
B = AFDC benefits
U = unearned income
M_f = the minimum benefit
G_f = the food stamp guarantee (when $Y_n = 0$)
D = the Food Stamp standard deduction
S = the monthly shelter deduction
R = household's monthly expenditure on rent or other shelter

Although this formula appears to be hopelessly complicated, it actually is quite simple in terms of determining the implicit tax rate on earnings that results from a reduction in Food Stamp benefits. Table 1 shows how the implicit Food Stamp tax rate varies over all possible combinations of parameters that determine the benefit level.

Obviously, there are large discontinuities in the tax rates across income levels. It seems reasonable to argue, however, that in making a decision about whether to work, a Food Stamp (and/or AFDC) recipient would look to women in similar circumstances who were working, in order to make some determination of an average marginal tax rate on earnings. Since the average tax rate of .246 prevails over very broad income categories, this is the rate used in the empirical analysis.

Table 1

Variations in Food Stamp Tax Rates

by Factors Determining Benefit Level, 1979

Parameter Determining Benefit level[a]	$R-.5Y_m > 115$	$115 > R-.5Y_m > 0$	$R-.5Y_m \leqq 0$
$Y_m \leqq 0$, $Y_n \leqq 0$, $FS = M_f$	0	0	0
$Y_m \leqq 0$, $Y_n \leqq 0$, $FS > M_f$	0	0	0
$Y_m \leqq 0$, $Y_n > 0$, $FS = M_f$	0	0	0
$Y_m \leqq 0$, $Y_n > 0$, $FS > M_f$	.246	.246	.246
$Y_m > 0$, $Y_n \leqq 0$, $FS = M_f$	0	0	0
$Y_m > 0$, $Y_n \leqq 0$, $FS > M_f$	0	0	0
$Y_m > 0$, $Y_n > 0$, $FS = M_f$	0	0	0
$Y_m > 0$, $Y_n > 0$, $FS > M_f$	.246	.369	.246

[a] See text for explanation of variables.

For the purpose of estimation, it is also important to recognize one additional complication of the Food Stamp program. From equation (11) it can be seen that Food Stamp benefits are negatively related to AFDC benefits. AFDC benefits are, in turn, negatively related to the implicit AFDC tax rate in each state. Consequently, Food Stamp benefits vary positively with the implicit AFDC tax rate. More formally using equations (1) and (11), the relationship between Food Stamps and AFDC benefits is given in equation (12).[11]

$$(12) \quad FS = G_f - (.246 - .3t)WH - .3[G_a - (1-r)U]$$

So the implicit tax rate on combined AFDC and Food Stamp benefits is equal to $.7t + .246$.[12]

One of the interesting implications of this interaction is that when AFDC benefits fall, Food Stamp benefits increase. Consequently, any decline in AFDC benefits overstates the true decline in the benefits package.[13]

II. DATA USED IN ESTIMATION

The 1981 version of the Panel Study of Income Dynamics (PSID) was used as the primary data base for the analysis. The PSID is an annual longitudinal survey begun in 1968 with a nationally representative sample of 5,000 families. By 1981 the sample size had increased to over 6,500 families due to new family formation by members of the original families. The PSID contains a wealth of socioeconomic variables as well as data on benefit levels paid under a variety of transfer programs, including AFDC and Food Stamps.[14]

Several other data sources were used to obtain data on program parameters. These data were then merged with the PSID. Two alternative

measures of Medicaid benefits were used. The first, based on average Medicaid payments by family size, year, and state, was generously provided by John Holahan of the Urban Institute. Unfortunately, these data are only available on a consistent basis after 1974. The second measure, which was kindly provided by Tim Smeeding, was based on the estimated annual market value of Medicaid as insurance by family size and state during 1979. These measures were then adjusted by the medical care cost component of the CPI to arrive at constant dollar estimates for 1973, 1975, and 1977. This was the measure that was ultimately used in the analysis.

