

The Effects of the Great Depression on Educational Attainment

Takashi Yamashita

Department of Economics
Reed College

3203 SE Woodstock Blvd.
Portland, OR 97202-8199

e-mail: takashiy@reed.edu

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Abstract

This paper examines the relationship between the Great Depression and the educational attainment of young adults in the 1930s, taking advantage of the state-level variation in employment as individuals were turning a critical age. In general, there were negligible effects of the Great Depression's severity on average years of schooling beyond the cohort and state-specific effects. Regional differences in availability of appropriate schools seem to matter for the substitution effect to operate to increase the years of schooling during the recession. Furthermore, at the top end of educational attainment, the income effect seems to outweigh the substitution effect as the severity of the Great Depression is associated with a large drop in white male's college attendance. In sum, the Great Depression may have increased the average educational attainment, but the net effects seem small. More importantly, it appears to have compressed the distribution of educational attainment among white males.

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This paper examines the relationship between the Great Depression and the educational attainment of young adults who were growing up during the 1930s. The era of the Great Depression is one of the most tumultuous periods in American economic history. Output declined by more than 40 percent between 1929 and 1932, and the unemployment rate exceeded 20 percent in 1932 and 1933. Unemployment was severe as the majority of those who were unemployed experienced a spell of unemployment longer than a year in certain parts of the country (Margo 1993).

Tremendous efforts have been devoted to the analysis of the Great Depression. Most of studies on the Great Depression have been concerned with its causes, its propagation mechanism and immediate effects (e.g., Friedman and Schwartz 1971, Bernanke 1983, Hamilton 1987, and Romer 1990 to name a few). Despite the great interest, however, there has been relatively little research on the long-term consequences of the Great Depression for those who grew up during this period.¹ This paper tries to fill the gap by investigating the effect of the Great Depression on the level of educational attainment of those who grew up during this tumultuous time in the history of the United States.

Generally, the theoretical effects of recessions on human capital investment are ambiguous as economic downturns could affect educational attainment in several ways. Recessions may affect the budget constraints of households through unemployment and income losses. This could lead to the affected individuals leaving school earlier than would otherwise be optimal (income effect). Furthermore, in the absence of a perfect loan market, economic downturns could increase the proportion of individuals who are liquidity constrained, leading further to interruption of schooling. When a breadwinner of a family becomes unemployed,

¹ One of a few exceptions is Fishback, Haines and Kantor (2007) who analyze the mortality and fertility rates between 1929 and 1940.

children of a certain age may give up schooling and look for a job to help the family (added-worker effect). On the other hand, recessions could lower the opportunity costs of attending school, thus increasing the schooling of the affected cohorts (substitution effect). Recent studies generally find that the substitution effect dominates the income effect, thus schooling seems to increase during recessions.

In addition to the standard factors, the Great Depression could have affected schooling decisions even more because of its severity and length. Two features of the Great Depression stand out. First, many banks went under during the Great Depression and in the absence of deposit insurance, many people lost their bank savings after massive bank failures. As a result, some had to quit schooling, as they were unable to withdraw their deposits in time for tuition payments. Second, because of the deflation spiral during this period, the real interest rate shot up between 1930 and 1933.² As prices started to rise after 1933, the real interest rate turned negative and stayed negative until 1938. As the higher interest rate exerts a similar effect as lowering the return on education on decision to invest in human capital, the return on education fluctuated widely during the Great Depression.

As in many sectors that were affected by the Great Depression, the education sector underwent drastic changes during the early 1930s. Funding was cut. School building construction was halted. School days were shortened. In some states, pay for teachers and administrators were in arrears. As budgets were cut and demand for vocational education increases, curricula were modified to emphasize more on job-related skills and less on art, music, and literature.

² Whether or not the deflation was anticipated is subject to controversy. See Cecchetti (1992) and Hamilton (1992).

Effects of recessions on schooling have been analyzed for a number of developing countries. Thomas, Beegle, Frankenberg, Sikoki, Strauss and Teruel (2004), using the longitudinal data, analyze the effect of Indonesia's financial crisis in 1997. Schady (2004), using three waves of Peruvian household survey data, examines the effects of the 1989-91 recession on education among school-age children. Both studies find that economic downturns tend to increase schooling of school-age children and young adults as the opportunity cost of schooling diminishes and employment opportunities dry up.

When exogenous events that affect the entire economy are catastrophic, such as wars and revolutions, there is often an unambiguous impact on education of particular cohorts. For example, Ichino and Winter-Ebmer (2004) examine the effects of WWII, by comparing educational attainment and earnings of Austrians and Germans who grew up during WWII to those in Sweden and Switzerland that did not participate in WWII. They find that Austrians and Germans who were born between 1930 and 1939 have lower average education by about 16 to 26 percent of a year compared to the cohorts born before and after them. This translates into 1.5 to 4.2 percent loss of subsequent earnings. On the other hand, they do not find declines in years of education in Sweden and Switzerland. Meng and Gregory (2002) analyze the impact of the Chinese Cultural Revolution on educational attainment. Because all schools in urban China were closed during the early years of the Cultural Revolution and the curriculum emphasized manual labor and university entrance was based on students' political attitudes in later years, certain cohorts of Chinese men and women lost up to eight years of education in the traditional sense. This missed opportunity exerts a toll on the affected cohorts, as each year of missed schooling is estimated to reduce the probability of obtaining a university degree by 1 percentage point.

