

'Second-chance' strategies for women who drop out of school

Young female dropouts may make several kinds of educational investments, all of which enhance earned income markedly; for the average woman, however, the increase in earnings is not enough to lift a family out of poverty

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In an economy that increasingly values skills, can a young woman without a high school diploma get a second chance? This article investigates four educational opportunities pursued by young women who drop out of high school. It begins with a discussion of the mechanisms through which these educational investments may affect earnings, and a brief review of relevant research. The article then documents the ways in which women who engage in educational activities differ from those who do not. Discussed next is the analytic strategy employed for distinguishing the effects of education and training on earnings from the effects of different preexisting characteristics on earnings. The article concludes with a presentation of the results of the study and a discussion of their significance.

Background

Four educational opportunities available to women without traditional high school diplomas. The most common educational activity pursued by women in the sample used in this study is obtaining the General Educational Development (GED) credential. The GED is awarded to those who receive passing scores on a battery of tests of writing, social studies, science, reading, and

mathematics. For individuals who dropped out of school with relatively strong academic skills, passing this test may be a matter of minimal preparation and one sitting of the 7½-hour battery of exams. For others, passing the test is a goal achieved only after months or years of remedial work and GED preparation classes. Although the data that follow do not permit one to know how many hours individuals prepare for the exam, for the purposes of this article, obtaining a GED will be referred to as an “educational activity.”

The second educational activity pursued by women in the sample may be termed “off-the-job training.” It includes training offered by proprietary institutions (such as beauty schools and secretarial schools) and those programs provided by government agencies (such as the Job Corps, the Youth Conservation Corps, and programs funded under the Job Training Partnership Act).¹ The third type of activity is “on-the-job training,” defined as training provided by an individual’s employer. This category includes formal company training programs run by the employer, seminars or training programs at work conducted by someone other than the employer, and training programs outside of work that were sponsored by the employer.² The final educational alternative examined is college, which includes community

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college and, of limited relevance to the sample studied in this article, 4-year college.

Theories of how education could affect earnings. In theory, there are several ways in which participation in an educational activity could increase a woman's earned income. Human capital theory posits that a worker who increases her mastery of academic or technical skills needed in the workplace will raise her marginal productivity, thereby allowing her to command a higher wage.³ For a woman who improves her reading and mathematics skills while preparing for the GED exams, or for an individual in a health care training program who gains substantive knowledge required in her field, human capital theory predicts that, other things being equal, she will earn higher wages after the certification or program than before.

An alternative theory is that education and credentialing programs offer individuals a chance to "signal" to employers that they possess desirable attributes.⁴ For a dropout who has relatively strong reading and mathematics skills, obtaining the GED is one way to distinguish herself from other dropouts with lower academic skills. The GED might signal more than just academic skills: an employer may favor a GED holder in part because the dropout, in obtaining the credential, has signaled that she has "gotten her life together."

Finally, education could lead to improved labor market outcomes by raising a woman's expectations about what she can do and where she can do it. Even if a woman learns no new skills and earns no credentials valued by employers, participating in an educational program could bolster her confidence and expand her networking opportunities. For a woman who has lived with the "shame" of dropping out of school, participating in a training program or obtaining a GED could increase her self-esteem, leading to delayed childbirth and increased commitment to the labor market. For example, a woman who enrolls in secretarial school may make contacts with teachers and fellow students that might lead to employment opportunities she would not otherwise have considered.

Recent literature. In the wake of an influential paper by S. V. Cameron and J. J. Heckman which found that *male* GED holders were by no means the "equivalents" of traditional high school graduates,⁵ several researchers have used national data sets to investigate the impact of GED certification on women's labor market outcomes. For example, employing data from the National Longitudinal Survey of Youth (NLSY), Cameron investigated cross sections of women observed at ages 25, 28, and 30.⁶ He attributed about half of any differences he found in the wages of GED holders and dropouts to the fact that GED holders get more college and training than other dropouts; the rest he credited to the relatively stronger academic backgrounds of GED holders.⁷ In a more recent paper, J. J. Heckman, J. Hsueh, and Y. Rubinstein used NLSY data to show that the

hourly wages of white women who obtain a GED do not differ significantly from those of other female dropouts with the same observable characteristics.⁸ The paper did not investigate the impact of GED certification on hours worked or annual earnings.

In their cross-sectional analyses of the NLSY Mother and Children File and the Washington State Family Income Study, J. Cao, E. Stromsdorfer, and G. Weeks echoed Cameron's finding that all differences between average hourly wage rates of GED holders and other dropouts can be explained by GED holders having higher test scores and more years of formal education.⁹ In contrast, using earnings data from the 1990 and 1991 High School and Beyond surveys, R. J. Murnane, J. B. Willett, and J. H. Tyler presented evidence that the impact of the GED on the earnings of women depends on their skill levels as 10th graders.¹⁰ They found substantial impacts of GED certification on the annual earnings of women who left high school with relatively weak academic skills, but no impact of GED certification on the earnings of women who left school with stronger academic skills. Then, using a unique data set that merges Social Security income with GED test scores, these same authors found that the acquisition of a GED is associated with 10- to 19-percent increases in earnings for white female dropouts whose skills put them on the margin of passing the 1990 GED exams.¹¹

Researchers who have studied the earnings impacts of social programs designed to increase GED certification have tended to find even stronger results.¹² J. M. Bos, for example, found that women who participated in an experimental program for school dropouts experienced monthly earnings gains of between 33 percent and 43 percent as a result of obtaining the GED.¹³ D. Friedlander, P. K. Robins, and Bos reported impacts of a similar magnitude in their analysis of California's Greater Avenues to Independence (GAIN) program.¹⁴

Several studies report that on-the-job training, off-the-job training, and college improve labor market outcomes.¹⁵ However, there appears to be a paucity of articles that examine the impact of these types of investments on labor market outcomes for female dropouts in particular.

This article contributes in two ways to the literature on the impact of education and training investments on the earnings of women who left high school without a diploma. First, the analysis takes advantage of longitudinal data to model the shape of the annual earnings profile over a period of more than 10 years after the women dropped out. This approach gives a more complete picture of how young women's earnings change in the years after dropping out than is possible in studies that examine the earnings of a particular year or earnings over a shorter period. Second, the analysis explicitly models the impact of the acquisition of a GED, off-the-job training, on-the-job training, and college on annual earnings. This strategy allows one to assess the extent to which the impact

