

THE EFFECT OF WELFARE ON HIGH SCHOOL GRADUATION

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Higher welfare support levels diminish the relative value of education according to standard economic theory. However, studies based on the negative income tax experiments have found that higher welfare support levels increase participation in the educational system. This study examines a nonexperimental source of data to determine the effect of higher expected state-level welfare benefits on high school graduation rates for the chief recipients of welfare, single mothers. A nationwide sample of 18 to 25 year-old single mothers is analyzed. The hypothesis that higher welfare levels adversely impact high school graduation rates is confirmed with a high degree of statistical precision.

Economists predict that educational levels will decline as welfare levels increase. The reasoning behind this hypothesis is that education is expensive to acquire in both time and money. Education improves one's future earning capacity. One invests in education today to receive a higher salary in the future. As the welfare system becomes more generous, the difference between income levels while working and income levels while not working diminishes, thereby reducing the incentive to invest in education. Experiments with the negative income tax, however, consistently dispute this prediction. One could argue that, since the experiments were temporary, participants may have been acting strategically by taking advantage of the temporarily higher support levels to invest in education so as to earn more income when welfare levels were expected to decline on termination of the experiment.¹

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¹For studies analyzing the impact of welfare on education, see Mallar (1976); McDonald and Stephenson (1979); Venti (1984); and Weiss, Hall, and Dong (1980). For criticisms of experimental studies, see Greenberg et al. (1981); Hausman and Wise (1979); Keeley and Robins (1980); Killingsworth (1983); and Metcalf (1973, 1974).

The Data

The data source is the U.S. Bureau of the Census *Current Population Survey: Annual Demographic Survey* (March Supplement, 1980–91).² This data source is a large, random sample of the United States regularly used by the federal government and analysts in economic studies and forecasts. Lower-income people are overrepresented in the sample, making it a particularly appropriate data set to use in an empirical study of the behavioral effects from welfare. Economic and demographic information is provided for noninstitutionalized civilians. The data herein are further restricted to a sample of low-income, nonfarm, nonmilitary single female household heads with at least one dependent child under the age of 18 and no man present in the home. Alaska and Hawaii were excluded because of higher local price levels and unique geographic isolation. The single female household heads were limited to range in age from 18 to 25. The sample included 6,111 observations. The average age of the sample of women is 21.6 years. The subjects have an average educational level of 11.1 years and an average of 1.7 children; 37 percent were black; 54 percent worked; and 62 percent participated in the income maintenance system. Table 1 provides a detailed description of the sample.

Comprehensive Welfare Statistics

The cash or cash-equivalent income maintenance system in the United States consists of Aid to Families with Dependent Children (AFDC), food stamps, general assistance, emergency assistance, and the low income home energy assistance program.³ Welfare consists of a guarantee level that increases with family size, and a tax rate on earned and unearned income. These five programs are aggregated in a comprehensive welfare model:

$$(1) \quad W_i = \alpha + \beta K_i + t_y Y_i + t_v V_i + \mu_i,$$

where W_i is the actual amount of welfare received; K_i is the number of dependent children in the home; Y_i is earned income; V_i is unearned income excluding welfare benefits; and μ_i is a mean-zero random error term. Since welfare benefits cannot fall below zero, a limited-

²The original collector of the data, the U.S. Census Bureau, and the distributor of the data, the Inter-university Consortium for Political and Social Research, bear no responsibility for uses of this data, nor for interpretations or inferences based on such uses. The opinions, analyses, and conclusions are solely those of the author.

³Although there are housing programs that are effectively cash-equivalent, their valuation is controversial and they have been excluded here. Less than 6 percent of the sample received housing benefits, so the effect of the understatement will be small.

TABLE 1
LOW-INCOME SINGLE FEMALE HOUSEHOLD HEADS 18-25 YEARS OLD, 1979-90

Variable	All	Grads	Nongrads	Black	Nonblack	Welfare	Nonwelfare
Age (years)	21.6	22.0	21.2	21.5	21.7	21.7	21.6
Education (years)	11.1	12.3	9.5	11.4	11.0	10.9	11.5
High School Grad. Rate (%)	56.7	100	0	59.1	55.2	50.1	67.4
Labor Supply (hrs/yr)	576	733	371	453	649	354	941
Labor Participation (%)	54	63	42	46	59	43	72
Welfare Participation (%)	62	54	71	72	55	100	0
Housing Subsidy Participation (%)	7.0	6.9	7.2	7.9	6.4	11.3	0
Children (number)	1.70	1.55	1.89	1.91	1.57	1.86	1.43
Black (%)	37	39	35	100	0	43	27
Total Income (\$/yr)	8,661	9,195	7,962	8,644	8,622	8,121	9,550
Earned Income (\$/yr)	3,011	3,935	1,801	2,360	3,397	1,651	5,248
Unearned Income (\$/yr)	2,578	2,864	2,204	2,614	2,557	1,531	4,302
Welfare (\$/yr)	3,072	2,396	3,957	3,754	2,668	4,939	0
Observations (number)	6,111	3,464	2,647	2,276	3,835	3,801	2,310

