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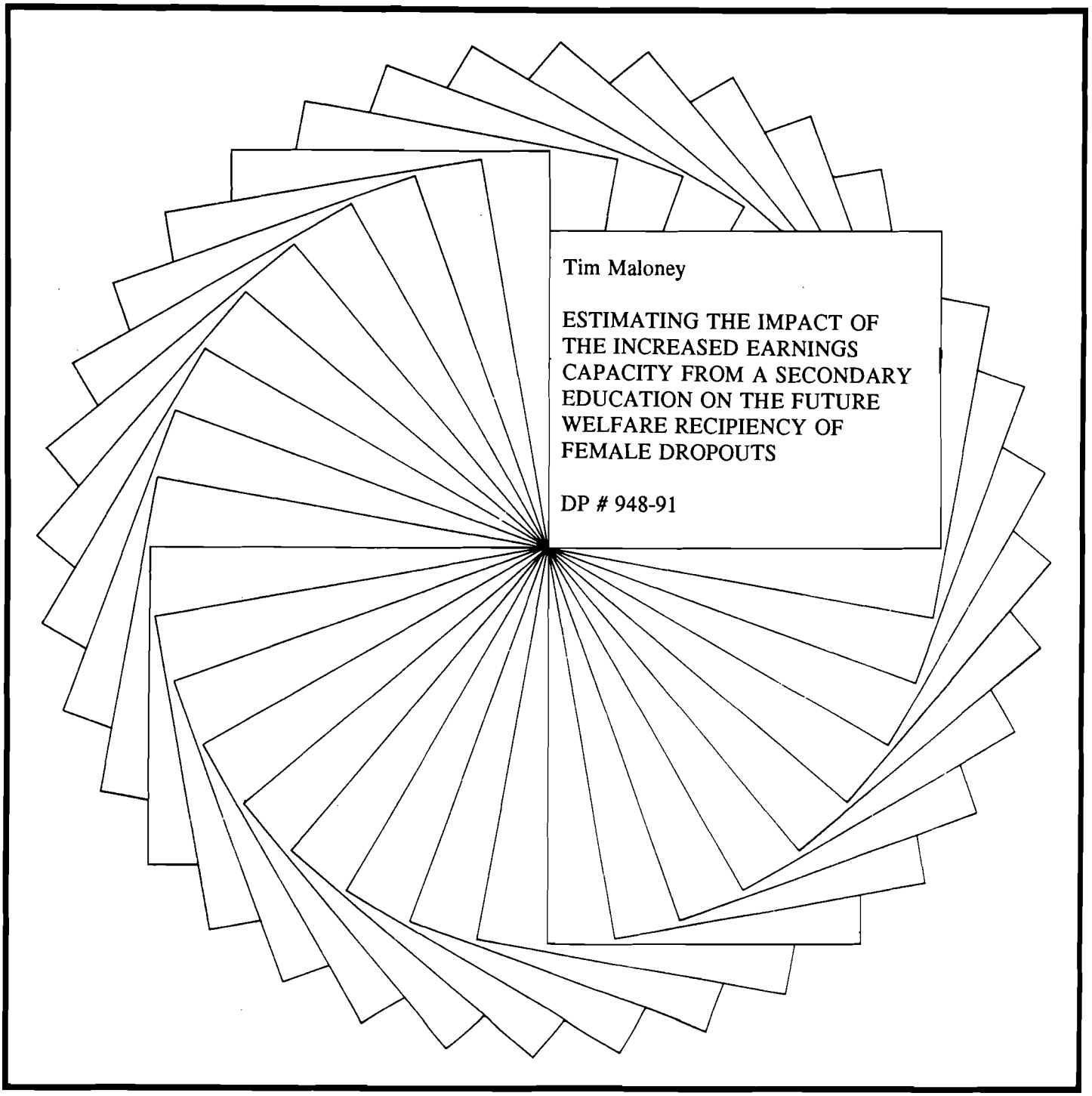

Institute for Research on Poverty
Discussion Paper No. 948-91

Estimating the Impact of the Increased Earnings Capacity from a Secondary Education on the Future Welfare Recipiency of Female Dropouts

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June 1991

This research was supported in part by a grant to the Institute for Research on Poverty from the U.S. Department of Health and Human Services. The opinions and conclusions expressed in this paper are those of the author and do not necessarily reflect the opinions or policy of the DHHS or the IRP. I thank Andrea Gilman and Nils Erik Larsen for providing excellent research assistance, and John Fitzgerald and Rachel Connelly for providing many useful comments during this research.

Abstract

Data from the National Longitudinal Survey of Youth are used to empirically isolate the impact of a secondary education on the long-term welfare participation of young female dropouts. A high school diploma or General Educational Development (GED) degree is assumed to influence welfare recipiency by increasing earnings capacity. Yet, causality may run in both directions. Although an exogenous increase in earnings capacity may reduce subsequent welfare recipiency, higher expectations of welfare recipiency may reduce educational attainment. To control for possible sample selection bias, the determinants of postschooling welfare experience are estimated conditional on these educational outcomes. Although an increase in earnings capacity is found to significantly reduce welfare recipiency, these effects would be overstated by at least 20 percent if the endogenous treatment effects were ignored. For the average dropout, her probability of receiving welfare in any future period is estimated to decline by 14.9 percent with a high school diploma and 8.7 percent with a GED degree. Yet, this secondary education would eliminate less than one-quarter of the substantial gap in welfare participation that currently exists between women who graduated from high school and those who dropped out.

ESTIMATING THE IMPACT OF THE INCREASED EARNINGS CAPACITY FROM A SECONDARY EDUCATION ON THE FUTURE WELFARE RECIPIENCY OF FEMALE DROPOUTS

The 1988 Family Support Act revised the national Aid to Families with Dependent Children (AFDC) program. Its stated purpose was to reduce the long-term welfare dependency of needy families with children. Each state must now establish a Job Opportunities and Basic Skills (JOBS) program to provide AFDC recipients with an array of services including basic and remedial education, specific job training, job placement, and supportive services such as child care and transportation. Some states have emphasized the importance of increasing the general educational attainment of welfare recipients. For example, a recent proposal in Missouri would require AFDC recipients who have not completed their high school education and who are not exempt because of home responsibilities to work toward their high school equivalency or General Educational Development (GED) degree (Ashcroft, 1987).