Since the tax rates that are relevant for this analysis are effective tax rates (rather than statutory tax rates), it was necessary to use estimated tax rates. The best available estimates of effective tax rates by state have been developed by Fraker, Moffitt, and Wolf. Using data from the biannual AFDC surveys, conducted by the Department of Health and Human Services, Fraker, Moffitt, and Wolf estimated effective tax rates for each state for 1967-1982.[15]

The strategy used for estimating tax rates was a simple one. The benefit received by a household was regressed against income -- both earned and unearned. The coefficients on these income terms were then the tax rates used in this analysis. Family size was controlled for by including a dummy variable for whether or not there were at least two children in the family, and then including the number of children in excess of two. This procedure is designed to account for nonlinearities in the AFDC benefits with family size. The basic estimating equation is then:

(13) $B = \alpha_0 + \alpha_1 K_2 + \alpha_2 K_3 - tWH - rU + \alpha$

where B = benefits

K_2 = 1 if there are at least two children in the family; 0 otherwise.

K_3 = the number of children in excess of two

U = unearned income

α = an error term

A modified Tobit estimation scheme was used to produce consistent estimates. The Fraker/Moffitt/Wolf estimates of effective tax rates are shown in a table in the Appendix.

Fortunately for the purpose at hand, these tax rates are estimated with substantial precision.[16] It seems that while there was a good deal of variation across states in their allowances for work-related expenses, there was tremendous consistency within states. This wide variation across states is especially useful for identifying labor supply responses.

In addition to the data mentioned above, data on statewide unemployment rates were appended to the PSID.[17] Once again, these data were only available after 1974.

The analysis was done for 1973, 1975, 1977, and 1979, and was restricted to female heads of households with a child present.[18] There were 527 such women present in the sample in 1973, 572 in 1975, 695 in 1977, and 687 in 1979. The means of the variables used in the analysis are presented in Table 2. A quick glance at the table indicates that the sample was becoming increasingly younger over time, and had fewer but younger children. Effective tax rates were rising, while break-even levels of income were falling.[19]

For consistency in presentation, all variables measured in dollars were

Table 2

Means of the Variables Used in the Analysis

Variables	1973	1975	1977	1979
AFDC recipient (%)	.385	.390	.368	.370
Log(Brkeven)[a]	2.96	2.82	2.78	2.68
Effective tax rate on earnings[b]	.379	.410	.409	.425
Age	39.30	38.36	37.18	36.42
Age of youngest child	5.02	5.03	4.99	4.89
City (% of SMSA)	.880	.879	.874	.881
Medicaid[c]	1511.08	1170.24	922.39	755.48
Minority (% nonwhite)	.787	.783	.751	.779
Number of children	2.68	2.44	2.23	2.09
Unemployment rate	n.a.	8.63	7.16	6.01
Education (% < 9 years)	.598	.577	.535	.531
N	527	572	695	687

[a]Expressed in 1973 dollars (monthly level).

[b]Incorporates Food Stamp tax rate.

[c]Expressed in 1973 dollars (annualized level).

measured in constant 1973 dollars. Women with unearned income high enough to disqualify them from AFDC recipiency were eliminated from the analysis.[20] The variable that was used for Medicaid payments is a measure of the insurance value of Medicaid services.[21] This value varies by family size, state, and year. The education variable is a dummy set equal to one if an individual has less than nine years of education. Finally, the effective tax rates have been multiplied by .5 so that the coefficient on the tax rate can be interpreted as an elasticity.[22] With this by way of background, we turn next to an examination of the results.

III. RESULTS

The results from the probit estimation are presented in Table 3. All estimated coefficients have been multiplied by $\hat{\sigma}$ to enable an identification of ϵ and β. The probit has been done in two separate forms. The first pools all years (1973, 1975, 1977, and 1979).[23] The second disaggregates the analysis by year. One set of results is not clearly preferable to the other, since a likelihood ratio test to check the validity of pooling across years does not result in a rejection of the null hypothesis of no structural shifts between years at standard levels of significance.

The results in Table 3 are largely consistent with our expectations. Women are less likely to be dependent on AFDC if they are older, more educated, white, and have fewer or older children. Living in an SMSA, in general, seems to increase the probability of dependence, but this result is not statistically significant consistently across years.

