The Effect of Welfare Benefit Reductions on the Earnings of Public Housing Residents

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Abstract

Recent welfare-reform legislation in the U.S. established time limits on eligibility for cash assistance, with the principal aims being to increase the labor supply and earnings of low-income households and to reduce the cost of public assistance programs. However, any increase labor earnings may be less than the decline in cash assistance, resulting in a net reduction in total household income. Thus, for households receiving both cash and housing assistance, an unintended consequence of the reform may be an increase in their rental subsidy, since they typically pay no more than thirty percent of their income in rent. Using data from the National Survey of American Families on 745 female heads of households residing in public housing, we estimate an annual-earnings equation that allows for the endogeneity of cash assistance. Our empirical results indicate that a $1000 reduction in cash assistance increases wage income by between $349 and $816. Since approximately twenty-five percent of welfare recipients also receive housing assistance, we conclude that a substantial portion of any reduction in cash assistance payments will be offset by increases in federal subsidies for low-income housing.

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1 Introduction

In 1996, the United States Congress enacted legislation that radically reformed the principal program by which cash assistance is provided to low-income families. The longstanding Aid to Families with Dependent Children (AFDC) program was replaced by Temporary Assistance to Needy Families (TANF), under which eligible households must enroll in either employment training or subsidized work programs. They also face a sixty-month lifetime limit on the receipt of benefits. The new program was designed to eradicate a culture of entitlement and dependence that many observers claimed had rendered the previous system costly and counterproductive.

The two main objectives of TANF are (1) to increase the employment and earnings of low-income households, and (2) to reduce the amount of federal spending on public assistance programs. However, progress in achieving these goals has been impeded by the fact that many poor families participate in several aid programs that have interrelated eligibility criteria. One important example concerns TANF recipients who also receive housing assistance and typically pay no more than thirty percent of countable income, which includes cash assistance, in rent.[1] The U.S. Department of Housing and Urban Development (HUD) makes up the difference through either subsidized vouchers or operating subsidies paid to local public housing authorities. As cash assistance declines and labor market income increases, the increase in wage income may be less than the reduction in cash assistance, resulting in a net decrease in total family income. In these instances, the rental subsidies increase so that some of the budgetary savings from lower welfare payments are offset by higher housing subsidies. The extent to which reductions in cash assistance are counterbalanced by additional housing subsidy

payments depends on the magnitude of the response of labor earnings to the decline in welfare payments.

Empirical studies of the effect of housing assistance on labor earnings are reviewed by Olsen (2001) and Shroder (2002). There has also been a considerable amount of empirical research on the effect of cash assistance on labor earnings, with the early literature surveyed by Danziger et al. (1981) and the more recent work surveyed by Moffitt (2002). Although specific results vary, the overall conclusion is that both rental subsidies and cash assistance payments reduce labor supply.

There are no reported estimates of the effect of cash assistance on the labor earnings of household heads who are also receiving housing assistance. Two studies, however, simulated the effects of the 1996 welfare reform legislation on the labor income of public housing residents and on the operating subsidy for federal housing programs. HUD (1998) analyzed data from several Public Housing Authorities (PHAs) to estimate the proportion of residents who would be successful in finding employment under TANF. This report concluded that the break-even rate of employment would be as high as 70 percent for some PHAs, and projected a decline in rental income of as much as $4 million. Newman and Harkness (1999) examined data from the 1994 file of the AFDC-Quality Control database. Their simulation results indicate that welfare reform will increase the proportion of public housing residents employed, but that few households will attain self-sufficiency before hitting the time limit for receiving welfare payments. Newman and Harkness (1999) predict an overall budget increase for HUD of one-half to one-and-one-half percent per annum.

We present empirical estimates of the marginal effect of a reduction in cash assistance on labor earnings for families participating in the AFDC program while living in public housing. We then use these estimates to predict the extent to which the change in net household income will affect the rental income for PHAs. Since our data are taken from the 1997 National Survey of American Families, our estimates are based on pre-TANF observations. The decision to reside in public housing is treated as exogenous in our estimation procedure. However, we treat as endogenous both the decision to participate in the AFDC program and the decision to supply labor. Consequently, the amount of cash assistance received and the amount of wage income earned are jointly determined. Since thirty-five percent of the households in our data set had no earnings and two-thirds received no cash assistance, we estimate a simultaneous-equations Tobit model that allows for zero values of the dependent variables.

We estimate that the marginal effect of cash assistance on labor earnings ranges between -0.349 and -0.816, depending on model specifications, implying that a $1000 reduction in cash assistance increases annual wage income by between $349 and $816. Thus, between twenty and sixty-five percent of each tax dollar not spent on cash assistance for residents of public housing will be diverted to spending on their rental subsidies. Since approximately one-quarter of all welfare recipients also receive housing assistance, we conclude that a substantial portion of the budgetary savings from reduced cash assistance will be offset by an increase in federal subsidies for low-income housing.[2]

Our empirical results have implications for a broader set of redistributive programs as well. Our findings imply that any reductions in cash transfers or their equivalents, such as Food Stamp allotments, to families residing in public housing will be

only partially offset by an increase in labor earnings. Additionally, our results imply that, for residents of public housing, the income effects arising from an increase in Medicaid co-payment requirements or a reduction in the earned income tax credit will not be great enough to offset the loss in subsidy payments. Since reforms such as these will also have substitution effects that reduce labor earnings, the predicted loss in income plus subsidy exceeds the range of twenty to sixty-five percent predicted for reductions in cash transfers.

In the next section, we develop a theoretical model of the joint labor-supply and welfare-participation decisions of a household eligible for welfare benefits and residing in public housing. The econometric model is set out in section 3, and the data we use to estimate the model are described in section 4. Empirical results are discussed in section 5, and conclusions are presented in section 6.

2 A Model of Labor Supply and Welfare-Program Participation

Consider a representative consumer living in public housing and eligible for welfare benefits whose utility $U(h, c, p)$ depends on labor supply *h*, consumption of a composite good *c*, and the decision to accept cash assistance, $p = 1$, or to forego participation in the welfare program, $p = 0$.[3] Thus, following Moffitt (1983), the model allows for welfare stigma by permitting utility to depend directly on the decision to participate in the welfare program. The consumer maximizes utility subject to the budget constraint

$$c = Wh + I + S + pb, \tag{1}$$

which requires that consumption expenditures *c* equal the sum of non-labor, non-welfare income *I*, transfer income consisting of a rental subsidy *S* and welfare benefits *pb*, and wage income *Wh*, where *W* is the after-tax wage rate.[4]

In addition to the participation decision *p*, the magnitude of the cash payment *b* is also endogenous, since it depends on the consumer's wage income. Although the receipt of a public housing subsidy is exogenous to the model, the magnitude of the subsidy is endogenous since it, too, depends on wage income. Assuming the individual pays more than the minimum rent, the formula for the rental subsidy is[5]

$$S = R - s(Wh + I + pb - D^R), \tag{2}$$

where *R* is the market rental value of the consumer's public housing residence, *s* is the fraction of gross income that residents are required to pay for rent (usually 30 percent), and D^R represents allowable deductions. The formula for welfare benefits is

$$b = \min\left\{P, \max\left\{0, r(G - Wh - I + D^W)\right\}\right\}, \tag{3}$$

where *P* is the state's maximum AFDC payment, $r \in (0,1)$ is the "rateable reduction," *G* is the state's guarantee amount, and D^W represents allowable deductions. When the term multiplying *r* is nonpositive, the consumer fails to satisfy the income requirement and is not eligible for welfare benefits.

