Did the Great Depression affect Educational Attainment in the US?

khalid kisswani

Quinnipiac University

Abstract

Great Depression is an example of a macroeconomic crisis that produced adverse economic and social effects in all spheres of life. Theoretical arguments about the real effects of the Great Depression on education vary. First is economic hardships, which might force individuals eligible to go to school to work instead. Second is that high unemployment would make going to school the best other viable alternative. Following these theoretical notions, this paper explores the impact of the Great Depression on education, on race (whites and blacks) and gender (males and females), during the period 1930-1940. Furthermore, I test the effects of state employment indices on education. The results (using 1960 census data) show some evidence that education of whites born between 1911 and 1915 was affected. However, there is no evidence that the variation in state employment indices affected the decision of schooling on the average (mean).

1. **Introduction**

Macroeconomic crises have adverse effects on various aspects of social and economic life, generating and profoundly impacting macroeconomic outcomes such as production and jobs. The Great Depression is a prime example of a macroeconomic crisis that produced adverse economic and social effects in all spheres of life. Kirkwood (1972) argues that during the Great Depression the fermenting of a macroeconomic crisis was characterized by many factors. Gross National Product (GNP) declined by 30% in real terms, farm income fell by 50 %, which further increased poverty, businesses closed, factories shut down, and banks ultimately failed. Kirkwood (1972) further shows that employment was affected severely. In 1929 only 3.2% of the population was unemployed, whereas in 1933 the unemployment reached as high as 25%. Moreover, net investment during the Great Depression era was negative, because private investment was far below depreciation. Thus, most effects of the Great Depression are well known and fairly cited. However, an important variable that has been ignored and has a bearing on our understanding the impact of macroeconomic crises is educational attainment.

The theoretical arguments about the real effects of the Great Depression on education vary. The first is that of economic hardships, which invariably causes the cost of education to become unaffordable. This might force individuals eligible to go to school to work for their sustenance. As a result, high school students would drop out, or would not seek further education. The second argument is that high unemployment would reduce the opportunity cost of going to school, making going to school the best other viable alternative. These two theoretical arguments represent the relation between income and substitution effects, and how one argument dominates the other. As we will see, these arguments are crucial in understanding the impact of macroeconomic crises on education.

Following these theoretical notions, this paper intends to explore the impact of the Great Depression on education, contributing to the literature by providing the evidence on these effects on race (whites and blacks) and gender (males and females), during the period from 1930 to 1940. Furthermore, this paper examines the effects of state employment indices on the average education (at the mean). More importantly, it tests the effects of state employment indices on the entire distribution of education (quantile regression).

The results (using individual census data from 1960) show some evidence that the Great Depression affected education of whites born between 1911 and 1915. However, the results show no evidence that the variation in state employment indices affected the decision of schooling on the average (mean), but it affected the education of white males at the top of the distribution (90% percentile).

This paper is organized into five sections. Section 2, reviews the literature. Section 3, explores the theory behind demand for education. Section 4, describes the data. Section 5, outlines the effects of the Great Depression on the educational attainment, and section 6 concludes.

2. Literature Review

The literature of human capital and earnings has grown out of the work of Mincer (1974) and Becker (1975). The literature shows that an individual chooses the level of education that maximizes the present value of earnings compared to the cost of seeking this level (direct or indirect), given the borrowing rate. Altonji (1993) expanded Mincer's (1974) and Becker's work (1975) by treating education as a sequential choice made under uncertainty. He examined how variables influencing tastes for schooling, ability to do college work, and the payoffs to college affect the expected return to schooling.

Due to certain institutional features, like compulsory laws and constraints on borrowing, the actual demand for education may be different from optimal choices. Such institutional constraints may affect the educational attainment in two ways. First, compulsory attendance and child labor laws may constrain education demand for bottom deciles or percentiles. People may stay in school longer than what they would choose to in the absence of these laws. Second, borrowing constraints may affect the education choice for top deciles or percentiles. In the absence of student loans people may be unable to attend school, even though the return on their schooling could exceed the interest rate on loans.

A number of studies find large effects of compulsory education laws on the probability of high school completion between 1920 and 1934. Lang and Kropp (1986) find that compulsory education laws affect enrollment, even for groups not targeted by the laws. Angrist and Krueger (1991), through the use of micro-data from the US Census data, find that children born earlier in the year will obtain fewer years of schooling. In their study they show a student's enrollment will depend on his age, which is determined by the quarter of birth. Lleras-Muney (2002), using the 1960 Census for students in secondary schooling from 1915 to 1939, also finds that increasing the legal age attendance requirement by one more year leads to a 5% increase in educational attainment. This effect was significant for whites but not for blacks.

Extreme circumstances, such as war, natural disasters, or political upheavals might also affect educational attainment. Meng and Gregory (2002) studied the impact of educational interruptions during the Chinese Cultural Revolution (1966-1977) when most schools in urban China ceased operations for 6 years. They find that the school interruption had a substantial impact on educational attainment, especially when the interruption occurs at high school level. They also find that children whose parents had lower educational achievement and lower occupational status were affected the most. Ichino and Winter-Ember (2004) tested the effects of World War II on educational attainment. They find that World War II led to a significant drop in the educational attainment of individuals who were of elementary school age during or immediately after the conflict, as opposed to those born in the previous or subsequent decades. Comparing the evidence for four countries, of which two were directly involved in the conflict (Austria and Germany) and two were not (Sweden and Switzerland), the magnitude of this educational loss is approximately 20% in years of education in Austria and Germany. These individuals also experienced a sizable loss of earnings some 40 years after the war, which may be attributed to the educational loss caused by the conflict.

On the other hand, other research shows that macroeconomic crises do not affect education. Goldin (1998) finds that secondary-school enrollment and graduation rates increased spectacularly in much of the US from 1910 to 1940; the advance was particularly rapid from 1920 to 1935, during the early years of the Great Depression, in the industrial area of the Northeast and Midwest. De Ferranti *et al* (2000) suggest that large enrollment decisions are unaffected by macroeconomic crises, especially moderate ones.

In 2002, Argentina's economy suffered the culmination of an economic decline that began in late 1998. The crisis was all the more unusual because it occurred when the rest of the world was experiencing slow growth, but not recession. Real GDP fell 28% from peak (1998) to trough (2002). Argentina's currency, the peso, was devalued in January 2002. Inflation was 41% in 2002 this caused real wages to fall 23.7% in 2002 and unemployment rose from 12.4% in 1998 to 18.3% in 2001 and 23.6% in 2002[1]. However, more recent work on Argentina confirms that the crisis of the late 1990s and early 2000s did not change overall enrollment level, but it may have negative effects on the quality of schooling because of high associated rates of teacher absenteeism (Espana *et al*, 2002).