Table 3
Probit Estimates Of Equation (10)[a]

	All years combined	1973	1975	1977	1979
1/s	.428 (7.47)	.356 (2.69)	.297 (2.58)	.523 (4.41)	.702 (4.98)
e_{79}	.630 (6.70)	----	----	----	.523 (5.32)
e_{77}	.565 (5.60)	----	----	.636 (5.10)	----
e_{75}	.495 (4.49)	----	.019 (.06)	----	----
e_{73}	.281 (1.40)	.079 (.25)	----	----	----
Age	-.002 (9.48)	-.003 (3.85)	-.004 (4.74)	-.002 (4.98)	-.002 (5.09)
Education	.033 (6.17)	.026 (1.85)	.053 (3.27)	.033 (4.05)	.020 (3.21)
City	.014 (1.59)	.058 (3.58)	.039 (1.48)	.011 (.82)	-.015 (1.57)
Minority	.030 (4.62)	.048 (2.67)	.015 (.74)	.026 (2.55)	.025 (3.30)
Medicaid	-.00001 (1.86)	-.00002 (1.02)	-.000003 (.15)	-.000003 (2.06)	-.00006 (3.41)
Unemployment rate	.013 (5.35)	----	.031 (6.01)	.005 (1.47)	.005 (1.51)
Age of youngest child	-.004 (3.52)	-.003 (1.08)	-.006 (1.74)	-.003 (1.71)	-.004 (2.64)
Number of children	.015 (5.52)	.006 (.90)	.021 (2.88)	.015 (3.20)	.016 (4.40)
Dummy Variable for 1973	.105 (3.54)	----	----	----	----
Constant	-.385 (10.78)	-.279 (2.49)	-.451 (4.10)	-.353 (6.76)	-.284 (6.62)
N	2481	527	572	695	687
Log of likelihood function	-1386.61	-303.52	-308.42	-379.89	-370.09

a Absolute t values are in parentheses. Please note that these are the t values for β/σ rather than the t values for σ itself.

The coefficients on the Medicaid variable are, however, surprising. One would expect that, ceteris paribus, individuals living in states with more generous Medicaid programs (as measured by insurance values) would be more likely to maintain AFDC eligibility. The results indicate just the opposite.[24] The conclusion that can be reasonably drawn from this is that the entire Medicaid issue has not been treated with sufficient sophistication in this analysis to enable an identification of its true impact on AFDC dependence.[25]

Perhaps the most interesting results from Table 3 are, however, the estimates of the compensated labor supply elasticities. In general, the estimated labor supply elasticities are increasing over time.[26] Unfortunately, it is not possible to test to determine whether this increase is a statistically significant one, since standard errors are only known for $\hat{\beta}/\hat{\sigma}$, rather than for $\hat{\beta}$. These results do present fairly stong evidence, however, of some positive increase in the labor supply response to the AFDC program over time.

There are several possible interpretations of this result. The first is that there has been a change in preferences over time, with leisure becoming increasingly preferred. The second, and not totally independent interpretation, is that these labor supply elasticities are capturing a "state dependence" phenomenon. According to this argument, the welfare population is likely to grow over time if the preferences of individuals are permanently altered (in favor of leisure) once a recipient experiences an initial period of welfare dependence. The results of other research do not, however, provide any compelling evidence for the existence of state dependence.[27]

The results are also subject to several qualifications. The first is that they are based on estimated tax rates (as opposed to actual rates).

Because of the degree of precision with which these rates have been estimated, this does not seem to be a very restrictive qualification.