By combining the formulas for *S* and *b* with the financial budget constraint, the consumer's non-wage income can be defined as an exogenous variable conditional on the welfare-participation decision. Assuming that welfare benefits are below the maximum allowed, *P*, the budget constraint can be rewritten as

$$c = (1 - s)(1 - pr)Wh + Y(p), \tag{4}$$

where

$$Y(p) \equiv (1-s)(1-pr)I + R + sD^R + (1-s)pr(G + D^W), \tag{5}$$

is the consumer's non-labor income, conditional on the welfare-participation decision.

For a consumer who elects to participate in the labor force, labor supply equates the marginal rate of substitution with the effective wage rate,

$$MRS \equiv -U_h / U_c = (1-s)(1-pr)W. \tag{6}$$

Notice that a decision to accept welfare benefits $(p = 1)$ reduces the effective wage rate, thereby influencing the labor-supply decision. In addition, labor supply is influenced by welfare stigma if the consumer's marginal rate of substitution depends on the welfare-participation decision.

The decision to participate in the welfare program is dictated by comparing utility on and off welfare. Let $V(p,(1-s)(1-pr)W,Y(p))$ be the consumer's indirect utility function, which depends on the participation decision *p* both directly and indirectly through its influence on the effective wage rate and on the consumer's nonlabor income. Define p^* to be the difference between utility on and off welfare,

$$p^* \equiv V(1,(1-s)(1-r),Y(1)) - V(0,(1-s)W,Y(0)). \tag{7}$$

The consumer chooses to participate in the welfare program if p^* is positive, and chooses to stay off welfare otherwise. Thus, p^* can be interpreted as a normalized measure of the "taste for welfare" or, alternatively, welfare stigma.

Denoting the labor-supply function by *H*, the consumer's labor supply, conditional on the welfare-participation decision, is given by

$$h^* = H(p,(1-s)(1-pr)W,Y(p)). \tag{8}$$

Hence, the model yields two state-dependent labor-supply equations, one pertaining to consumers who choose to receive welfare benefits $(p = 1)$ and the other pertaining to those who choose not to receive these benefits $(p = 0)$. Public housing residents on welfare face a lower effective wage rate and a higher non-wage income than residents not receiving cash assistance.

Figure 1 illustrates the consumer's labor-supply decision and highlights the effect of welfare payments on consumption opportunities. Leisure (hours worked) is measured along the horizontal axis. The right vertical axis measures nonlabor income, which depends on whether the individual is enrolled in the welfare program. Consumption expenditures equal to the sum of nonlabor income and after-tax wages are measured along the left vertical axis. A consumer located at point *B* in the diagram is not working, but receives welfare plus the rental subsidy in nonlabor income $Y(1)$. Each hour of work while on welfare yields the after-tax wage rate *W* minus a fraction *s* for rent and a fraction *r* subtracted in accordance with welfare program rules. At point *D*, wage income is at the threshold of eligibility for welfare benefits. A consumer at point *E* is not eligible for welfare and receives only the rental subsidy as nonlabor income $Y(0)$, but enjoys a higher effective wage rate since earnings are not subject to the rate reduction applied to the wages of welfare recipients.

If no stigma costs are incurred by being on welfare, then an individual would never choose to consume along the line segment *AD* at a point such as *F*, since higher consumption with less labor can be enjoyed by participating in the welfare program and consuming at point *C*. However, for consumers who bear a substantial stigma cost when

on welfare, forgoing welfare benefits may be optimal even though they meet the income requirement for eligibility.[6]

3 The Econometric Model and Estimation Techniques

The labor-supply equations (3) for those who do and those who do not participate in the welfare program are estimated as earnings equations, since we are interested in the elasticity of wage income with respect to welfare benefits. Further, in order to use all information regarding the extensive and intensive decision margins, the labor-supply and welfare-benefits variables are treated as left-censored continuous variables in the empirical specification. The resulting system is a simultaneous-equations Tobit model of desired labor earnings and desired welfare benefits.

The criteria for identification must be addressed before estimation proceeds to ensure that unique estimates of the structural parameters of the earnings equation are obtained. If the two endogenous variables were not censored, but instead were continuously observed, the system would simply be a classical simultaneous-equations model, and the usual identification conditions would apply. In particular, the necessary (order) condition for identification is satisfied if, among the exogenous variables in the system, there is at least one that affects earnings but not welfare benefits, and at least one that affects welfare benefits but not earnings. Because of the intrinsic nonlinearity of the Tobit model, however, identification can be achieved through the functional form rather than by using the standard exclusion restrictions.

In a system of censored dependent variables, a coherency condition must be imposed since, otherwise, the nonlinearity implicit in the censoring precludes unique or sensible solutions for the reduced forms [Schmidt (1981); Heckman (2001)]. Consider a

simultaneous, two-equation Tobit model where both the latent and observed versions of the dependent variables appear on the right-hand side:

$$y_1^* = \beta_1 y_2^* + \gamma_1 y_2 + \boldsymbol{\delta_1 x_1} + \varepsilon_1 \tag{9}$$

$$y_2^* = \beta_2 y_1^* + \gamma_2 y_1 + \boldsymbol{\delta_2 x_2} + \varepsilon_2 . \tag{10}$$

The relationship between the observed and unobserved variables is given by the usual Tobit specification with left censoring; that is, $y_1 = y_1^*$ if $y_1^* > 0$ and $y_1 = 0$ if $y_1^* \leq 0$ for y_1, and similarly for y_2. The system can be described as a model with mixed latent and observed variables. Amemiya (1974) was the first to consider such models, and showed that the coefficient restriction $1 - \gamma_1\gamma_2 > 0$ is necessary for internal consistency, or unique solvability, of the model. Similar conditions are inherent in all simultaneous-equation models that involve a mixture of latent variables and their partially observed realizations. Notice that the restriction involves only the coefficients on the observed censored variables, and does not pertain to the coefficients associated with the latent, continuous variables. Therefore, in models with latent and observed dependent variables, the form of the endogenous variables appearing on the right-hand side is important.