Maloney (1991) used a sample of young women taken from the National Longitudinal Survey of Youth (NLSY) to estimate the impact a secondary education would have on the potential market wage rates or earnings capacities of female dropouts. The estimated rates of return were 10.2 to 10.6 percent for a regular high school diploma and 6.2 to 6.5 percent for a GED degree. This was true even after allowance was made for the lower innate abilities among dropouts, their lower rates of human capital accumulation in school, and possible self-selection in the decision of whether or not to complete a secondary education.

One issue not explored in this previous paper was the potential impact of this increased earnings capacity on the future AFDC recipiency among female dropouts. There are a variety of ways in which an exogenous increase in earnings capacity might reduce long-term welfare dependency. It might affect subsequent fertility decisions, household formation or dissolution, attachment to the labor market, job search, occupational mobility, and layoff and recall, as well as potential wage rates. No attempt will be made in this study to disentangle these many effects. Yet

for general policy purposes, it is the overall causal link between earnings capacity and AFDC recipiency that may be important.

The preferred approach in addressing such a question would be to observe potential market wage rates and AFDC recipiency before and after the completion of a secondary education among female dropouts in a controlled experiment. Since such data are currently unavailable, the next best approach is to econometrically model the determinants of educational attainment and subsequent AFDC recipiency using the same cross-section of women from the NLSY as the earlier paper.[1] The key is that expectations of future welfare recipiency may have affected observed schooling outcomes. Thus, we must allow for self-selection in educational attainment. In other words, we cannot assume that dropouts who attain a secondary education would face the same long-term AFDC recipiency rates as an observationally equivalent high school graduate or GED recipient.

Section I highlights the theoretical and empirical issues raised in this paper by presenting a model of the demand for education under a generic income maintenance program. Section II develops an econometric procedure for estimating the determinants of long-term welfare recipiency. Section III describes the NLSY data used to estimate these equations, and Section IV presents these empirical findings. Section V draws some general conclusions from this analysis.

I. OPTIMAL SCHOOLING CHOICE IN THE PRESENCE OF A SIMPLE INCOME TRANSFER PROGRAM

We begin with a theoretical framework that will simplify the relationship between educational attainment and subsequent welfare recipiency, and motivate the empirical model developed in the next section. A model of optimal schooling choice is presented in which individuals can choose between market work with a stochastic wage and welfare recipiency with a guaranteed level of income after the completion of that schooling.

The wage rate facing a woman in the labor market in year t is written as a log-linear function of her years of schooling, her innate ability (A), and an error term (ϵ_t).[2]

$$(1) \qquad \ln W_t = \beta_1 S + \beta_2 A + \epsilon_t$$

The error term summarizes all of the stochastic elements of future wage rates. In each period, the wage is revealed when the person draws ϵ_t from a normal distribution with a zero mean and constant variance. Investments in education shift the entire wage distribution for an individual. However, unlike most models of optimal schooling behavior, the precise wage that will be available in any future period is unknown a priori.

It is assumed that a woman maximizes the discounted value of her lifetime wealth by choosing the optimal level of schooling (S). She does this with the understanding that in each period after the completion of her education, she can either work for the wage revealed in that period or forgo market work and receive a "guaranteed" level of income G through a government transfer program.[3] We consider the possibility that the woman will not evaluate a dollar of labor market earnings and transfer payments equally. The "effective" transfer payment is written as $\delta_1 G - \delta_2$, where in general $0 \leq \delta_1 \leq 1$ and $\delta_2 \geq 0$. This assumption can be motivated in a number of ways. First, there may be some "stigma" attached to welfare recipiency. This could be related to the act of participating in the transfer program (i.e., $\delta_1 = 1$ and $\delta_2 > 0$), the level of benefits received (i.e., $0 < \delta_1 < 1$ and $\delta_2 = 0$), or both (Moffitt, 1983). Second, it could be said that individuals must pay a "price" to become and remain categorically eligible for this transfer program. Under the AFDC program, for example, this might include living in a single-headed household with children.

No wage is received while attending school. This forgone wage is the only "cost" of education. No source of postschooling human capital investment is allowed. For expository

convenience, we assume that the individual lives forever. The discounted value of expected lifetime wealth can be written as

$$(2) \qquad V(S) = \int_s^{\infty}\int_{-\infty}^{\infty} Max(W_t, \delta_1 G - \delta_2) e^{-rt} de_t dt$$

where future income is discounted by some interest rate (r). The first integral indexes the period of this infinite life. The second integral captures the uncertainty within each period over the market wage. Once the market wage is revealed in a given period, the individual chooses the maximum of the two effective income amounts: the market wage or welfare income.

We can rewrite this wealth expression in the following way:

$$(3) \qquad V(S) = \int_s^{\infty} [Prob(lnW_t > \ln(\delta_1 G - \delta_2)) E(W_t | lnW_t > \ln(\delta_1 G - \delta_2)) + Prob(lnW_t \leq \ln(\delta_1 G - \delta_2))(\delta_1 G - \delta_2)] e^{-rt} dt$$

where the expected value of income in any period is the sum of two components within the integral. The first is the probability that the wage draw will exceed the effective income guarantee and the woman will choose market work, multiplied by the expected wage conditional on this decision to work. The second is the probability that the wage draw will be less than or equal to this effective income guarantee and the woman will choose welfare recipiency, multiplied by the effective guarantee. The essence of this simple welfare program is that it provides insurance against bad wage draws.

There is clearly a potential moral hazard problem associated with educational attainment in the presence of this simple income transfer program. This can be shown by deriving a general expression

for this optimal schooling decision. Since the wage distribution is lognormal, we can simplify this wealth expression:

$$(4) \qquad V(S) = \int_s^{\infty}[(1-\Phi(Z-\sigma_\epsilon))\bar{W} + \Phi(Z)(\delta_1 G-\delta_2)]e^{-rt}dt$$

where $\Phi(.)$ is the cumulative distribution function of the standard normal, σ_ϵ is the standard deviation of ϵ_t, $Z=[\ln(\delta_1 G-\delta_2)-\beta_1 S-\beta_2 A]/\sigma_\epsilon$, and $\bar{W}=\exp(\beta_1 S+\beta_2 A)$ (i.e., the unconditional mean wage).[4] Let this expected income in each period equal Y. As Rosen (1974) shows, the general stopping rule for schooling can be written as

$$(5) \qquad Y_s/Y = r$$

where Y_s is the partial derivative of expected annual income with respect to schooling. The woman will maximize her expected lifetime wealth by discontinuing her schooling when this marginal benefit is equal to the opportunity cost of this investment.