In Indonesia the deep financial crisis of 1998 appears to have little effect on schooling outcomes (Thomas *et al*, 2004). Schady (2004), in his analysis of the impacts of the macroeconomic crisis (1988-1992) on education in Peru, finds no effect on attendance rates but a significant decline in the fraction of children who are both employed and attend school. Therefore, given all previous findings, a careful empirical work is needed in order to understand the ambiguous effect of macroeconomic crises on schooling.

3. **Demand for Education.**

In the economic model of human capital, individuals acquire schooling until the marginal benefit of an additional year of education equals the marginal cost in order to maximize the present value of lifetime income (Willis, 1986; Altonji, 1993). The marginal benefit of one year of schooling is the resulting increase in the discounted expected stream of earnings, and the marginal cost is the forgone income and direct private costs like tuition and books. Given this decision rule, the reason some individuals invest in more education than others must arise from factors that either raise the rate of return they receive or lower the cost they must pay for funds.

The effect of a macroeconomic crisis on schooling is ambiguous in theory. In general, an adverse macroeconomic shock will depress current employment and wage prospects, thus the opportunity cost of attending school will fall. Holding everything else the same, this should increase investments in human capital. A shock could also make borrowing constraints more binding and thus reduce the total amount of schooling attainment. When macroeconomic shocks are persistent, they may also depress expected lifetime earnings, thus affecting the marginal benefit from schooling. If the lifetime earnings of all individuals are reduced by the same percentage, regardless of their schooling, then the marginal benefit associated with an additional year of schooling will be lower. Crises need not, however, have a uniform effect across the board on expected earnings. Additionally, the effect of a crisis on the wages and employment prospects of adults in a

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[1] United States Congress report (June 2003).

household may also have an effect on the schooling and employment decisions of children (Schady, 2004).

Thus, because of the ambiguous effect on schooling, students or their parents may choose more or less schooling; they may anticipate or postpone further schooling. The total effect of a crisis on schooling will depend on the relative magnitude of the changes in the marginal costs and benefits from education.

4. **Data**

In this paper, I use the 1960 Census which is provided in the Integrated Public Use Microdata Series (IPUMS)[2]. The IPUMS consists of twenty-seven high-precision samples of the American population drawn from fourteen federal censuses. The IPUMS assigns uniform codes across all the samples and brings relevant documentation into a coherent form to facilitate analysis of social and economic change. Since the IPUMS includes nearly all the detail originally recorded by the census enumerations, users can construct a great variety of tabulations interrelating any desired set of variables.

My sample is drawn from the 1% state sample. I limit the sample to whites and blacks (men and women) born in the US between 1896 and 1925. The sample contains 240,018 white males, 251,677 white females, 24,360 black males, and 27,588 black females. Birth year is derived from reported age and quarter of birth.[3] Individuals born in Hawaii and Alaska are excluded from the sample. People reported to be born in the District of Columbia and people who did not report their state of birth are excluded as well. This is done because this paper utilizes the state employment indices for the period of 1930-1940, and these indices do not include the District of Columbia. Depending on the state of birth, 48 dummy variables for states are included where each equals one if the person is born in the state, zero otherwise. Years of education are the number of years of schooling completed, and the number is derived from the highest grades completed (years of education range between 0-18 years of education). In this paper I add to the data the states employment indices from 1930 to 1940, which I use from Wallis (1989).

Following Angrist and Krueger (1991), I constructed four dummy variables on the basis of quarter of birth. This is done because most school districts require students to attain age six by January 1 of the academic year in which they plan to attend and to turn 16 (in most of the states) to drop out of school. These requirements cause quarter of birth and years of education to be correlated (Angrist and Krueger, 1991). A student who is born in the third quarter will wait until the subsequent year to enroll in school, while another student born in the first quarter will be able to enroll that same year. This means that the variation in education is related to quarter of birth. Also, according to the quarter of birth, some students turn 16 before others, which enable them to drop out of school earlier.

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[2] Ruggless *et al*, 2004.
[3] Census reports data in April, therefore, year of birth is equal to "1960-age", if born in first quarter, and year of birth is equal to "1960-age-1", if not born in first quarter.

Two additional variables are also constructed. The first is employment index at age 18, and the second is employment index at age 16. They are derived by matching the state employment indices to the year of birth when the person turned 18 and 16, between 1930 and 1940 (because the indices are reported for this period), and to his state of birth. This is done because this paper tests the relation between the state employment indices and years of education, with respect to the fact that students earn their high school diploma at age 18 and they can drop out of school at age 16. The data is analyzed for each group of white males, white females, black males, and black females separately.

5. The Effects of the Great Depression on the Educational Attainment
A) Educational Attainment.
The major characteristics of the sample and the main variables are described in this part. Table 1 report the mean and standard deviation of the variables used in the analysis according to the person's weight. Furthermore, figure 1 describes the educational attainment by year of birth for whites, blacks, males, and females separately. The measure of educational attainment is calculated by averaging the number of years of schooling completed by individuals born in each year between 1896 and 1925.

Table 1 and figure 1 are here.

Table 1 show that the mean of the years of education for white females is the largest, 10.42 years, whereas for white males the mean is 10.29 years. Black males and females show lower means, 6.94 years and 7.74 years respectively. Figure 1 shows that all the groups experienced an increase in the mean of educational attainment (for people born between 1896 and 1925). This is consistent with Goldin (1998) that the availability and expansion in schools, especially secondary schools, increased the enrollments in high schools through the period of 1910-1940, known as the "high school movement".

However, panels' c and d in figure 1 show that the average years of education decreased for black males born in 1910, 1912, 1915, and 1917. As for black females who were born in 1912, 1917, and 1919, we see the same pattern of reduction in the average years of education. This is not the case for whites (males and females). Now, those people born between 1911 and 1920 have turned 18 during the Great Depression era; accordingly, a question could be raised if these limps in the educational attainment are a result of the Great Depression or are caused by other anomaly.

To further explore the cross-cohort differences in educational attainment, I detrend the secular educational trend. This is done by regressing years of education on the year of birth, normalized to 1896, and quarter of birth dummies.[4] The secular educational trend was captured by a linear trend for white males and black females, and by a quadratic trend for black males and white females.[5] The residuals from these trends capture the

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[4] See Angrist and Krueger (1991) for the importance of using the quarter of birth in determining the years of education.