We avoid forcing a potentially inappropriate constraint on the model by specifying the structural form as

$$y_2^* = \beta_2 y_1^* + \boldsymbol{\delta_2 x_2} + \varepsilon_2 \tag{11}$$

$$y_1^* = \beta_1 y_2^* + \boldsymbol{\delta_1 x_1} + \varepsilon_1 , \tag{12}$$

where $y_2^* = Wh^*$ is desired labor earnings, $\mathbf{x_2}$ is a vector of exogenous variables determining y_2^*, $y_1^* = p^* b$ is desired welfare income, $\mathbf{x_1}$ is a vector of exogenous

variables determining y_1^*, $\boldsymbol{\delta_2}$ and $\boldsymbol{\delta_1}$ are vectors of parameters associated with the variables in $\mathbf{x_2}$ and $\mathbf{x_1}$, respectively, β_2 and β_1 are scalar parameters, and ε_2 and ε_1 are distributed as bivariate normal random variables with correlation ρ. The random variables y_2, actual earnings, and y_1, actual welfare income, are the observed realizations of their latent counterparts, y_2^* and y_1^*, and are left-censored at zero, so that $y_1 = y_1^*$ if $y_1^* > 0$ and $y_1 = 0$ if $y_1^* \leq 0$ for y_1, and similarly for y_2. The model described by equations (11) and (12) implies that desired, rather than actual, welfare benefits and earnings are simultaneously determined. Hence, it is the magnitude of the distaste (preference) for receiving welfare, rather than the actual amount of benefits received, that affects desired earnings.

Single-equation estimation of the earnings equation (11) would ignore the simultaneous determination of desired welfare benefits and desired earnings, and would yield a biased and inconsistent estimate of the focal parameter β_2 if the error term in the equation (12) determining welfare benefits is correlated with labor earnings. The direction of this bias depends on whether the correlation is positive or negative. If the two are negatively correlated, as presumed, the single-equation estimator of the welfare-benefits coefficient in the earnings equation would be biased downward, overstating the true negative relationship between welfare benefits and earnings.

It is possible to estimate this model by full-information maximum likelihood (FIML). However, to avoid the transmission of a possible misspecification of the equation determining welfare benefits to the earnings equation, we use a limited-information maximum likelihood (LIML) procedure. The limited-information

framework is natural in this setting since the parameter of prime interest (β_2) appears only in the earnings equation.

Amemiya (1974) proposed a two-stage estimation procedure which uses only the observations that have positive values for both dependent variables. However, it is desirable to use all of the observations when, as is the case with the NSAF sample, a substantial number of individuals are either nonworkers or nonparticipants in the welfare program, or both. The reduced form of the model is

$$y_2^* = \boldsymbol{\pi}_2'\mathbf{X} + v_2 \tag{13}$$

$$y_1^* = \boldsymbol{\pi}_1'\mathbf{X} + v_1, \tag{14}$$

where $\boldsymbol{\pi}_2$ and $\boldsymbol{\pi}_1$ are vectors of reduced-form coefficients, $\mathbf{X}$ is a vector of all of the exogenous explanatory variables in the model, and v_2 and v_1 have the bivariate normal distribution $N(0,0,1,1;\rho)$. Again, since the structural equation (11) determining desired earnings is of principal interest, only equation (14) determining desired welfare benefits will be estimated in its reduced form.

The model is estimated in two stages. In the first stage, equation (14) is estimated by Tobit ML. The reduced-form coefficient estimates are then used to create the instrument $\hat{y}_1^* = \hat{\boldsymbol{\pi}}_1'\mathbf{X}$. This instrument is a consistent estimator of y_1^*, and is asymptotically uncorrelated with the disturbance term in equation (11). In the second stage, equation (11) is estimated by Tobit ML, using the instrument from stage one in place of y_1^*. This two-step procedure yields a consistent estimate of the focal parameter, β_2. Following Murphy and Topel (1985), the standard errors of the estimated

parameters in equation (11) are corrected for the use of an instrument as an explanatory variable.

4 The Data

The NSAF is a survey of the economic, health, and social characteristics of children, non-elderly adults, and their families. Rounds one and two of the survey were completed in 1997 and 1999, respectively. In each wave, over 40,000 households were interviewed, yielding information on more than 100,000 people. However, the same households were not necessarily interviewed every year; therefore, the NSAF is not a panel data set. To include in the survey a representative array of government programs, fiscal capacities, demographic characteristics, and child well being, the NSAF over-sampled the populations of thirteen states.[7] Each round of the survey produced a large, representative sample of the noninstitutionalized, civilian population under the age of 65 in these thirteen states and for the nation as a whole.

We use data from the 1997 survey since, in addition to indicators for Census region and state of residence, it contained a local geographic variable that is useful for estimating the annual earnings equation. Since female heads of household are, overwhelmingly, the largest demographic category to receive welfare benefits, it is sensible to restrict the sample to this group. The survey, however, did not identify the head of household. Therefore, under the assumption that the public housing lessee is the head of the household, we included only those women whose name appeared on the lease. Disabled women were excluded since they do not participate in the labor force. Households with no children younger than 18 years of age are categorically ineligible for welfare and, therefore, were also excluded from the sample. Of the 1,377 respondents

indicating that they were living in a public housing project, the final sample consists of 745 non-disabled, non-elderly women who were public housing lessees with at least one family member present who was less than 18 years old.

The 1997 survey provides data on welfare-program benefits, labor-market earnings, and labor supply for the previous year. Table 1 presents the distribution of respondents by welfare-program participation and labor supply for the year 1996. Approximately two-thirds (65.1 percent) of the sample worked and almost 40 percent received welfare (AFDC) benefits for at least one month during the year. Examining the joint distribution of labor supply and welfare-program participation, the largest proportion of survey respondents in the sample (46.8 percent) were employed but not enrolled in the welfare program. Among all respondents receiving welfare, about one-half were working.

Table 2 presents the sample means and definitions of the variables used in the empirical analysis. In general, the means of the variables are as expected. On average, nonworking women were more likely to receive welfare and less likely to have a high-school diploma than those who were employed. The average age of both groups is 33 years. Workers were less likely than non-workers to have children less than 5 years old. A larger proportion of the non-working women reported being in fair or poor health at the time of the interview. One-third (33.0 percent) lived in the South Census region.

Non-labor, non-transfer income consists of an individual's income from capital assets and the earnings of other family members. The data provide information regarding the amount of interest from savings accounts, money-market funds and certificates of deposits, and government bonds. Since 97 percent of the respondents indicated having

zero capital income, however, this component of non-labor income was not utilized in the analysis. The average annual earnings of other family members, the variable used to approximate non-labor non-transfer income, is approximately $900. The sample from which this mean was calculated includes individuals whose family members had zero income.

5 Estimation Results

The reduced-form, first-stage model determining welfare benefits given in equation (14) is estimated by Tobit maximum likelihood. The results are presented in Table 3. An increase in the number of children less than 5 years old, as well as an increase in the number of children between the ages of 5 and 17, increases welfare benefits. The estimated marginal effect indicates that the addition of one more child increases welfare benefits by about $360 per year. Compared to living in the East region, residing in the South has a negative effect on annual welfare benefits earnings (-$1,175 per year), whereas being a resident within the West region has a positive effect ($516 per year).

The predicted value of desired welfare benefits, $\hat{y}_1^* = \hat{\boldsymbol{\pi}}_1'\mathbf{X}$, obtained from estimates of this model is used as a regressor in the second-stage earnings equation (11). The variable indicating the number of children between 5 and 17 years old is omitted from the earnings equation, and age squared is excluded from the welfare-benefits equation. These exclusion restrictions aid in the identification of the model, but are not necessary because of the inherent nonlinearities in the Tobit model.