With some algebraic manipulation, we can reduce this partial derivative to the following:

$$(6) \qquad Y_s = \beta_1[(1-\Phi(Z-\sigma_\epsilon))\bar{W} + \frac{1}{\sigma_\epsilon}(\phi(Z)(\delta_1 G-\delta_2) - \phi(Z-\sigma_\epsilon)\bar{W})]$$

where $\phi(Z)$ is the probability density function of the standard normal. This expression can be interpreted with some simplifying assumptions. Suppose a woman expects to work in all postschooling periods (i.e., $\Phi(Z)=0$). This might occur because of high draws on innate ability, because she lives in a state with a relatively low guarantee, or because she heavily discounts the value of these welfare benefits. Under these circumstances, this partial derivative would reduce to $\beta_1\bar{W}$. Substituting this expression into the optimal stopping rule and recognizing that annual income is

simply $\bar{W}$ in this case, the first-order condition for wealth maximization is $\beta_1 = r$. Thus, Rosen's conclusion that the coefficient on years of schooling in the log wage equation is the rate of return to education is a special case of this more general expression.

At the other extreme, suppose the woman expects to receive welfare in all postschooling periods (i.e., $\Phi(Z) = 1$). This might occur because of low draws on innate ability, because she lives in a state with a relatively high guarantee, or because she does not heavily discount the value of these welfare benefits. Under these circumstances, this partial derivative would reduce to zero. The woman has no incentive to invest in education because it has no impact on her expected lifetime wealth.[5]

This theoretical model raises a number of issues that will be incorporated into the empirical model of welfare recipiency developed in the next section. First, educational attainment, and to that extent future earnings capacity, is a choice variable for the individual. Second, any exogenous increase in the expectation of future welfare recipiency will reduce the demand for education. Third, lower levels of schooling will reduce earnings capacity and raise the probability of future welfare recipiency. Our goal is to isolate the impact of an exogenous increase in earnings capacity, associated with additional educational attainment, on the future welfare recipiency of female dropouts. To accomplish this task, we must recognize the possible sample selection bias in the completion of a secondary education.

II. AN EMPIRICAL MODEL OF WELFARE RECIPIENCY

Using the theoretical framework of the previous section, we now develop an empirical model for estimating the determinants of welfare recipiency. It was assumed earlier that a woman receives welfare benefits in a given period if the revealed wage is less than the effective income guarantee. If we had retrospective information on the fraction of time in which the woman actually received

welfare over her lifetime (P^*), we could write this welfare propensity as an exact linear probability function of this effective income guarantee and the mean of her log wage distribution ($\ln\bar{W}$).

$$(7) \qquad P^* = \Phi[\ln(\delta_1 G - \delta_2) - \ln\bar{W}]$$

An error term will be added to this expression, because proxy measures will have to be substituted for these dependent and independent variables. First, we only observe the welfare history of a woman over a finite period. Suppose that we observe T months after the completion of her education. In K months she receives welfare. The observed probability of welfare recipiency is $P=K/T$, and it approximates P^* with some error u (i.e., $u=P^*-P$). As the number of months observed increase for all women in the sample, E(u) goes to zero and the Var(u) can be approximated by $P(1-P)/T$. The minimum chi-squared method or weighted least-squares could then be used to estimate this expression, where the appropriate weights are $(T/P(1-P))^{1/2}$. Second, we do not observe the effective income guarantee for the individual. A vector of exogenous variables (X) will be used as a proxy for this factor. It will include the mean of the actual guarantee facing the woman over the relevant period and personal and family background characteristics that might be related to any stigma attached to welfare recipiency.

Finally, an estimate of the earnings capacity of the woman at the end of her schooling ($\ln\hat{W}$) will be included in this expression as a proxy for the mean of her log wage distribution. The next section describes the way in which this estimated earnings capacity is obtained. To simplify the empirical relationship among these variables, we write the observed rate of welfare recipiency as a linear function of X, $\ln\hat{W}$, and a disturbance term μ.

$$(8) \qquad P = \tau X + \gamma \ln\hat{W} + \mu$$

This raises the question of why the dependent and time-varying independent variables in equation (8) are not subscripted for the period of observation. Changes in the likelihood of welfare recipiency could be regressed on changes in both the structure of welfare programs and earnings capacity over time. For example, a fixed-effect probit model might be used to estimate such an equation, where all measured and unmeasured time-invariant factors are relegated to the individual-specific constant term.

A number of problems prevent the implementation of this approach. First, because we would need some variation in the dependent variable for each observation, the large proportion of women who do not change welfare status over the observed period (i.e., those continuously on or off welfare) would have to be dropped from the estimation. Second, we may be interested in how the measured time-invariant factors (i.e., personal and family background characteristics) would affect welfare recipiency. Third, and most important, our estimate of the impact of changing earnings capacity on changing welfare recipiency would be biased, unless we explicitly recognize the simultaneity between these variables. Changes in potential market wage rates over the work life largely depend on accumulated work experience. For example, if no work occurred in the previous period because of welfare recipiency, earnings capacity would not increase. It would be difficult to know whether current welfare recipiency is indirectly or directly related to this past welfare participation (i.e., no change in earnings capacity vs. state dependence).

If equation (8) were estimated using weighted ordinary least-squares (OLS), the hypothesized negative impact of earnings capacity on welfare recipiency could be overstated. The problem is that the causality might run in both directions. Although an exogenous decrease in earnings capacity should increase future welfare recipiency, any expectation of higher future welfare recipiency would reduce educational attainment, thereby lowering acquired earnings capacity at the completion of

schooling. The solution to this problem is to allow for the endogeneity of educational attainment and the potential sample selection bias associated with actual welfare recipiency.

We begin by assuming that educational attainment is the only way in which individuals can choose to increase their earnings capacity. Instead of considering the number of years of schooling as the relevant choice variable, we allow individuals to choose among three alternative educational states: "High school graduates" terminate their formal schooling after receiving their regular high school diploma; "GED recipients" discontinue their formal schooling before receiving their high school diplomas, but receive their high school equivalency degrees; and "Dropouts" receive neither their high school diplomas nor GED degrees.