The second qualification is that the estimated tax rates are probably downwardly biased, since they have not incorporated implicit tax rates from other programs in which AFDC recipients may participate. Nor have federal, state, or payroll taxes been considered. To the extent that the implicit tax rate is underestimated, the labor supply response will be overestimated.[28] There is no reason to expect that this bias (to whatever extent it exists) has increased over time.[29]

The final and perhaps most serious limitation of these results is that they are based on a probit estimator which implicitly assumes that earnings are lognormally distributed. Unfortunately, this is an underlying assumption which cannot be tested.[30] In some recent work, based on experimental data, Plant (1984) has shown that a probit estimator tends to overestimate labor supply elasticities (both in magnitude and significance) relative to a distribution-free estimator. This finding indicates that the magnitude of the elasticities reported here should perhaps not be taken too seriously. However, the finding that, within a consistent estimation framework, estimated labor supply elasticities increase over time is not so easily dismissed. So while the magnitudes of the estimated labor supply elasticities may be overstated, there is no reason to expect that the upward trend in the estimates is a statistical artifact of the estimator chosen.

IV. CONCLUSIONS

The PSID in combination with recently available estimated tax rates (over time and across states) has proved to constitute an interesting base for estimating the labor supply response to the AFDC program over time. By using a simple estimation procedure that neatly sorts out that welfare dependence which is mechanistic from that which results from a behavioral reponse to the program, we are able to develop some sense of whether or not "voluntary" welfare dependence has been increasing.

The evidence provided here does provide some support of that hypothesis. Within a consistent framework, estimated compensated labor supply elasticities have increased over the time period under consideration. In other words, within the group of individuals who are eligible for the program, welfare dependence has increased over time, ceteris paribus. At the same time, the pool of individuals who are demographically eligible for the program has also increased. Unfortunately, the estimates produced here are not sufficiently refined to provide a clear sorting out of these two distinct phenomena.[31] We are only in a position to say that both factors appear to have been at work.

Perhaps the most serious qualification that needs to be considered in weighing the significance of these results is that the estimator used here is likely to overestimate compensated labor supply elasticities. The basic finding--that the estimates of labor supply elasticity have increased over time is, however, not to be easily dismissed.

Appendix
Estimated Effective Tax Rates
By Year and State[a]

	Effective Tax Rate on Earnings				Effective Tax Rate on Unearned Income			
	1973	1975	1977	1979	1973	1975	1977	1979
Alabama	.16	.18	.19	.32	.75	.84	.89	1.00
Alaska	na	na	.23	.27	na	na	.87	.96
Arizona	.23	.26	.32	na	.53	.53	.88	na
Arkansas	.07	.06	.17	.20	.30	.35	.75	1.01
California	.25	.23	.27	.26	1.03	.89	.93	.85
Colorado	.32	.39	.36	.40	.97	.83	.81	na
Connecticut	.22	.43	.42	.41	.92	.90	.96	1.06
Delaware	.16	na	.29	na	.40	na	.92	na
D.C.	.18	.25	.24	.30	.57	.73	.89	.98
Florida	.18	.25	.12	.21	.61	.95	.61	.68
Georgia	.13	.14	.14	.13	.55	.54	.81	.93
Hawaii	.20	na	.34	na	1.05	na	.78	na
Idaho	na	na	.29	.29	na	na	1.05	.88
Illinois	.23	.32	.34	.55	.69	.97	.98	.86
Indiana	.04	.19	.12	.17	.26	.64	.42	.43
Iowa	.23	na	.23	.24	.94	na	.76	.64
Kansas	.23	.38	.36	.47	.90	.95	.80	.98
Kentucky	.17	.20	.17	.21	.97	.94	1.10	1.08
Louisana	.18	.25	.27	.28	.96	.77	1.06	.94
Maine	-.01	.06	.20	.31	.18	.41	1.05	.97
Maryland	.21	.21	.23	.18	.76	.83	.80	1.00
Massachusetts	na	.27	.27	.28	na	.45	.83	.75
Michigan	-.13	.36	.35	.36	.75	.89	.85	.94
Minnesota	.20	.23	.18	.27	.86	.95	.61	.94

[a] The 1973 and 1977 estimates were generated by Wolf while the 1975 and 1979 estimates were generated by Fraker and Moffitt.