Table 4 presents the estimated coefficients and marginal effects of the second-stage earnings equation. A one-tailed t-test is used to assess the statistical significance of

the estimated coefficients on all of the variables except the regional indicators. Possessing a high-school diploma has a positive and statistically significant effect on earnings at the one percent level. The coefficient on the number of children less than 5 years old is negative and statistically significant at the 5 percent level, whereas having poor or fair health and higher earnings of other family members each has a negative effect on earnings at the 10 percent level. Using a two-tailed significance test for the coefficient on the regional variables, we find that, compared to living in the East, residing in either the Midwest or the West regions has a positive effect on earnings.

To calculate the marginal effects of the explanatory variables in the Tobit model, each coefficient is scaled by the probability of having positive earnings. The marginal effects on annual earnings of a one-unit increase in the explanatory variables are presented in column 3. A $1,000 reduction in cash assistance results in an increase in annual earnings of $756, after taking into account the endogeneity of the welfare benefits received.

Local Geographic Data

Region of residence is a potentially useful explanatory variable since economic conditions that affect work behavior and welfare-program participation may vary geographically. In addition, the theoretical model indicates that labor earnings are affected by the rent that residents of public housing would have paid in the private market had they not lived in public housing. Empirically, this is approximated by the "fair market rent" (FMR), which varies across metropolitan areas and non-metropolitan counties. The NSAF classifies individuals by Census region and by state of residence. A

variable that identifies respondents by "sub-state geographic area" (SGA) was created from the 1997 wave by placing each household into a grouping of one or more counties.[8]

Using this locally specific identifier, an unemployment-rate variable was constructed for each SGA to control for geographic differences in labor-market conditions. County unemployment rates for 1996 were obtained from the Local Area Unemployment Statistics (LAUS) Program of the U.S. Department of Labor, Bureau of Labor Statistics (BLS). The BLS uses disaggregation techniques (either the population-claims or the census-share method) to obtain current estimates of employment and unemployment for counties within multi-county labor market area's (LMA's). LMA unemployment rate estimates, which are produced using the "Handbook" method, could not be used since the definitions of LMA's and SGA's are not necessarily the same.[9] The unemployment rate used for one-county SGA's is simply the county unemployment rate published by the BLS in the Local Area (LA) series, which includes data for all counties and cities of 25,000 or more. For multiple-county SGA's, the unemployment rate was constructed by averaging the county unemployment rates obtained from the LA series.

The FMR, obtained from the "Historic Fair Market Rent Database" (HUDUSER, a division of HUD), was used to approximate the rent that residents of public housing would have paid in the private market had they not lived in public housing.[10] The FMR varies by number of bedrooms in the housing unit and geographic location. For all counties and MSA's in the 13 states, the 1996 two-bedroom FMR and the current, 2003 FMR for each bedroom size (0 – 4 bedrooms) were used to construct the appropriate FMR for each observation. The ratio of each bedroom-size FMR to the two-bedroom FMR for the year 2003 was applied to the 1996 two-bedroom FMR to estimate the 1996

FMR for each bedroom size. The FMR depends not only on state of residence but also on whether the location is urban or rural. Using information on the SGA and the number of bedrooms in the public housing unit, an FMR was assigned to each household.

Following Keane and Moffitt (1998), Painter (2001), and Yelowitz (2001), we use the FMR, or an estimate of it, as an explanatory variable in the equation determining annual earnings.[11] Since we do not address issues associated with selection into public housing, the fact that a public-housing unit is not available to every eligible household is not relevant to our analysis.[12] Further, since the focal parameter of this study is the effect of welfare benefits on earnings, the FMR is used solely to account for differences in the budget constraints of residents due to the variation in rental rates across local housing markets.

Almost 90 percent (663 individuals) of the entire sample resides in one of the 13 over sampled states. The means and definitions of the variables for this subsample are provided in Table 5. The largest proportion (12.8 percent) of respondents resided in Wisconsin. New York and Massachusetts were the second and third most represented states, with approximately 11 percent of the sample living in each. Only 3.6 percent of this subsample lived in California. The average local unemployment rate was 5.9 percent and the average FMR was $661. The distribution of residents in the subsample by various demographic characteristics (age, race, education, health status, etc.) is almost identical to that of the sample as a whole. In addition, the percentage of household heads receiving welfare and the percentage that was working in 1996 were essentially the same in the subsample and the full sample. Annual earnings and welfare benefits were also

similar; however, households in the subsample earned $90 a year more and received $58 a year more in benefits, on average.

The model was estimated with data from this subsample by two-stage Tobit ML, controlling for differences in state welfare programs in the reduced-form welfare-benefits equation (14) and for local conditions of the labor and housing markets in the annual earnings equation (11). The results are presented in Tables 6 and 7, respectively.

Since state welfare programs differ in their generosity, twelve dummy variables are introduced as explanatory variables in the welfare-benefits equation. Holding constant the number of children less than 5 years of age and the number of children between the ages of 5 and 17, women living in public housing in Alabama, Florida, Mississippi, New Jersey, and Texas receive lower welfare benefits than those residing in Wisconsin, the omitted state. By contrast, residents of public housing in California, Massachusetts, Minnesota, New York, and Washington receive higher benefits. Black women annually receive $1,167 more in welfare benefits than observationally equivalent whites. The coefficient on FMR indicates that a $1,000 increase in the FMR increases the amount of welfare benefits received by $1,120.

The predicted value of welfare benefits was then used as an explanatory variable in the earnings equation, along with the local unemployment rate and the FMR. The empirical results are presented in Table 7. An increase in the number of children less than 5 years old, having poor or fair health, a higher unemployment rate, and greater earnings of family members decrease the earnings of the household head. By contrast, older women and those with a high school diploma had higher labor income. There was no difference in the labor-market earnings of public housing residents by region or

between black and white women. This specification, which controls for the unemployment rate and the FMR in the equation determining earnings, predicts that a $1,000 reduction in welfare benefits increases earnings by $349. We conclude from the findings presented in Tables 4 and 7 that the marginal effect on earnings of a reduction in cash assistance is overstated when conditions in the local labor and housing markets are not taken into account.[13]

Bivariate Sample-Selection Model

Because both the earnings and welfare-benefit variables are censored as a result of the underlying labor-supply and welfare-participation decisions, a selectivity model is an alternative framework for estimating consistently the effect of cash assistance on earnings. This approach allows the parameters that determine the probability of observing positive earnings and those that determine the density of the positive observations on earnings to be different. This approach originated with Heckman (1974, 1976, 1979), and follows Fraker and Moffitt (1988), Moffitt and Wolfe (1990), and Keane and Moffitt (1998).[14]

We confine our analysis in this section to individuals who are both receiving welfare and working. This approach yields an estimate of the effect of decreased welfare benefits on labor-market earnings, given that earnings are positive. The model must still account for the welfare-participation choice as well as decision to enter the labor market; otherwise the estimates would suffer from sample-selection bias since the joint probability of observing positive welfare benefits and positive earnings is generated by nonrandom choices. Given that the individual chooses to participate in the welfare program, however, the magnitude of the benefits received is assumed to be exogenous.