A reduced-form equation is used to represent the high school completion decision:

$$(9) \qquad HS^* = \pi_1 Q_1 + e_1$$

where HS^* is the latent propensity to receive a regular high school diploma. The vector Q_1 contains personal and family background characteristics, the quality of the school attended, the condition of the local labor market, and the income guarantee available during formal schooling. These regressors serve as proxies for the benefits and costs that underlie this educational investment decision. The observed outcome is dichotomous. Either the woman completes her high school education (HS=1), or she does not (HS=0).

$$HS = \begin{cases} 0 & \text{iff } HS^* \leq 0 \\ 1 & \text{iff } HS^* > 0 \end{cases}$$

For women who do not finish high school, there is a second opportunity to complete their secondary education.[6] A reduced-form equation is used to represent this GED recipiency decision:

$$(10) \qquad GED^* = \pi_2 Q_2 + e_2$$

where GED^* is the latent propensity to receive a high school equivalency degree. The vector Q_2 contains personal and family background characteristics, the highest grade of formal schooling completed, and the length of time elapsed since the termination of schooling. Again, the observed outcome is dichotomous. Either the woman receives her GED degree (GED=1), or she does not (GED=0). This GED recipiency outcome is unobserved among women who receive their high school diplomas.

$$GED \mid HS=0 = \begin{cases} 0 & \text{iff } GED^* \leq 0 \\ 1 & \text{iff } GED^* > 0 \end{cases}$$

$$GED \mid HS=1 = \text{unobserved}$$

Three equations now comprise our empirical model:

$$HS^* = \pi_1 Q_1 + e_1 \tag{11}$$

$$GED^* = \pi_2 Q_2 + e_2 \tag{12}$$

$$P = \tau X + \gamma \ln\hat{W} + \mu. \tag{13}$$

The error terms are assumed to have a trivariate normal distribution. Since the same unobserved factors may affect both schooling outcomes (i.e., e_1 and e_2 may be correlated), equations (11) and (12) will be estimated in a bivariate probit system. To remove the potential correlation between $\ln\hat{W}$ and μ and produce an unbiased estimate of γ, we write the expectation of welfare recipiency conditional on the regressors and the sample selection regime that determines educational attainment as

$$\begin{aligned} E(P \mid X, \ln\hat{W}, HS, GED) &= \tau X + \gamma \ln\hat{W} + E(\mu \mid HS, GED) \\ &= \tau X + \gamma \ln\hat{W} + \eta_a \lambda_a + \eta_b \lambda_b. \end{aligned} \tag{14}$$

The two additional regressors (λ_a and λ_b) correct for possible sample selection bias. They are constructed from the bivariate probit estimation of the schooling equations (see Appendix 1).

The estimated coefficients on these sample selection terms will have an important interpretation in the context of this study. Note that λ_a will be positive among graduates and negative among both GED recipients and dropouts, while λ_b will be positive among GED recipients and negative among dropouts. If $\eta_a < 0$, then high school graduates have lower welfare recipiency rates than observationally equivalent women who do not complete their high school education. If $\eta_b < 0$, then GED recipients have lower welfare recipiency rates than observationally equivalent dropouts. This would mean that even if dropouts were to complete their secondary education, they would continue to face higher relative rates of welfare recipiency.

Once equation (14) has been estimated, we can predict the changes in welfare recipiency for the average dropout if she were to receive either her high school diploma or GED degree.

$$\Delta P_{HS} = \gamma \Delta \ln W_{HS} \tag{15}$$

$$\Delta P_{GED} = \gamma \Delta \ln W_{GED} \tag{16}$$

The variables ΔP_{HS} and ΔP_{GED} are the expected changes in welfare recipiency for a dropout who acquires either form of a secondary education, respectively. The estimated gains in earnings capacities for dropouts associated with these alternative degrees ($\Delta \ln W_{HS}$ and $\Delta \ln W_{GED}$) will be taken from a previous study (Maloney, 1991). The purpose of the present study is to obtain an unbiased estimate of the coefficient γ.

III. DATA

A cross-section of young women is taken from the 1985 NLSY. This data set began collecting information on 12,686 males and females between the ages of 14 and 22 in 1979. It now

contains detailed information on their educational attainment, family background characteristics, labor market conditions, measures of cognitive achievement, wage and work information, and welfare recipiency histories.

Table 1 provides some descriptive statistics for our subsample of 2,601 young women, grouped by their educational attainment at the time of the 1985 interview. In order to treat both a high school diploma and a GED degree as terminal degrees, our subsample does not contain women who were enrolled in school in 1985 or who had completed any formal schooling beyond high school.[7] Nearly two-thirds of the women had graduated from high school; of the nongraduates, about one-fourth had earned their GED degrees.

The estimated earnings capacities of these women at the time of the completion of their education were constructed from the results of an earlier study (Maloney, 1991). The wage rates of women who were working at the time of the 1985 interview were regressed on various personal characteristics and local labor market conditions, along with a measure of their cognitive achievement. The information on cognitive achievement comes from the Armed Services Vocational Aptitude Battery (ASVAB), which was administered to these women in the summer and fall of 1980. This variable is critical to this study, because it serves as a proxy for differences in innate ability and allows for variation in potential market wage rates among women with the same educational attainment.

Separate log-wage regressions were estimated for working women who did and did not complete their secondary education. These results are reproduced in Appendix 2. Two sources of sample selection bias were considered: the completion of a secondary education and current employment status at the time of the 1985 interview. High school graduates and GED recipients were collapsed into a single schooling category because earlier results had indicated that the two groups were very similar in terms of their human capital accumulation during regular schooling, their returns

Table 1

Descriptive Statistics for 1985 NLSY Subsample of Young Women

	High School Graduates	GED Recipients	Dropouts
Age	23.6	23.5	23.5
% black	26.7	23.8	24.7
% Hispanic	11.9	15.0	18.0
% raised in household headed by a single female	18.1	25.1	30.1
Years of formal schooling completed	12.0	10.2	9.5
Estimated earnings capacity at time of completed education	$4.26	$4.09	$3.50
% observed months received AFDC since completion of education	9.0	16.9	27.5
% observed months received AFDC or food stamps since completion of education	11.4	21.2	32.8
Number of observations	1,650	227	724
% of overall subsample	63.4	8.7	27.8

Source: 1985 National Longitudinal Survey of Youth.

to human capital in the labor market, and their overall earnings capacities. Predicted earnings capacities at the time of the completion of education were created by setting labor market experience equal to zero and local labor market conditions at their sample means. As Table 1 indicates, compared to the average dropout, the average high school graduate and GED recipient faced initial market wages that were 21.7 and 16.9 percent higher, respectively.