[5] For each group detrending was done by regressing years of education on polynomial of years of birth from linear up to sixth polynomial and on quarter of birth. Then by calculating Schwarz Information Criteria (SIC), the best detrending model for each group was the one that has the minimum SIC.

effects of the unobservable factors on years of education such as income and borrowing constraint. Furthermore, these unobservable factors were also influenced by the Great Depression. Income declined due to higher unemployment rates, and this lower income affected the borrowing constraint. Therefore, we can conclude that the residuals may be used to show the impact of the Great Depression on education. The residuals from these trends are displayed in figure 2.

Figure 2 is here.

The residuals plotted in figure 2 show some evidence that educational attainment for people born in the early 1910s was lower than the cohorts before and after, especially for white males and females. The negative deviations from the secular trend for white males and females characterize the period between 1910 and 1920, while the evidence of similar negative deviations for blacks (males and females) during the same period is not strong.

To support the evidence from the plotted residuals, I estimate the relation between these residuals and the birth cohort. The model regresses the residuals, plotted in figure 2, on dummies for five birth cohorts and quarter of birth dummies with a constant.[6] The results are reported in table 2. In table 2, the difference between the coefficients of two consecutive cohorts can be interpreted as the difference between the numbers of years of schooling completed, on average.

Table 2 is here.

Looking at the white male's column of table 2, the average educational loss of the white male cohort born between 1911 and 1915 amounts to approximately 6.1% of a year of schooling (22.3 days) with respect to the previous cohort and to 6.4% (23.4 days) with respect to the following cohort, and both differences are statistically significant (different from zero). The corresponding losses for the white female cohort born between 1911 and 1915 are 7.2% (26.3 days) and 4.2% (15.3 days) and are also statistically significant. This could present some evidence that the Great Depression might have affected the educational attainment of white students born between 1911 and 1915, as compared to the cohort before and after.

For blacks (males and females) no statistically significant difference can be found in table 2. The regression shows that the educational attainment for blacks (males and females) was not affected, since the coefficients are not statistically different from zero. This suggests that the Great Depression did not affect the schooling decision for blacks (males and females).

One of the explanations for this could be that African Americans were not still fully integrated in the society during the period 1929-1936. Discrimination still existed, there were no equal opportunities in schools or jobs, plus their wages were much lower than

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[6] The regression was done for different models for all groups using each time different cohort periods, and the results were similar in significance and effects.

their white counterparts, which might have forced blacks into job market instead of schooling (Freeman *et al*, 1973; Smith and Welch, 1977). Furthermore, human capital theory suggests that blacks may have faced a borrowing constraint during the Great Depression where it could have been difficult to get loans to finance schooling. Becker called these differences in opportunity (Kaufman and Hotchkiss, 2003). Opportunity, in this sense, relates to the availability and cost of funds for investment in schooling. Inequality of opportunity leads to inequality in years of education. This could be the case for blacks, where lack of available funds and cost of funds led to lower years of education.

One more issue here could be that blacks had lower demand for human capital investment (years of education). This may be due to discrimination in the labor market. The rate of return from a given expenditure on schooling depends on the market earnings from work after the schooling is completed. Discrimination, whether in the form of wage discrimination or occupational discrimination, would result in a lower rate of return for a given expenditure on schooling, causing a lower demand for schooling by blacks.

Another potential explanation could be the child labor laws (Ensign, 1969; Trattner, 1970; Krueger and Tjornhom, 2002). In most states it was illegal to hire students who had not turned 14. This may have constrained blacks to stay in school until they were 14 and became legally eligible to work, which could be accounted for by the lower mean of years of education in table 1 (7 years). Therefore, the Great Depression did not show strong evidence of affecting the education for blacks, because already their years of education were affected by both low demand for human capital and child labor laws.

As for white males and females, one of the explanations for the effects on the cohort of 1911-1915 could be the added worker effect (Kaufman and Hotchkiss, 2003). A lot of people lost their jobs during the Great Depression period. This resulted in a great decrease in their entire families' incomes, causing a pure negative income effect for other family members, such as students. Assuming that leisure time is a normal good, the reduction in family income will lead to a decreased demand for leisure and a greater supply of labor, as the student children seek work to supplement family income. From here one can argue that white students found themselves in a situation where they had to drop out of school and participate in the labor market by looking for a job to support their families. This could explain why the educational loss was captured by the regression. However, the cohort between 1911 and 1913 turned 16 between 1927 and 1929, when the economy was booming. This could mean that these cohorts may have dropped out of school at age 16, and that's why the regression is capturing the negative deviations in years of education.

The residuals analysis shows that whites (males and females) who were born between 1911 and 1915 suffered a loss in their education, while there is no evidence of the same effect for whites born before or after this cohort. As for the blacks (males and females), the results show no evidence that the Great Depression had any effect on their education.

To clearly explore if the educational loss, that whites born between 1911 and 1915 suffered, could be attributed to the Great Depression, I use an exogenous variable that

may have affected the years of education and was, in turn, affected by the Great Depression. The variable is the state employment indices. This is done to overcome the identification problem. The next part discusses the identification problem and tests the relation between the employment levels and the years of education.

B) The Impact of Employment Levels on Years of Education
B-I   Identification Problem and Employment Indices:
The impact on years of education of whites born between 1911 and 1915 could be attributed to the Great Depression, or may be a result of factors other than the Great Depression. Hence, I will use the state employment indices to clarify this issue. The employment levels demonstrate severity of the Great Depression at the state level. In the economic theory, the decision of schooling is affected by the employment levels, since it represents the opportunity cost. Therefore, using the employment indices to test for any effect on education will help to explore further if the Great Depression have affected the years of education.

The severe impact of the Great Depression on the labor market is evident in the unemployment rates. Between 1929 and 1933, the unemployment rate increased by over 20 points (Margo, 1993). For the remainder of the decade, the unemployment stayed in the double digits. In addition to high levels of unemployment, the 1930s witnessed the emergence of widespread and persistent long-term unemployment (unemployment durations longer than one year) as a serious policy problem. Margo (1991) reports that in Massachusetts State, in 1934, fully 63% of unemployed persons had been unemployed for a year or more, and similar numbers were observed in Philadelphia in 1936 and 1937. Margo (1991) also shows that between 1931 and 1940, the aggregate unemployment rate, including persons holding work relief jobs, never dipped below 14%. The unemployed were older and had completed, on average, 1.5 fewer years of schooling than the employed. Therefore, with family incomes dropping, pursuing education would have been more difficult; however, with insufficient employment opportunities not pursing education would not yield any positive benefits.