Table 1. Sample means in the full sample and in selected subgroups

Category	All dropouts	Women who dropped out of school and then—				
		Got no further education	Got a GED credential	Got any off-the-job training	Got any on-the-job training	Completed a year or more of college
Number	689	246	283	267	111	63
Percent of all dropouts ¹	100	36	41	39	16	9
Race or ethnicity:						
Black .....	.22	.22	.20	.28	.15	.16
Hispanic .....	.23	.23	.21	.26	.23	.27
Non-Hispanic white .....	.54	.55	.59	.46	.62	.57
Family background and skills:						
Mother's highest grade completed	9.35 (3.04)	8.64 (3.09)	10.04 (2.93)	9.39 (2.95)	10.30 (2.80)	10.14 (3.31)
Highest grade completed upon dropping out	9.13 (1.38)	8.81 (1.48)	9.34 (1.20)	9.23 (1.32)	9.23 (1.24)	9.33 (1.28)
Armed Forces Qualifications Test score	19.54 (17.37)	14.19 (14.17)	26.78 (18.55)	19.83 (18.47)	25.66 (19.43)	32.48 (19.74)
Family status:						
Ever married .....	.73	.72	.76	.67	.81	.79
Ever had children .....	.90	.90	.89	.91	.87	.92
Ever a teen parent .....	.54	.61	.51	.50	.46	.44
Labor market outcomes:						
Annual earnings, 1990 dollars (including zero earnings)	\$4,725.33 (4,681.80)	\$3,609.11 (4,223.65)	\$5,838.16 (5,045.45)	\$4,617.25 (4,142.84)	\$7,824.61 (5,149.83)	\$7,914.54 (6,672.66)
Probability of employment .....	.65	.57	.72	.66	.83	.78

¹ The percentages shown at the top of the last five columns do not sum to 100 percent because one-third of the sample participated in more than one type of educational activity.

NOTE: Standard deviations are shown in parentheses for continuous variables.

of attaining a GED on earnings comes through the mechanism of improving access to other education and training opportunities. The strategy also provides a relatively comprehensive treatment of the range of educational opportunities available to young women “in search of a second chance.”

Research design

The sample. The data to be presented are drawn from the NLSY, a national survey of 12,686 young women and men sponsored by the Bureau of Labor Statistics. In 1979, the first year of data collection, information about a wide range of topics, including education, employment, and family status was collected for individuals ranging from 14 to 21 years of age. Extensive follow-up data were collected in each subsequent year. The sample used in this article consists of 689 women who dropped out of school before obtaining a high school diploma. The women are drawn from the random cross-sectional sample and supplemental oversamples of black, Hispanic, and economically disadvantaged white youths.¹⁶ The goal of the analysis is to determine the impacts of various educational activities on the annual earnings of these women. To ensure that there is full information about each woman’s employment history, the sample is limited to women who were aged 14 to 17 in the first year of the survey. The analysis uses data from the year after dropout through the 1994 survey. This gives a maxi-

imum of 16 years of information on each woman, although because many did not drop out until after 1979 and not all women were surveyed in all years, the average number of years of data per woman is approximately 12. (The appendix gives definitions of the variables used in the analysis.)

Who pursues education? The first column of table 1 presents descriptive information on the full sample of women who dropped out before completing high school. Twenty-two percent of the women were black, 23 percent Hispanic, and 54 percent non-Hispanic white. The typical woman in the sample dropped out of school after having completed ninth grade and has a mother who completed only slightly more education than herself. On average, the women in the sample scored 19.54 on the Armed Forces Qualifications Test (AFQT), a general measure of aptitude and trainability.¹⁷ This score is roughly half of the mean AFQT score of women in the NLSY who have traditional high school diplomas. Approximately three-quarters of the women in the sample were married at some point during the survey, and 90 percent had at least one child. Fifty-four percent of the sample became parents as teenagers. Finally, the average annual earnings for all women in all years (including zero earnings for years in which women have no earnings) is \$4,725 (in 1990 dollars), and the probability of a woman reporting earnings in any particular year is 65 percent.

Women participate in various human-capital-enhancing

educational activities in different proportions, with the GED being the most common step taken. The second row of the table shows that only 36 percent of the women in the sample chose not to pursue some sort of further education. Forty-one percent obtained a GED during the period the sample was studied, 39 percent obtained off-the-job training, 16 percent obtained on-the-job training, and 9 percent completed a year or more of college.¹⁸ (The percentages do not sum to 100, because approximately one-third of the sample participated in more than one type of educational activity.)

How do women who pursue these educational activities differ from women who do not? Women who obtain a GED, get on-the-job training, or attend college are more similar to each other than to women who get off-the-job training or no training at all. Women who participate in at least one of those three activities are more likely to be white, to have completed more school before dropping out, to have mothers who are more educated, and to have higher AFQT scores than other women. Women who participate are also more likely to marry and less likely to be teen parents than women who do not pursue further education. Finally, over all years of participation in the labor force, the women who obtain GED certification, participate in on-the-job training, or attend college have higher average annual earnings and a greater probability of employment. Among participants in the three activities, the women who go on to college start off with the highest skills and end up with the highest average annual earnings.

Women who participate in off-the-job training are also different from women who do not get further education, but along other dimensions. For one thing, off-the-job-training participants are more likely to be black. For another, although off-the-job training attracts women with somewhat stronger test scores than women who do not pursue education, the skills gap is much smaller than that observed with the other educational activities. Even when test scores for just black women with off-the-job training are compared with scores of black women with no further education, the small advantage the former have is not statistically significant. Off-the-job-training participants are less likely to have ever been married and less likely to have been teen parents than nonparticipants. Finally, differences in average annual earnings and in the probability of employment between off-the-job-training participants and women without further education are much smaller than between women who participated in the other educational activities and women who did not participate in any postdropout education.

When do women receive their education? Chart 1 shows the percentages of women who participate in the various human-capital-enhancing activities at each age. The upper left panel of the chart shows that, among those who obtain the GED, most do so while still quite young: the median age at which

the sample receives the GED is 19, and the median number of years elapsed between the time the woman drops out and receipt of the GED is 3, with a small, but consistent, proportion of older dropouts obtaining the credential. The upper right panel of the chart shows that, as with the GED, women are most likely to pursue off-the-job training in the years immediately after they leave school. Unlike obtaining the GED, however, which is effectively a one-time event, participation in off-the-job training does not decline as rapidly with age. As will be shown later, this behavior may result from some women pursuing training over a period of years.

The lower left panel of the figure shows that participation in on-the-job training follows a pattern different from that of the other alternatives: chiefly, employers are more likely to provide training to older women. This finding is consistent with other research showing that youths take time to find “good” jobs.¹⁹ Finally, the lower right panel of the chart shows that college participation peaks at age 21, although several women do report attending college in their late twenties.

How much education do women get? The NLSY does not contain data on the number of hours individuals spend preparing for the GED examination or enrolling in college courses. The survey does, however, allow estimates of the number of hours of training a woman accumulates over time and also permits tracking the number of years of college a woman completes. In other work, Murnane, Willett, and Boudett have shown that obtaining the GED and continuing one’s education are by no means independent: women who obtain a GED are more likely to pursue training and college after receiving the credential than they otherwise would have been.²⁰ This makes sense, since GED certification may open doors to educational opportunities that are not available to dropouts who lack the credential. Many training and college degree programs require a high school diploma or GED certificate for admission, and the possession of a GED certificate satisfies the Federal requirement that a student demonstrate an “ability to benefit” in order to be eligible for Federal financial aid to pay for such programs. To illustrate the higher levels of participation in training among GED holders, table 2 shows the amounts of training and college received by women with and without the GED at ages 24 and 29.