Identifying the effects of macroeconomic shocks is often difficult, as macroeconomic shocks affect the entire economy. With respect to the effects on education, macroeconomic shocks affect entire cohorts of school-age children. Without a strong identification assumption that there is no cohort effect, the effect of macroeconomic shocks on education may be confounded by the unobserved cohort effect. For example, Schady (2004) uses the exposure to a macroeconomic crisis to identify the effect of Peru's major recession on education. His exposure index is measured as the number of years a child was between the ages of 6 and 17 during 1988-92, and hence is indistinguishable from the unobserved cohort effect.

In this paper, the effect of the Great Depression on educational attainment is identified by taking advantage of differences in severity of the Great Depression at the state level. As documented by Wallis (1989), there was considerable variation in the employment index among states during the 1930's. Figure 1 presents the employment index at the regional level, taken from Wallis. This figure clearly demonstrates cross-sectional as well as time-series variation in the severity of the Great Depression. For example, the Mountain region suffered most severely, while the South suffered far less than the rest of the country. These differences are largely attributable to the differences in regional trend in employment growth and industrial composition (Rosenbloom and Sundstrom 1999). During the contraction phase, regions with a high concentration of certain industries, such as lumber and cotton suffered larger declines in employment, while New England and South Atlantic regions suffered less. During the recovery period (1933-37), on the other hand, New England and South Atlantic experienced slower growth compared to previously hard-hit regions such as Mountain and East South Central. I exploit these differences in the employment index, which are plausibly exogenous to educational attainment, to study the effects of the Great Depression on schooling decisions.

I want to stress at the outset that this paper measures educational attainment by years of schooling but do not take into account changes in school quality. During the Great Depression, however, school years were shortened. While the average decline of a school year was 1.5 days from 1929/30 to 1931/32, there were a handful of states that shortened school days by more than ten days (United States Office of Education 1938). In addition, instruction in various fields, such as music and art, was eliminated at many schools. As funds were cut for schools and classrooms were overcrowded in some regions of the country, many schools promoted and graduated students who would otherwise have been held back. The quality of instruction thus inevitably worsened during the Great Depression. Because I use the Census data, however, I am not able to measure changes in educational attainment due to shortening of school years. Nor does this paper address the deterioration of quality of instruction during this period. The estimates provided in this paper could thus be considered as a lower bound for the effect of the Great Depression on educational attainment of the affected cohorts.

I. Data

I use the one-percent sample from the U.S. Decennial Censuses of 1960, made available by the Integrated Public Use Microdata (IPUMS) Series at the University of Minnesota (Ruggles and Sobek et al. 2003). I limit the sample to U.S. native-born whites and blacks born between 1912 and 1926.³ I exclude from the sample those who were born in the states of Alaska, Hawaii, the District of Columbia, and Native-American Territories as well as those whose place of birth is not recorded in IPUMS. I also eliminate observations for which age and birth place were allocated.

³ The choice of these birth-year cohorts is dictated by the availability of the employment index for 1930-1940 and a ‘critical age’ in deciding human capital investment.

Measuring the highest grade achieved in a retrospective data set such as Census is subject to a host of problems. First, because mortality is correlated with educational attainment, members of older cohorts who have survived to a Census year are more likely to be better educated compared to the average of their respective cohorts. Using the sample of men and women who have survived to a Census, therefore, older cohorts may appear to have higher education due to selection. My samples are, however, relatively young (the oldest individuals are 48 at the time of Census) in 1960. Since the association between education and mortality usually manifests in individuals older than 55, the bias arising from mortality selection bias would be small for my sample.⁴

Second, individuals may overstate their educational attainment when societal norms for education increase. Older individuals in my sample, therefore, could have exaggerated their highest grade achieved when asked by Census enumerators, resulting in the bias from “educational creep.” In this respect, the measurement problem in the highest grade achieved in the 1940 Census is well known (Goldin 1988). Goldin documents that the Census data overstate the educational attainment of older cohorts by a substantial margin. Comparing the 1940 U.S. Census and the actual enrollment and graduation data, she concludes that the graduation rate of the 1892-1902 birth cohort may be overstated by a factor of 1.5 or 2. For my sample, one can evaluate the magnitude of possible overstatement by looking at the comparison of high school graduation rates compiled from the 1940 Census and contemporaneous administrative data

⁴ Another possible problem is that black schools in early twentieth century were ungraded (Margo 1990). This creates a problem when comparing educational attainment of blacks and whites of older cohorts. However, as I estimate regressions separately for blacks and whites, the inter-racial comparison is not an issue. My black samples are relatively young (born between 1914 and 1926) who went to school in the 1920s and 1930s when the ungraded school system is less common compared to older cohorts. I also estimate the relationship between the employment index and educational attainment by region (South and non-South).

(figure 6 (p. 366) of Goldin). The comparison of the two data sets reveals that there is no discrepancy in graduation rates between the two distinct data sources for the cohorts born after 1916. For the earlier cohorts, however, the “educational creep” may exist, as the graduation rate calculated from the 1940 Census is about 20 percent higher than the rate obtained from the contemporaneous data, while the gap quickly narrows as the cohort ages. If the 1960 data are comparable to the 1940 data, therefore, the magnitude of educational creep in the 1960 Census would be negligible for the cohorts born after 1916, while a small “education creep” may exist for the earlier cohorts.