The state employment indices I use in this paper are from Wallis (1989). Wallis (1989) estimated the state employment indices during the Great Depression period, 1930 to1940. The Great Depression affected different states differently, where some had severe unemployment rates while others had only moderate rates. For example, Arizona had employment indices of 81%, 68.9%, and 72.6% for the years 1931, 1932, and 1933 respectively; while Florida had 96.6%, 101.1%, and 91.8% for the same years. The indices also show that unemployment declined steadily between 1929 and 1932-1933, rose through 1937, fell in 1938, and again rose by the end of the decade. Manufacturing industries were harder hit by the depression than non-manufacturing industries; they fell farther in the 1929-1933 downturns and again in 1937-1938, ending the decade with low levels of employment relative to non-manufacturing industries.

The decision to invest in more schooling is affected by the opportunity cost of labor market (forgone income of not working). This cost was low during the Great Depression period because of the high rates of unemployment. Therefore, the next section tests if

high employment indices led to more schooling. For this purpose, I derive the variable, state employment index at age18, which matches the state employment index for each person, when he turned 18, and the state he was born in. Because Wallis (1989) reports state employment indices between 1930 and 1940, the state employment index at age 18 is derived for people born between 1912 and 1922, who turned 18 between 1930 and 1940. This is done to keep the variables consistent.

B-II   Did Employment Indices Affect Schooling?
To test the relation between years of education and employment levels, I regress years of education on state employment indices when the person is 18, year of birth dummies for years between 1912 and 1922 (because students turn 18 between 1930 and 1940 if were born between 1912 and 1922), state of birth dummies, and quarter of birth dummies, with a constant.

Table 3 is here.

The results of the regression (reported in table 3) show that the variation in the state employment levels did not affect the education of white males and blacks (males and females). However, the results show a small and negligible effect on white females. The average educational loss for white females is 0.4% of a year of schooling (1.5 days) for every 1% increase in employment indices, and significantly different than zero, with respect to who was born in 1912.

One explanation for this small educational loss could be that white females preferred work over education when employment indices were high. The Leisure/Labor model suggests that when the opportunity cost increases, people will demand less leisure and choose to work more. Therefore, white females preferred to reduce education (leisure) and increase their participation in the labor market when employment indices increased. This means that the substitution effect dominates the income effect. This is also consistent with the findings of Goldin and Katz (1995). They find that females high school graduates earned more than those with lower education during the Great Depression period in clerk jobs. This indicates that when unemployment increased white females believed that the return on education was high, and therefore, they preferred to go to school.

For blacks (males and females), I find, as expected, that variations in state employment levels did not affect the years of education. This is consistent with the residuals analysis, which shows no impact of the Great depression on blacks' education.

For white males, the variations in the state employment indices did not show any effect on the years of education, because income effect and substitution effect cancel each other out at the mean. This indicates that the income effect, demanding more leisure (education) and less hours of work, is equal to the substitution effect, demanding more hours of work and less education, causing no effect on the average education.

The previous analysis shows no evidence that the variations in state employment indices affected the human capital accumulation decision made by white males and blacks (males and females); at the time they turned 18. As for white females, there is a significant but small and negligible effect. All in all, the use of state employment indices showed no evidence, at the mean, that the Great Depression lowered education.

Also because students in the US are required legally to stay in school until the age of 16, one more issue we can look at is the impact of state employment indices on the student's decision to drop out of school when s/he turns 16 (drop-out age). As before, due to the reason that state employment indices are for the period 1930 to 1940, I derive a variable that represents state employment indices at age 16 for each person , between 1930 and 1940, according to his or her state of birth. This is done for people born between 1914 and 1924 to be consistent with the employment indices.

In this model, I regress years of education on the state employment indices when the person is 16, year of birth dummies for years between 1914 and 1924 (because students turn 16 between 1930 and 1940 if born between 1914 and 1924), state of birth dummies, and quarter of birth dummies, with a constant.

Table 4 is here.

The results (reported in table 4), once again, show no evidence that the variations in the state employment indices affected the years of education at the mean, using the drop-out age. The coefficients for white males and blacks (males and females) are not significant. This suggests that we can't reject the null hypothesis that coefficients equal zero (no relation). However, for white females the coefficient on the state employment index is negative and significantly different from zero, but it is also small and negligible (for every 1 percent point increase in the state employment index the loss of white females is 0.7% of years of education (2.6 days)). All this indicates that the variations in state employment indices did not show any effect on the students' decision to drop out of school for white males and blacks (males and females), whereas it shows little evidence for white females.

This section shows that the state employment indices did not affect the years of schooling, whether when the student turned 18 or even 16 years old. Since the residuals analysis suggests that whites born between 1911 and 1915 were affected, this implies that the total effect is not shown because the substitution effect and the income effect are canceling each other out at the mean, which is the OLS regression. Therefore, part D of this paper will discuss the regression around the 90% quantile, to see if still the two effects cancel each other out for the top 10% students. But before doing so, I test in the next part if the Great Depression had any impact on the probability of earning a degree, whether high school or college, using also the state employment indices as an exogenous variable.

C) The Impact of State employment Indices on the Probability of Earning a Degree
For further exploration, this part tests if the state employment indices had any impact on the probability of earning a college degree or a high school diploma. It tests the relation

between state employment indices and the probability that a person graduates from college when s/he has turned 18 between 1930 and 1940. It also tests the relation between state employment indices and the probability that a person continues schooling and earns a high school diploma when s/he has turned 16 between 1930 and 1940. For this purpose, I start by estimating the probability of earning a college degree (college equals 1 if years of education are 16 or more and equals 0 otherwise) on state employment indices at age 18, year of birth dummies, state of birth dummies, and quarter of birth dummies. The regression is done for people with 12 years of education or more.

Table 5 is here.

Table 5 reports the results. The results show that for blacks (males and females) and white males, there is no evidence of any effect. As for white females, the effect is small and negligible, despite it is being significant (higher state employment indices led to increase the probability of earning a college degree by 0.05%). Therefore, the state employment indices did not affect the probability that a person would earn a college degree. This suggests that there is weak evidence that the Great Depression affected the probability of a person earning a college degree.

Now I turn to estimate the probability of graduating from high school (high school equals 1 if years of education are 12 or more and equals 0 otherwise) on state employment indices at age 16, year of birth dummies, state of birth dummies, and quarter of birth dummies. The regression is done for people having 8 years of education or more.

Table 6 is here.

Table 6 reports the results. The results show a small significant impact for whites (males and females) and black females. The higher state employment indices led to a decrease in the probability of earning a high school degree by 0.1%, 0.1%, and 0.2% for each group respectively. This indicates that the effect is negligible economically. As for the coefficient on black males, it was not significant. Hence, the results suggest that the probability of earning a high school diploma was affected but by very little by variations in the state employment indices during the Great Depression.