(continues on next page)

Appendix (continued)

	Effective Tax Rate on Earnings				Effective Tax Rate on Unearned Income			
	1973	1975	1977	1979	1973	1975	1977	1979
Mississippi	.03	.04	.06	.13	.18	.19	.18	.42
Missouri	.06	.02	.05	.22	.11	.08	.27	.71
Montana	.24	na	.30	na	.86	na	.71	na
Nebraska	.06	na	.31	na	.39	na	.71	na
Nevada	na	na	.12	.42	na	na	.76	.95
New Hampshire	na	na	.92	na	na	na	.85	na
New Jersey	.26	.28	.26	.28	.88	1.01	.94	.97
New Mexico	.20	na	.28	na	.96	na	.99	na
New York	.24	.33	.29	.30	.98	.93	.92	.98
North Carolina	.24	.28	.27	.25	.96	.99	.98	.65
North Dakota	.35	na	.26	na	.96	na	1.01	.96
Ohio	.17	.38	.37	.47	.84	.96	1.01	.62
Oklahoma	.31	.46	.42	.46	1.02	na	.85	1.01
Oregon	.42	.34	.22	.28	1.00	.71	.84	.92
Pennsylvania	.29	.25	.30	.29	.94	.99	.92	.98
Rhode Island	.23	na	.39	na	.95	na	.90	na
South Carolina	.11	.17	.10	.13	.50	.53	.51	.37
South Dakota	.17	na	.33	na	.82	na	.78	na
Tennessee	.11	.11	.15	.16	.38	.33	.81	.15
Texas	.22	.28	.19	.31	1.09	.97	1.24	.86
Utah	.34	.38	.37	na	1.14	.86	.74	na
Vermont	na	na	.43	na	na	na	.85	na
Virginia	.40	.39	.36	.38	.98	.91	.82	.59
Washington	.39	.36	.41	.37	1.05	.87	.71	.77
West Virginia	.31	.38	.42	.31	.87	.92	.94	.88
Wisconsin	.36	.25	.27	.27	1.01	.92	.76	.61
Wyoming	na	na	.34	na	na	na	.39	na

NOTES

1. As is explained in more detail below, the tax rate used here is a tax rate on gross earnings, not net earnings. Consequently, it is not necessary to explicitly introduce earnings-related deductions into equation (1), since they have already been accounted for in the tax rate, t.

2. See Hutchens (1978), Fraker and Moffitt (1983b), and Wolf (1984).

3. The 1967 amendment to the Social Security Act required that all states use what came to be known as the "30 and 1/3 disregard" in calculating welfare benefits. That is to say that the first $30 of earned income was disregarded in determining benefits (i.e., was not taxed) and 1/3 of all earned income beyond $30 was disregarded. So the implicit marginal tax rate on earnings beyond $30 was 2/3. However, states also had the right to allow recipients to take a variety of deductions for work-related expenses before the implicit tax rate of 2/3 was applied. Fortunately, for the purpose of this analysis, allowable work-related expenses varied considerably across states.

4. Fraker and Moffitt (1983b), and Wolf (1984).

5. The reader is reminded of the special definition of t that is being used here, which has already implicitly accounted for deductions and the earned income disregard. It should also be noted that reductions in payments from other transfer programs (perhaps most important Food Stamps) and reductions in earnings from income taxes are ignored. While the latter is a trivial omission for extremely low-income individuals, the former is not. Later in this section, the analysis is generalized to account for

tax rates in the Food Stamp program.

6. This assumption is discussed in more detail in the next section of the paper.

7. Throughout the 1970's participation rates among eligibles were fairly constant at around 90 percent. See Levy (1979). The methodology outlined here does not attempt to measure welfare stigma; i.e., why some eligible families choose not to participate.

8. Hicks (1946) was the first to derive this criterion. More recently a number of authors - including Greenberg and Kosters (1973), Rea (1974), Keeley et al. (1978), and Ashenfelter (1983) - have discussed this relationship. Specifically, let e(W,v) represent the minimum unearned income required to reach utility v, given the wage W. Then e[(1-t)W, v] is the minimum unearned income required to reach the same level of utility for AFDC recipients, since the wage rate is reduced by the implicit tax. If

$$\text{(i)}\quad e[(1-t)W,\ v] - e(W,\ v) < G_a - rU$$

then the family will participate. Approximating the left-hand side of (i) by a second-order Taylor series expansion around the nonrecipient equilibrium, and using the fact that $\partial e/\partial W = -H$ (Shepherd's Lemma) and

$$\frac{\partial^2 e}{\partial W^2} = -\frac{\partial H}{\partial W},$$ leaves

$$\text{(ii)}\quad tWH - \tfrac{1}{2}\frac{\partial H}{\partial W}(tW)^2 < G_a - rU.$$