The table shows that, as of age 24, 21 percent of women without a GED and 38 percent of eventual GED holders participated in off-the-job training. Five years later, both of these percentages were substantially higher, and the gap in training participation rates by GED status had shrunk somewhat. The median number of hours of training accumulated by women who did not obtain a GED during the sample period was 214 at age 24, a figure that rose to 230 at age 29. For eventual GED holders, median hours increased by 100 (from 428 to 528) between age 24 and age 29. In general, not only do

Chart 1. Ages at which women make educational investments

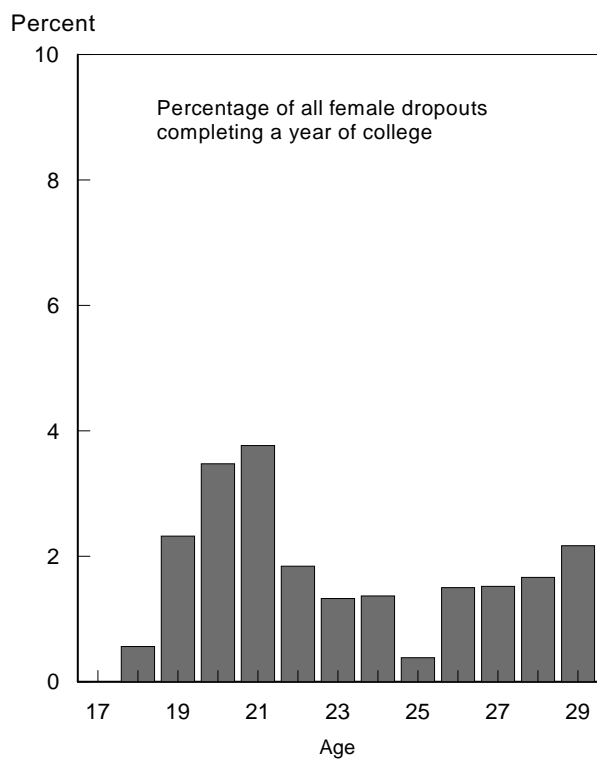
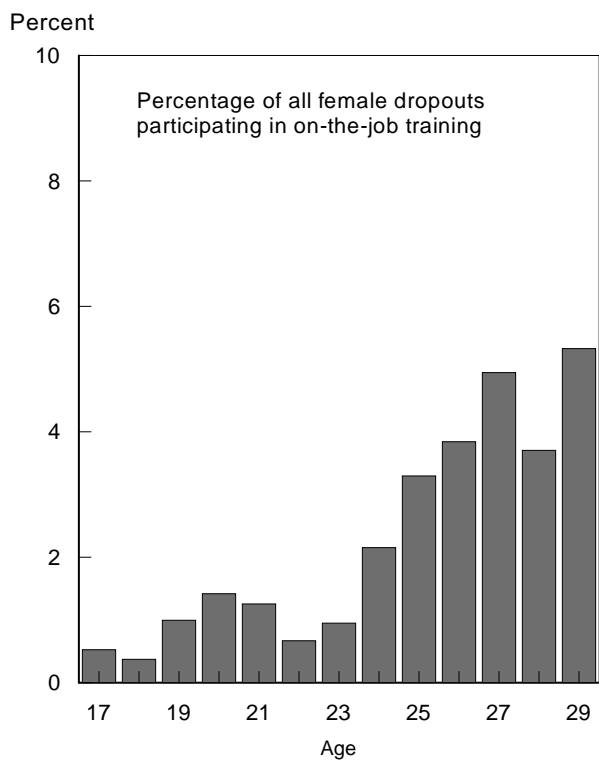
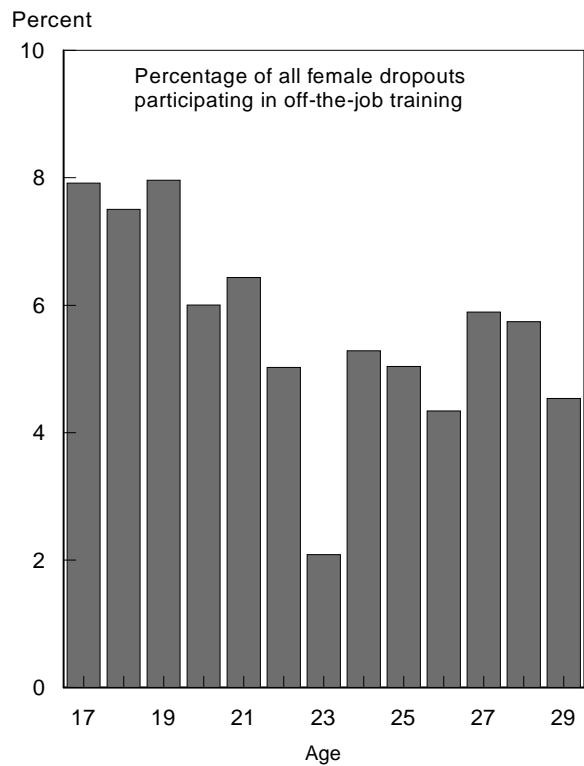
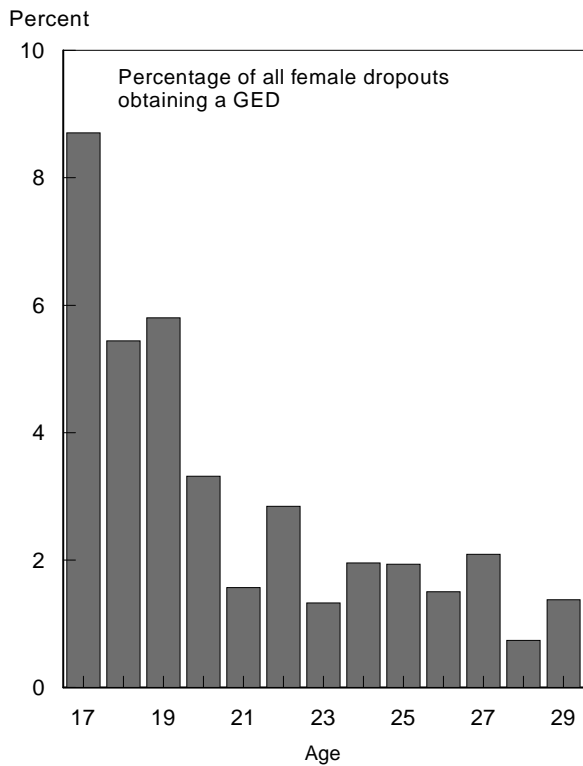


Table 2. Participation in training and attendance at college among women aged 24 and 29 and without a traditional high school diploma, by GED status

Type of activity	Women aged 24 years who—		Women aged 29 years who—	
	Lacked the GED	Received the GED	Lacked the GED	Received the GED
Number in sample	411	202	290	194
Off-the-job training:				
Percent with any training	21.17	38.12	35.52	46.39
Median hours for those with training	214.20	428.40	229.60	527.80
On-the-job training:				
Percent with any training	3.16	7.43	11.38	21.65
Median hours for those with training	86.80	138.60	37.80	77.00
College:				
Percent who completed a year or more of college, but received no degree .....	.00	11.39	.00	20.10
Percent with associate's degree .....	.00	.50	.00	3.10

NOTE: Sample sizes differ from those of table 1 because table 2 includes only people who were interviewed in their 24th or 29th year.