To assess the magnitude of the overstatement in the 1960 Census, I compare the data from the 1940, 1950, and 1960 Censuses and plot in figure 2 the average years of schooling calculated from the three Censuses for the 1900-1925 birth cohorts, separately by race and gender. Compared with the 1940 Census estimates, the 1960 average years of schooling appear systematically higher for the older cohorts in question (born between 1912 and 1915), thus aggravating the educational creep bias even further.⁵ Compared with the average years of schooling estimated from the 1950 Census, on the other hand, the 1960 average years are generally lower, suggesting the magnitude of over-statement in the 1960 Census is not larger than in the earlier Censuses. Using the 1960 Census, therefore, would not introduce a further bias for the cohorts born after 1916. For the cohorts born between 1912 and 1915, on the other hand, their self-reported highest grade achieved may be overstated. In the regression analysis, however, I control for birth-year as well as the state-of-birth dummy variables. Thus as long as there is no systematic differences within a birth cohort in a given state, inclusion of the older birth cohorts would not cause further bias in my results.

⁵ I cannot deny the possibility of these cohorts having gone back to school after the 1940 Censuses.

The key variable used for identification is the state-level employment index (August 1929=100) for each year from 1930 to 1940 constructed by Wallis (1989). The index was calculated from the Bureau of Labor Statistics's establishment surveys of employment. The establishment sample was a self-reported, nonrandom sample. Furthermore, because the BLS reported changes in employment over a two-months period for firms that reported in both months, the reported percentage change is biased due to attrition and entry of new firms. Wallis constructed the yearly index by benchmarking the estimated employment changes to the known employment totals, such as Census of Manufacturers, appropriately reweighted by employment shares (Wallis 1989).

In regression analysis, I use this employment index of the year when individuals turned a critical age. I define the "critical age" as 16 and 18 for whites and 14 and 16 for blacks. I choose these ages because these ages are the age when an individual makes a decision to drop out of school and to attend college or not.⁶ Age 16 is the minimum age stipulated by the compulsory schooling laws in many states that one has to remain in school. Age 18 is the age when one starts attending college. Age 14 is often the minimum age for a work permit in many states. I justify the choice of age 16 and 18 based on the government document from the period that asserts that staying in school beyond the compulsory schooling age is the main culprit in increasing enrollment in the early 1930s. High school enrollment increased considerably during the early years of the Great Depression. Nationally, the increase in enrollment was 28.9 percent between 1930 and 1934. A large part of the increase in enrollment was accounted for in the last two years of high school. In particular, between 1930 and 1934, there was a 37.5 percent increase in the third-year enrollment, while the fourth-year classes witnessed an increase of 43.4

⁶ I obtain similar results when the employment indices at ages 19, 17 or 15 are used.

percent. In addition, thousands of high school graduates returned to high school to take additional courses. From 1932 to 34, there was a 38.4 percent increase in enrollment of post-graduate students in high school (United States Office of Education 1938). The increases in the last years of high school indicate that those who would have otherwise left school after reaching the minimum compulsory schooling age remained in school because of the dismal employment situation. Furthermore, the increase in post-graduate enrollment suggests that those who had no means of going to college but could not find employment found schooling an attractive alternative.

I assume that individuals received schooling in the state in which they were born. This is the same assumption used by Card and Krueger (1992) and Lleras-Muney (2002). These authors assert that the mobility during the first half of the twentieth century was low and errors arising from mismatches would be small. Contrary to the assertion of the previous authors, however, the mobility in the 1930s seems quite high. In 1940, about one quarter of the 1912 birth cohort lived in a state different from the one they were born in. Naturally, the mobility is lower for younger birth cohorts but still quite substantial; nearly 12 percent of the 1925 birth cohort lived in 1940 in a state different from the one they were born in. Using the employment index of the state of birth during the 1930 thus might introduce attenuation bias due to measurement error.

If geographical mobility is correlated with employment index of the state,⁷ then using the employment index of the state of birth could introduce additional bias in my estimation. However, the direction of bias is not clear. I regress the indicator variable whether or not an individual is living in the same state in which one was born on employment index turning a critical age of 14, 16, or 18 and dummy variables for year and state of birth, separately for four

⁷ For relationship between the New Deal programs and internal migration, see Fishback, Horace, and Kantor (2001).

race-gender categories (results not reported). In any specification, the coefficient estimate on the employment index at the critical age is numerically small (between -0.0005 and 0.0004) and statistically not significant from zero. It therefore seems unlikely that the employment index of the state of birth would introduce additional bias in a systematic way above and beyond the attenuation bias due to the measurement error.

Wallis's employment index is not adjusted for population growth. The index, therefore, may underestimate the severity of the Great Depression and present an optimistic view of the recovery. Wallis (1989) documents, however, that adjusting the employment index by total population growth or working population growth between 1930 and 1940 does not change the relationship across regions. A possible exception to this is the Pacific region. Because there was a large influx of migrants from depressed agricultural regions to California and the other western states, adjusting for population growth reveals that the Pacific region did not enjoy fairly high rates of employment growth, as the unadjusted raw index might suggest. In order to control for differential population growth in different states, I include in my regressions the population index of the state in the year sample individuals are turning the critical age. State-level population figures (16 years and older) between 1930 and 1940 are linearly interpolated using the 1930 and 1940 Censuses, and the population index was calculated as a ratio of the state population relative to that of 1930.