Since the unobserved characteristics of individuals that affect these decisions are likely to be correlated, the selection equations are jointly estimated in a bivariate probit model. Assuming the model is correctly specified, this procedure yields full-information maximum likelihood (FIML) estimates of the parameters determining the joint participation decisions. Selectivity-correction variables obtained from this first-stage are then used to augment the earnings equation.

The selectivity model of earnings is

$$y_2 = \mathbf{x}'\boldsymbol{\beta} + y_1\gamma + e \tag{15}$$

$$d_2^* = \boldsymbol{\alpha}_2'\mathbf{v}_2 + u_2 \tag{16}$$

$$d_1^* = \boldsymbol{\alpha}_1'\mathbf{v}_1 + u_1 \tag{17}$$

where d_2^* is a latent variable measuring "desired labor supply," and d_1^* is an unobservable variable capturing "desired welfare benefits." The observable labor-force participation variable is $d_2 = 1$ if $d_2^* > 0$, and $d_2 = 0$ otherwise, and the variable describing welfare-program participation is $d_1 = 1$ if $d_1^* > 0$, and $d_1 = 0$ otherwise; e, u_2, and u_1 have a trivariate normal distribution with variances σ^2, 1, and 1, respectively, and correlations $\rho_{12} = corr(u_1, u_2)$, $\rho_{2e} = corr(u_2, e)$, and $\rho_{1e} = corr(u_1, e)$; $\mathbf{v}_2$ and $\mathbf{v}_1$ are vectors of exogenous variables determining d_2^* and d_1^*, respectively, and $\boldsymbol{\alpha}_2$ and $\boldsymbol{\alpha}_1$ are the associated parameter vectors. The augmented earnings equation is

$$y_2 = \mathbf{x}'\boldsymbol{\beta} + y_1\gamma + \lambda_1\beta_{\lambda 1} + \lambda_2\beta_{\lambda 2} + \eta, \tag{18}$$

where η satisfies the classical regression assumptions. The coefficients on the selectivity variables

$$\lambda_2 = \phi(-\boldsymbol{\alpha}_2'\mathbf{v}_2)\Phi\left[(-\boldsymbol{\alpha}_2'\mathbf{v}_2 - \rho_{12}\mathbf{v}_2)/(1-\rho_{12}^2)^{1/2}\right]\Big/\Phi_2 \tag{19}$$

and

$$\lambda_1 = \phi(-\boldsymbol{\alpha}_1'\mathbf{v}_1)\Phi\left[(-\boldsymbol{\alpha}_1'\mathbf{v}_1 - \rho_{12}\mathbf{v}_1)/(1-\rho_{12}^2)^{1/2}\right]\Big/\Phi_2\,, \tag{20}$$

are $\beta_{\lambda 2} = \rho_{12}\sigma_{2e}$ and $\beta_{\lambda 1} = \rho_{12}\sigma_{1e}$, respectively, where $\phi(\cdot)$ and $\Phi(\cdot)$ denote the normal probability density and cumulative distribution functions, and Φ_2 is the bivariate normal cumulative distribution function evaluated at $(-\boldsymbol{\alpha}_2'\mathbf{v}_2, -\boldsymbol{\alpha}_1'\mathbf{v}_1, \rho_{12})$.

Table 8 presents the means and definitions of the variables used for the subsample of public housing residents who both work and receive welfare. Compared to the entire sample (Table 2), those who both work and receive welfare have slightly lower earnings and receive more than twice the amount of welfare benefits. Individuals in this subsample are more likely to be black and less likely to be in poor health. Their average age is approximately a year and a half lower than the mean age for the whole sample.

The empirical estimates of the selection equations determining the joint decisions about work and welfare-program participation are presented in Table 9. In general, the qualitative results are as anticipated. Graduation from high school increases the probability that a resident of public housing works, whereas poor health has a negative effect. The number of children less than 5 years old has a positive effect on welfare participation and a negative effect on the probability of working. An increase in the number of children between the ages of 5 and 17 residing in the household also increases

the likelihood that of receiving welfare. The results indicate that, other things held constant, black women are more likely to work than whites. As indicated by the sign and statistical significance of ρ_{12}, the equation error terms are negatively correlated. That is, unobserved individual characteristics that increase the probability of working also decrease the probability of receiving welfare.

The selectivity-corrected earnings equation (23) was estimated by ordinary least squares, and the results are presented in Table 10. The estimated marginal effects of the regressors on earnings consist of two components: a direct effect on mean earnings and, for those explanatory variables that affect the probability of selection, an indirect effect as a result of their influence on earnings channeled through the two selectivity variables. In the earnings equation, the sign and statistical significance of the estimated coefficient on λ_1, the welfare selectivity variable, indicate that negative self-selection into the welfare program is present. The model predicts that, for women in public housing who work and receive welfare, a $1,000 reduction in benefits increases labor-market earnings by $816. This estimate is slightly higher than the estimate obtained using the two-stage Tobit model.

6 Conclusions

Recent welfare-reform legislation in the U.S. established time limits on eligibility for cash assistance, with the aims being to increase the employment and earnings of low-income households and reduce the cost of public assistance programs. However, any increase in wage income resulting from the reform may be less than the decline in cash assistance, resulting in a net reduction in total household income. For families receiving cash assistance and residing in public housing, an unintended consequence of the reform

may be an increase in their implicit rental subsidy, since they typically pay no more than thirty percent of their income in rent. As a result, some of the anticipated cost savings in cash assistance from welfare reform may simply be shifted to housing subsidies.

Since households eligible for welfare decide jointly whether to receive cash assistance and whether to work, a simultaneous equations model of welfare benefits and labor-market earnings is estimated. Using data from the National Survey of American Families on 745 female heads of household residing in public housing, we estimate the marginal effect of a decrease in cash assistance on labor earnings. Our empirical results indicate that a $1000 reduction in welfare payments increases annual wage income by between $349 and $816. We infer that between twenty and sixty-five percent of each tax dollar diverted from cash assistance for residents of public housing will be reallocated to spending on their rental subsidies. Since about one-quarter of all welfare recipients also receive housing assistance, we conclude that a substantial portion of the budgetary savings from reducing cash transfers will be offset by an increase in federal subsidies for low-income housing.

Footnotes

[1] "Housing assistance" refers to federal housing subsidy programs for low-income households financed by the U.S. Department of Housing and Urban Development. These include both public housing and certificate and voucher programs authorized under Section 8 of the U.S. Housing Act of 1937 that subsidize housing in the private rental market. See Newman (1999) for an overview of these programs.

[2] The estimate of twenty-five percent is reported in Newman and Harkness (1999, p. 29).

[3] In the empirical implementation of the model, all individuals meet the eligibility requirements for cash assistance with respect to household composition. Eligibility with respect to household income will be determined endogenously in the model.