GED holders obtain more than twice as much off-the-job training as other dropouts, but their participation also becomes more intensive over time, a pattern not seen as strongly among women without the credential.

As with off-the-job training, GED holders are much more likely than other dropouts to obtain training provided by their employers. As shown in the lower left panel of chart 1, much of the participation occurs as women get older. Not so obvious from the figure is the shorter duration of training programs attended by older women: the median number of training hours falls as the participant moves from age 24 to age 29.²¹ For both dropouts and eventual GED holders, the amount of time women spend in employer-provided training by age 29 is less than 100 hours, only a fraction of the time women spend in training programs not financed by employers.

With regard to college, the table shows that a large fraction of the relatively small number of women who complete a year or more of college do so in their late twenties. By age 29, the percentage of GED holders who have completed some college (but have not earned a degree) is 20 percent, a percentage twice as large as that at age 24. It is important to note, however, that only 3 percent of 29-year-old GED holders actually have completed at least a 2-year degree.²²

Statistical analysis. Table 1 shows that women who pursue educational activities work more and earn more than women who do not. The table also shows that, for most of the activities examined, women who participate in further education have higher test scores and more educated parents than other female dropouts. Given these observed differences, it is reasonable to assume that women who choose to invest in their own human capital may differ from other women in unmeasured ways as well, such as in their motivation or their ability to

learn new job skills. If the modeling strategy presented in these pages does not take those preexisting differences into account, it could attribute to human-capital investments earnings differences that would have occurred in the absence of further education.

Accordingly, the analysis that follows must investigate (1) how the earnings of a woman who pursues further training or credentials differ from *what she would have earned if she had not participated in education* and (2) the extent to which any impact of a GED on earnings is attributable to increased participation in college and training among GED holders. The multiple-regression model addresses the first issue by using up to 16 years of data on each woman to model the shape of her annual-earnings trajectory over time: before, during, and after her participation in educational and training activities. In addition, to control for all measured *and unmeasured* differences that do not change among women over time, the model employs the method of fixed effects, specifying a unique intercept for each woman. The second issue is addressed by including participation in training and college as predictors in the model, allowing the direct effect of GED certification and other training activities on earnings to be partitioned out. The regression model is therefore of the form

$$\begin{aligned}
 \text{AnnualEarnings}_{it} = & B_0 + B_1 \text{YearsSinceDropout}_{it} + B_2 \text{YearsSinceDropout}_{it}^2 + \\
 & B_3 \text{Black} \times \text{YearsSinceDropout}_{it} + B_4 \text{Black} \times \text{YearsSinceDropout}_{it}^2 \\
 & + B_5 \text{YearsSinceGED}_{it} + B_6 \text{YearsSinceGED}_{it}^2 + B_7 \text{UnemploymentRate}_{it} \\
 & + B_8 \text{CurrentOffJobTraining}_{it} + B_9 \text{CumulativeOffJobTraining}_{it} + \\
 & B_{10} \text{CurrentOnJobTraining}_{it} + B_{11} \text{CumulativeOnJobTraining}_{it} + \\
 & B_{12} \text{CurrentCollege}_{it} + B_{13} \text{CumulativeCollege}_{it} + e_{it}
 \end{aligned}$$

where the subscript *i* indicates the individual and the sub-

script t indicates the time at which the observation occurred. In fitting this model, the value of the outcome in years in which a woman reported no earnings is included as zero. This enables the model to capture the fact that some of the benefit of participating in human-capital-enhancing activities may lie in moving women from nonemployment to employment, not just in increasing earnings among women who would have worked anyway. The model allows the individual earnings trajectory to be curvilinear, with a slope and curvature that may change after receipt of the GED. Parameters B_1 and B_2 describe the growth in annual earnings of a woman who lacks the GED credential; B_3 and B_4 allow the rate of growth and curvature to be different for black women.²³ Parameters B_5 and B_6 permit the acquisition of the GED to affect the growth of earnings, leading to a difference in slope and curvature after receipt of the credential.²⁴

The model equation for annual earnings also controls for the local unemployment rate in each period²⁵ and for a number of predictors describing a woman's participation in training and attendance at college. These predictors allow for training obtained in the current period to have an impact different from that of cumulative training obtained up until, but not including, the current period.²⁶ Attendance at college is measured as the number of years of college *completed*. To allow for some comparability between the impact of college and that of training, the training data, which are measured in hours, were converted to years. A year of training is defined to be equal to 1,120 hours, or 8 months of full-time (35 hours per week) training.

Results

Estimates of the impacts of education on earnings. The first fitted model in table 3 shows fixed-effects estimates of the effects of the predictors of annual earnings. The intercept estimate cited in this fitted model represents the average value of earnings when the values of all the predictors have been set to zero—that is, the predicted earnings immediately after dropping out for a white woman without any additional education or credentials and who lives in an area of average unemployment. In the year after such a woman leaves high school, she is predicted to earn \$1,369. Her earnings in subsequent years are predicted to rise (at a decreasing rate), with negligible differences in the growth rates of black and white women. The model shows a positive and statistically significant impact of the GED on earnings growth. Estimates generated by the fitted model predict that, by the 7th year after obtaining her GED (the 10th year after the typical GED holder dropped out of school), the woman receives an earnings boost of \$1,328. This earnings gain, which is statistically significant, represents a 25-percent increase over what the woman is predicted to have earned had she not obtained the credential.

It is interesting to compare this estimate of the impact of the GED *net of training and college* with the estimate derived

from the second fitted model in the table, which does not control for participation in other educational activities. In the second model, the estimated total impact of the GED on earnings is \$1,917. Comparing predicted values from the two models shows that two-thirds of the \$1,917 increase is a direct impact of the GED, while the remaining one-third comes from an indirect impact of the GED on the likelihood that a woman would attend college or participate in training, each of which, in turn, affects earnings.

In addition to affording an estimate of the direct impact of the GED, model 1 provides estimates of the impacts of college and training. The fitted model shows that, during the years in which a woman participates in off-the-job training, she earns \$2,143 less than she otherwise would have earned. During the years in which she is in college, she is predicted to forego \$773. These findings are not surprising: students have less time available for work than nonstudents have. The estimates for the cumulative effects of training and college, though, tell the more important story: for each year of off-the-job training in which she participates, a woman is predicted to earn \$1,239 more in all future years; and for each year of college she completes, the impact on her earnings is a gain of \$1,153.