NOTE: All dollar values in constant 1990 terms.

SOURCE: U.S. Bureau of the Census, *Current Population Surveys: Annual Demographic Files, 1980-91*.

dependent variable regression, the tobit procedure, was used to estimate the model. Here, α is interpreted as the guarantee level for the single female household head; β is the incremental guarantee allowed per child; t_e is the welfare tax rate on earned income; and t_u is the welfare tax rate on unearned income.

Equation 1 was estimated using data for each state from the *Current Population Survey: Annual Demographic Survey* for each year from 1979 to 1990 for adult single female household heads of nonretirement age (Gensler 1993). The descriptive statistics provide a nonexperimental source of comprehensive welfare information derived from a randomly collected nationally representative sample. For the sample analyzed herein, the average expected guarantee level for a mother with two children in constant 1990 dollars was about \$4,290 per year. The tax rate on earned income averaged 57 percent, and the tax rate on unearned income averaged 35 percent.

A Decision Theoretic Model of High School Graduation

To determine the effect of the income maintenance system on high school graduation rates, I model the decision to complete high school as a latent variable, discrete binary choice decision. A subject decides either to complete high school or to drop out of high school. The decision itself is based on a marginal cost/benefit estimation that assesses whether the benefits of graduating from high school (such as greater employment opportunities) outweigh the costs (such as time, boredom, and risks to personal safety and dignity from assaults from fellow students). The marginal cost/benefit estimation itself is unobserved. Only the behavioral response to the estimation, graduating from high school or dropping out, is observed. It is assumed that a number of personal demographic characteristics and environmental conditions, including the welfare system, affect this decision. The difference between the cost and benefit can be represented by an unobserved variable, G^* , which is dependent on observable characteristics and an error term: $G^* = \beta'X + e_g$, where X is a vector of observable characteristics, and e_g is assumed to be a mean-zero normally distributed random error term. Here, $\beta'X$ is the index function. Although G^* is unobserved, the decision to graduate, G , is observed: $G = 1$ if $G^* > 0$, and $G = 0$ if $G^* \leq 0$. The probability that $G = 1$ is $\text{Prob}[G^* > 0] = \text{Prob}[\beta'X + e_g > 0] = \text{Prob}[e_g > -\beta'X]$. Since the error term is assumed to be symmetric, $\text{Prob}[G^* > 0] = \text{Prob}[e_g < \beta'X] = \Phi \beta'X$ where Φ is the normal cumulative distribution function. This is the functional form of a probit model. Accordingly,

the decision to participate in the welfare system can be estimated by means of a probit procedure.

The estimation process proceeds as follows: The model of high school graduation is estimated by means of a probit procedure using full information, maximum likelihood techniques on the entire sample of low-income, single female household heads which includes both graduates and nongraduates. The descriptive welfare statistics of each state's overall income maintenance system by year is included in the estimation. The subject's race is controlled for by means of a dummy variable (1 for black, otherwise 0). Because completing high school is a time-intensive activity, additional years beyond the subject's 18th birthday are included. The prospect of outside nonwelfare support is controlled for by including unearned, nonwelfare income. That form of income most likely represents gifts from parents, child-support, or scholarships. The employment conditions are represented by the state unemployment rate and state per capita income. Table 2 provides definitions for the variables. The resulting model of high school graduation is:

$$(2) \quad \text{Grad} = \beta_0 + \beta_1 W + \beta_2 \text{TY} + \beta_3 \text{TV} + \beta_4 R + \beta_5 \text{Maj} \\ + \beta_6 \text{UY} + \beta_7 U + \beta_8 \text{PCI} + v,$$

where v is a mean zero random error term. Table 3 presents the maximum likelihood estimates of the coefficients for the high school graduation model determined by the probit procedure.

