Labor Market Impacts of the GED® Test Credential on High School Dropouts: Longitudinal Evidence from NLSY97

GED Testing Service® Research Studies, 2011-2

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Acknowledgments

The author would like to thank Sandy Baum and Stephen Reder for their efforts in the review process and insightful comments. For further information on the study, please contact the author at wsong@acenet.edu.

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Introduction

Ever since achieving a high school credential by passing the GED® test became widely institutionalized through adult education programs in the United States, outcomes for GED test credential recipients have continued to be of great interest to the adult education community and the general public. Does earning a GED test credential bring positive life changes to adults who did not complete a high school education? Does obtaining a GED test credential help the recipients find better employment opportunities and earn higher wages? Does a GED test credential serve as a stepping stone to further education? Economic impacts of the GED test credential, particularly labor market outcomes, have continued to be one of the most debated topics for labor economists and adult educators (Heckman, Humphries, & Mader, 2010; Song & Patterson, 2011).

Very few studies of GED test credential recipients have examined the impacts of the credential from a national and longitudinal perspective; even fewer have provided information on their occupational changes after obtaining a GED test credential. This study utilizes a new wave of data from the National Longitudinal Survey of Youth 1997 (NLSY97), a national longitudinal study sponsored by the U.S. Department of Labor, to examine the impacts of the GED test credential on the labor market outcomes of high school dropouts. The analyses take advantage of 12 years of data to explicitly model the impacts of the acquisition of a GED test credential on the hourly wages and work hours of youth who did not complete a high school education and to explore the immediate impact on occupational change upon obtaining a GED test credential.

Literature Review

Generally, education may affect the labor market outcomes in two ways: through human capital accumulation or sorting (Stiglitz, 2000). The former refers to the increased productivity of workers resulting from accumulation of human capital through education (Becker, 1964); the latter serves as a sorting signal (also known as "sheepskin effects")—workers use education to signal their ability, and employers use education to screen workers (Spence, 1973). Previous studies (e.g., Cameron & Heckman, 1993; Tyler, 2005) have claimed that the human capital accumulation effect of the GED® test credential is limited. Cameron and Heckman's 1993 study on the males in NLSY79 concluded that, after statistical controls, the GED test credential recipients were indistinguishable from the high school dropouts on labor market performance. The study also attributed the observed higher wages of the GED test credential recipients over high school dropouts to the fact that the GED test credential recipients had one more year of schooling before dropping out of school. Two other cross-sectional studies based on the NLSY79 data (Cameron, 1995; Cao, Stromsdorfer, & Weeks, 1996) found that the modest differences between average hourly wages of GED test credential recipients and uncredentialed high school dropouts could be explained by higher test scores and years of schooling. These studies also found few sheepskin effects derived from the GED test credential.

The findings from the above cross-sectional studies then redirected researchers to further examine the impact of the GED test credential on high school dropouts from a longitudinal perspective or within subgroups of high school dropouts. Using the NLSY79 data, Murnane, Willett, and Boudett (1999) found that, five years after receipt of a GED test credential, low-skilled male credential holders have wages six percent higher and annual earnings 10 percent higher than low-skilled uncredentialed dropouts. Boudett, Murnane, and Willett (2000) estimated that, controlling for other on-the-job or off-the-job training, by the 10th year after dropping out of high school, a female GED test credential recipient earns $1,328 or 25 percent more in annual earning than a woman without a GED test credential. Through a natural experiment design and use of unique Social Security income data, Tyler, Murnane, and Willett (2000) found that for white male and female dropouts, having a GED test credential resulted in earnings five years later that were 10 to 19 percent higher than they would have been otherwise. Based on a longitudinal dataset from Florida GED Test Administration and Unemployment Insurance, Tyler (2004) found that six years after taking the GED test, male credential recipients in Florida earned 13 to 20 percent more than those who attempted but did not pass the tests.

Furthermore, after the high school dropouts obtain their GED test credentials, will they use the credential to further their career development? Will they change to new, or probably, better paid, occupations? The effects of the education-occupation match have been well documented in many studies. According to labor economists, an “education-occupation match” is defined as when a worker’s education equals the amount of education that is generally required in their occupation (Quinn & Rubb, 2005). Workers who have more schooling than is required by their occupation are likely to believe that they have a good chance of upward occupational mobility because of their comparatively high educational level and thus could move to an occupation that requires their level of education which would increase their earnings. On the other side, individuals with less education than required by their occupations are likely to believe that they have a poor chance of upward occupational mobility due to their comparatively low educational level. For example, they might dread becoming worse off by moving into an occupation in a field they’ve been in for many years that suddenly requires more years of education than they’ve had. Therefore, having more schooling than is required to perform an occupation may increase the turnover or mobility of workers (Alba-Ramirez, 1993; Robst, 1995; Sicherman, 1991).

The literature review suggests that the economic returns for a dropout who obtained a GED test credential take time (at least five years) to accrue, and that the returns to GED test credential recipients are higher for low-skilled dropouts. In addition, theoretically, earning a GED test credential may positively benefit occupational mobility of high school dropouts. As the nation’s economy evolved substantially in the past two or three decades, using a new wave of national data to examine the labor market outcomes of GED test recipients becomes a priority. Using NLSY97 data, Song and Patterson (2011) examined the labor market performance of GED test passers compared with high school dropouts and high school graduates as of 2008. They found that GED test credential recipients take a middle position in average wages and hours worked, between uncredentialed dropouts and high school graduates. In addition, for those who obtained a credential or diploma for at least five years, GED test passers and traditional high school graduates earned the same hourly wage. This paper focuses on the longitudinal impact of earning a GED test credential for the young people who dropped out of high school early.

Further, it explores the occupational change patterns of GED test credential recipients after they earned their credential, which was not reported before. The findings will provide valuable information to the adult education or workforce development field.

Methods and Data Sources

The National Longitudinal Survey of Youth 1997 (NLSY97) collects extensive information on the respondents' labor market behavior and educational experience to help study the transition from school to work and from adolescence to adulthood. The survey sample was designed to represent U.S. residents in 1997 who were born during the years 1980 through 1984. The cohort members were aged 12 to 16 as of December 31, 1996. The original sample includes 8,984 respondents. The respondents have then been interviewed annually. By 2008, the most current data available to date, the respondents were 24 to 28 years of age.

Among the approximately 9,000 respondents, 944 reported their highest educational degree attainment was a GED® test credential; while 1,319 remained as uncredentialed high school dropouts as of 2008. The study addresses the following three research questions:

1. How did the labor market performance of the GED test credential recipients compare with that of uncredentialed high school dropouts as of 2008?
2. From a longitudinal perspective, how does obtaining a GED test credential affect a high school dropout's hourly wages and total annual hours of work?
3. What are the effects of obtaining a GED test credential on occupation? What are the patterns of occupational change for high school dropouts after they obtain a GED test credential?

To address the first question, the author conducted statistical comparisons of the labor market outcomes of GED test credential recipients and uncredentialed high school dropouts. The analysis includes comparison of mean hourly wages and total hours of work in 2008; it also includes comparison of labor force participation, job satisfaction, employer industry, size, and fringe benefits between the GED test credential recipients and uncredentialed dropouts.