A year of on-the-job training is also associated with an increase of \$3,939 in after-training earnings. It is problematic, however, to interpret this relationship as an estimate of the causal impact of on-the-job training. The reason is that the fitted model also predicts that a woman earns \$11,351 more during the year in which she participates in full-time on-the-job training than she would otherwise have earned.²⁷ A woman who participates in on-the-job training could have higher earnings as a result of that training, or her employer could have offered the training as a result of promoting her to a higher paid position. Because the decision whether to offer training is made by the employer (and not by the individual, as it typically would be in the case of deciding to attend college or to participate in off-the-job training), it is not appropriate to infer from this estimate that on-the-job training *caused* the person's earnings to rise. Therefore, employer-provided training is included in the model mostly as a control.

Model 3 adds to model 1 predictors, indicating whether each woman is married or is caring for one or more of her own children during each survey year. Both of these family choices are associated with lower annual earnings. A married woman is predicted to earn \$410 per year less than she would earn if she were unmarried; a mother is predicted to earn \$2,690 per year less than she would earn if she were childless. Including family status controls in the model dampens, but does not eliminate, the impact of most educational activities on earnings; off-the-job training is the one exception to this pattern. Apparently, 5 percent to 15 percent of the impact of the other activities stems from the fact that women who participate in educational activities make family choices that are somewhat different from those of women who do not so participate. The remainder of the article focuses on estimates derived from

Table 3. Coefficients and standard errors from fitted fixed-effects regression models predicting annual earnings in 1990 dollars¹

Statistical quantity	Model 1	Model 2	Model 3
Intercept	² 1,369.431 (165.910)	² 1,328.608 (165.263)	² 2,176.022 (176.126)
Years since dropping out	² 549.769 (63.421)	² 569.755 (63.827)	² 830.386 (65.358)
Square of years since dropping out	² -15.787 (4.246)	² -15.876 (4.276)	² -26.270 (4.236)
Black:			
Years since dropping out	2.282 (104.543)	23.969 105.655	-44.105 (104.963)
Square of years since dropping out	-7.873 (6.736)	-8.581 (6.827)	-7.400 (6.780)
Years since GED was awarded	² 339.239 (92.660)	² 441.764 (90.939)	² 299.131 (91.671)
Square of years since GED was awarded	² -21.358 (7.498)	² -23.978 (7.594)	³ -17.120 (7.432)
Unemployment rate	³ -62.355 (25.877)	³ -59.166 (25.897)	-41.873 (25.434)
Current off-the-job training	² -1,889.783 (543.778)	—	² -2,142.607 (539.391)
Current on-the-job training	² 11,730.821 (1,821.580)	—	² 11,351.146 (1,862.210)
Current college	-772.774 (591.107)	—	-840.022 (582.744)
Cumulative off-the-job training	² 1,238.733 (337.049)	—	² 1,256.055 (334.063)
Cumulative on-the-job training	² 3,938.782 (1,198.660)	—	² 3,422.426 (1,208.770)
Cumulative college	² 1,152.871 (359.011)	—	² 1,062.139 (353.139)
Married	—	—	³ -410.186 (168.370)
Parent	—	—	² -2,690.350 (194.404)
R ² .....	.517	.523	.538
Using above regression estimates:			
Predicted impact in year 7 after receiving GED	² \$1,328	² \$1,917	² \$1,255
Predicted impact as a percent of predicted earnings, no GED	25	35	16

¹ N = 689.
² p < 0.01.
³ p < 0.05.

NOTE: Standard deviations are shown in parentheses. Dash indicates predictor not included in model.

model 1, which does *not* control for family status, on the ground that it may be appropriate to attribute to educational activities earnings gains that result from more educated women making different family choices.

Table 3 illustrates the relationship between human-capital investments and earnings. However, it does not answer the question of whether increases in earnings stem from increased work effort or higher wages. It is to this question that we now turn.

Labor supply and wage impacts. Table 4 summarizes the results of multiple-regression models fitted with four different dependent variables: annual earnings, probability of employment, annual hours worked, and the natural logarithm of hourly wages. The annual-earnings estimates are derived from model 1 of table 3. (The output for the models with the other three dependent variables, which have specifications analogous to model 1, can be obtained from the first author upon request.²⁸)

Table 4 shows the predicted impact of human-capital investments on labor market outcomes 10 years after the individual has dropped out of high school, with the investment

assumed to have occurred 3 years after the person dropped out. The first column summarizes impacts on earnings; the remaining columns provide insight into how these impacts came about. For example, the second column shows that, 10 years after dropping out of high school, a woman who obtained a GED the 3rd year after she dropped out is not significantly more likely to be employed than she would have been without the credential. The third column indicates the same with respect to the woman's likelihood of working longer hours. The last column shows the source of the impact of the GED on earnings: a woman who obtains a GED is predicted to earn an hourly wage 10 years after dropping out that is 6 percent higher than she would have earned in the absence of the credential.

For off-the-job training, the story is different: earnings impacts are driven by women *working* more, not *earning* more for each hour worked. The second row of the table reveals that a woman who obtains a year of off-the-job training 3 years after dropping out of high school is 13 percent more likely to be working in the 10th year after she dropped out than she otherwise would have been. Given that she works at all, a woman is predicted to work 212 hours more per year if

she has obtained off-the-job training. The 2-percent increase in wages shown in the last column of the second row is not statistically significant.²⁹ For on-the-job training, the impact on annual earnings is associated with women both working more and earning higher hourly wages.

In the case of attending college, the effect of education on earnings is more difficult to estimate precisely, owing partly to the fact that so few women dropouts complete even a year of college. The last row of the table shows that attending college has a positive impact on a woman's probability of employment, annual hours worked, and hourly wage, but in no case is the impact statistically significant on its own.³⁰ Apparently, the impact of college on earnings is a result of the accumulation of a number of weaker effects.

Summary and implications

Summary of key findings. Chart 2 summarizes the main findings of the research presented in this article. The chart shows the predicted income profile for three women. A woman who obtains no postdropout education or training is represented by the solid line. A woman who obtains a GED 3 years after dropping out of school is represented by the bold line. Finally, the hatched line represents a woman who obtains both the GED and a year of off-the-job training 3 years after dropping out. (The impact of college is not shown in the chart, because it is so close in magnitude to that of off-the-job training; nor is the impact of on-the-job training pictured, because

of the difficulty in interpretation described earlier.)

The chart illustrates two key points. First, there *are* steps a woman without a traditional high school diploma can take to increase her earnings. Ten years after dropping out of school, obtaining a GED in the 3rd year after dropping out is associated with an earnings gain of approximately 25 percent; a GED *and* a year of off-the-job training or college boosts income by nearly 50 percent. The logical next question becomes "Do these investments justify their costs?" Table 5 shows the present value of the predicted stream of increased earnings associated with off-the-job training and college for a range of assumptions about discount rates and the number of years a woman works after obtaining further education. If a woman works for 20 years after obtaining training, then, even at a discount rate of 10 percent, the present value of the stream of her additional earnings after training is worth more than \$10,000. When we consider that the woman's forgone earnings during her year of training would amount to an estimated \$2,143, it would appear that a training program costing a student less than \$8,000 would be a decent investment *from the perspective of the student*. Whether there are positive net benefits *to society* as well would depend, of course, on the total social cost of providing the training opportunity.