From the previous analysis and regressions, the paper shows weak and negligible evidence for the effects of the state employment indices on years of education, or the probability of earning a degree (college or high school). This is interpreted as little effect of the Great Depression on education. As mentioned before, the reason for this could be that the income effect and the substitution effect of the Great Depression are canceling each other out at the mean (average education). This suggests that the low opportunity cost and restrictions on borrowing may have led to a corner solution rather than to an interior solution, and that is why we do not see any effect on years of education. For this reason, the next part will investigate if the Great Depression affected the 90% quantile of students or not, since the regressions around the mean show no significant impact.

D) Quantile regression of Years of Education and State Employment Indices

That there appears to be little effect of the Great Depression on the average schooling years does not mean that there were little effects on the overall population. For example, Lleras-Muney plots years of education for each decile for the 1901-1925 birth cohorts. In her Figure 2 (p. 421), we see a noticeable dip in educational attainment for the 90-percentile of the distribution for the birth cohorts born during 1910s. In order to see whether or not this pattern holds in the data in this paper, I create similar plots from my sample for 10-, 50- and 90-percentiles of the distribution of years of education.

Figure 3 is here.

Figure 3 presents these plots for four different race/sex categories. The plot for the 90th percentile of white males shows a noticeable dip of the years of education for the 1913 and 1916 birth cohorts and there is a dip for the 1913 birth cohort for black males. On the other hand, there is no change for white females and an increase for the 1916 birth cohort for black females at the 90-percentile of educational attainment.

I formally test whether or not the variation in the state-level employment index had effects on educational attainment at the top tail of distribution. As before, I regress the years of education on the employment index at age 18, the dummy variables for 48 states, ten birth-years, and three quarters of birth for a sub-sample of those who were born between 1912 and 1922 but this time using the quantile regression. Table 7 presents the results of the quantile regressions separately for four demographic groups.

Table 7 is here.

The results show that top 10% of white males were affected. The coefficient for white males is positive and statistically significant (3%). It is possible that the variations in the state employment indices encouraged white male students to get more education and graduate from school. On the other hand, for white females and blacks (males and females) there is no evidence that high employment indices had any effect on the top 10%.

From this part, I conclude that the substitution effect and the income effect may be canceling each other out at the mean, but the income effect is winning at the top tail of the distribution. One explanation for this could be that the 1960 Census includes WWII veterans. These veterans greatly benefited from the GI Bill, which provided financial incentives to return to school. This could be the case for white males.

6.   Conclusion

This paper shows evidence that the Great Depression (through the residuals analysis) affected the years of education for the cohort of white males and females born between 1911 and 1915, but did not affect blacks (males and females). However, when looking at the impact of the employment indices on schooling, the results show that the state employment indices, which were affected by the Great Depression and were used as an exogenous variable, did not affect the educational attainment of students. This suggests

that the income effect and the substitution effect are canceling each other out at the mean, which is why the variations in state employment indices show no effect on education at the mean. Also, it could be that the residuals analysis captures the 16 year old students who preferred to drop out of school when the economy was booming between 1927 and 1929, rather than showing the result of the Great depression.

When looking at the impact of the variations in the state employment indices on the 90th percentile of students' education, white males appear affected, which suggests that the income effect was larger than the substitution effect for the top 10%. The insignificant impact of the Great Depression on blacks' educational attainment could be a good topic for further research.

TABLE 1

Descriptive Statistics

Variable	White Males	White Females	Black Males	Black Females
Age	46.88	46.96	46.78	46.57
	(8.31)	(8.38)	(8.31)	(8.35)
Years of education	10.29	10.42	6.94	7.74
	(3.52)	(3.07)	(3.94)	(3.71)
Born in second quarter/(Q2)	0.24	0.24	0.25	0.25
	(0.43)	(0.43)	(0.43)	(0.43)
Born in third quarter/(Q3)	0.26	0.26	0.26	0.26
	(0.44)	(0.44)	(0.44)	(0.44)
Born in fourth quarter/(Q4)	0.24	0.25	0.23	0.24
	(0.43)	(0.43)	(0.42)	(0.43)
Number of observations	240,018	251,677	24,360	27,588

- Standard deviation is in parentheses.
- The calculations were according to the personal weight.
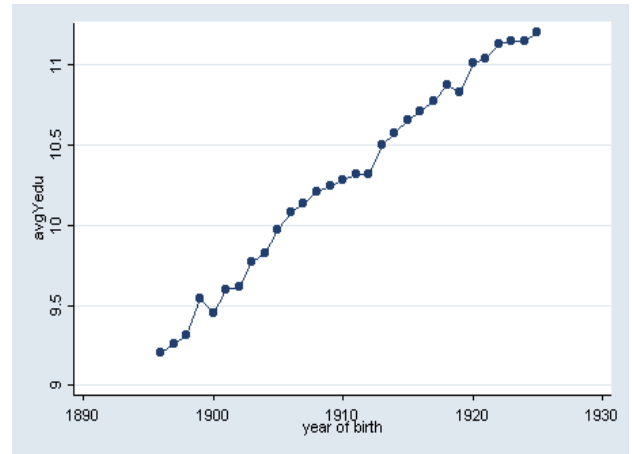
Figure 1

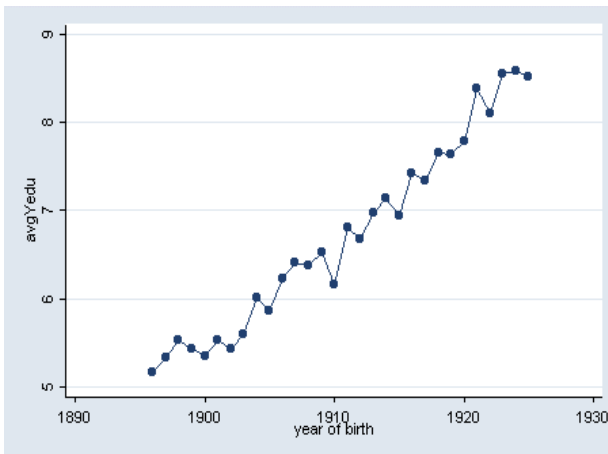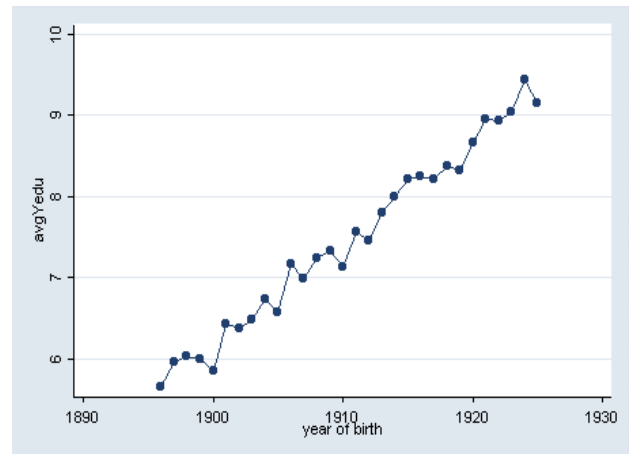## The Educational Attainment