All comparisons for the first research question are based on the *t* tests. Effect size statistics are then calculated for the group differences that are statistically significant ($p<0.05$). Cohen's *d* is the most commonly reported effect size measurement for practical significance of group differences. However, the general threshold suggested by Cohen (1988) for small, medium, and large effects (d=0.2, 0.5, 0.8, respectively) has been cautioned by researchers in the social sciences (Bloom, Hill, Black & Lipsey, 2008; Valentine & Cooper, 2003). Another method for characterizing effect sizes, U_3, was also proposed by Cohen (1988). This statistic describes the percentage of scores in the lower-meaned group that are exceeded by the average score in the higher-meaned group. For an effect size that is more readily interpretable, this paper reports U_3 on the mean differences. For the differences between two proportions, effect size index *h* is reported. Cohen (1988) suggested the same criteria for interpreting *h*, i.e., h=0.2 for a small effect, h=0.5 for a medium effect, and h=0.8 for a large effect.

To address the second research question, i.e., to better estimate the effect of earning a GED test credential on high school dropouts over time, this study uses longitudinal data to fit

fixed-effects regression models of wages and hours of work over time. By using the fixed-effects strategy, the author imposes time independent effects for each entity that are possibly correlated with the repressors such as acquisition of a GED test credential. This helps to eliminate a possible source of bias.

NLSY97 has collected labor market-related information on its cohort members annually, starting from Year One (1997). One set of dependent variables are the natural logarithms of hourly compensation in each year. Natural logarithms are routinely used in labor economics to fit the assumptions of regression models. Another set of dependent variables are the cohort members' total number of hours working on employee-type jobs annually. An employee-type job is defined as a situation in which the respondent has an ongoing relationship with a specific employer, which is a good indicator of how much the respondent's services are needed by employers and of how easy it is for the respondent to find employment in the labor market.

Since information on when cohort members earned a GED test credential is available, the treatment variable is a dummy variable to indicate whether the respondent has a GED test credential in each year. The control variables include age or years after dropping out, gender, ethnicity, marital status, and family conditions. Interactive variables, e.g., females who are married or living with children whose ages are under five years, are also used to better evaluate the impacts of the GED test credential on labor market outcomes. The regression models can be specified as

$$\ln W_{it} = \alpha + \beta_1 T_{it} X_{it} + \beta_2 Z_{it} + e_{it}$$
$$H_{it} = \alpha + \beta_1 T_{it} X_{it} + \beta_2 Z_{it} + e_{it}$$

where $\ln W_{it}$ represents the natural logarithm of hourly wage for individual *i* at time *t*, H_{it} represents the total hours of work for individual *i* at time *t*, T_{it} represents number of years after GED test credentialing, X_{it} represents the GED test credential status for individual *i* at time *t*, and Z_{it} represents a set of regressors such as demographics and years after dropping out.

To address the third research question, the author examined the occupational change patterns of the GED test credential recipients, compared with those of high school dropouts. The author first examined the distribution of the first and latest occupation for the uncredentialed dropouts and for the GED test credential recipients as well as the frequencies of occupational change from 1997 to 2008. To evaluate the immediate impact of GED test credentialing on occupational change, the author analyzed the occupational changes of the GED test credential recipients within three years of their credentialing and compared them with the uncredentialed dropouts. As the uncredentialed dropouts did not have the same intervention (i.e. earning a GED test credential) and the credential recipients obtained credentials in different years, the comparisons are conducted with the uncredentialed dropouts at ages around the mean age when the GED test credential recipients obtained their credential.

In addition, in order to evaluate if an occupational change is a "good" change, the author examined the change in the mean hourly wage between the previous occupation and the new occupation. If a person moves from a lower-paid occupation to a higher-paid occupation, this move is considered a positive occupational change as the worker stands a better chance of wage increase in the new occupation regardless his/her personal wage change. For this analysis, the

author cross-walked the NLSY97 occupation code to the 7-digit Standard Occupational Classification (SOC) code used by the U.S. Department of Labor to compile the average national occupation wage for each occupation.

Finally, for the second and third research questions, this paper includes only the work experiences of the respondents at and after the age of 16. All individual wages and mean national occupational wages have been adjusted for inflation and are stated in 2008 dollars.

Demographic Characteristics and Family Background

Table 1 summarizes the demographic characteristics and family background of the high school dropouts who obtained a GED® test credential by the year of 2008 (hereafter referred to as the "GED group") and those who remained as uncredentialed high school dropouts (hereafter referred to as the "UDO group"). The gender and age distribution of these two groups are comparable: 43 percent of the UDO group and 41 percent of the GED group were females; both groups were relatively evenly distributed at each age from 24 to 28 years (ranging from 17 percent to 23 percent), with a mean age of 26. The ethnicity distribution of the GED group was quite different from the distribution of the UDO group: the GED group had a higher percentage of black youth (36 percent versus 30 percent of the UDO group), and a lower percentage of Hispanic youth (20 percent versus 30 percent of the UDO group).

The schooling experiences of the GED group and the UDO group were similar. The median highest grade completed by both groups was 10th grade; their high school overall GPA was 2.3 for both, and they both left school at a mean age of 17.5 years. However, the GED group's mean AFQT percentile score[i] (31) was higher than that of the UDO group (21). For the GED group, the mean age when they obtained the GED credential was 19.4 years.

Table 2 presents the family background of the GED group and the UDO group. NLSY97 administered surveys to the respondents' parents at the first round of the survey (in 1997). Right before the NLSY97 surveys, the GED group's families on average had an annual household income of $31,648, which is higher than the $23,420 for the UDO group. The mean household net worth of the GED group ($44,029) was also much higher than that of the UDO group ($27,369).

In terms of parent education, the GED group's parents reported higher levels of education than the parents of the UDO group. More than half of the parents of the UDO group did not complete high school, as compared to only about one-third of the parents of the GED group. About 14 percent of the parents of the UDO group had some postsecondary education, while more than 22 percent of the parents of the GED group had postsecondary education experiences (26 percent for mothers).

Finally, even though the GED group might have come from families with higher socio-economic status—higher household incomes and better educated parents —they tended to come from families with the same family makeup as the UDO group. Only 27 percent of the youth from both groups lived with both biological parents at the start of the NLSY97 surveys, about

half lived with single parents (41 percent lived with biological mother only), and 14 percent lived with biological mother and her partner.

Table 1.
Demographic Characteristics of GED Test Credential Recipients and High School Dropouts

	UDO group (N=1,319)	GED Group (N=944)
Gender (Percent)		
Male	56.8	59.3
Female	43.2	40.7
Age in 2008		
24 (%)	19.6	17.4
25 (%)	21.2	20.6
26 (%)	21.8	19.5
27 (%)	20.1	23.1
28 (%)	17.3	19.5
Mean Age (years)	25.9	26.1
Race/Ethnicity (Percent)		
Black	30.1	35.6
Hispanic	29.5	19.8
Mixed Race, Non-Hispanic	0.7	1.2
Non-black/Non-Hispanic	39.7	43.4
*Highest Grade Completed**		
7th Grade and below (%)	5.2	1.4
8th Grade (%)	18.3	10.3
9th Grade (%)	23.1	21.8
10th Grade (%)	24.1	31.2
11th Grade (%)	27.3	29.8
12th Grade (%)	1.7	5.4
- Mean Highest Grade Completed	9.8	10.0
- Median Highest Grade Completed	10th Grade	10th Grade
Age When Leaving High School		
15 and younger (%)	9.7	6.0
16 (%)	20.3	19.9
17 (%)	27.7	29.5
18 (%)	22.5	27.5
19 (%)	8.6	9.3
20 and older (%)	11.2	7.9
Mean (Years)	17.5	17.5
Mean Age When Earning a GED Test Credential (Years)	NA	19.4
High School Overall GPA	2.3	2.3
AFQT Percentile Score	21	31

Note: Due to rounding procedures, some percentages may not add up to 100 percent.
* The percentages for ungraded respondents are not reported.