[4] The tax in this instance is the earned income tax credit, since the low-income workers in our sample do not pay income taxes.

[5] If formula (2) yields a value for *S* less than $25, then the individual is charged a minimum rent of at least $25. A Public Housing Authority can charge up to $50 minimum rent.

[6] Welfare reform placed a lifetime cap on the number of months a household can receive welfare benefits. As a result, some eligible consumers may decide to stay off welfare to preserve future eligibility. This is not relevant for our study since the data we use refer to a period before this reform was introduced.

[7] The thirteen targeted states, which account for over one-half of the U.S. population, were Alabama, California, Colorado, Florida, Massachusetts, Michigan, Minnesota, Mississippi, New Jersey, New York, Texas, Washington, and Wisconsin.

[8] The main criterion for constructing the SGAs was that the area have a total Census population projection for 1997 of above 100,000 for persons under age 65.

[9] The "Handbook" procedure uses data from several sources, including the Current Population Survey, the Current Employment Statistics program, State Unemployment Insurance (UI) systems, and the decennial census, to create estimates that are adjusted to the statewide measures of employment and unemployment. The disaggregation techniques use data obtained from the decennial census, annual population estimates, and current UI data. Since these estimates are influenced to some degree by the generosity of the UI programs, the unemployment-rate variable may be correlated with the characteristics of the state/local welfare programs.

[10] Note that the FMR is technically a parameter only in Section 8 programs. In the public-housing program the government offers a certain unit at a below-market price, so the FMR is not pertinent.

[11] The latter two studies utilized the FMR, as well as other program parameters, to estimate the labor-supply effects of housing programs.

[12] There exists the potential for bias associated with both administrative selection on the part of the PHA and self-selection by the low-income household.

[13] Note that the results shown in Table 4 utilize the full sample, whereas those in Table 7 are obtained from the subsample residing in the 13 over sampled states.

[14] Heckman (2001) provides an overview of several issues that must be confronted in estimation with micro data, including unobserved heterogeneity.

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TABLE 1 — WELFARE AND LABOR-FORCE PARTICIPATION IN 1996

	Did not work	Worked	Row Total
Did not receive AFDC	117	349	466
	25.1%	74.9%	100%
	45.0%	72.0%	62.6%
	15.7%	46.8%	62.6%
Received AFDC	143	136	279
	51.3%	48.7%	100%
	55.0%	28.0%	37.4%
	19.2%	18.3%	37.4%
Column Total	260	485	745
	34.9%	65.1%	
	100.0%	100.0%	
	34.9%	65.1%	

Cell count
Row percentage
Column percentage
Percentage of total

TABLE 2 — MEANS AND DEFINITIONS OF VARIABLES

Variable	Means			Definition
	All (N = 745)	Workers (N_1 = 485)	Non-workers (N_2 = 260)	
Endogenous				
Work participation	0.65	1.00	0.00	Equals 1 if total earnings > 0 in 1996
Earnings	$5351.26	$8219.98	$0.00	Total earnings in 1996
Welfare participation	0.37	0.28	0.55	Equals 1 if individual received AFDC for at least one month in 1996
Welfare benefits	$1456.26	$882.26	$2526.98	Amount of AFDC benefits received in 1996
Exogenous				
High-school diploma	0.70	0.77	0.58	Equals 1 if individual possesses at least a high-school diploma
Family earnings	$901.61	$705.76	$1266.96	Total earnings of other family members
Age	33.06	33.07	33.05	Age in years
Black	0.52	0.55	0.46	Equals 1 if individual is black
Poor or fair health	0.23	0.20	0.30	Equals 1 if health is poor or fair
Family members less than age 5	0.82	0.72	0.99	Number of family members less 5 years old
Family members 5-17 years old	1.38	1.29	1.54	Number of family members between 5 and 17 years old
Midwest	0.24	0.28	0.16	Equals 1 if current residence in Midwest
South	0.33	0.35	0.29	Equals 1 if current residence in South
West	0.14	0.14	0.15	Equals 1 if current residence in West
Other				
Weeks worked	24.18	37.15	0.00	Number of weeks worked in 1996
Hours worked	22.19	34.09	0.00	Number of hours per week worked in 1996
Hourly wage rate	$5.13	$7.87	0.00	Derived hourly wage rate
Months on welfare	4.77	3.05	7.98	Number of months on AFDC in 1996

TABLE 3 — REDUCED-FORM WELFARE BENEFITS EQUATION

	Coefficient	Marginal effect	|t-statistic|
Age	-0.196	-0.075	1.203
	(0.163)		
Age squared	0.002	0.001	0.970
	(0.002)		
Black	0.288	0.111	0.680
	(0.424)		
High-school diploma	0.320	0.123	0.700
	(0.457)		
Number of children less than 5	0.949***	0.366	3.706
	(0.256)		
Number of children 5-17 years	0.941***	0.363	4.896
	(0.192)		
Poor or fair health	0.214	0.082	0.431
	(0.495)		
Family earnings (in $1000's)	-0.078	-0.030	1.367
	(0.057)		
Midwest	-0.076	-0.029	0.142
	(0.538)		
South	-3.048***	-1.175	5.658
	(0.539)		
West	1.337**	0.516	2.170
	(0.616)		
Intercept	1.063	0.410	0.366
	(2.904)		
σ	4.568		
N	745		
Log of the likelihood function	-1075.11		

Notes: The dependent variable is annual welfare benefits in $1000's. Standard errors are shown in parentheses under the associated coefficient estimates. The equation was estimated by Tobit ML.

*** Significant at the 1-percent level.

** Significant at the 5-percent level.

* Significant at the 10-percent level.

TABLE 4 — ANNUAL EARNINGS EQUATION: ENDOGENOUS WELFARE BENEFITS

	Coefficient	Marginal effect	|t-statistic|
$\hat{y}_{i1}^{*} = \hat{\boldsymbol{\delta}}'\mathbf{z}_i$	-1.166***	-0.756	2.786
	(0.419)		
Age	0.520	0.337	0.976
	(0.533)		
Age squared	-0.006	-0.004	0.771
	(0.008)		
Black	1.745	1.131	1.626
	(1.073)		
High-school diploma	3.247***	2.103	2.800
	(1.160)		
Number of children less than 5	-0.982**	-0.636	1.654
	(0.594)		
Poor or fair health	-1.700*	-1.100	1.341
	(1.266)		
Family earnings (in $1000's)	-0.258*	-0.167	1.425
	(0.181)		
Midwest	2.953***	1.913	2.642
	(1.118)		
South	-2.810	-1.820	1.428
	(1.967)		
West	2.039*	1.321	1.709
	(1.193)		
Intercept	-10.161	-6.583	1.141
	(8.902)		
σ	8.361		
N	745		
Log of the likelihood function	-1918.618		

Notes: The dependent variable is annual earnings in $1000's. The standard errors, shown in parentheses under the associated coefficients, are the corrected standard errors following Murphy and Topel (1985). The equation was estimated by Tobit ML.