Two measures of "welfare recipiency" will be used in this study. Both are based on data collected during each annual survey of the NLSY on the number of months in the previous calendar year in which benefits from various transfer programs were received. The maximum number of observed months is 96, with the earliest being January 1978 and the latest December 1985. This welfare recipiency history is assumed to begin in the month following the completion of an individual's education (i.e., the receipt of a high school diploma or GED degree, or the termination of formal schooling). No data are available on the receipt of welfare benefits prior to January 1978. We do not observe the early welfare history of the 27.3 percent of the women in our subsample who had completed their education prior to this time. For the average woman with this truncated welfare history, nearly 21 months of data are unobserved.

The first measure of welfare recipiency is intended to capture AFDC participation. Because of concern about possible misreporting, women were considered to have been AFDC recipients in a given month if they reported the receipt of cash benefits under either AFDC or general assistance (state or local welfare programs). The second variable is designed to be a more comprehensive measure of welfare recipiency. It includes the receipt of either AFDC benefits or food stamps in a given month. By either measure, there is a substantial difference in welfare participation among the women in the three educational categories. The probability of welfare recipiency for the average dropout is approximately three times the probability facing the average high school graduate, and 1.5 times the probability facing the average GED recipient.

IV. EMPIRICAL RESULTS

Table 2 presents the results from the bivariate probit estimation of the two schooling outcomes. After other measured factors were held constant, being black or Hispanic increased the probability of high school graduation among the women in our subsample. However, since actual graduation rates were quite similar between whites and nonwhites, this effect of race is largely offset by the other measured factors in this equation. Most of the family background characteristics have the expected signs, and most are significantly different from zero at conventional test levels. For example, women were less likely to graduate from high school if, at age 14, they lived in households headed by a single female or did not have access to newspapers, magazines, or library cards.

Two sets of additional regressors are also included in the high school completion equation. The first includes six proxies for school quality.[8] All have the expected signs, and four of the six are significant. Women were less likely to graduate from high school if they attended schools with large proportions of black or Hispanic students, high dropout rates among tenth graders, or few library books per student. The second set of regressors includes proxies for the state of residence of these women at age 14. None of these variables are significant. One key variable in this group is the mean value of the state's basic AFDC guarantee during the period when these women were supposedly making their decisions of whether or not to complete their high school education.[9] The earlier theoretical model suggested that women who face more generous welfare programs may acquire less education, all else held constant. Yet, women who lived in states with higher AFDC benefit levels were no more likely to drop out before receiving their high school diplomas. In fact, the coefficient on this variable is positive, but insignificant.

For those women who did not receive a high school diploma, race and family background appear to have little direct impact on their probability of receiving a GED degree. Among family background characteristics, only the absence of younger siblings and additional schooling among

Table 2

Bivariate Probit Estimates of Determinants of Schooling Outcomes

	Completion of High School	GED Recipiency Conditional on Absence of High School Diploma
Constant	-.236	-3.790**
	(.331)	(.625)
Black	.602**	-.012
	(.099)	(.163)
Hispanic	.292*	.145
	(.125)	(.175)
Born in South	.040	.010
	(.074)	(.111)
Born in foreign country	.114**	.079
	(.127)	(.240)
Catholic	.220**	.061
	(.075)	(.148)
Lived in urban area at age 14	-.242**	-.209
	(.070)	(.157)
Lived in household headed by a single female at age 14	-.433**	-.044
	(.055)	(.153)
Newspapers or magazines in home at age 14	.172**	.028
	(.066)	(.121)
Library card in home at age 14	.260**	.110
	(.060)	(.128)
Number of older siblings	-.021*	.005
	(.012)	(.022)
Number of younger siblings	-.046**	-.053*
	(.015)	(.030)
Highest grade completed by father	.027**	.038*
	(.010)	(.021)
Highest grade completed by mother	.054**	.031
	(.012)	(.026)

(table continues)

Table 2, continued

	Completion of High School	GED Recipiency Conditional on Absence of High School Diploma
Health limitations	-.186*	-.093
	(.115)	(.222)
Highest grade of formal schooling completed	---	.259***
		(.051)
Years since formal schooling completed	---	-.022
		(.018)
Characteristics of school last attended:		
% black enrollment	-.341*	---
	(.178)	
% Hispanic enrollment	-.553*	---
	(.231)	
% students disadvantaged	-.246	---
	(.175)	
% 10th graders who drop out	-.532***	---
	(.162)	
Books per student in library	.974***	---
	(.363)	
Student-teacher ratio	-.443	---
	(.681)	
Characteristics of state of residence at age 14:		
Index of per capita money income[a]	-.001	---
	(.004)	
Civilian unemployment rate[a]	-.011	---
	(.022)	
Basic AFDC guarantee[a]	.068	---
	(.231)	

(table continues)

Table 2, continued

	Completion of High School	GED Recipiency Conditional on Absence of High School Diploma
School expenditures per pupil[a]	-.033 (.068)	---
Correlation between error terms (ρ)	-.187 (.386)	
Log-likelihood	-2,027.7	
Number of observations	2,601	

Source: Computations by author based on the 1985 National Longitudinal Survey of Youth.

Notes: Standard errors in parentheses. The first dependent variable assumes a value of one for women who completed their regular high school education and zero otherwise. For those who did not receive a high school diploma, the second dependent variable assumes a value of one if they received a GED degree and zero otherwise. The variables "Basic AFDC guarantee" and "School expenditures per pupil" are measured in thousands of 1985 dollars.

[a] State average during years when respondent was between 14 and 17.
** Significant at 1 percent level, two-tailed test.
* Significant at 10 percent level, two-tailed test.

fathers seems to significantly increase this probability. The only other significant regressor in the GED recipiency equation is the highest grade of formal schooling completed. The length of time elapsed between the completion of formal schooling and the 1985 interview has no measurable impact on the probability of acquiring a GED degree.

The estimated correlation between the error terms in the two schooling equations is negative, but insignificant. There is no statistical evidence that unmeasured factors affecting high school graduation are correlated with unmeasured factors affecting eventual GED recipiency.