Table 2.
Family Background of GED Test Credential Recipients and High School Dropouts

	UDO group	GED Group
Mean Household income in 1996 (right before first year of survey)	$23,420	$31,648
Mean Household net worth in 1996	$27,369	$44,029
*Father's Highest Grade Completed**		
Up to 8th grade	22.7	11.4
9th–11th grade	28.4	23.9
12th grade	36.0	41.8
1–2 years of college	7.6	12.2
3–4 years of college	4.5	9.0
Above 4 years of college	0.7	1.7
*Mother's Highest Grade Completed**		
Up to 8th grade	19.6	8.7
9th–11th grade	33.0	25.6
12th grade	33.7	39.4
1–2 years of college	10.9	16.3
3–4 years of college	2.3	7.4
Above 4 years of college	0.5	2.7
Relationship to Household Parent Figure		
Both biological parents	27.5	27.0
Two parents, one is biological mother	13.8	13.9
Biological mother only	41.4	42.1
Other arrangements	17.2	17.0

Note: Due to rounding procedures, some percentages may not add up to 100 percent.
* The percentages for ungraded respondents are not reported.

In summary, the GED group came from families with higher household incomes and better educated parents; however, they tended to have the same family makeup as the UDO group, and their schooling experiences are similar to those of the UDO group. The UDO group and the GED group basically obtained the same years of schooling and achieved the same high school GPA. This finding is different from the NLSY79 study, where GED test credential recipients on average had obtained one more year of schooling than the dropouts (Cameron & Heckman, 1993), which may represent an underlying social, institutional, or demographic change.[ii]

Labor Market Outcomes as of 2008

This section presents simple mean-difference and univariate distributional comparisons between the GED® group and the UDO group on their labor market outcomes in the latest round of data available from NLSY97, i.e., in 2008. In addition to the most commonly reported measurements such as hourly wage, family income, and hours of work, this section also reports information on the cohort members' job satisfaction and their employer industry, size, and fringe benefits. Comparisons of these measures are descriptive and do not imply causality.

Table 3 summarizes some major labor market outcomes for the uncredentialed high school dropouts (the UDO group) and GED test credential recipients (the GED group). Respondents who were enrolled in postsecondary education programs were not included, as enrolling in further education could significantly affect a person's hours of work and income.[iii] In 2008, the mean hourly compensation on the respondent's most recent job was $12.33 for the UDO group and $14.08 for the GED group. The total work hours on employee-type jobs for the UDO group and the GED group were 1,057 and 1,183, respectively. The GED group earned higher hourly wages and worked more hours than the UDO group, and these differences are statistically and practically significant.

In terms of wage income, family income, and poverty ratio (i.e., ratio of household income to the poverty line), the GED group also performed better than the UDO group. The wage income for the UDO group and the GED group was $18,963 and $21,694, respectively. The family income of the NLSY respondents was $31,553 for the UDO group and $43,767 for the GED group.

The U_3 statistics indicates that for hourly compensation, the average of the GED group is at the 57th percentile of the hourly compensation of the UDO group, meaning the average hourly compensation of the GED group is higher than the hourly compensation of 57 percent of the UDO group. For family income, the average of the GED group is at the 62nd percentile of the family income of the UDO group, meaning the average family income of the GED group is higher than the family income of 62 percent of the UDO group.

The recent labor force participation of these two groups was also examined. NLSY97 collects information on the respondents' employment status in each week; thus it would be more informative to examine the cohort members' labor force participation over a longer period of time, such as a three-year time period. From 2006 to 2008, very few members in the UDO group and the GED group had changed their school enrollment status. Thus the labor force participation of these two groups during 2006 to 2008 was calculated based on the same school enrollment status as of 2008. The results are also summarized in Table 3. As shown in the table, the numbers of weeks being employed in the last three years were 89 and 101 for the UDO group and GED group, respectively. Both groups spent a considerable number of weeks in the last three years being unemployed or out of the labor force—60 for the UDO group and 47 weeks for the GED group, respectively.

Table 3.
Selected Labor Market Outcomes of GED Test Credential Recipients and High School Dropouts

	UDO group (N=849)	GED group (N=584)	Difference	Effect size (U_3 for mean differences)
Hourly compensation on most recent job[1]	$12.33 (8.84)	$14.08 (11.23)	$1.75**	0.570
Hourly pay on most recent job[2]	$11.44 (8.14)	$12.64 (9.13)	$1.20*	0.555
Total work hours at employee-type jobs in 2008 (N)	1,057 (1,002)	1,183 (960)	126*	0.551
Total work hours at all jobs in 2008 (N)	1,157 (1,050)	1,350 (983)	193**	0.575
Wage Income	$18,963 (14,776)	$21,694 (17,311)	$2,731*	0.568
Family Income	$31,553 (36,389)	$43,767 (45,805)	$12,214**	0.618
Ratio of household income to poverty level (in 2007)	1.64 (2.10)	2.38 (2.65)	0.74**	0.624
Labor Force Participation in the last 3 years as of 2008				
Weeks being employed (N)	89.2 (54.3)	101.2 (48.5)	12.0**	0.591
Weeks being unemployed (N)	15.1 (22.7)	13.4 (21.0)	-1.7	--
Weeks out of labor force (N)	45.2 (50.0)	34.0 (42.9)	-11.2**	0.406
Weeks in military service (N)	0.4 (6.3)	1.1 (11.7)	0.7	--
Job Satisfaction: Like the current job very much or fairly well (%)	54.2	62.9	8.7**	0.177‡

Note:
** p<0.01.
*p<0.05.
‡ This value is effect size index *h*.
Standard errors are in parentheses. Effect sizes are not calculated for statistically insignificant differences.
1. This hourly wage includes all extra compensation such as overtime, tips, bonuses, etc.
2. This hourly wage is a more traditional measure, with overtime and performance pay excluded.

Further, the NLSY97 study asks all respondents about their job satisfaction on each job they reported. On their most recent job in 2008, 63 percent of the GED group reported that they liked it very much or fairly well, which is higher than the 54 percent the UDO group reported.

Table 4 presents the industry of the most recent employers that the uncredentialed high school dropouts and GED test credential recipients worked for. The industries in the NLSY97 study were coded according to the 2002 Census industry classification system. The UDO group and the GED group did not differ much in the industries they worked in. Most of the UDO group and the GED group tended to work in one of six industries: construction; manufacturing; retail

trade; professional and related services; educational, health, and social services; or entertainment, accommodations, and food services. Entertainment, accommodations, and food services is the industry that hired the highest percentage of both the UDO group and the GED group. In terms of the size of their employers, the UDO group and the GED group are also very comparable.

Table 4.
Employer Industry of High School Dropouts and GED Test Credential Recipients

	UDO group	GED Group	Difference
Industry (Percent)	(N=667)	(N=512)	
Construction	14.5	13.1	-1.4
Manufacturing	8.3	10.9	2.6
Wholesale Trade	3.5	2.3	-1.2
Retail Trade	12.6	14.5	1.9
Transportation and Warehousing	5.7	3.9	-1.8
Finance, Insurance, and Real Estate	1.7	2.5	0.8
Professional and Related Services	12.4	12.1	-0.3
Educational, Health, and Social Services	10.5	9.8	-0.7
Entertainment, Accommodations, and Food Services	21.7	19.3	-2.4
Other Services	5.6	5.7	0.1
Employer size: Number of employees at current location	(N=443)	(N=333)	
1 to 5 (%)	18.5	13.8	-4.7
6 to 20 (%)	30.3	30.0	-0.3
21 to 50 (%)	20.8	21.9	1.1
51 to 100 (%)	8.1	12.0	3.9
101 to 200 (%)	9.0	7.5	-1.5
201 to 500 (%)	9.0	9.3	0.3
501 to 1000 (%)	1.4	3.3	1.9
1001 and above (%)	2.9	2.1	-0.8

Note: Only industries in which at least two percent of GED test credential recipients or high school dropouts worked are listed in this table, thus the columns do not add up to 100 percent.