*** Significant at the 1-percent level, for the appropriate (one- or two-tailed) test.

** Significant at the 5-percent level, for the appropriate (one- or two-tailed) test.

* Significant at the 10-percent level, for the appropriate (one- or two-tailed) test.

TABLE 5 — MEANS AND DEFINITIONS OF VARIABLES FOR RESPONDENTS RESIDING IN THE 13 OVERSAMPLED STATES

Variable	Means (N = 663)	Definition
Dependent		
Work participation	0.66	Equals 1 if total earnings > 0 in 1996
Earnings	$5441.49	Total earnings in 1996
Welfare participation	0.38	Equals 1 if individual received AFDC for at least one month in 1996
Welfare benefits	$1514.63	Amount of AFDC benefits in 1996
Independent		
High-school diploma	0.71	Equals 1 if individual possesses a high-school diploma
Family earnings	$883.56	Total earnings of other family members
Age	33.07	Age in years
Black	0.52	Equals 1 if individual is black
Poor or fair health	0.23	Equals 1 if health is poor or fair
Family members less than age 5	0.82	Number of family members less than 5 years old
Family members 5-17 years old	1.37	Number of family members between 5 and 17 years old
Alabama	0.076	Dummy indicating Alabama is state of residence
California	0.036	Dummy indicating California is state of residence
Colorado	0.066	Dummy indicating Colorado is state of residence
Florida	0.069	Dummy indicating Florida is state of residence
Massachusetts	0.110	Dummy indicating Massachusetts is state of residence
Michigan	0.049	Dummy indicating Michigan is state of residence
Minnesota	0.057	Dummy indicating Minnesota is state of residence
Mississippi	0.098	Dummy indicating Mississippi is state of residence
New Jersey	0.081	Dummy indicating New Jersey is state of residence
New York	0.111	Dummy indicating New York is state of residence
Texas	0.072	Dummy indicating Texas is state of residence
Washington	0.042	Dummy indicating Washington is state of residence
Wisconsin	0.128	Dummy indicating Wisconsin is state of residence
Unemployment rate	5.94	Unemployment rate in 1996 of county of residence
Fair market rent	$661	Section 8 fair market rent for area of residence
Other		
Weeks worked	24.62	Number of weeks worked in 1996
Hours worked	22.54	Number of hours per week worked in 1996
Hourly wage rate	$5.27	Derived hourly wage rate
Months on welfare	4.79	Number of months on AFDC in 1996

TABLE 6 — REDUCED-FORM WELFARE BENEFITS EQUATION (WITH STATE AND LOCAL VARIABLES)

	Coefficient	Marginal effect	|t-statistic|
Age	-0.980	-0.079	0.321
	(3.054)		
Age squared	0.002	0.001	0.954
	(0.002)		
Black	1.167***	0.457	2.561
	(0.456)		
High-school diploma	0.181	0.709	0.397
	(0.456)		
Number of children less than 5	0.798***	0.313	3.085
	(0.259)		
Number of children 5-17 years	0.710***	0.278	3.359
	(0.211)		
Poor or fair health	0.079	0.031	0.156
	(0.506)		
Family earnings (in $1000's)	-0.054	-0.021	0.962
	(0.056)		
Alabama	-4.058***	-1.589	3.842
	(1.056)		
California	2.500**	0.979	2.082
	(1.201)		
Colorado	-0.667	-0.261	0.719
	(0.928)		
Florida	-2.354**	-0.922	2.454
	(0.960)		
Massachusetts	1.577*	0.618	1.874
	(0.841)		
Michigan	-1.437	-0.563	1.382
	(1.040)		
Minnesota	1.709**	0.669	1.819
	(0.940)		
Mississippi	-5.204***	-2.038	4.899
	(1.062)		
New Jersey	-2.645**	-1.036	2.491
	(1.062)		
New York	2.743***	-1.074	2.588
	(1.060)		
Texas	-2.428**	-0.951	2.444
	(0.993)		
Washington	2.117*	0.829	1.965
	(1.077)		
Unemployment rate	0.173*	0.068	1.789
	(0.097)		
FMR (in 1000's)	3.056*	1.120	1.827
	(1.672)		
Intercept	-0.980	-0.384	0.321
	(3.054)		

TABLE 6 (continued) — REDUCED-FORM WELFARE BENEFITS EQUATION (WITH STATE AND LOCAL VARIABLES)

σ	4.242
N	663
Log of the likelihood function	-941.54

Notes: The dependent variable is annual welfare benefits in $1000's. Standard errors are shown in parentheses under the associated coefficient estimates. The equation was estimated by Tobit ML.
*** Significant at the 1-percent level.
** Significant at the 5-percent level.
* Significant at the 10-percent level.

TABLE 7 — ANNUAL EARNINGS EQUATION: ENDOGENOUS WELFARE BENEFITS (WITH STATE AND LOCAL VARIABLES)

	Coefficient	Marginal effect	|t-statistic|
$\hat{y}_{i1}^{*} = \hat{\boldsymbol{\delta}}'\mathbf{z}_i$	-0.532**	-0.349	2.035
	(0.261)		
Age	0.458*	0.300	1.489
	(0.308)		
Age squared	-0.005	-0.003	1.161
	(0.002)		
Black	1.093	0.717	1.268
	(0.862)		
High-school diploma	2.735***	1.792	2.961
	(0.924)		
Number of children less than 5	-1.424***	-0.933	2.782
	(0.512)		
Poor or fair health	-1.632*	-1.069	1.562
	(1.044)		
Family earnings (in $1000's)	-0.236**	-0.155	1.923
	(0.123)		
Midwest region	2.135	1.400	1.604
	(1.331)		
South region	-1.390	-0.911	0.872
	(1.593)		
West region	0.943	0.618	0.734
	(1.285)		
Unemployment rate	-0.442**	-0.290	2.388
	(0.185)		
FMR (in 1000's)	-0.381	-0.250	0.118
	(3.227)		
Intercept	-4.777	-3.131	0.867
	(5.510)		
σ	8.326		
N	663		
Log of the likelihood function	-1723.97		

Notes: The dependent variable is annual earnings in $1000's. The standard errors are shown in parentheses under the associated coefficients and have been corrected following Murphy and Topel (1985). The equation was estimated by Tobit ML.

*** Significant at the 1-percent level, for the appropriate (one- or two-tailed) test.

** Significant at the 5-percent level, for the appropriate (one- or two-tailed) test.

* Significant at the 10-percent level, for the appropriate (one- or two-tailed) test.