II. Analysis of the Relationship between the Great Depression and Educational Attainment

(a) Differences in State-Level Employment Index

I regress the years of education on the employment index and the population index in the year when an individual turns a critical age, the dummy variables for ten birth-years, three quarters of birth and 48 state of birth for a sub-sample of those who turned the critical age between 1930 and 1940 (e.g., for whites, those who were born between 1912 and 1922 for the employment index at 18 regression, and those who were born between 1914 and 1924 for the employment index at 16 regression, etc.) separately for whites and blacks by gender. Table 1 reports the results of the regressions, separately for race and gender. The estimated relationships are numerically small, and all but for white females are statistically insignificant. Even for white females, for which the coefficient is significant nearly at the 1-percent level (p-value of 0.012), the effect is economically small (6% increase in schooling for a 10-point reduction in employment index).

I suspect that various factors were at work to derive these results. For some, schooling decisions were constrained from below by child labor laws and compulsory schooling laws. As Lleras-Muney (2002) has documented, there was a steady trend in rising educational attainment at the bottom of the distribution, who would be normally affected by the compulsory schooling laws. For some others, dismal job market opportunities lowered the opportunity costs of schooling and enticed them to stay in school. Yet for some others, a drastic reduction in family income during the Great Depression propelled them to give up pursuing further studies which could be otherwise possible. At the end, however, it appears that the substitution effect and

income effect cancelled out each other, and on average the effects of the Great Depression on educational attainment were negligible.

The stronger effects of the state employment index for white females may be explained by the differential labor market situations women faced during the 1930s. First, during the 1930s women faced higher returns on schooling than men. During the early twentieth century, there was a compression of wage gaps that existed between clerical workers and production workers due to an increased supply of high school graduates who were trained to do much of the clerical work. Goldin and Katz (1995) document that for male workers, the estimated clerk wage/production wage gap narrowed from 1.67 in 1909-14 to 1.15 in 1939 (table 2). For female workers, however, while the wage gap narrowed substantially between clerical and production jobs, the premium for clerical work was still substantial throughout the 1930s: in 1909-14, the clerical workers on average earned double what production workers did, and in 1939, the premium was still over 50 percent. Provided that many clerical jobs required high school diplomas, there was an added incentive for women to stay in school longer as returns to high school education was higher for women than for men. The substitution effect may have worked stronger for women than for men, and hence I observe a statistically-significant and negative relationship between the state-level employment index and the years of schooling.

Another possible reason could be that some women stayed in school longer as the prospect for marriage dimmed substantially during the Great Depression. The age at first marriage increased during the 1930s. This may be because marriage is often an expensive proposition and people tend to delay marriage in economic downturns. Instead of marrying early and dropping out of school, women could have continued education. Using the same data set, I test the hypothesis if the age at first marriage is related to the state employment index when one

turns 18. While the results are not reported here, I find that the coefficient of the state employment index is negative and statistically significant after controlling for the state year and quarter of birth.

I have so far treated the 1930s as a single period. History of the Great Depression is far from monotonic, however. After the stock market crash of October 1929, the economy did not go into a free fall right away. However, starting in late 1930, the economy went through a long excruciating process of contraction; GNP declined by 8.9 percent, 7.7 percent, and 13.2 percent from 1930 to 1932, respectively and unemployment rate rose from 3.2 percent to 23.6 percent in the three years. Only after the drastic measure of Bank Holiday on March 5, 1933 and an aggressive infusion of money supply, the economy's bottomless fall ended. GNP declined by modest 2.1 percent in 1933 and started growing again in 1934. Various measures to bolster employment were undertaken under the New Deal. After a few years of robust growth, however, the economy again experienced a year-long recession in 1937II-1938II: output declined by 4.0 percent in 1938 while unemployment stayed high. The economy then registered again strong growth in 1939 and 1940. These colossal fluctuations of the economy would naturally affect people's expectations about future income, which in turn would affect education decisions.

I divide the sample period into the two phases, the contraction period (1930 to 1934) and the recovery period (1935 to 1940) and estimate again the effects of the employment indices at the critical ages. Table 3 reports the results of this exercise for four categories of race and gender. None of the estimates are statistically significantly different from zero, or within-group estimates across two periods are different from each other. A relatively large estimate is obtained for the black male sample in the contraction phase, indicating a possibly strong substitution effect for black males in the early 1930s. However, the estimate is only marginally

significant (p-value of 0.055). I thus conclude that the effect of the Great Depression on education was very small, if it existed at all.⁸

(b) Regional Variation in Supply-Side Factors

As there was tremendous state-level heterogeneity in the severity of the Great Depression, there could be heterogeneity of response of teenagers to the local economic conditions. In this section, I consider three possible sources of state-level heterogeneity that are related to the provision of educational infrastructure. I posit that the provision of infrastructure is important because lack of accessibility to schools could act as significant transaction costs which may hinder smooth adjustment of human capital investment behavior in response to economic shocks. Because the supply of educational institutions is fixed in the short run, all students may not be accommodated even when there is strong, growing demand. The supply constraint is particularly important during the Great Depression when school budgets were severely cut. Capital outlays for public schools were reduced from \$371 million in the 1929/30 academic year to only about \$59 million in 1933/34 (Moreo 1996).