None of the differences presented in this table are statistically significant. Effect size statistics are not calculated for statistically significant differences.

Another indicator of employment outcome is fringe benefits. Fringe benefits, such as medical insurance and retirement plans, are an important component of employment conditions. The NLSY97 survey asks if the respondents' employers provide any benefits to them on their jobs. Table 5 summarizes the information on whether the cohort members' employers provided any benefits on the job and what benefits were provided. Forty (40) percent of the UDO group reported that they did not receive any benefits from their most recent employers, while only 31 percent of the GED group reported so. The GED group's employers also provided life insurance, dental benefits, a retirement plan, tuition reimbursement, and an employee stock ownership plan more often than the employers of the UDO group. In terms of effect sizes, the differences in percentages of employers providing benefits in the above areas have a practically small effect, as all effect sizes *h* are close to 0.2 or over 0.2.

Table 5.
Employer Benefits for High School Dropouts and GED Test Credential Recipients

	UDO group	GED Group	Differ-ence	Effect Size (*h*)
Percent of employer providing any benefits	(N=491)	(N=369)		
- Provided Benefit (%)	59.7	68.6	8.9**	0.19
Percent of employers providing the following benefits:	(N=293)	(N=253)		
- Medical Insurance	76.1	77.9	1.8	--
- Life Insurance	41.3	54.2	12.9**	0.26
- Dental Benefits	59.0	72.3	13.3**	0.28
- Paid Maternity/Paternity Leave	21.5	26.9	5.4	--
- Unpaid Maternity/Paternity Leave	21.2	22.5	1.3	--
- Retirement Plan	38.6	47.0	8.4*	0.17
- Tuition Reimbursement	12.0	20.6	8.6**	0.24
- Company Provided Or Subsidized Childcare	6.8	5.9	-0.9	--
- Employee Stock Ownership Plan	13.7	22.9	9.2**	0.24

Note: ** p<0.01; *p<0.05.
Effect size statistics are not calculated for statistically significant differences.

In summary, by 2008, or at the ages of 24 to 28 years, the GED group tended to work in the same industry and for employers of comparable size as the UDO group; however, the GED group earned higher hourly wages, worked more hours, had higher wage incomes and family incomes, enjoyed higher job satisfaction, and received better fringe benefits from their employers.

Longitudinal Analysis of the GED Credential on Hourly Wages

From a longitudinal perspective, how does obtaining a GED® test credential relate to a high school dropout's hourly wages and labor supply? This section examines the relationship of GED test credential acquisition with the hourly wages and work hours of high school dropouts over time. The analysis takes advantage of longitudinal data collected from 1997 to 2008 to explicitly model how young people's wages and hours of work change after dropping out of school, particularly after later obtaining a GED test credential. As discussed earlier, the sample used in this study contains the 2,263 NLSY97 respondents who did not have a traditional high school diploma or postsecondary education degree by 2008. About 90 percent of this group dropped out of high school before 2003. By 2008, 944 respondents received GED test credentials, with 85 percent earning the credential before 2005. Therefore, the longitudinal data allows enough years to have elapsed after dropping out and enough years after GED test credentialing to assess the impact of the credential on the wages and work hours of a dropout. A longitudinal analysis gives a more complete picture of how young people's wages change in the years after dropping out than cross-sectional analyses.

For hourly wage, the NLSY97 respondent's hourly compensation on his or her most recent job at each round of annual survey is used. The outliers that were outside the 1st percentile and 99th percentile of the hourly wages reported by all NLSY97 respondents in each year have been discarded by the author in order to present the wage information more accurately. The study also excluded the work experiences of the respondents when they were under the age of 16 years or before they dropped out of school.[iv] In addition, all hourly compensation amounts have been adjusted for inflation and are in 2008 dollars. For hours of work, the respondents' total number of hours working on employee-type jobs is used, as these work hours can better represent the demand for the respondent's labor on the labor market.

Figure 1. Mean Hourly Compensation of High School Dropouts by GED Credential Status: 1997–2008

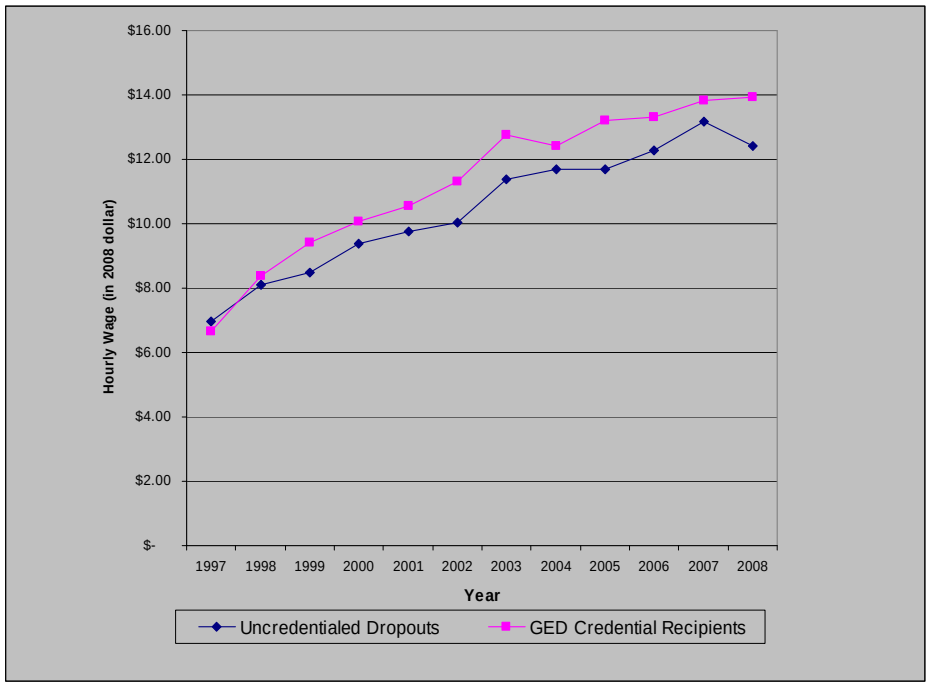

Figure 1 presents the mean hourly compensation (in 2008 dollars) for high school dropouts by their GED test credential status from 1997 to 2008. In each year, if a high school dropout received a GED test credential, he or she would be moved to the GED group. The mean hourly compensation of the uncredentialed dropouts and GED test credential recipients both started below $7.00 in 1997. Over the years, the gap between these two groups appears to grow. By 2008, the mean hourly compensation of the uncredentialed dropouts was slightly over $12.00, while the mean hourly compensation of GED test credential recipients was close to $14.00.

Table 6 presents the results from fixed effects modeling of the longitudinal data analysis. In the models, in addition to GED test credentialing status, other demographic variables are controlled, such as gender, ethnicity, marital status, and parenting status, and AFQT scores.[v] Model 1 and Model 2 estimate the hourly compensation change and the annual hours of work on employee-type jobs, respectively, for high school dropouts from the year they dropped out. In the year of dropping out, a single, non-Hispanic, non-black male with average AFQT score (26 for high school dropouts and GED test credential recipients) who had no credentialing could expect

to earn an hourly wage of $8.87. His wages in subsequent years are predicted to rise, although at a decreasing rate. Four years after dropping out, if his education or family status does not change, his hourly wage is expected to be $10.69.