(a): <u>White Males</u>
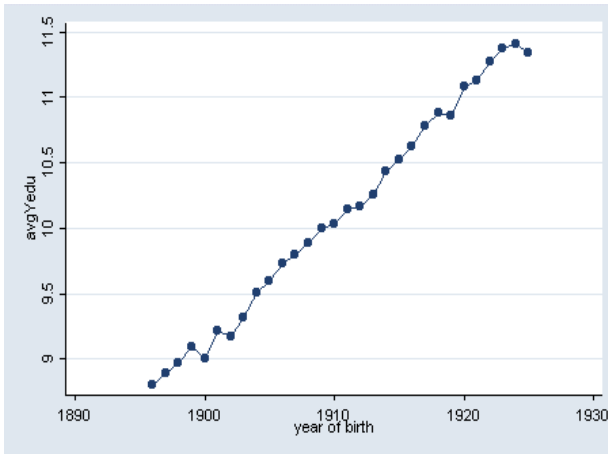
(b): <u>White Females</u>

(c): <u>Black Males</u>

(d): <u>Black Females</u>
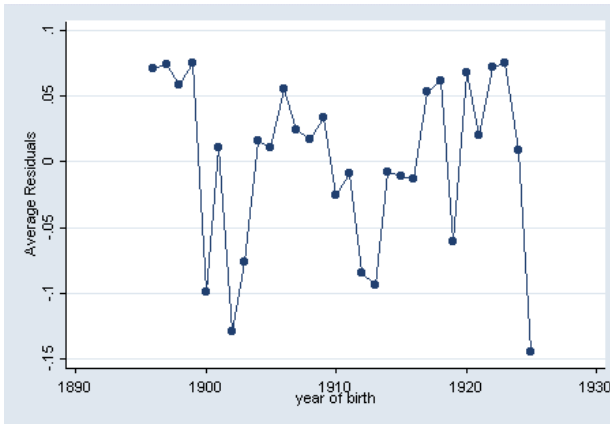

*avgYedu: is the average years of education.
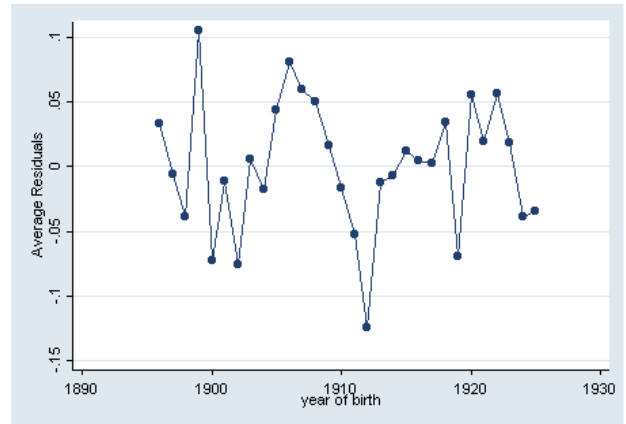
Figure 2

The Average Residuals Plots
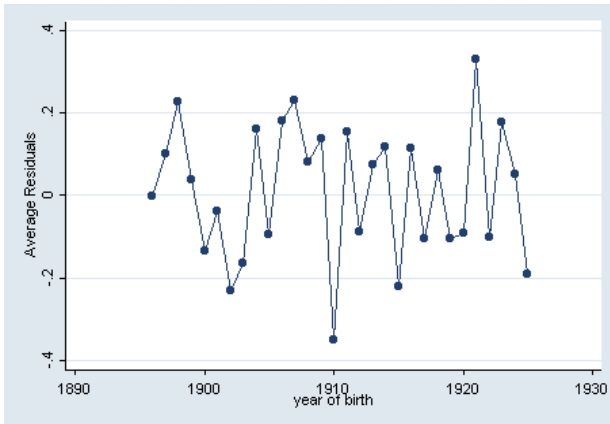
(a): <u>White Males</u>

(b): <u>White Females</u>
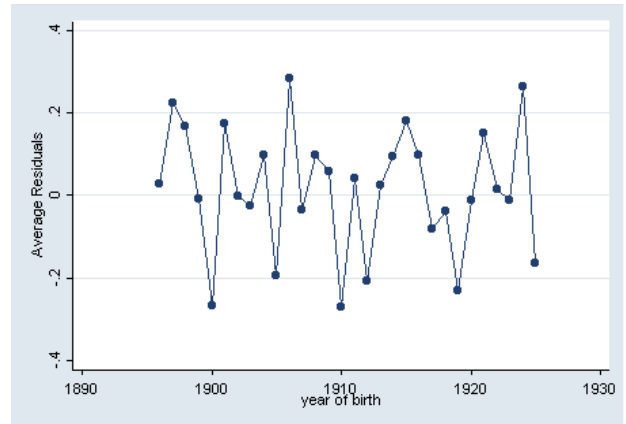

(c): <u>Black Males</u>

(d): <u>Black Females</u>

TABLE 2

The Regression of Residuals on Birth Cohort

Variable	White Males	White Females	Black Males	Black Females
Born 1901-1905	-0.058**	-0.007	-0.081	0.023
	(0.029)	(0.026)	(0.097)	(0.090)
Born 1906-1910	-0.006	0.040	0.009	0.028
	(0.028)	(0.025)	(0.093)	(0.085)
Born 1911-1915	-0.067**	-0.033	-0.009	0.050
	(0.026)	(0.024)	(0.092)	(0.082)
Born 1916-1920	-0.003	0.009	-0.41	-0.034
	(0.026)	(0.023)	(0.090)	(0.080)
Born 1920-1925	-0.019	0.007	0.034	0.071
	(0.026)	(0.023)	(0.088)	(0.078)
constant	0.026	-0.003	0.012	-0.025
	(0.025)	(0.022)	(0.081)	(0.074)
R-squared	0.0001	0.0001	0.0001	0.0001
Number of observations	240,018	251,677	24,360	27,588

-The dependent variable is the residual of a regression of years of education on polynomial in age estimated separately for white and black, males and females. The table reports the coefficients of the regression of these residuals on the five cohort dummies and quarter of birth, with a constant.
-Robust standard errors are reported in parenthesis.
- Born 1896-1900 is the base.
- Born in the first quarter of the year is the base.
** Significant at the 5% level.
*** Significant at the 10% level.