A reduction in school budgets also has implications for transaction costs of attending schools. Operating budgets were cut for schools across the board, and many rural schools were

⁸ One could argue that a possible explanation for small and statistically insignificant coefficient estimates is that the state dummy variables and the employment index are closely correlated to each other and that by including state dummies I am simply capturing the collinearity between the two variables. Although this argument may have some validity, I argue it is not the entire story. First, there is a tremendous variation in the employment index across years within the states. Thus the employment index captures changes in educational attainment across birth-year cohort within the state of birth. Second, if collinearity between the two variables is the main culprit, then I would expect that coefficient estimates would always be small and statistically insignificant. However, certain results (e.g., Mid-Atlantic & Northeast state sample and results from quantile regressions) are numerically large and statistically significant even after controlling for state-specific fixed effects. The employment index, therefore, must contain some useful information beyond the state specific dummy variables.

no longer able to provide transportation to students in remote areas. [source?] Even when education is provided free of charge, an increased transaction cost may hinder students from attending schools in times of financial distress. Thus I would expect that responses to economic downturns could be different between the populous states and the states that are sparsely populated and thus access to school is difficult.

The first feature to consider is variation in population density and resultant accessibility to schools in different regions of the country. I estimate the same regressions with a sub-sample of white men and women in the “Mountain” states, which were hard hit by the Great Depression but very sparsely populated, and in the “Mid-Atlantic” and “East North Central” regions that were also severely hit by the Great Depression but were more populated. The results of this exercise are presented in table 4. For both male and female, the estimates from the Mountain states samples are numerically small and statistically insignificant. On the other hands, the estimates from the Mid-Atlantic and East North Central regions are numerically large and highly significant. The estimates indicate that a 10-percentage point decrease in employment index is associated with a 10- to 11-percent of a year longer stay in school for white men and women.⁹ My results here, therefore, confirm the assertion of Goldin that “the Great Depression may have had on positive effect: it enticed the youth to stay in school” (Goldin 1999, p. S80) with a qualifier; the positive effect of the Great Depression on schooling appears to be limited to certain states that are populous.

⁹ The 10-percentage point difference in employment index --- roughly the difference between Illinois (70.4) and Kentucky (80.2) in 1933 --- was not uncommon during the early 1930s. Even within the same state, the 10-percentage point change in employment index over a two-year period was observed. For example, in Michigan, the employment index changed from 79.8 in 1932 to 68.1 in 1933 and then to 78.9 in 1934.

When discussing supply of post-secondary education in the early 20th century, one cannot overly stress the importance of the role played by junior colleges. The junior college is truly a creation of the twentieth century American educational system. Originally intended as a way to free universities from freshman and sophomore instructions so that universities could be reconstituted as research and training centers for intellectual elite (Steven Brint and Jerome Karabel 1989), the first independent junior college was founded in 1901 in Chicago. The idea of junior college took some time to take root in other parts of the country. By 1920, there were only 52 junior colleges in nation, of which only ten were funded publicly. The creation of junior colleges accelerated during the 1920s; by 1928, there were 248 two-year colleges (114 were public) enrolling nearly 45,000 students (Brint and Karabel 1989).

While four-year colleges faced extremely tough challenges, junior colleges thrived during the 1930s. The number of junior colleges increased from 277 in 1930 to 456 in 1940. Concomitantly, the enrollment grew from 55,616 in 1930 to nearly 150,000 in 1940. The expansion is attributed to junior college's relatively inexpensive cost structure to operate at a time when demand for higher education was high (Brint and Karabel 1989). For many high school graduates, junior colleges presented the only affordable opportunity to continue education as their tuition charges were lower compared to four-year colleges and universities.

The growth of junior colleges was uneven across regions. As junior colleges were created with sponsorship of universities to encourage an increasing number of high school graduates to "give up college work at the end of the sophomore year" (quoted in Brint and Karabel 1989, p. 25), university sponsorship was critical in establishment of junior colleges in many states. In 1930, only four states (California, Illinois, Michigan and Missouri), where university sponsorship was vigorous, plus Texas accounted for 64 percent of total junior college

enrollment. New junior-college systems were introduced in Wisconsin, Georgia, and Utah while four states opened public systems. Much of the growth in the 1930s came in states that had already become established centers of junior colleges, however. By 1940, the three largest states (California, Illinois, and Texas) enrolled 66 percent of all public junior college students, while less than 2 percent of enrollments nationwide were accounted for by 11 states in the Northeast (Brint and Karabel 1989). I, therefore, re-estimate the regressions with the sub-sample of “Junior College” states and present the results in table 4. Again, the estimated substitution effect of the Great Depression seems strong and significant for white females: a 10-percentage point decrease in the state employment index is, on average, related to one-seventh of a year longer stay in school. The estimates for the white males in the “Junior College” states, however, are small and statistically insignificant from zero. Looking at the results in panel A of table 4, availability of school infrastructure and ease of access to schools are an important determinant for the substitution effect to work to increase educational attainment during economic recessions.

Another possible source of state-level heterogeneity is the existence of Jim Crow and de jure segregation in the South. Schools were not integrated in the Southern states. As many Federal programs were administered locally, Southern blacks benefited little from programs implemented in the 1940s and 1950s. Collins (2001) reports that the change in the non-white/white ratio of defense-related employment was appreciably lower in the South than in the non-South states under the Fair Employment Practice Committee. Turner and Bound (2003) demonstrate that the effects of the G.I. Bill on years of college education and the probability of college completion were considerably lower for Southern blacks. Although decision to invest in human capital is largely individual, it would not be surprising if blacks in South as they faced different constraints than those in the non-South states.