The results from the estimation of the welfare recipiency equations are presented in Table 3. Again, two dependent variables are used. The first measures the proportion of observed months since the completion or termination of education in which women received AFDC benefits. The second considers the receipt of either AFDC or food stamps over the same period. For expository purposes, regression estimates with and without the inclusion of the correction terms for sample selection bias are reported.[10]

A woman's estimated earnings capacity at the completion of her education is found to be negatively related to her subsequent welfare recipiency. These coefficients are highly significant in all equations. Yet, the sample selection regime that determines secondary school completion appears to bias the estimation of these effects. When the two correction terms are included, these coefficients decline in absolute value by approximately 20 percent in the AFDC equation and 24 percent in the AFDC or food stamp equation. Furthermore, this sample selection bias seems to be associated exclusively with high school completion. The coefficient on λ_a is negative and significant, while the coefficient on λ_b is positive and insignificant in both equations. This means that women who graduate from high school face lower welfare recipiency rates than observationally equivalent women who do not complete this education. However, there is no evidence of any systematic difference in welfare recipiency between observationally equivalent GED recipients and dropouts.

Table 3

Estimated Determinants of Welfare Recipiency

	Dependent Variable			
	AFDC		AFDC or Food Stamps	
	Weighted OLS	Weighted OLS w/Correction Terms	Weighted OLS	Weighted OLS w/Correction Terms
Constant	.579**	.458**	.775**	.594**
	(.053)	(.059)	(.062)	(.069)
Black	.133**	.139**	.149**	.158**
	(.012)	(.012)	(.013)	(.013)
Hispanic	.035*	.030*	.035*	.027
	(.016)	(.016)	(.017)	(.017)
Born in South	-.049**	-.048**	-.061**	-.058**
	(.012)	(.012)	(.013)	(.013)
Born in foreign country	-.098**	-.096**	-.129**	-.128**
	(.020)	(.020)	(.022)	(.022)
Catholic	-.026*	-.026*	-.033**	-.032**
	(.011)	(.011)	(.012)	(.012)
Lived in urban area at age 14	.007	.008	.006	.006
	(.010)	(.010)	(.011)	(.011)
Lived in household headed by a single female at age 14	.031**	.031**	.041**	.039**
	(.009)	(.009)	(.010)	(.010)
Number of older siblings	.004*	.004*	.006**	.006**
	(.002)	(.002)	(.002)	(.002)
Number of younger siblings	.013**	.014**	.018**	.018**
	(.002)	(.002)	(.003)	(.003)
Highest grade completed by father	.001	.001	.000	-.000
	(.002)	(.002)	(.002)	(.002)
Highest grade completed by mother	-.004*	-.004*	-.006**	-.006**
	(.002)	(.002)	(.002)	(.002)

(table continues)

Table 3, continued

	Dependent Variable			
	AFDC		AFDC or Food Stamps	
	Weighted OLS	Weighted OLS w/Correction Terms	Weighted OLS	Weighted OLS w/Correction Terms
Health limitations	.027	.029	.054**	.056**
	(.019)	(.019)	(.021)	(.021)
Mean local unemployment rate since completion of education	.004*	.005**	.007**	.007**
	(.002)	(.002)	(.002)	(.002)
Mean state AFDC guarantee since completion of education	.160**	.161**	---	---
	(.033)	(.033)		
Mean state AFDC plus food stamp guarantee since completion of education	---	---	.111**	.114**
			(.036)	(.036)
Predicted earnings capacity at time of completed education	-.465**	-.372**	-.595**	-.454**
	(.034)	(.040)	(.038)	(.044)
Sample selection term for completion of high school (λ_a)	---	-.034**	---	-.052**
		(.007)		(.008)
Sample selection term for completion of GED degree (λ_b)	---	.005	---	.011
		(.011)		(.012)
Adjusted R^2	.192	.200	.239	.253
Number of observations	2,601			

Source: Computations by author based on the 1985 National Longitudinal Survey of Youth.
Notes: Standard errors in parentheses. The dependent variables measure the proportion of observed months that the woman has received AFDC, and AFDC or food stamps, since the completion of her education. The variable "Basic AFDC guarantee" is measured in thousands of 1985 dollars.
** Significant at 1 percent level, two-tailed test.
* Significant at 10 percent level, two-tailed test.

We can easily interpret the magnitude of these coefficients on earnings capacity. After correcting for sample selection bias, an exogenous 10 percent rise in earnings capacity reduces the probability of receiving AFDC in a given month by approximately 3.7 percentage points, and the probability of receiving either AFDC or food stamps by 4.5 percentage points.

Race and family background characteristics generally have the expected signs in these regressions, and almost all are significant. Unlike the results reported for predicted earnings capacity, the correction for sample selection bias has little impact on these estimated coefficients. Holding other measured factors constant, black women have welfare recipiency propensities nearly 14 and 16 percentage points higher than those of white women, using the alternative definitions of welfare participation. Women born in the South or in foreign countries have lower rates of welfare recipiency. The opposite is true of women raised in households headed by a single female, in large families, or by mothers with few years of schooling.

The characteristics of the area of residence during the observed postschooling period also have the expected effects. A higher mean local unemployment rate or mean income guarantee significantly increases welfare recipiency. A 1 percentage point rise in the unemployment rate leads to a .4 to .7 percentage point rise in these two measures of welfare participation. A $100 rise in the maximum AFDC guarantee for a woman with three children causes a 1.6 percentage point rise in the probability of AFDC recipiency. A $100 increase in the combined AFDC-food stamp guarantee leads to a 1.1 percentage point rise in the probability of either AFDC or food stamp recipiency.

Using the estimated coefficients from the equations adjusted for sample selection bias, the relative importance of the measured regressors in explaining the higher observed welfare participation rates among dropouts is summarized in Table 4. The large gaps in the actual rates of welfare recipiency between dropouts and those who have completed their secondary education are reproduced at the top of the table. The average dropout is then alternatively given some of the mean

Table 4

Impact of Regressors in Explaining the Higher Rates of Welfare Recipiency among Dropouts

	AFDC	AFDC or Food Stamps
Actual rates of welfare recipiency for the average:		
High school graduate	9.0%	11.4%
GED recipient	16.9%	21.2%
Dropout	27.5%	32.8%
Predicted changes if the average dropout were given the same mean characteristics of the average:		
1. High school graduate		
A. Race and family background	-1.4%	-2.2%
B. Unemployment rate and welfare guarantee levels	.1%	.1%
C. Earnings capacity	-7.0%	-8.6%
Overall impact	-8.3%	-10.7%
2. GED recipient		
A. Race and family background	-1.0%	-1.6%
B. Unemployment rate and welfare guarantee levels	.2%	.4%
C. Earnings capacity	-5.6%	-6.9%
Overall impact	-6.4%	-8.1%

Source: Computations by author based on the 1985 National Longitudinal Survey of Youth.

characteristics of the average high school graduate and GED recipient, and the impact on welfare participation is calculated. Race and family background characteristics together account for approximately 1 to 2.2 percentage points of the higher rates of welfare recipiency among dropouts. Measured area characteristics explain virtually none of the observed gaps. Because dropouts lived in local areas with lower unemployment rates and in states with nearly identical welfare guarantee levels, giving them the same average area characteristics of secondary school completers would actually raise their welfare participation by .1 to .4 percentage points.