Table 6.
Coefficient Estimate from Fixed-Effects Regression Models on Log Hourly Compensation and Annual Hours of Work

	Model 1 Log Hourly Compensation		Model 2 Annual Hours of Work (Employee-type job)	
	Estimate	Std Dev	Estimate	Std Dev
Intercept	2.140**	0.017	827.2**	42.75
Years since dropping out	0.060**	0.005	139.3**	10.53
Square of years since dropping out	-0.003**	0.001	-12.9**	1.06
Female	-0.122**	0.015	-189.9**	34.61
Hispanic	0.030	0.017	-31.9	41.79
Black	-0.055**	0.016	-297.0**	39.99
Years since GED test credentialing	0.020*	0.008	44.9**	16.58
Square of years since GED test credentialing	-0.001	0.001	-3.4	2.08
Married	0.131**	0.024	127.3**	47.12
Living with children under age of 5	0.030	0.017	197.0**	32.95
Female and married	-0.158**	0.032	-146.0*	62.83
Female and living with children under age of 5	-0.034	0.023	-283.9**	43.98
AFQT	0.002**	0.000	2.3**	0.82

Note: ** P<0.01; * P<0.05.

Results from Model 1 indicate that the relationship of obtaining a GED test credential is positive and statistically significant with the log hourly compensation of high school dropouts. After earning the GED test credential, a high school dropout's hourly wage is expected to increase by 2.0 percent every year beyond an expected wage increase based on experience. What's more, the positive effect of GED test credentialing does not flatten out as years go by, at least for the sample used in this study. This is probably due to the fact that the GED test credential recipients in this sample are still in their mid 20s. Take the example of the same male dropout discussed earlier: If he obtained a GED test credential four years after dropping out of high school, then three years after credentialing his hourly wage could be expected to be $12.15, which is 6 percent higher than the hourly wages if he had not obtained the GED test credential. Five years after GED test credentialing his hourly wage could be 10 percent higher than the hourly wages if he had not obtained the credential.

Results from Model 2 show that the relationship of obtaining a GED test credential is positive and statistically significant with the high school dropouts' total hours of work at employee-type jobs annually. After earning the GED test credential, a high school dropout's total hours of work is expected to increase by 45 hours every year beyond an expected work hour increase based on experience. This may be an indicator that earning a GED test credential might make it easier for high school dropouts to find full-time jobs or part-time jobs.

Other variables also play a part in high school dropouts' hourly wages and total hours of work. Being female, black, married and female, or female living with children under the age of five is negatively associated with changes in hourly wages and hours of work. In contrast, being male, married and male, or male and living with children under the age of five is positively associated with changes in hourly wages and hours of work.

GED Test Credential and Early Career Occupations

After the high school dropouts left school, what occupation did they choose? For those who earned a GED® test credential, how could earning the credential impact their occupational choices? Did they change to another, perhaps better-paying occupation after obtaining the GED test credential? These questions, associated with the third research question, will be addressed in this section.

First and Latest Occupation and Frequency of Occupation Change

Table 7 summarizes the first occupational group and the most recent occupational group reported by the UDO group and the GED group. The occupational groups—also referred to as job families later in this paper—are presented according to the major occupational groups used by the U.S. Department of Labor based on the Occupational Classification (SOC) Code. After leaving school, the most common occupations chosen by the UDO group and the GED group are food preparation-related occupations and sales-related occupations. About half of the UDO group (45 percent) and the GED group (50 percent) started their careers from those two job families. Particularly, the most common occupations in these two broader job families are cashiers, cooks, dishwashers, waiters and waitresses, food preparation and serving workers, and retail sales persons.

Other major job families of the first occupations from the UDO group and the GED group alike include cleaning and building service occupations, office and administrative support occupations, and transportation and material moving occupations, with up to 10 percent of the UDO group or the GED group working in each job family. The most commonly reported jobs in these occupational groups include janitors and cleaners, freight movers and laborers, stock clerks, and order fillers.

As young people gained more work experience and skills, they tended to leave the food preparation or sales occupations and move into occupations that may require higher-level skills, such as management, healthcare practitioners or support, construction, or production occupations. The GED group saw a larger drop in the food preparation occupations (16 percentage points) and sales occupations (9 percentage points) than the UDO group (9 and 5 percentage points, respectively). Correspondingly, the GED group has a higher increase in the occupations that may require higher skill levels, including management (4 percentage points), health practitioners or support (5 percentage points), office and administrative support (4 percentage points), and construction[vi] (7 percentage points).

Table 7
First and Latest Occupation Reported by High School Dropouts and GED Test Credential Recipients

Occupation	GED Group			UDO group		
	First Occupation (N=938) %	Latest Occupation (N=856) %	Difference % points	First Occupation (N=1,153) %	Latest Occupation (N=1,099) %	Difference % points
Management occupations	0.1	3.9	3.8	0.3	1.0	0.8
Business and financial operations occupations	0.0	0.5	0.5	0.2	0.7	0.5
Computer and mathematical occupations	0.3	0.3	0.0	0.0	0.3	0.3
Architecture and engineering occupations	0.2	0.3	0.1	0.0	0.0	0.0
Life, physical, and social science occupations	0.0	0.1	0.1	0.0	0.0	0.0
Community and social services occupations	0.8	0.2	-0.5	0.3	0.3	0.0
Education, training, and library occupations	0.8	1.1	0.3	1.0	1.1	0.2
Arts, design, and entertainment occupations	1.0	1.7	0.8	0.4	0.8	0.4
Healthcare practitioners and technical occupations	0.0	1.1	1.1	0.0	0.3	0.3
Healthcare support occupations	1.4	4.9	3.5	1.0	2.3	1.3
Protective service occupations	1.1	2.4	1.3	0.5	1.6	1.0
Food preparation and serving related occupations	28.6	12.3	-16.3	26.3	17.4	-8.9
Cleaning and building service occupations	8.9	6.2	-2.7	10.5	10.2	-0.3
Personal care and service occupations	4.5	5.0	0.5	5.0	5.7	0.7
Sales and related occupations	21.4	12.4	-9.1	18.2	12.9	-5.3
Office and administrative support occupations	9.3	13.1	3.8	9.1	8.7	-0.4
Farming, fishing, and forestry occupations	1.5	0.3	-1.2	2.7	1.6	-1.1
Construction and extraction occupations	5.7	12.8	7.1	7.1	12.5	5.4
Installation, maintenance, and repair occupations	1.2	3.9	2.8	2.2	3.5	1.3
Production occupations	3.9	8.0	4.1	5.6	8.0	2.4
Transportation and material moving occupations	9.6	9.5	-0.1	9.9	11.4	1.5

Frequency of Occupational Changes

As discussed earlier, this section analyzes the occupational change patterns reported by the UDO group and the GED group in the NLSY97 study. For simplicity, and also for assuring greater accuracy in respondents' memories of their job information, only the information on the respondents' most recent occupation reported in each round of the NLSY97 survey was used. Therefore, from 1997 to 2008, the respondent could have reported a maximum of 12 occupations or 11 occupational changes. Table 8 summarizes the information on frequencies of occupational change by GED test credential status. In general, the UDO group and the GED group differ in their frequencies of occupational changes. Out of 12 possible occupations, on average, the GED group held 4.5 unique occupations, while the UDO group held 3.6 unique occupations. From 1997 to 2008, the mean number of times that the GED group changed their occupation was 4.2 times, versus 3.1 times for the UDO group.