The bottom panel of table 4 presents the estimates from the results from the black samples estimated separately for the South and non-South regions. Although the results are not statistically significant, the estimates are more negative and numerically larger (in absolute values) in the non-South states than in the South for black men and women. Particularly for black men, the estimates is large and reasonably significant (p-value of 0.052), implying a large substitution effect at work in the non-South regions. Although such differences may reflect the differences in industrial structure between the South and non-South states, the findings are consistent with the hypothesis that social institutions in the South were not conducive to blacks to stay in school longer in response to economic circumstances.

(c) The Effects of the G.I. Bill

Finally, estimating the relationship between the Great Depression and educational attainment is further complicated by the existence of the G.I. Bill. Many men in my sample served during WWII. In my sample, 66 percent of white males and 48 percent of black males for the 1914-24 birth cohorts (those who turned 16 between 1930 and 1940) served during WWII. If they took advantage of the G.I. Bill after the war, their education level would be higher than in the absence of the G.I. Bill. If the employment index at the state level and the WWII veteran status are correlated, estimates obtained from the regressions excluding the WWII veteran status would be biased.

Controlling for the WWII veteran status creates a host of econometric issues. In the simplest form, I could include a binary variable for the WWII veteran status in the right-hand side of the regressions and estimate the effect of the employment index on educational attainment. However, because literacy, mental and physical fitness were requirement for enlistment, the veteran status and unobservable ability that might affect educational attainment

would be correlated. This correlation will create a familiar endogeneity bias in estimation. Ideally, if I could find an instrumental variable that is correlated with the veteran status but not with the error term, then I could resort to the instrumental variable estimation. Unfortunately, because the cohorts of interest in my sample (born in 1912-24 for white men, and born in 1914-26 for black men) volunteered for military service, I am not able to use the quarter of birth variable as an instrument used by Angrist and Krueger . As the youngest cohort in my sample are black men and women born in 1926 (who turned 14 in 1940), I cannot use the instrument (dummy variable for being born after the third quarter of 1927) used by Bound and Turner , either.

Alternatively, I can estimate the magnitude of the bias arising from omitting the WWII veteran status variable from my estimation. Specifically, the size of the omitted variable bias is determined by the true effect of the omitted variable on the outcome variable times the relationship between the omitted variable (WWII veteran status) and the variable of interest (state-level employment index). I thus regress the binary variable of WWII veteran status on the state employment index and other control variables to assess the magnitude of association between these two variables. The results are reported in table 5, which indicate the association is numerically very small, almost indistinguishable from zero (and statistically insignificant), ranging from 0.00002 to 0.0004 for white men and -0.0002 to 0.0007 for black men. The estimates of the effect of WWII service on years of college completed are between 0.23 and 0.28 years for white men (Bound and Turner 2002). Multiplying this with the estimate of the regression coefficient of the state-level employment index at age 16 would yield 0.0001, which is about 3.3 percent of the estimate obtained in table 1, column (2). The estimate of the effect of

the Great Depression on educational attainment could therefore be biased upward, but its magnitude would be extremely small.

(d) Income Effect

That there appears little effect of the Great Depression on the average years of schooling does not mean that there was little effect on the overall population. For example, Lleras-Muney plots years of education for each decile (p. 421) for the 1901-1925 birth cohorts. In her Figure 2, there is a noticeable dip in educational attainment for the 90-percentile of the distribution for the birth cohorts born during the 1910s. The Great Depression was the time when those who were born in the 1910s were turning college age. In the 1930s, while high-school education and junior colleges were mostly free, colleges and universities were not. At public universities, the average in-state tuition and fees were \$61 in 1933 (\$753 in 1997 dollars). At private institutions, the average was \$265, or \$3,272 in 1997 dollars (Goldin and Katz 1999, p. 50). Hence high-school graduates whose families suffered from lower income during the Great Depression might have given up on higher education. Indeed, the percentage of high-school graduates attending college a year after graduation declined from 31.5 percent in 1929 to 22.9 percent in 1933, and the enrollment at four-year colleges and universities declined by 8.6 percent between 1932 and 1934 (United States Office of Education 1935). If the Great Depression had a profound impact on the decision to attend college, then that effect would show up in the top tail of the distribution but might not at the mean.¹⁰

¹⁰ Anecdotal evidence abounds; over 60 percent of the freshmen at the University of Chicago who did not return in the fall semester of 1931 did so because of financial reasons. Only 54 percent of students who entered Stanford in 1930 graduated four years later (Levine 1986).

I formally test whether or not the Great Depression has affected the educational attainment at the top tail of the distribution. Specifically, as before, I regress the years of education on the employment and population indices at age 18, the dummy variables for 48 states, ten birth-years, and three quarters of birth for a sub-sample of white men who were born between 1912 and 1922 but this time using the quantile regression, estimating the effect at the 90 percentile. Table 6 presents the results of the quantile regressions, which indicate that there was a strong income effect.¹¹ For white males at the 90-percentile of the educational attainment distribution, a 10-point decrease in the employment index has led to a quarter of a year shorter stay in school, even after controlling for the state of birth and the year of birth. Thus for white males, there is evidence that the severity of the Great Depression might have affected college-attendance decisions of those who were turning 18 during the 1930s.