TABLE 3

The Regression of Years of Education on State Employment Indices at Age 18

Variable	White Males	White Females	Black Males	Black Females
State Employment index at age 18	-0.003 (0.002)	-0.004 ** (0.002)	-0.006 (0.007)	-0.008 (0.006)
Constant	11.19** (0.226)	11.08** (0.192)	9.64** (0.697)	10.29** (0.605)
R- squared	0.07	0.055	0.117	0.092
Number of Observations	104,643	108,938	10,452	12,116

-The dependent variable is the years of education. The table reports the coefficients of the regression of years of education on the state employment indices when the person at age 18, year of birth dummies, state of birth dummies, and quarter of birth, with a constant.
-Robust standard errors are reported in parenthesis.
- Born in 1912 and born in New York State are the bases.
- Born in the first quarter of the year is the base.
** Significant at the 5% level.

TABLE 4

The Regression of Years of Education on State Employment Indices at Age 16

Variable	White Males	White Females	Black Males	Black Females
State Employment index at age 16	-0.002 (0.002)	-0.007** (0.002)	-0.003 (0.007)	0.006 (0.006)
Constant	11.45** (0.224)	11.71** (0.185)	9.76** (0.663)	9.37** (0.589)
R- squared	0.068	0.055	0.114	0.091
Number of Observations	107,143	111,782	10,760	12,526

-The dependent variable is the years of education. The table reports the coefficients of the regression of years of education on the state employment indices when the person at age 16, year of birth dummies, state of birth dummies, and quarter of birth, with a constant.

-Robust standard errors are reported in parenthesis.

- Born in 1914 and born in New York State are the bases.

- Born in the first quarter of the year is the base.

** Significant at the 5% level.

TABLE 5

The Probit Regression of Being a College Graduate on the State Employment Indices at Age 18

(data set is for 12 years of education or more).

Variable	White Males	White Females	Black Males	Black Females
State Employment index at age 18	0.0006 (0.0004)	0.0005*** (0.0003)	0.0005 (0.002)	0.0001 (0.001)
Pseudo R- squared	0.006	0.008	0.030	0.026
Number of Observations	52,042	58,052	1,916	2,687

-The dependent variable is that the person earned a college degree (equals 1 if years of education equal 16 or more, zero other wise). The table reports the coefficients of the regression of college on the employment indices when the person at age 18, year of birth dummies, state of birth dummies, and quarter of birth.
-Robust standard errors are reported in parenthesis.
- Born in 1912 and born in New York State are the bases.
- Born in the first quarter of the year is the base.
-The coefficients are reported as dF/dx.
** Significant at the 5% level.
*** Significant at the 10% level.

TABLE 6

The Probit Regression of Being a High School Graduate on the State Employment Indices at

Age 16 (Data set is for 8 years of education or more)

Variable	White Males	White Females	Black Males	Black Females
State Employment index at age 16	-0.001** (0.0004)	-0.001** (0.0003)	-0.001 (0.001)	-0.002** (0.001)
Pseudo R- squared	0.0148	0.0193	0.0256	0.0217
Number of Observations	93,565	101,068	5,761	7,893

-The dependent variable is that the person earned a high school degree (equals 1 if years of education equal 12 or more, zero other wise). The table reports the coefficients of the regression of high school on the state employment indices when the person at age 16, year of birth dummies, state of birth dummies, and quarter of birth.
-Robust standard errors are reported in parenthesis.
- Born in 1914 and born in New York State are the bases.
- Born in the first quarter of the year is the base.
- The coefficients are reported as dF/dx.
** Significant at the 5% level.

TABLE 7

The 90% Quantile regression of years of education on stat employment indices at age 18

Variable	White Males	White Females	Black Males	Black Females
State Employment index at age 18	0.03** (0.001)	2.58e-13 (2.27e-09)	-6.28e-14 (4.42e-09)	3.28e-14 (2.27e-09)
Constant	13.12** (0.094)	15 (2.67e-07)	12 (4.44e-07)	14 (2.33e-07)
Pseudo R- squared	0.017	0.008	0.016	0.015
Number of Observations	104,643	108,938	10,452	12,116

-The dependent variable is the years of education. The table reports the coefficients of the 90% quantile regression of years of education on the state employment indices when the person at age 18, year of birth dummies, state of birth dummies, and quarter of birth, with a constant.
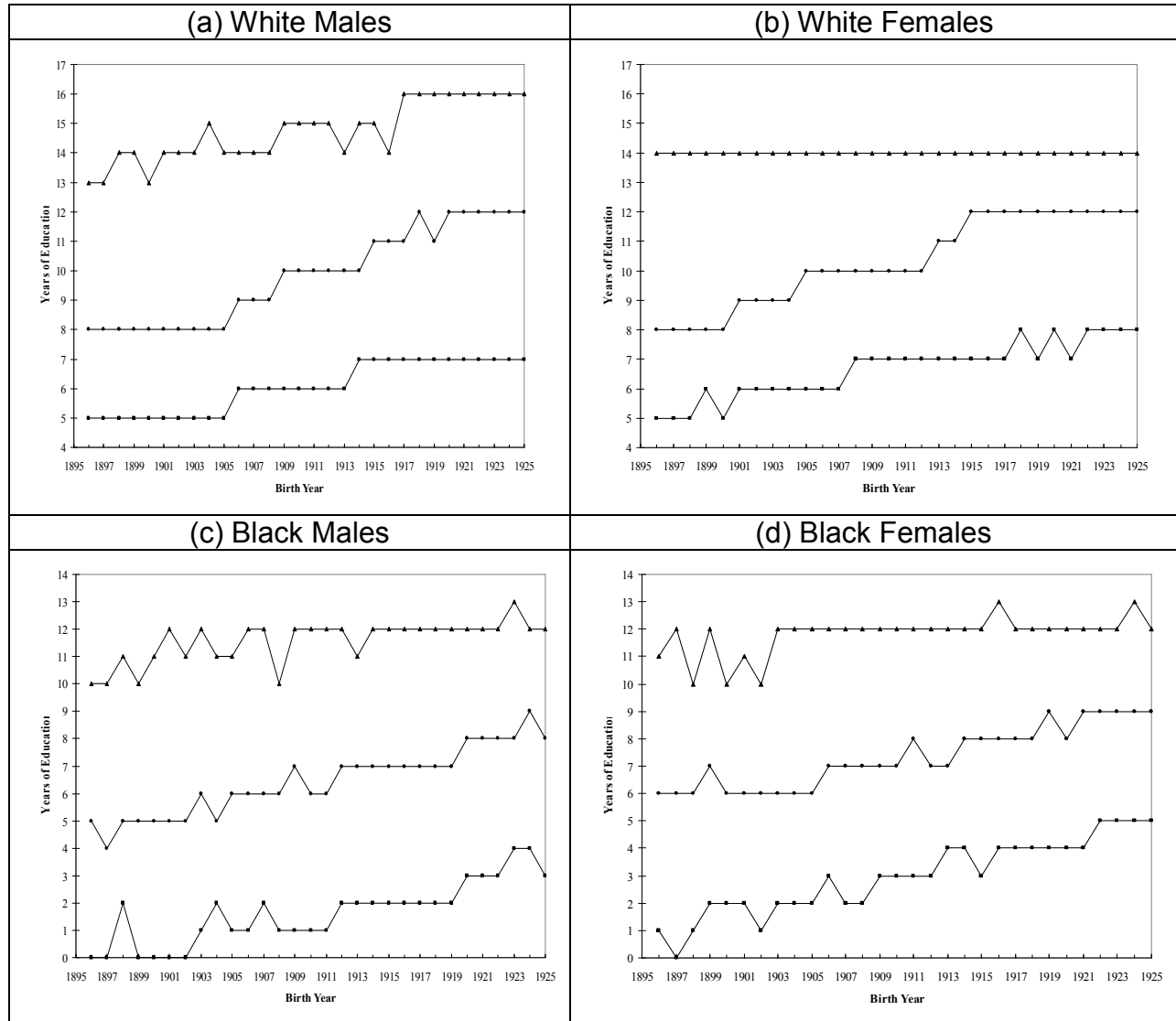
-Robust standard errors are reported in parenthesis.