TABLE 8 — MEANS AND DEFINITIONS OF VARIABLES FOR THE SAMPLE THAT WORKS AND RECEIVES WELFARE

Variable	Means (N = 136)	Definition
Dependent		
LF participation	1.00	Equals 1 if total earnings > 0 in 1996
Earnings	$5138.16	Total earnings in 1996
Welfare participation	1.00	Equals 1 if individual received AFDC for at least one month in 1996
Amount of welfare	$3146.30	AFDC benefits in 1996
Independent		
High-school diploma	0.76	Equals 1 if individual possesses at least a high-school diploma
Family earnings	$531.82	Total earnings of other family members
Age	31.62	Age in years
Black	0.63	Equals 1 if individual is black
Poor or fair health	0.17	Equals 1 if health is poor or fair
Family members less than age 5	0.93	Number of family members less than age 5
Family members 5-17 years old	1.37	Number of family members between 5 and 17 years old
Midwest	0.34	Equals 1 if current residence in Midwest
South	0.26	Equals 1 if current residence in South
West	0.18	Equals 1 if current residence in West
Tenure	2.44	Number of months on current job
Other		
Weeks worked	26.54	Number of weeks worked in 1996
Hours worked	31.55	Number of hours per week worked in 1996
Hourly wage rate	8.75	Derived hourly wage rate
Months on welfare	8.99	Number of months on AFDC in 1996

TABLE 9 — WORK AND WELFARE PARTICIPATION

	Work		Welfare	
	Coefficient	|t-statistic|	Coefficient	|t-statistic|
Race	0.228**	2.336	0.008	0.078
	(0.010)		(0.963)	
High-school diploma	0.506***	4.989		
	(0.102)			
Number of children less than 5	-0.225***	4.096	0.223***	3.950
	(0.055)		(0.056)	
Number of children 5-17			0.087**	2.147
			(0.401)	
Poor or fair health	-0.260**	2.299		
	(0.113)			
Intercept	0.180	1.555	-0.633***	5.973
	(0.116)		(0.106)	
ρ_{12}	-0.403***	7.386		
	(0.545)			
N	745			
Log of the likelihood function	-914.06			

Notes: Standard errors are shown in parentheses under the associated coefficient estimates. The model was estimated by bivariate probit ML.

*** Significant at the 1-percent level.

** Significant at the 5-percent level.

* Significant at the 10-percent level.

TABLE 10— ANNUAL EARNINGS EQUATION: BIVARIATE WORK AND WELFARE PARTICIPATION SAMPLE-SELECTION MECHANISM

	Coefficient	|t-statistic|
Welfare benefits (in $1000's)	-0.816***	3.486
	(0.234)	
Age	-0.476	1.201
	(0.396)	
Age squared	0.010	1.628
	(0.006)	
Black	0.203	0.165
	(1.227)	
High-school diploma	1.191	0.610
	(1.951)	
Tenure	0.129	0.990
	(0.130)	
Family earnings (in $1000's)	-0.031	0.218
	(0.142)	
Midwest region	0.015	0.013
	(1.139)	
South region	-4.361***	3.394
	(1.285)	
West region	-0.944	0.728
	(1.296)	
Intercept	18.923	1.544
	(12.256)	
λ_2	5.315	1.289
	(4.123)	
λ_1	-8.788**	2.228
	(3.945)	
N	136	
Log of the likelihood function	-387.950	

Notes: Standard errors are shown in parentheses under the coefficient estimates. The equation was estimated by OLS.

*** Significant at the 1-percent level, for the appropriate (one- or two-tailed) test.

** Significant at the 5-percent level, for the appropriate (one- or two-tailed) test.

* Significant at the 10-percent level, for the appropriate (one- or two-tailed) test.

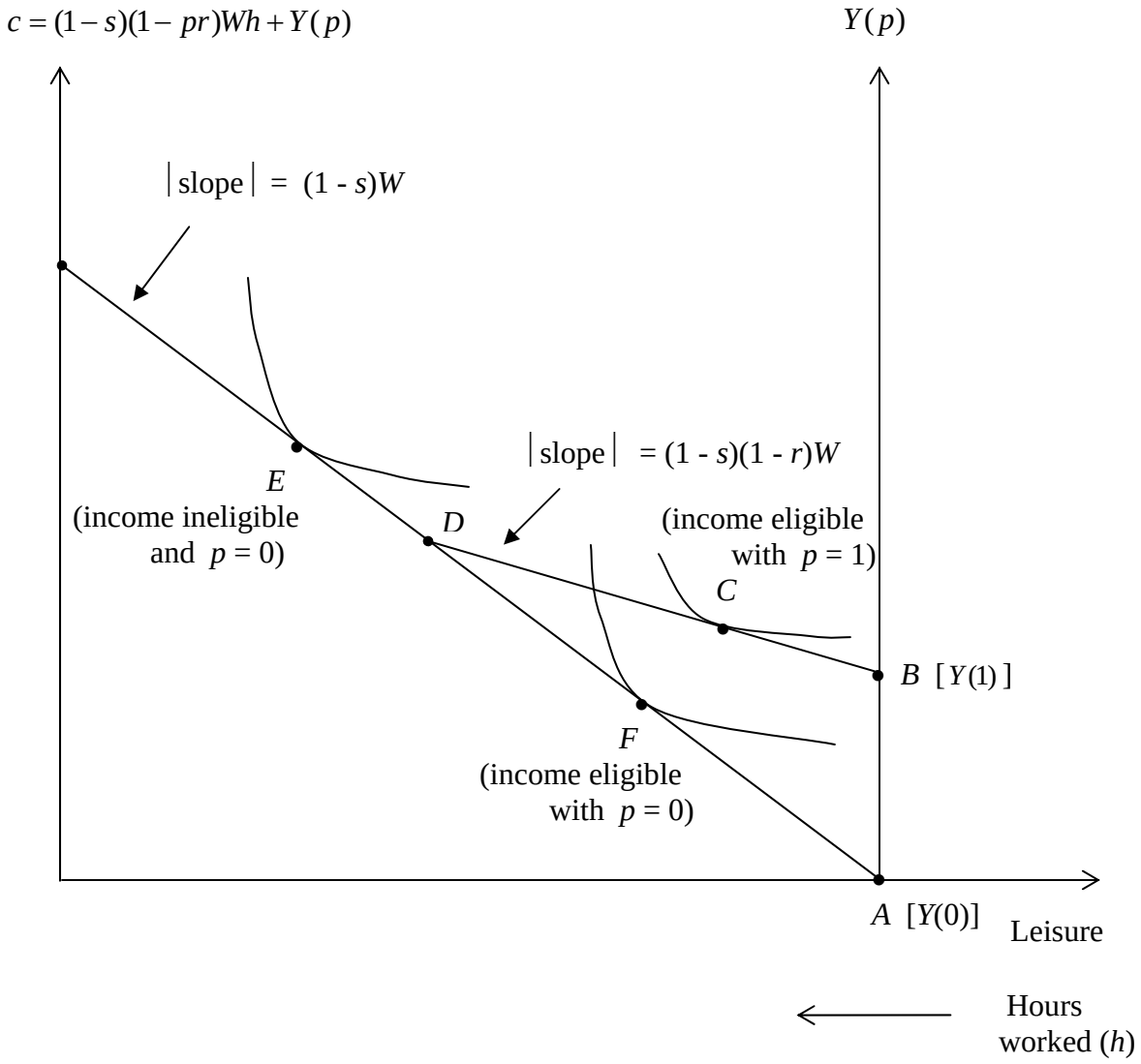

FIGURE 1—THE EFFECT OF WELFARE ON THE LABOR-SUPPLY DECISION