The second, more sobering lesson from chart 2 is that it is important to keep the absolute size of the earnings gain in perspective. A woman who both obtains a GED and completes a year of training or college is still predicted to earn *less than \$8,000* in the 10th year after dropping out of school. Although

Table 4. Summary of predicted impacts of human-capital investments on labor market outcomes 10 years after the woman has dropped out of high school

Type of educational activity	Impact on—			
	Annual earnings (1990 dollars)	Probability of employment	Annual hours worked	Natural logarithm of hourly wage
Number in sample	689	541	662	636
GED credential:				
Total effect	¹ 1,999	.03	³ 102	² .07
Direct effect, net of training	¹ 1,328	-.01	53	³ .06
One year of off-the-job training	¹ 1,239	¹ .13	¹ 212	.02
One year of on-the-job training	¹ 3,939	³ .09	³ 221	² .13
One year of college	¹ 1,153	.04	27	.02

¹ $p < 0.01$.

² $p < 0.05$.

³ $p < 0.10$.

NOTE: The numbers in this table show the predicted change in each dependent variable associated with four educational activities. Labor market impacts are calculated 10 years after the individual has dropped out, and the educational activity is assumed to have occurred 3 years after the person dropped out (the median number of years elapsed between dropping out and the attainment of the GED for this sample). All estimates are derived from the fixed-effects specification given in the model equation in the text. For annual

earnings, the output of the regression is reported in table 3; the output for the other dependent variables is available from the first author upon request. The annual-earnings model and the probability-of-employment model were fitted with the outcome set to zero for years in which a woman did not work; the number of annual hours worked and the natural logarithm of hourly wages were estimated *excluding* observations of zero hours or wages. The sample size for the probability of employment, which was estimated with the use of a conditional logit, is smaller than the full sample of 689 women, because estimates can be identified only by using women with some variation in the employment variable.

Chart 2. Annual-earnings profiles of female dropouts

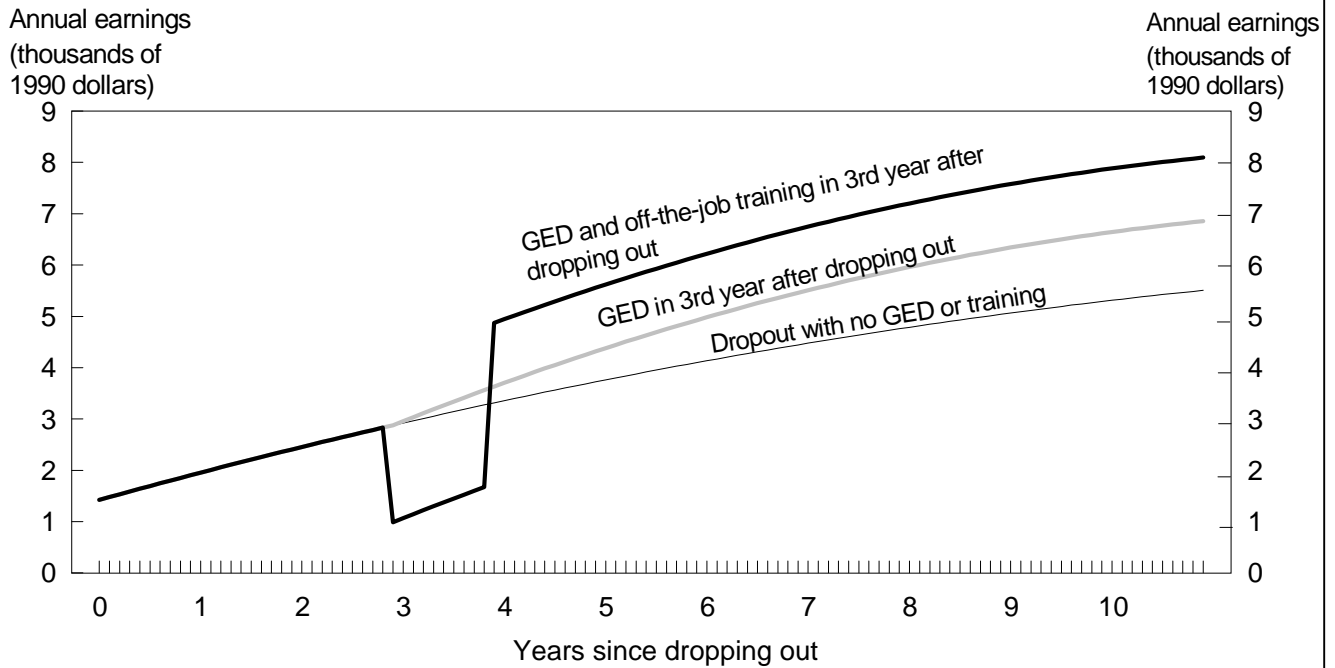


Table 5. Present discounted value of additional earnings generated by 1 year of off-the-job training or college

Educational investment	Predicted opportunity cost to student	Total cost of program to student and society	Benefit to student for following number of years after training:				
			1	5	10	20	30
Off-the-job training							
Discount rate (percent):							
10	\$2,143	varies	\$1,256	\$4,761	\$7,718	\$10,693	\$11,840
5	2,143	varies	1,256	5,438	9,698	15,653	19,308
3	2,143	varies	1,256	5,752	10,714	18,686	24,618
College							
Discount rate (percent):							
10	773	varies	1,153	4,371	7,085	9,816	10,869
5	773	varies	1,153	4,992	8,903	14,369	17,724
3	773	varies	1,153	5,280	9,835	17,154	22,599

NOTE: This table uses estimates of current costs and of annual benefits of training and college given in model 1 of table 3. To determine whether education has a *net* present value, one should compare the total cost (including the predicted opportunity cost to the student and the cost of the

program to the student and society) with the predicted benefits for a particular combination of assumptions about the discount rate and the number of years that a woman will work.

this amount may be impressive compared with that earned by a woman who does not pursue further education, it is still only 87 percent of the poverty line for a family of two in 1994.³¹ By the 10th year after dropping out, most women are parents, but less than half are still married. For the average woman, then, obtaining a GED, with or without further education, does not bring economic independence.