Table 8.
Average Frequency of Occupational Change, High School Dropouts and GED Test Credential Recipients

	GED Group (N=938)	UDO group (N=1,153)
Number of unique occupations held	4.5	3.6
	(1.9)	(1.9)
Times changing occupations	4.2	3.1
	(2.2)	(2.3)
Times changing to occupations outside job family	3.6	3.0
	(2.0)	(1.9)
Times changing to better paid occupations	2.4	2.0
	(1.3)	(1.2)
Percent of times changing to better paid occupations	57.3%	55.0%

Note: Standard deviations are in parentheses.

A further look into the change in patterns found that over 80 percent of the occupational changes are changes out of the respondents' previous job family and into a new job family. For example, if a respondent changed jobs from a cashier to a retail sales person, it would be a within-job-family change because both jobs are in the sales-related occupational group. However, if that respondent changed jobs from a cashier to a nursing aide, it would be a change outside of his or her previous job family (from sales-related occupational group to healthcare support occupations). The high percentage of job family changes indicates that the majority of the UDO group and the GED group were engaged in work that does not require a high level of expertise, thus it was relatively easy for them to switch to jobs outside their previous industry or occupation. Further, most of the changes were changes to a better paid occupation, with the GED group doing about the same (57 percent) as the UDO group (55 percent).

Immediate Impact of GED Test Credentialing on Occupational Change

How do GED test credential recipients use the credential to benefit their careers? Do they change their occupation immediately after obtaining their credential? Or do they wait? The previous section gave an overview of the occupational patterns and the frequency of occupational change for the GED group and the UDO group over the years from 1997 to 2008. However, the summary statistics presented above may not be sufficient to fully inform about the impact of the GED test credential on the credential recipients' choices of occupations, as compared with uncredentialed high school dropouts. Looking at summary statistics over a long period of time could easily eclipse stronger short-term occupational change patterns. If the GED test credential recipients obtained their credentials late in the time period, then in the earlier years their occupational patterns might have been indistinguishable from those of uncredentialed dropouts. If they obtained their credentials early, the effect of GED test credential on occupational change

may be waning off. Therefore, there is a need to examine the occupational change patterns of the GED group within a shorter period of time after they earned the GED test credential.

This section examines the occupational patterns of the GED test credential recipients within three years after they obtained the GED test credential, i.e., in the same year that the recipients obtained the credential and one and two years after, and will compare these patterns with those of the UDO group over a three-year timeframe.

Seventy-seven (77) percent of the GED group changed their occupation at least once within three years of obtaining the GED credential, with 45 percent changing occupations more than once. Specifically, among those who reported an occupation before the year of credentialing, 47 percent changed to a new occupation within the same year of credentialing, 18 percent changed to a new occupation in the next year, and 9 percent changed to a new occupation in the third year.

What new occupation would GED test credential recipients pursue right after they obtained the GED test credential? Table 9 presents the occupational distribution of the GED group before and after the GED test credentialing. The occupations in the year before GED test credentialing and the first new occupations in or after the year of credentialing are listed.

As shown in Table 9, right before the GED group obtained the credential, almost half of them (46 percent) worked in food preparation-related and sale-related occupations. Within three years of GED test credentialing, 9 percent left the food preparation occupations and 6 percent left the sales occupations. At the same time, the GED group saw increases in immediate new occupations in the following areas: management occupations (2 percent), office and administrative support occupations (3 percent), construction occupations (4 percent), production occupations (2 percent), and transportation occupations (3 percent).

Further, since about two thirds of the GED group who switched to new occupations within three years of GED test credentialing did so in the same year as they obtained the credential, could the occupational change pattern differ for those who changed occupations within the first year of GED test credentialing with those who waited one or two years to make a change? Table 10 presents the before-and-after changes in occupational distribution for those who changed occupations in the same year of GED test credentialing, and those who did so one and two years after.

As presented in Table 10, among the GED test credential recipients who changed their occupation in the same year as earning a credential, 11 percent left the food preparation occupations and 7 percent left sales-related occupations; at the same time, 4 percent joined the office and administrative support occupations, 5 percent joined the construction occupations, and 4 percent and 5 percent joined the production occupations and transportation occupations, respectively. Among the GED test credential recipients who changed their occupation in the year after credentialing, there was not a significant shift in occupational distribution—the food preparation, sales, and transportation occupations each saw a 4 percent decrease, while the management, construction, and installation, maintenance, and repair occupations each had an increase of 3 to 4 percent. Finally, among those who waited to change their occupations in the

third year, 10 percent left the food preparation occupations, and 6 percent left the sales occupations; at the same time, 3 percent joined the management occupations, 5 percent joined the health support occupations, and 5 percent joined the office and administrative occupations. It is possible that some GED test credential recipients waited to gain more skills and training before they changed their occupations, particularly to management or healthcare support occupations. However, as the numbers of GED test credential recipients who changed occupation one or two years after credentialing are relatively small, this observation needs to be interpreted with caution.

Table 9
Occupational Distribution Before and After GED Test Credentialing

Occupation	Year Before GED Test Credentialing (%)	Within 3 Years of GED Test Credentialing* (%)	Difference (% points)
Management occupations	0.7	2.2	1.5
Business and financial operations occupations	0.2	0.8	0.7
Computer and mathematical occupations	0.2	0.3	0.2
Community and social services occupations	0.2	0.3	0.2
Education, training, and library occupations	0.8	1.0	0.2
Arts, design, and entertainment occupations	1.3	1.8	0.5
Healthcare practitioners and technical occupations	0.2	0.3	0.2
Healthcare support occupations	1.3	2.5	1.2
Protective service occupations	1.0	1.3	0.3
Food preparation and serving related occupations	24.8	15.6	-9.3
Building, cleaning, and maintenance occupations	7.1	5.0	-2.2
Personal care and service occupations	4.6	4.8	0.2
Sales and related occupations	21.4	15.4	-6.0
Office and administrative support occupations	9.6	12.8	3.2
Farming, fishing, and forestry occupations	1.2	0.7	-0.5
Construction and extraction occupations	7.3	11.6	4.3
Installation, maintenance, and repair occupations	1.7	2.5	0.8
Production occupations	7.1	9.3	2.2
Transportation and material moving occupations	9.4	11.9	2.5

Note: N=604.
*The first new occupation within 3 years of GED test credentialing is listed.

Table 10
Changes in Occupational Distribution and Mean Occupational Wages within Three Years of GED Test Credentialing

	Changed in the same year of earning GED test credential (N=400)	Changed in the year after earning GED test credential (N=137)	Changed in the 2nd year after earning GED test credential (N=67)
Changes in Occupational Distribution (Difference in Percentage Points)			
Management occupations	0.8	2.9	3.0
Business and financial operations occupations	0.8	0.7	0.0
Computer and mathematical occupations	0.0	0.7	0.0
Community and social services occupations	0.3	0.0	0.0
Education, training, and library occupations	-0.3	1.5	0.0
Arts, design, and entertainment occupations	0.3	0.7	1.5
Healthcare practitioners and technical occupations	0.3	0.0	0.0
Healthcare support occupations	1.5	-1.5	4.5
Protective service occupations	0.0	0.7	1.5
Food preparation and serving related occupations	-11.0	-3.7	-10.4
Building, cleaning, and maintenance occupations	-2.8	-2.2	1.5
Personal care and service occupations	0.3	1.5	-3.0
Sales and related occupations	-6.5	-4.4	-6.0
Office and administrative support occupations	3.8	0.7	4.5
Farming, fishing, and forestry occupations	-0.8	0.0	0.0
Construction and extraction occupations	5.3	2.9	1.5
Installation, maintenance, and repair occupations	0.0	3.7	0.0
Production occupations	3.5	0.0	-1.5
Transportation and material moving occupations	4.8	-4.4	3.0
Changes in Average National Occupational Wage	19%	19%	22%

With the majority of the GED test credential recipients changing occupations within three years of credentialing, what are the chances of them changing to a better paid occupation? As presented in Table 10, the increase in average occupational hourly wages with the first occupational change for those who changed in the first, second, and third year of GED test credentialing is 19 percent, 19 percent, and 22 percent, respectively.