The most important determinant of welfare recipiency is initial earnings capacity. If the average dropout were given the mean earnings capacity of the average high school graduate, it would lower her welfare recipiency by between 7 and 8.6 percentage points. This would eliminate between 37.8 and 40.2 percent of the actual gaps in welfare participation between these groups.[11] Because the difference in initial earnings capacity between the average dropout and GED recipient is somewhat smaller, giving the average dropout this additional earnings capacity would lower her welfare recipiency by between only 5.6 and 6.9 percentage points. However, because the actual gaps in welfare participation are also much smaller between these groups, this additional earnings capacity would eliminate between 52.8 and 59.5 percent of these gaps.

Finally, we use these estimated results to predict how the additional earnings capacity that dropouts could expect to receive by completing their regular high school education or GED degree would affect their future welfare recipiency. In the earlier study by Maloney (1991), point estimates for the rates of return to this educational attainment for the average dropout were calculated. For the average dropout, her potential market wage might increase by as much as 10.9 percent with a high school diploma or by 6.5 percent with a GED degree. Using these numbers and the estimated coefficients or earnings capacity from Table 3, we can now estimate the importance of a secondary education for reducing the long-term welfare recipiency among dropouts. A high school diploma

would lower AFDC participation by as much as 4.1 percentage points and AFDC or food stamp participation by as much as 4.9 percentage points (ΔP_{HS} = -.372 x 10.9 or ΔP_{HS} = -.454 x 10.9). A GED degree would lower AFDC participation by as much as 2.4 percentage points and AFDC or food stamp participation by as much as 3.0 percentage points (ΔP_{GED} = -.372 x 6.5 or ΔP_{GED} = -.454 x 6.5).

These estimated effects of a secondary education on the welfare recipiency among female dropouts would eliminate only a small proportion of the substantial gaps in welfare participation that currently exist between these groups. A high school education would eliminate 22.2 and 22.9 percent of these respective differences in welfare recipiency between the average high school graduate and dropout.[12] A GED degree would eliminate 22.6 and 25.9 percent of these respective differences in welfare recipiency between the average GED recipient and dropout.[13] Thus, we could expect that approximately 74 to 78 percent of the current differences in welfare recipiency rates between women who have and have not completed their secondary education would persist even if these dropouts were to complete their secondary education.

V. CONCLUSION

This study finds that the expectation of future welfare recipiency causes women to discontinue their high school education and thus halt the accumulation of earnings capacity. High school graduates experience lower rates of postschooling welfare recipiency than observationally equivalent dropouts or GED recipients. For similar reasons, more generous welfare programs may reduce the incentive for high school completion. However, the probability of receiving a high school diploma is unaffected by the state AFDC guarantee during a woman's teenage years.

Once we control for the sample selection bias associated with these schooling outcomes, an exogenous increase in earnings capacity is found to reduce welfare recipiency. The magnitude of this

effect would be overstated by at least 20 percent if these endogenous treatment effects were not considered. Given the estimated rates of return to a secondary education for female dropouts from a previous study (Maloney, 1991), it is estimated that the AFDC recipiency of the average dropout would be reduced by 4.1 percentage points with a high school diploma and 2.4 percentage points with a GED degree. This represents, respectively, a 14.9 and 8.7 percent reduction in current AFDC participation among dropouts. Although these effects may appear to be substantial, they would eliminate at most one-quarter of the current gap in welfare recipiency between women who have and have not completed their secondary education.

In the previous study mentioned above, the author found that in terms of the accumulation of human capital through formal schooling, the rate of return on this human capital in the labor market, and overall earnings capacities, high school graduates and GED recipients were quite similar. However, in this study we find that in terms of welfare recipiency, GED recipients and dropouts are quite similar.

There are a couple of distinct advantages to this analysis over previous empirical studies on AFDC recipiency (e.g., see the recent work by Blank [1989], Graham and Beller [1989], and Connelly [1990]). First, these earlier studies relied almost exclusively on measures of AFDC recipiency in a single period. Since the known welfare history of women is used to construct long-term measures of participation in this study, we should have produced better estimates of the determinants of this behavior. Second, these earlier studies often included among the regressors variables that were largely endogenous in nature (e.g., years of schooling, number and ages of children in the household, and work experience). Without considering potential simultaneous-equation bias, it is difficult to interpret the resulting coefficient estimates. To eliminate this problem, the regressors included in this study include largely exogenous factors such as personal and family background characteristics. When earnings capacity is included as a regressor, explicit recognition is given to possible self-selection in educational attainment.

One shortcoming of this study is that no attempt has been made to isolate the variety of ways in which an increase in educational attainment might translate into a reduction in welfare recipiency. The assumption motivating this analysis is that education is only important because of its impact in shifting the distribution of market wages facing a woman. Yet, education may affect subsequent welfare recipiency through its impact on household formation or dissolution, fertility, attachment to the labor market, job search, occupational mobility, and layoff and recall. Future studies should explore these many individual effects that increased educational attainment might have on subsequent welfare recipiency.

Appendix 1

Explanation of the Correction Terms for Sample Selection Bias Derived from the Bivariate Probit Estimation of the Schooling Equations

Let $C_1=\pi_1 Q_1$ and $C_2=\pi_2 Q_2$. The correction terms for sample selection bias among high school graduates can be written as

$$\lambda_a = \phi(C_1)/\Phi(C_1) \qquad \lambda_b = 0$$

where the first variable is the well-known inverse Mill's ratio, and the second is zero because the GED recipiency outcome is never observed among graduates.