Implications for research. This article has shown that the impact of a GED on a woman's earnings, while initially modest, grows over time. It is therefore important that researchers evaluating the effectiveness of GED programs allow several

years to measure the impact of those programs. For example, as currently written, guidelines for assessing the impact of adult education programs in response to the Workforce Investment Act of 1998 suggest measuring employment outcomes within 1 year of completion of an adult education program.³² By contrast, the analysis presented herein suggests that a longer time horizon may be needed to capture meaningful impacts. In any case, that same analysis affords a message to young dropouts, namely, that many women who obtain a GED—but especially those who use the credential as a stepping-stone to training or college—have opened the door to a second chance at economic opportunity. □

Notes

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¹ Types of training are summarized in this way because inconsistencies in the collection of data make it difficult to distinguish reliably between the various types of training in all survey years. For example, funding for the National Longitudinal Survey of Youth (NLSY) shifted in 1987 from the Employment and Training Administration to the Bureau of Labor Statistics, resulting in a decreased emphasis on distinguishing between government and other types of training. (See *NLSY User's Guide* (Columbus, OH, Ohio State University, Center for Human Resource Research, 1995), chapters 1.14, 1.35.)

² The learning of skills on the job as part of the experience of working, but not as part of a formal training program, is not deemed on-the-job training.

³ G. S. Becker, *Human Capital: A Theoretical and Empirical Analysis with Special Reference to Education* (New York: National Bureau of Economic Research, 1964).

⁴ M. Spence, "Job Market Signaling," *Quarterly Journal of Economics*, August 1973, pp. 355–74.

⁵ S. V. Cameron and J. J. Heckman, "The Nonequivalence of High School Equivalents," *Journal of Labor Economics*, vol. 11, no. 1, pp. 1–47.

⁶ S. V. Cameron, "Assessing High School Certification for Women Who Drop Out," paper presented at the annual meeting of the American Economics Association, Washington, DC, January 1995.

⁷ Cameron also conducted a longitudinal analysis in which he included dummy variables indicating whether a particular wage observation pertained to an individual's pre-GED or post-GED period. When he averaged the wages earned during all periods before the individual obtained a GED and compared the figure with the average wages earned during all periods after the student received the GED, Cameron found that the difference was not statistically different from zero. However, when he broke down the pre- and post-GED periods more finely, Cameron found that the longer the interval after GED receipt, the larger was the wage gap. In fact, the difference between wages observed 5 or more years after attainment of the GED and wages observed before attainment of the GED was nearly 6 percent, a finding that is consistent with the estimates of the impact of the GED on wages 5 years after certification presented later in the article. Cameron found that he could not reject the hypothesis that, as a group, the coefficients on the post-GED attainment periods were different from those on the pre-GED attainment periods. This finding is consistent with the hypothesis that it takes several years for GED certification to affect wages.

⁸ J. J. Heckman, J. Hsueh, and Y. Rubinstein, "The GED is a 'Mixed Signal': The Effect of Cognitive and Non-cognitive Skills on Human Capital and Labor Market Outcomes," paper presented at the National Bureau of Economic Research Summer Labor Economics Workshop, Cambridge, MA, July 2000.

⁹ J. Cao, E. Stromsdorfer, and G. Weeks, "The Human Capital Effect of General Education Development Certificates on Low Income Women," *Journal of Human Resources*, vol. 31, no. 1, 1996, pp. 206–28.

¹⁰ R. J. Murnane, J. B. Willett, and J. H. Tyler, "Who Benefits from Obtaining a GED? Evidence from High School and Beyond," *Review of Economics and Statistics*, February 2000, pp. 23–37.

¹¹ J. H. Tyler, R. J. Murnane, and J. B. Willett, "Estimating the Labor Market Signaling Value of the GED," *Quarterly Journal of Economics*, May 2000, pp. 431–68.

¹² For two reasons, analyses of formal adult education programs might be more likely than analyses of national data sets to find a positive impact of the attainment of a GED on earnings. First, in preparing students to take the exam, formal programs may actually help participants improve their human capital; national surveys include GED holders who took the exam with little preparation. Second, evaluations of programs tend to model the impact of GED certification on labor market outcomes as occurring over time, with a period of years

allowed for follow-up. This is not the case in some studies based on national data sets.

¹³ J. M. Bos, *The Labor Market Value of Remedial Education: Evidence from Time Series Data on an Experimental Program for School Dropouts*, Ph.D. dissertation, New York University, 1995.

¹⁴ D. Friedlander, P. K. Robins, and J. M. Bos, *The Labor Market Value of GED Attainment and Higher TALS Scores for AFDC Recipients in GAIN*, research paper supported by the U.S. Department of Education, New York, Manpower Demonstration Research Corporation, 1995.

¹⁵ See R. B. Freeman, "Occupational Training in Proprietary Schools and in Technical Institutes," *Review of Economics and Statistics*, August 1974, pp. 310–18; T. J. Kane and C. E. Rouse, "Labor Market Returns to Two- and Four-Year College," *American Economic Review*, June 1995, pp. 600–14; and L. M. Lynch, "Private-Sector Training and the Income of Young Workers," *American Economic Review*, March 1992, pp. 299–312.

¹⁶ Data in this analysis are not weighted, because weights generated for use on the full sample of 12,686 respondents would not necessarily be applicable to the selected sample of 689 female dropouts.

¹⁷ In 1980, 94 percent of the original 1979 NLSY sample took the Armed Services Vocational Aptitude Battery (ASVAB), a series of multiple-choice tests. A composite score derived from four subsections of the test is used to construct the AFQT score. The scores used in this article are based on the 1989 calculation of the composite ASVAB score. (See *NLSY User's Guide*, p. 52.) All scores are corrected for age on the basis of the full NLSY sample.

¹⁸ We thank Nachum Sicherman and Ann Bartel for sharing their code for calculating training in the NLSY. Training and college data are collected differently: training questions allow for a calculation of the number of hours of training obtained, whereas college questions tend to focus on the distinction between number of years of education attended versus number of years completed.

¹⁹ See, for example, R. J. Murnane, J. B. Willett, and F. Levy, "The Growing Importance of Skills in Wage Determination," *Review of Economics and Statistics*, May 1995, pp. 251–66.

²⁰ R. J. Murnane, J. B. Willett, and K. P. Boudett, "Does Acquisition of a GED Lead to More Training, Post-Secondary Education and Military Service for School Dropouts?" *Industrial and Labor Relations Review*, October 1997, pp. 100–16.

²¹ Only after 1987, however, did NLSY surveys begin asking respondents about training programs of less than 1 month's duration. This may explain the pattern of shorter training spells for older women.

²² One of the criteria used in this article to accurately identify dropouts in the NLSY is that the individual not have attended college. Among the very small number of individuals who did not have a GED, but who did report having attended college, most appeared to be traditional high school graduates who had missing data on the question about whether they had a high school diploma or a GED credential. Because most colleges require a high school diploma or a GED certificate for admission, the restriction was imposed that women who reported college have one of these credentials.

²³ Hypothesis tests indicated that interactions allowing the earnings growth trajectory to be different for Hispanic women were not needed in any of the models used.