Rearranging terms leaves

$$\text{(iii)}\quad G_a - rU - tWH = B > -\tfrac{1}{2}\frac{\partial H}{\partial W}(tW)^2.$$

9. Note that equation (3) gave us the probability of dependence without any change in labor supply and equation (8) gives us the probability of dependence after families have altered their labor supply in response to the program.

10. Clearly, there are other forms of assistance available to the low-income population such as subsidized housing and day care. Consideration of these programs is beyond the scope of the current analysis. Their exclusion is probably not very significant since AFDC, Food Stamps, and Medicaid (which is discussed in the next section) are by far the most important programs for the welfare population.

11. Here it has been assumed that $Y_n > 0$, $FS > M_f$, and either $R - .5Y_m > 115$ or $R - .5Y_m < 0$. For other combinations of the parameters determining Food Stamp benefits, equation (12) will also vary.

12. Since the Food Stamp program is run uniformly nationwide, there is not the state-by-state variation in this tax rate that there is in the AFDC tax rate.

13. Virtually all AFDC recipients are also Food Stamp recipients.

14. These variables are collected on an annualized basis. A recipient is therefore, defined as an individual receiving any positive level of benefits during the year.

15. The PSID cannot be used to estimate effective tax rates because there are not enough observations within most of the states represented. Although the sample sizes in the biannual AFDC survey are very large, they are still not large enough to estimate tax rates in all states in each year.

16. The t values on the tax rates were often in excess of 10.

17. The PSID does actually have a measure of local unemployment rates, which would be preferable to state-wide rates. But because the data are grouped in categories which are not consistently defined across years, it cannot be used in this analysis.

18. At the time at which the analysis was done, these were the only years for which the effective tax rate had been measured.

19. The decline in break-even levels was also caused in part by a decline in average family size as well as a decline in the real guarantee level. For instance, between 1973 and 1979, the real guarantee for a family with two children fell by almost 20 percent.

20. Although this is not necessary from a theoretical perspective, it is from a practical one since it is impossible to calculate the log of a break-even level for these women.

21. The alternative measure that was available (the average value of Medicaid services received by an AFDC family) produced very similar results.

22. See equation (10).

23. The pooled analysis obviously contains some multiple observations on the same individuals. These multiple observations have implicitly been assumed to be independent.

24. This result also held when the alternative measure of Medicaid values (i.e., an average value) was used.

25. For instance, because of the discontinuous nature of Medicaid benefits (i.e., an individual either is or is not eligible for them), the budget constraint is more complex than the one which has been assumed in this analysis.

26. In the disaggregated analysis, the trend from one time period to the next is not consistently positive, although the trend over the entire time span clearly is.

27. See Plant (1984).

28. The estimated labor supply elasticities reported in Table 3 do, however, fall well within the range that has been reported by others. See, for instance, Killingsworth for a summary of these estimates.

29. While it is true that the tax burden on the poor has increased over time (largely because of inadequate indexing of federal and payroll taxes), these taxes were still virtually zero in 1979 for the sample under consideration here.

30. If we had experimental data on a group of participants and controls, this assumption could, indeed, be tested. See Plant (1984), for instance. However, since these data have not been generated by an experiment, the true income distribution has been contaminated by the existence of the program, rendering invalid any tests for the absence of normality.

31. Since the sample consists only of those individuals who are demographically eligible for the program, nothing can be said about how changes in the number of eligible individuals has affected the number of individuals who are dependent. And <u>within</u> the eligible population, the estimates are not sufficiently consistent (between the results that are aggregated vs. those that are disaggregated) to sort out the precise increase in dependence that has resulted from an increase in behavioral response.

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