The correction terms for GED recipients are

$$\lambda_a = -\phi(-C_1)\Phi(C_2^*)/\theta_{01} \qquad \lambda_b = \phi(C_2)\Phi(C_1^*)/\theta_{01}$$

$$C_1^* = (-C_1+\rho C_2)/(1-\rho)^2 \qquad C_2^* = (C_2-\rho C_1)/(1-\rho)^2$$

$$\theta_{01} = F(-C_1, C_2; -\rho)$$

where θ_{01} is the probability of observing a GED recipient in the sample, F(.) is the standard bivariate normal distribution function, and ρ is the correlation between the error terms in the two selection equations.

The correction terms for dropouts are

$$\lambda_a = -\phi(-C_1)\Phi(C_2^*)/\theta_{00} \qquad \lambda_b = -\phi(-C_2)\Phi(C_1^*)/\theta_{00}$$

$$C_1^* = (-C_1+\rho C_2)/(1-\rho)^2 \qquad C_2^* = (-C_2+\rho C_1)/(1-\rho)^2$$

$$\theta_{00} = F(-C_1, -C_2; \rho)$$

where θ_{00} is the probability of observing a dropout. See Tunali (1982) or Maddala (1983, pp. 278-283) for additional details on this double selection procedure.

Appendix 2

Estimated Determinants of Market Wage Rates

	Secondary School Completers[a]	Dropouts
Constant	1.377**	1.334**
	(.059)	(.155)
Black	.063*	-.005
	(.030)	(.072)
Hispanic	.089**	.087
	(.034)	(.058)
Health limitations	.003	.004
	(.056)	(.087)
Area unemployment rate	-.012**	-.012
	(.004)	(.009)
County population totals millions	.045**	.022*
	(.008)	(.013)
Predicted labor market experience	.061**	.058*
	(.009)	(.031)
Vocational training	.069**	-.005
	(.020)	(.048)
Human capital or cognitive achievement	.125**	.080**
	(.014)	(.031)
GED recipient	-.028	------
	(.034)	
Sample selection term for secondary school completion (λ_a)	.010	.021
	(.049)	(.073)
Sample selection term for employment (λ_b)	.029	.133
	(.047)	(.095)
Adjusted R^2	.169	.045
Number of observations	1,223	257

Source: Computations by author based on the 1985 National Longitudinal Survey of Youth.
Notes: Standard errors in parentheses. The dependent variable is the natural log of hourly earnings in the main job held at the time of the 1985 interview.
[a] Includes high school graduates and GED recipients.
** Significant at 1 percent level, two-tailed test.
* Significant at 10 percent level, two-tailed test.

Notes

[1] One experiment entitled Project Redirection encouraged AFDC recipients who had dropped out of school to obtain their GED degrees. Its goal was to increase the economic self-sufficiency of welfare recipients. The results of the program have been mixed (Polit, Quint, and Riccio, 1988). By the five-year follow-up, Project Redirection participants were less likely to be living in households in which someone was receiving AFDC. However, since the experimental and control groups were equally likely to have completed their secondary education, it would be difficult to determine if this difference in welfare recipiency was due to educational attainment or earnings capacity.

[2] Person subscripts are suppressed throughout this paper for notational simplicity.

[3] For simplicity, we assume that the woman cannot work while receiving transfer payments, nor can she choose to refrain from both work and welfare in the same period. We acknowledge these additional complexities at the end of this section.

[4] The expression for the truncated mean of a lognormal variable is taken from Johnson and Kotz (1970, p. 129).

[5] This result is obviously dependent on the implicit assumption that the only value of schooling to the individual is its impact on future wage rates. Alternatively, if education is valued as a consumption good or because it raises home productivity or results in better marriage prospects, then it would have some positive value even if the woman expected to refrain from market work in all future periods.

[6] A GED degree can be obtained by passing written examinations on mathematics, social studies, science, literature and the arts, and writing skills. About 80 percent of GED test-takers formally prepare for these tests, often by enrolling in adult education programs (American Council on Education, 1989). Although all states grant GED degrees, the standards for a passing grade on these tests vary by state.

[7] Exclusions were also made for women who were self-employed, working without pay, farmers, in the military, unable to work because of health limitations, or enrolled in government training programs. Observations were dropped because of missing information on key variables (e.g., state of residence and hourly earnings for those employed).

[8] The NLSY conducted a "school survey" in 1979, in which representatives from the school last attended by the youth provided information about that school. These data are available for over two-thirds of the women in our sample. Instead of excluding the remaining one-third, these women were treated as if they had attended a school with the mean characteristics of those of their race (black, Hispanic, white, and others) where this information was reported. For example, unless other information is available, a black woman is assumed to come from a school where 39.8 percent of the students are disadvantaged; a white woman is assumed to come from a school where 19.7 percent are disadvantaged. This decision is justified on the basis of the continuing racial segregation of secondary schools in the United States.

[9] This is the mean of the state's maximum monthly AFDC benefit for a woman with three children, during the years when each woman in our subsample was between the ages of 14 and 17. Using the Consumer Price Index to inflate earlier values, this variable is measured in thousands of 1985 dollars.

[10] The estimation technique is weighted OLS. The weights are equal to $(T/P(1-P))^{1/2}$, where T is the number of observed months, and P is the proportion of months in which welfare benefits were received. The problem is that this variable will be undefined for women who were on or off AFDC in all periods (i.e., $P=1$ or $P=0$). To include these observations in the regressions, we set $P=.99$ and $P=.01$ in constructing these weights for women continuously on or off AFDC, respectively.

[11] These figures were derived by dividing the estimated changes in welfare recipiency by the observed gaps in actual welfare participation noted at the beginning of Table 4. For example, 7.0 is

approximately 37.8 percent of the 18.5 percentage point difference in AFDC recipiency rates between graduates and dropouts. The results of similar calculations will appear later in the text.

[12] 4.1 represents approximately 22.2 percent of the 18.5 percentage point gap in AFDC recipiency rates between graduates and dropouts. 4.9 represents approximately 22.9 percent of the 21.4 percentage point gap in AFDC or food stamp recipiency rates between graduates and dropouts.

[13] 2.4 represents approximately 22.6 percent of the 10.6 percentage point gap in AFDC recipiency rates between GED recipients and dropouts. 3.0 represents approximately 25.9 percent of the 11.6 percentage point gap in AFDC or food stamp recipiency rates between GED recipients and dropouts.

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