TABLE 2
VARIABLE DEFINITIONS

Variable	Definition
W	Effective welfare guarantee level by state, year, and family size in constant 1990 \$1,000s per year.
TY	Effective welfare tax rate on earned income by state and year.
TV	Effective welfare tax rate on unearned income by state and year.
Maj	Years of majority = Age-18.
R	Race dummy variable = 1 if black, 0 otherwise.
UY	Unearned nonwelfare income in constant 1990 \$1,000s per year.
U	State unemployment rate by year.
PCI	State per capita income by year in constant 1990 \$1,000s per year.

TABLE 3
MAXIMUM LIKELIHOOD ESTIMATES FOR HIGH SCHOOL GRADUATION MODEL: PROBIT ANALYSIS OF SINGLE FEMALE HOUSEHOLD HEADS

Variable	Coefficient	Std. Err.	<i>t</i> -statistic	<i>p</i> > <i>t</i>	Marg. Prob.
W	-.05158	.00838	-6.157	0.000	-.0337
TY	.00093	.00114	.821	0.412	.0006
TV	.00253	.00090	2.805	0.005	.0017
Maj	.13426	.00738	18.182	0.000	.0877
R	.19194	.03527	5.443	0.000	.1254
UY	.03058	.00322	10.895	0.000	.0032
U	.00893	.00833	1.072	0.284	.0006
PCI	-.01899	.00725	-2.621	0.009	-.0124
Constant	.08934	.14274	10.895	0.000	—

NOTE: Number of observations: 6,111; dependent variable: high school graduation (1 if graduate, 0 otherwise); log of likelihood function: initial -4,181, at convergence -3,923; overall significance of model: $\chi^2(12) = 1,459$. See Table 2 for variable definitions.

SOURCE: U.S. Bureau of the Census (1980-91).

Estimation Results

The marginal probabilities are provided as well as the coefficients from the estimation. The marginal probabilities indicate the magnitude of the change in the high school graduation rate from a one unit change in the independent variable. Since these effects are nonlinear, extrapolation beyond one unit quickly becomes suspect. The income maintenance system's guarantee level does, in fact, have a statistically significant negative impact on high school graduation rates, as predicted by economic theory. A \$1,000 increase in the guarantee level would decrease the high school graduation rates of low income, single mothers by about 3 percent. That represents a large increase in welfare and a small but nontrivial decline in graduation rates. The implicit welfare tax rates have a trivial or statistically insignificant impact on graduation rates. The impact on graduation rates from the tax rate on earned income is statistically insignificant. The effect from unearned income tax rates is statistically significant, but trivial in magnitude. A 10 percentage point increase in the unearned income tax rate would increase high school graduation rates by less than two-tenths of 1 percent. Samuel Rea (1977) indicated that the effect from tax rates is ambiguous.⁴ Estimation demonstrates that as a substantive matter it is zero.

⁴The effect of implicit welfare taxes is ambiguous due to opposing substitution and income effects (Rea 1977: 612).

The age factor is statistically significant and demonstrates that for this demographic group additional time beyond the normal 18 years is needed to complete high school. In this low-income sample, blacks averaged over one-third year more education than similarly situated nonblacks. Estimation indicates that blacks have a 12 percent higher high school graduation rate than similarly situated low-income non-black single mothers. Note that the effects of unearned income were quite significant even if small. The unemployment rate was statistically insignificant. State per capita income had a trivial effect. Both the estimated effects from unearned income and state per capita income were of the opposite sign from theoretical expectation. Increases in unearned income reduce the incentive to complete high school. Since this is a low-income sample, increases in unearned income may indicate higher levels of child support, which may correlate positively with continued education (i.e., the absent father may be more likely to make child support payments where the child remains in school). Higher per capita state income should increase the level of education since education would have a greater return in a more developed economy. Of course, both these counterintuitive effects are very small.

Conclusion

The theoretical predictions of economic theory are confirmed by the analysis. Increases in the welfare system do not promote accumulation of human capital. The findings of the negative income tax experiments that increases in welfare promote education would appear to be a result of short-term strategic behavior as predicted by standard economic theory. The impact on educational levels is fairly small and may be able to be counteracted with appropriate programs and incentive structures such as scholarships, time limitations, and other subsidies. However, the basic negative relationship between welfare and education must be understood before effective public policies concerning welfare, education, and poverty can be formulated. Although these findings contrast with much of the empirical literature, the very large sample, the nonexperimental nature of the sample, the comprehensiveness of the measure of welfare, the high degree of statistical significance, and the conformity with standard economic theory lend substantial credence to the results.

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