As mentioned earlier, 45 percent of the GED group who changed their occupation within three years of credentialing changed their occupation more than once during those three years. When all occupational changes are examined, the mean percentage change from the average hourly wage of the previous occupation to the new occupation is an increase of 19 percent, 16

percent, and 15 percent in the first, second, and third year of GED test credentialing, respectively.

In this section, the GED test credential recipients' occupational change patterns within three years of obtaining the GED test credential and the corresponding changes in average national occupational wages have been examined. Is the proportion of GED test credential recipients changing occupations in these three years typical among all youth who did not have a traditional high school diploma? Is the possible wage gain from switching to a new occupation common across all occupational changes? Having a comparison group could be very helpful. However, as the UDO group did not have the same intervention (i.e. earning a GED test credential) and the GED test credential recipients obtained credentials in different years, it is difficult to make a comparison side by side.

As presented earlier in this study, the mean age for the GED group and the UDO group was both 17.5 years when they left high school, and the mean age for the GED group to obtain the GED test credential was 19.4 years. Therefore, examining the occupational change patterns of the UDO group from ages 19 to 21 or 20 to 22 holds promise for an equitable comparison with the occupational change patterns of the GED group within three years of obtaining their credentials. For clarity of presentation, the following comparisons with the GED group are mainly based on the occupational patterns of the UDO group from age 19 to 21. Any major differences in the patterns of the UDO group from age 20 to 22 are discussed later in the text.

During this three-year timeframe, the UDO group changed occupations less often than the GED group. In terms of frequency of occupational change, the percentages of the UDO group changing occupations from age 19 to 21 was 54 percent, which is lower than the 77 percent of the GED group who changed their occupation within three years of GED credentialing. At the age of 19, only 30 percent of the UDO group changed occupation, which is also lower than the 47 percent of the GED group who changed their occupation within the same year of GED credentialing.

Table 11 presents the first occupational changes for the UDO group from age 19 to 21. As shown in Table 11, among the UDO group who reported an occupation before the age of 19, 25 percent had food preparation occupations, 18 percent had sales related occupations, and 13 percent had the transportation and material moving occupations. When they changed to their first new occupations between ages 19 and 21, 7 percent left the food preparation occupations and 3 percent left the sales related occupations. At the same time, 5 percent joined the construction occupations and 3 percent joined the office and administrative support occupations.

Could the UDO group potentially benefit from their occupational changes? For the UDO group members who made at least one occupational change from ages 19 to 21, the average percentage change between the national average hourly wage of the previous occupation and the new occupation was 14 percent, 13 percent, and 12 percent in the first, second, and third year, respectively. These occupational wage increases were 3 to 6 percentage points lower than those of the GED group presented earlier.

Table 11.
Occupational Distribution of Uncredentialed High School Dropouts, Ages 19 and 21

Occupation	At Age 19 (%)	At Age 21 (%)	Difference (% Points)
Management occupations	0.0	0.5	0.5
Business and financial operations occupations	0.3	0.3	0.0
Computer and mathematical occupations	0.3	0.0	-0.3
Life, physical, and social science occupations	0.2	0.2	0.0
Community and social services occupations	0.0	0.3	0.3
Education, training, and library occupations	1.4	0.3	-1.1
Arts, design, and entertainment occupations	0.5	0.8	0.3
Healthcare practitioners and technical occupations	0.0	0.2	0.2
Healthcare support occupations	1.2	1.8	0.6
Protective service occupations	0.8	1.1	0.3
Food preparation and serving related occupations	24.9	18.2	-6.6
Building, cleaning, and maintenance occupations	8.0	6.8	-1.2
Personal care and service occupations	4.1	5.3	1.2
Sales and related occupations	17.8	15.1	-2.7
Office and administrative support occupations	8.7	11.6	2.9
Farming, fishing, and forestry occupations	1.8	0.9	-0.9
Construction and extraction occupations	8.6	13.4	4.8
Installation, maintenance, and repair occupations	1.8	3.2	1.4
Production occupations	7.2	7.8	0.6
Transportation and material moving occupations	12.7	12.5	-0.2

Note: N=664.

The patterns of the UDO group who changed occupations between ages 20 and 22 were also examined. The overall patterns are similar to those from age 19 to 21 except that very few people left the food preparation occupations and a higher percentage (6 percent) of the UDO group left the sales related occupations for their first occupational change. The average occupational wage increase for the UDO group from age 20 to 22 were also a little bit lower, at 13 percent, 12 percent, and 7 percent in the first, second, and third year, respectively.

In summary, the directions of the first occupational change of the GED group within three years of GED credentialing were similar to that of the UDO group from the ages of 19 to 21 or 20 to 22, except that a higher percentage of the GED group left the food preparation or sales-related occupations (15 percent, versus 7 to 9 percent of the UDO group) for occupations that may require higher skill levels, and that the percentage increases between the national average hourly wage of the previous occupation and the new occupation were higher for the GED group.

Discussion

The statistics and analyses in the previous sections suggest that in the NLSY97 cohort, the GED® test credential recipients and uncredentialed high school dropouts had very similar schooling experiences. On average, they both completed 10th grade and left high school at the age of 17.5; their high school GPAs were the same at 2.3. This information indicates a social or demographic shift from the previous NLSY79 cohort—the GED test credential recipients in the new NLSY97 cohort did not have an academic advantage over high school dropouts when they started to earn a GED test credential.[vii]

Yet both comparisons of labor market outcomes as of 2008 and regression analyses on longitudinal data show that GED test credential recipients hold a statistically significant yet modest advantage over high school dropouts in the labor market. While no causality should be inferred, the relationship between increases in measures and GED test credentialing is apparent in the data. As of 2008, GED test credential recipients earned higher hourly compensation, worked more hours, had higher family incomes, enjoyed higher job satisfaction, and tended to receive better fringe benefits from their employers. From a longitudinal perspective, for each year after earning a GED test credential, the hourly wages of credential recipients would increase by 2.0 percent beyond increases in wages of uncredentialed high school dropouts that come with the accumulation of work experiences.

Moreover, this study is among the first to examine the occupational change patterns of GED test credential recipients immediately after credentialing. Compared with uncredentialed dropouts, GED test credential recipients exhibited a much higher percentage of occupational changes within three years of earning the credential. A high proportion of the credential recipients left the lower paying and less skill demanding food preparation and sales-related occupations and joined a wide variety of new occupations. It suggests that the GED test credential provided more options of occupational choices for the credential recipients. It is also possible that the GED test credential helped to increase the confidence of the credential recipients so that they became less afraid of job changes and were willing to explore more opportunities and thus led to more occupational changes. Further more, the GED test credential recipients were also more likely to move to occupations with a higher average occupational wage increase.