The effect of the Great Depression on white males' educational attainment can be seen in changes in distribution of years of schooling. For example, only 8.5 percent of the 1913 birth cohort has more than 16 years of education, in contrast with 9.2 percent of the 1909 birth cohort and 9.4 percent of the 1911 birth cohort. This decrease in college graduation was compensated for by an increase in high school graduation. Of the 1913 birth cohort, fully 24.9 percent had exactly 12 years of schooling, while the comparable numbers are 19.7 percent and 22.5 percent for the 1909 and 1911 birth cohorts, respectively. Thus it appears that white men who were graduating from high school in the early 1930s were giving up college and went into the labor force more so than the cohorts who were merely a few years older than they.

For a sub-sample of black men born between 1914 and 1924, I estimate the effect of the state-level employment index at age 16 at the 70 percentile. The second column of table 6

¹¹ I find no statistically significant results for females (white and black) at any decile.

reports the results of the quantile regression. As in the case of white males, I find a strong income effect at work; a 10-point decrease in employment index has led to one-fifth of a year shorter stay in school. Compared to white males, the income effect for black men seems to have manifested earlier in life, at 10th grade, when they were no longer bound by the state compulsory education laws.

III. Conclusions

The Great Depression has had long-lasting effects on those who were growing up during this period. One such effect could be that the Great Depression increased the educational attainment of the cohort of white men and women who were turning college age during the early 1930's through the reduced outside opportunities during this deep and prolonged economic downturn. My estimates suggest that the effects were small and by and large statistically not different from zero. However, by splitting the sample into different regions, I find numerically larger and statistically significant results in states where the population density was higher and/or access to alternative schooling system, such as junior colleges, was readily available. In such states, the substitution effect of the recession has dominated the income effect. As a result, the net effect of the Great Depression was to increase the average years of schooling.

On the other hand, for certain segments of the population, the Great Depression had an effect to reduce education attainment. In particular, at the top end of educational distribution of white men, the income effect seems to have dominated the substitution effect and the severity of the Great Depression is associated with a substantial decrease in the years of schooling. Similarly a strong income effect is observed for black men, at the 70-percentile of the

distribution. From these results, the main impact of the Great Depression on educational attainment appears to compress the overall distribution of educational attainment.

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Table 1 Relationship between Employment Indices and Educational Attainment, by Race and Gender

	A. White				B. Black			
	Males		Females		Males		Females	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Employment index at age 18	-0.003 (0.003)		-0.005 (0.003)					
Employment index at age 16		-0.003 (0.002)		-0.006* (0.002)	-0.005 (0.008)		0.003 (0.006)	
Employment index at age 14						0.003 (0.006)		0.003 (0.006)
Adjusted R ²	0.070	0.068	0.055	0.055	0.117	0.112	0.094	0.094
No. of obs	10,291	105,474	105,924	108,738	10,306	10,599	11,808	12,231

Note: Dependent variable is the highest grade achieved in years. Regressions also control for the dummy variables for year, quarter and state of birth and the population index of the year an individual is turning a critical age in the state of birth. Robust standard errors are reported in parenthesis and account for clustering on year and state of birth.

* significant at the 5% level

Table 2 Return on Education by Sex and Occupation, in 1926-29 and 1939

Ratio of earnings of clerical group to those of production workers in manufacturing								
Year	All clericals		Clerks		Typists and stenographers		Bookkeepers and cashers	
	females	males	females	males	females	males	females	males
1926	1.480	1.113	1.177	1.084	1.641	1.319	2.205	1.604
1927	1.501	1.131						
1928	1.546	1.117						
1929	1.527	1.128						
1939	1.557	1.150	1.499	1.088	1.652	1.100	1.613	1.268

Source: Goldin and Katz, 1999

Table 3 Estimates by Birth-Year Group, by Race and Gender

A. Whites, by Gender								
Variable	Males				Females			
	Born 1912-16	Born 1917-22	Born 1914-18	Born 1919-24	Born 1912-16	Born 1917-22	Born 1914-18	Born 1919-24
Employment index at age 18	0.002 (0.004)	-0.003 (0.003)			0.005 (0.004)	-0.006 (0.004)		
Employment index at age 16			-0.002 (0.004)	-0.004 (0.004)			0.007 (0.004)	-0.004 (0.003)
Adjusted R ²	0.061	0.066	0.061	0.065	0.050	0.053	0.048	0.058
No. of obs.	44,598	58,314	46,481	58,993	45,735	60,189	45,756	61,174
B. Blacks, by Gender								
	Males				Females			
	Born 1914-18	Born 1919-24	Born 1916-20	Born 1921-26	Born 1914-18	Born 1919-24	Born 1916-20	Born 1921-26
Employment index at age 16	-0.025 (0.013)	0.011 (0.011)			-0.007 (0.012)	0.016 (0.011)		
Employment index at age 14			0.010 (0.012)	-0.005 (0.011)			-0.009 (0.010)	0.012 (0.009)
Adjusted R ²	0.115	0.106	0.113	0.097	0.076	0.099	0.086	0.087
No. of obs.	4,278	6,028	4,624	5,975	4,929	6,879	5,297	6,934

Note: See note in table 1.