- Born in 1912 and born in New York State are the bases.

- Born in the first quarter of the year is the base.

** Significant at the 5% level.

Figure 3: Educational Attainment at 10-, 50-, and 90-percentiles

REFERNCES

1. Altonji, J.G., (1993). "The Demand for and Return to Education when Education Outcomes Are Uncertain", Journal of Labor Economics, 11(1), 48-83.
2. Angrist, J. D., Krueger, A. B., (1991) "Does Compulsory Schooling Attendance Affect Schooling and Earnings?" Quarterly Journal of Economics, 106(4), 979-1014.
3. Becker, G. S., (1975) "Human Capital: A Theoretical and Empirical Analysis" New York: National Bureau of Economic Research.
4. De Ferranti, D., Perry, G.E., Gill I. S., Serven L., (2000) "Securing Our Future in a Global Economy" World Bank, Working Paper, Washington D.C.
5. Ensign, F.C. (1969) "Compulsory School Attendance and Child Labor", New York, NY: Arno Press & The New York Times.
6. Espana, S., Parandekar, S., Savanti, M. P., (2002) "El Impacto de la crisis en el proceso educativo Argentina" World Bank, Working Paper, Washington D.C.
7. Freeman, R.B., Gordon, R. A., Bell, D., Hall, R. E. (1973) "Changes in the Labor Market for Black Americans, 1948-72" Brookings Papers on Economic Activity, No.1.
8. Goldin, C. (1998) "America's Graduation from High School: The Evolution and Spread of Secondary Schooling in the Twentieth Century." Journal of Economic History, 58 (2), 345-74.
9. Goldin, C., Katz, L., (2003) "Mass Secondary Schooling and the State: The Role of State Compulsion in the High School Movement." NBER Working Paper, No. 10075.
10. Goldin, C., Katz, L., (1995) "The Decline of Non-Competing Groups: Changes in the Premium to Education, 1890 to 1940." NBER Working Paper, No. 5202.
11. Ichino, A., Winter-Ebmer, R., (2004) "The Long-Run Educational Cost of World War II." Journal of Labor Economics, 22 (1), 57-86.
12. Kaufman, B.E., Hotchkiss, J., (2003) "The Economics of Labor Markets", Thomson-South Western, 6th. Edition.
13. Kirkwood, J.B., (1972) "The Great Depression: A Structural Analysis", Journal of Money, Credit and Banking, 4 (4), 811-837.
14. Krueger, D., Tjornhom, J. (2002) "Economic Inequality and the Emergence of Child Labor Laws", Stanford Law School, Working Paper, No. 246.
15. Lang, K., Kro, D., (1986) "Human Capital versus Sorting: The Effects of Compulsory Attendance Laws", Quarterly Journal of Economics, 101 (3), 609-624.
16. Lleras-Muney, A., (2002) "Were Compulsory Attendance and Child Labor Laws Effective? An Analysis from 1915 to 1939." Journal of Law and Economics, 45 (2), 401-35.
17. Margo, R. (1991) "The Microeconomics of Depression Unemployment." Journal of Economic History, 51 (2), 333-341.
18. Margo, R.A., (1993) "Employment and Unemployment in the 1930s." Journal of Economic Perspectives, 7 (2), 41-59.
19. Meng, X., Gregory, R., (2002) "The Impact of Interrupted Education on Subsequent Educational Attainment: A Cost of the Chinese Cultural Revolution." Economic Development and Cultural Change, 50 (4), 935-59.

20. Mincer, J., (1974) "Schooling Experience and Earnings", National Bureau of Economic Research, New York.
21. Ruggles, S., Sobek, M., atthew, Alexander T., Fitch, C. A., Goeken, R., Hall P. K., King, M., Ronnander, C. (2004) "Integrated Public Use Microdata Series: Version 3.0 [Machine-readable database]", Minneapolis, MN: Minnesota Population Center.
22. Schady, N.R. (2004) "Do Macroeconomic Crisis Always Slow Human Capital Accumulation" The World Bank Economic Review, 18 (2), 131-154.
23. Smith, J., Welch, F.R. (1977) "Black-White Male Wage Ratios: 1960-70" The American Economic Review, 67(3), 323-338.
24. Thomas, D., Beegle, K., Frankenberg, E., Sikoki, B., Strauss, J., Teruel, G., (2004) "Education in a Crisis", Journal of Development Economics, 74(1), 53-85.
25. Trattner, W.I. (1970)"The Crusade for the Children", Chicago, Illinois, Quadrangle Books.
26. United States Congress Report, Joint Economic Committee (2003) "Argentina's Economic Crisis: Causes and Cures".
27. Wallis, J.J., (1989) "Employment in the Great Depression: New Data and Hypotheses." Explorations in Economic History, 26 (1), 45-72.
28. Willis, R.J., (1987) "Wage Determinants: a Survey and Reinterpretation of Human Capital Earnings Functions", Hand Book of Labor Economics, 1, 525-602.