The stronger labor market outcomes of the GED test credential recipients in the NLSY97 cohort may be attributed to two factors. First, when preparing for the GED test, high school dropouts accumulated human capital. Previous studies tended to underestimate the human capital accumulation of the GED test candidates. Studies have cited very limited hours spent in preparing for the GED test, for example, average preparation hours of 20 (Malizio & Whitney, 1981 in Cameron & Heckman, 1993) to 30 hours (Baldwin, 1990 in Tyler, 2005), as evidence of very limited human capital accumulation. However, these statistics provide incomplete information for hours spent on test preparation. The data cited in pervious studies most likely came from surveys conducted at GED testing centers when candidates registered for testing, i.e., before testing. The candidates might have spent significantly more hours preparing for the rest of the test battery or retests at a later time, yet that data is under-reported or not collected at all.

Therefore, these GED test candidates would have accumulated considerably more human capital through preparing for the GED test than was reported in previous studies.

Second, there might be some "sheepskin" effect or sorting function of the GED test credential. Many adults dropped out of high school under adverse life circumstances. By taking the GED test and earning a GED test credential, they took the initiative to regroup their lives and move forward. Employers may value the GED test credential recipients over uncredentialed dropouts, by regarding GED test credential holders as having higher motivation and commitment, in addition to better skills and discipline.

These findings across time can benefit adult learners who lack a high school credential. To begin with, knowing that the backgrounds of these adult learners are comparable suggests that a second chance to earn a credential is a widespread possibility. Adult learners who wonder whether they have the skills to pass the GED test may find reassurance in the fact that others who had a schooling experience like theirs have been able to pass. Adult educators and counselors can share this information to encourage adult learners that many people from educational backgrounds similar to theirs have experienced the success of earning a GED test credential.

In addition to that encouragement, those who work with adult learners can also pass along the findings about stronger labor market outcomes as an incentive to work toward a GED test credential. Getting a better job is a major reason that adults take the GED test (American Council on Education, 2010). While annual increases would be expected to be modest (2 percent), the widening gap between uncredentialed dropouts and GED test credential recipients across time offers potential for increases in hourly compensation for employees with GED test credentials. For example, five years after credentialing, an average GED test credential recipient could expect to have an hourly compensation 10 percent higher than that of the uncredentialed high school dropouts, in addition to the annual compensation increase that high school dropouts gain with work experiences. Furthermore, Song and Patterson (2011) showed that hourly compensation of adults with GED test credentials at least five years after earning the credential were about the same as those for traditional high school graduates. For high school dropouts in later years who might feel a sense of stigma because of the years lost in learning skills, earning a GED test credential allows them not only to demonstrate high school-level skills but potentially increase in wages, benefits, and family income.

Finally, adult education programs offering employability skills training and transition planning often include resume writing and mock job interviews. In this process, adult educators could teach adult learners to highlight the advantages of having the GED test credential. These advantages include not only strong academic skills but also determination to resume education and flexibility to take an alternative path.

Limitations and Future Research

Before concluding, there are some limitations to this study. First, the analyses on hourly wages and occupations of the NLSY97 respondents are based on the most recent jobs reported by the respondents at the time of survey each year. A considerable proportion of high school dropouts and GED® test credential recipients had multiple jobs in a year. Using the job that lasted the

longest time during a year may represent the respondents' work experiences best, even though using it risks reflecting respondents' potentially inaccurate memory. Second, this study did not consider the effects of training or education programs other than GED test credentialing. It is possible that the respondents might have received on-the-job or off-the-job training that could have led to a wage increase. Third, the participants in the NLSY97 study are still quite young. Though 12 years passed from initial data collection through 2008, longer-term effects are as yet unknown. Research from later waves of data collection will add to the picture of longitudinal effects for both groups.

Fourth, in this study, a positive occupational change was defined as a higher average occupational wage of the new occupation than the previous occupation that a respondent held. Average national occupational wages were used in the analyses. However, depending on where a respondent lives, average occupational wages may vary substantially across states or regions. The public-use data of the NLSY97 study did not include the respondents' states of residence. Future studies could consider using restricted-use data to obtain information on average occupational wages in the states or regions where the respondents worked to evaluate the respondents' occupational changes even more rigorously. Further, is the finding about occupational change related to job satisfaction? In other words, if earning a GED test credential were to permit an adult not only higher occupational mobility but also increases in wages and employee benefits, would the adult experience enhanced job satisfaction? This study did not make such a connection, but future research could consider whether such a relationship exists and how it might change across time, particularly in the occupations which adults with previously low skill levels move into once passing the GED test.

Finally, NLSY97, even as a large-scale, carefully crafted quantitative study, captures little qualitative information about the experiences of high school dropouts. A note of concern needs to be raised here. The wage and work hour increases experienced across time do not appear to benefit women as much as men, mothers of young children as much as fathers, nor non-white adults as much as white adults. Future research could seek an enhanced understanding of the circumstances of leaving high school before completion and the effect on the individual, either initially, several years later, or at the time of GED testing. Knowing what happened to the adult qualitatively, particularly by gender, parental status, and ethnic group, and the ramifications on his or her income would round out the evidence base from which to interpret the labor market effects of the GED test credential on high school dropouts.

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[i] The NLSY97 study administered Armed Forces Qualification Test (AFQT) to all eligible cohort members during the ages of 12 to 18 years. AFQT scores were combined from four tests from the Armed Services Vocational Aptitude Battery (ASVAB), which is a multiple-aptitude test battery most widely used to determine if a test-taker is qualified to enlist in the military and to assign that person to an appropriate job in the military. The Department of Defense AFQT scores were reported as percentiles ranging from 1 to 99 based on a reference group of a nationally representative sample of 18- to 23-year-old youth. The NLSY97 managed the same subtests to the respondents and used similar formula to generate the percentile scores. However, the NLSY percentile scores were computed within each group of 20 three-month age groups of its respondents. The mean AFQT percentile score for the NLSY97 respondents is 45. The AFQT percentile score reflects work done by NLS program staff and is neither generated nor endorsed by the Department of Defense. Previous studies based on the NLSY data have used the AFQT scores as a measurement of ability.

[ii] For a comparison of sample characteristics between NLSY79 and NLSY97 studies, please refer to Table 1 in Song & Patterson, 2011.

[iii] As of 2008, 97 percent of the NLSY97 respondent who reported their highest education attainment as less than high school were not enrolled in school nor had obtained further postsecondary education. In contrast, 21 percent of the respondents who reported a GED test credential as their highest education degree had some college education but were not currently enrolled; 7 percent of were currently enrolled in two-year or four-year institutions. This seems to suggest the GED test credential is a stepping stone for postsecondary education.

[iv] There were 260 high school dropouts and 3 GED test credential recipients who did not report the year when they dropped out of school.

[v] It is suspected that a considerable proportion of GED test credential recipients are incarcerated. However, this may not be the case for NLSY97 data, at least not for the data up to 2008. From 2000 to 2006, the percentages for incarcerated respondents were less than 2 percent for either UDO group or GED group; only in 2007 and 2008 the percentages went up to 4 or 5 percent for both groups, which may be contributed to the economic recession. In addition, some respondents may be only incarcerated for a very short time. Thus the impact of incarceration on the analyses should be very limited, if any.

[vi] For those who newly entered into the construction occupations, more than 40 percent became a carpenter, an electrician, or a cement masons and concrete finisher. These positions usually require a professional certificate or enrollment in a multi-year apprenticeship program. The national average hourly wages for these occupations ranged from $18.75 to $23.98 in 2008.

[vii] Although the GED group's mean AFQT percentile score is about 10 percentage points higher than that of the UDO group (31 vs 21), they are both far below the NLSY97 average, which is 45. In addition, the methodology difference of the NLSY97 AFQT score and the Dept. of Defense AFQT percentile score are discussed in endnote i.

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