Table 4 Regressions by Region, by Race and Gender

	A. Whites, by Gender					
	Males			Females		
	Mountain states	Mid-Atlantic & East North Central states	“Junior College” states	Mountain states	Mid-Atlantic & East North Central states	“Junior College” states
Employment index at age 18	-0.008 (0.010)	-0.010** (0.003)	-0.007 (0.006)	-0.008 (0.011)	-0.011** (0.003)	-0.014** (0.005)
Adjusted R ²	0.071	0.025	0.047	0.073	0.020	0.035
No. of obs.	3,670	44,412	27,252	3,773	45,172	28,249
	B. Blacks, by Gender					
	Males		Females			
	South	Non-South	South	Non-South		
Employment index at age 16	-0.008 (0.009)	-0.042 (0.021)	0.003 (0.007)	-0.016 (0.022)		
Adjusted R ²	0.056	0.083	0.044	0.067		
No. of obs.	8,614	1,692	9,809	1,999		

Note: See note in table 1. The Mountain states are Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, and Wyoming, the Mid-Atlantic states are New Jersey, New York, and Pennsylvania, and the East North Central includes Illinois, Indiana, Michigan, Ohio, and Wisconsin. The “Junior College” states are defined as California, Iowa, Illinois, Kansas, Michigan, Mississippi, Oklahoma and Texas, and the South are defined as Alabama, Florida, Georgia, Mississippi, North and South Carolinas, Virginia, Tennessee, Arkansas, Louisiana, Texas, Kentucky, and Missouri.

** significant at the 1% level

Table 5 Regressions of WWII Veteran Status, Males by Race

	White males		Black males	
Employment Index at 18	0.00020 (0.00035)			
Employment Index at 16	0.00043 (0.00032)		0.00071 (0.00086)	
Employment Index at 14			-0.00015 (0.00080)	
Adjusted R ²	0.1177	0.0825	0.0566	0.0385
No. of obs.	102,912	105,474	10,306	10,599

Note: Dependent variable is the binary variable indicating the veteran status during WWII. Regressions also control for the dummy variables for year, quarter and state of birth and the population index of the year an individual is turning a critical age in the state of birth. Robust standard errors are reported in parenthesis and account for clustering on year and state of birth.

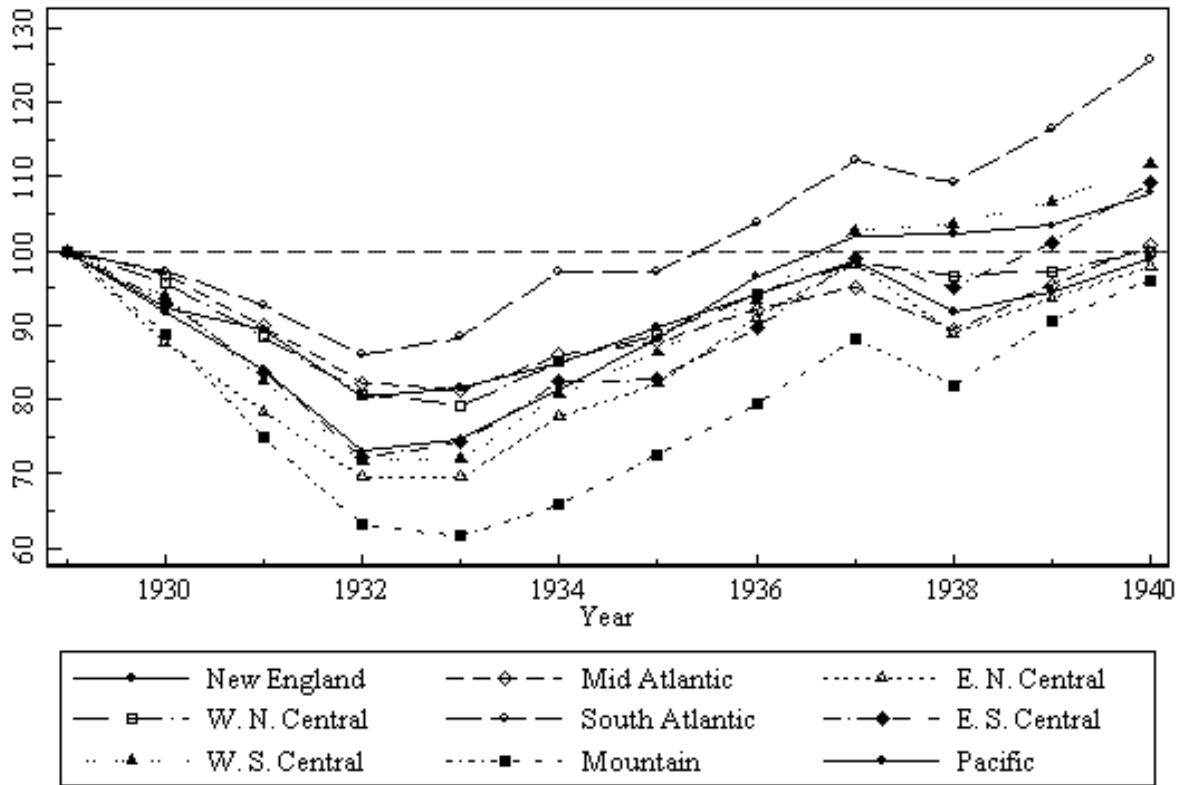
Table 6 Quantile Regressions for the Employment Indices on Education, Males, by Gender

	White males (90 percentile)	Black males (70 percentile)
Employment index at age 18	0.027** (0.001)	
Employment index at age 16		0.020** (0.005)
Pseudo R ²	0.017	0.069
No. of observations	102,912	10,306

Note: See note in table 1.

** significant at the 1% level

Figure 1 Total Employment Index 1929-1940 (August 1929=100) by Census Region



Source: Wallis (1989), Table 2

Figure 2 Comparison of Self-Reported Years of Schooling in the 1940, 1950, and 1960 Censuses