²⁴ Many alternative specifications for the effect of attaining a GED on earnings were explored; the model presented here was found to be the best. There was no evidence either of a temporary dip in earnings immediately preceding the acquisition of the GED (a possibility discussed in O. Ashenfelter, "Estimating the Effect of Training Programs on Income," *Review of Economics and Statistics*, February 1978, pp. 47–57) or of a difference in the impact of the GED on the earnings of women

with different initial AFQT scores. The possibility that women with different skill levels would be affected differentially by their acquisition of a GED was explored; no statistically significant pattern was found. This result differs from that obtained with a similar model applied to men: wages of men whose initial skill levels were weakest were affected the most by their acquisition of the GED. (See Murnane, Willett, and Boudett, "Do Male Dropouts Benefit from Obtaining a GED, Postsecondary Education, and Training?" *Evaluation Review*, October 1999, pp. 475–502.) The result is also different from what Tyler, Murnane, and Willett ("Labor Market Signaling Value of the GED") found regarding women in the High School and Beyond database.

In addition, all of the models examined were refitted with a random-effects specification. The fixed-effects specifications tended to produce larger impacts from GED and training, but smaller impacts from college, than the random-effects specifications generated. The fixed-effects results are emphasized because a Hausman test indicated that the random-effects specification is not justified. Results from these alternative specifications are available from the first author upon request.

²⁵ To make interpreting the regression table and figures easier, the unemployment rate is centered so that it is equal to the actual rate minus 7.78, the average local unemployment rate in the sample.

²⁶ Participating in training and attending college are modeled differently from obtaining a GED. Because obtaining a GED is a one-time event, it is possible to model earnings after receipt of the GED as a smooth quadratic function. By contrast, participating in training and attending college can occur in multiple bursts of unequal length and duration, making a quadratic function inappropriate for those predictors.

²⁷ Very few women, however, report completing a full year of on-the-job training during any given year. Among women with positive values for CurrentOnJobTraining, the median number of hours of training received was 3 percent of a year (34 hours). This figure corresponds to an earnings boost of $\$11,731 \times 0.03 = \352 during the year of training.

²⁸ Notice that the sample sizes differ for each dependent variable. The annual-earnings analysis is based on the full sample of 689 women and includes years in which a woman reported zero earnings. The probability-of-employment analysis, which is estimated by using a conditional logit function (following G. Chamberlain, "Analysis of Covariance with Qualitative Data," *Review of Economic Studies*, January 1980, pp. 225–38), is based on a subsample of the full sample of 689 women for technical reasons. (The conditional logit analysis removes person-specific heterogeneity by conditioning on the number of times that the dependent variable equals unity for each individual. Because the model is identified only for individuals with variation in the dependent variable, to estimate the probability of employment using a fixed-effects strategy, 148 women (21 percent of the sample) who worked in none or all of the observed periods must be dropped from the sample.) Finally, the annual-hours-worked and "log"-hourly-wage analyses include only observations whose outcomes are nonzero; women who report zero values of the outcome in all periods are dropped from the sample.

²⁹ Using data only through the 1983 NLSY survey, Lynch was able to isolate off-the-job training programs that were not provided by a government agency. Lynch's analysis found that training in such programs was associated with higher hourly wages for individuals without high school diplomas. During the early 1990s, the Federal Government closed approximately 1,000 proprietary schools that had made fraudulent use of student financial aid programs. It is possible that the economic payoff to students of the remaining 3,000 or so proprietary schools is higher than the estimate presented in the current article, which is based on data from the 1980s. (See Lynch, "Private-Sector Training.")

³⁰ One reason the estimate presented here of the impact of a year of college on wages is not as large as that of other researchers (see, for example, Kane and Rouse, "Labor Market Returns," who found the impact of attending college on wages to be 5 percent) could be that the

sample studied was a particularly disadvantaged group of women who may not have had access to the highest-quality college programs.

³¹ *Statistical Abstract of the United States* (U.S. Bureau of the Census, 1999), table 762 (using a 1990 threshold, because all earnings men-

tioned in this article are reported in constant 1990 dollars).

³² See *Measures and Methods for the National Reporting System for Adult Education: Implementation Guidelines* (U.S. Department of Education, June 2000).

APPENDIX: Definitions of variables used in the analysis

<i>Variable</i>	<i>Definition</i>
AnnualEarnings	The product of AnnualHoursWorked and HourlyWage. If either hours or wages are missing, AnnualIncome is set to zero. Income greater than \$50,000 is set to Missing.
Employed	Equals 1 if woman worked for pay during survey year, 0 otherwise.
AnnualHoursWorked	Number of hours worked in previous year. If survey period covers more or less than 1 year, data are prorated. Top coded at 3,000.
LogHourlyWage	Natural logarithm of the hourly rate of pay at the respondent's current or most recent job. Wages less than 2 or greater than 75 dollars per hour are set to Missing.
YearsSinceDropout	Number of years that have elapsed between year of dropout and time of survey.
YearsSinceGED	Number of years that have elapsed between year of GED and time of survey.
UnemploymentRate	Local unemployment rate for year of survey, transformed so that the average rate for the sample (7.78%) is centered on zero. Missing values are set to the average rate.
Black	Equals 1 if woman is black, 0 otherwise.
Hispanic	Equals 1 if woman is Hispanic, 0 otherwise.
GradeAtDropout	Highest grade of school completed before dropping out.
Mother'sEducation	Number of years of education completed by dropout's mother.
AFQTScore	AFQT score, using 1989 calculation, corrected for age. When missing, this variable is imputed using subject's race and mother's education.
CurrentCollege	Equals 1 if woman is attending college this period, 0 otherwise.
CumulativeCollege	Number of years of college the woman completed up until, but not including, the current period.
CurrentOnJobTraining	Amount of on-the-job training received this period, measured in years, where 1 year equals 8 months of 140 hours of training.
CumulativeOnJobTraining	Number of years of on-the-job training received up until, but not including, current year.
CurrentOffJobTraining	Amount of off-the-job training received this period, measured in years, where 1 year equals 8 months of 140 hours of training.
CumulativeOffJobTraining	Number of years of off-the-job training received up until, but not including, current year.
Married	Equals 1 if woman is married and living with her husband in the current period, 0 otherwise.
Parent	Equals 1 if woman is caring for one or more of her own children during the current period, 0 otherwise.

APPENDIX: Definitions of variables used in the analysis

<i>Variable</i>	<i>Definition</i>
Annual Earnings	The product of Annual Hours Worked and Hourly Wage. If either hours or wages are missing, AnnualIncome is set to zero. Income greater than \$50,000 is set to Missing.
Employed	Equals 1 if woman worked for pay during survey year, 0 otherwise.
Annual Hours Worked	Number of hours worked in previous year. If survey period cover smore or less than 1 year, data is prorated. Top coded at 3,000.
Log Hourly Wage	Natural logarithm of the hourly rate of pay at the respondent's current or most recent job . Wages less than 2 or greater than 75 dollars per hour are set to Missing.
Years Since Dropout	Number of years that have elapsed between year of dropout and time of survey.
Years Since GED	Number of years that have elapsed between year of GED and time of survey.
Unemployment Rate	Local unemployment rate for year of survey, transformed so that the average rate for the sample (7.78%) is centered on zero. Missing values are set to the average rate.
Black	Equals 1 if woman is black, 0 otherwise.
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