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HOW AMERICA GRADUATED FROM HIGH SCHOOL: 1910 TO 1960

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ABSTRACT

Human capital accumulation and technological change were to the twentieth century what physical capital accumulation was to the nineteenth century -- the engine of growth. The accumulation of human capital accounts for almost 60% of all capital formation and 28% of the per capita growth residual from 1929 to 1982. Advances in secondary schooling account for about 70% of the increase in total educational attainment from 1930 to 1970 for men 40 to 44 years old. High school, not college, was responsible for the enormous increase in the human capital stock during much of this century. In this paper I answer when and where high schools advanced in the 1910 to 1960 period.

The most rapid expansion in the non-South regions occurred in the brief period from 1920 to 1935. The 1920s provided the initial burst in high school attendance, but the Great Depression added significantly to high school enrollment and graduation rates. Attendance rates were highest in states, regions, and cities with the least reliance on manufacturing and in areas where agricultural income per worker was high. Schooling was particularly low where certain industries that hired youths were dominant and where the foreign born had entered in large numbers before the immigration restriction of the 1920s. More education enabled states to converge to a higher level of per capita income between 1929 and 1947, and states rich in agricultural resources, yet poor in manufacturing, exported educated workers in later decades.

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This study concerns the diffusion of the American high school in the twentieth century and briefly touches on its contributions to economic growth and to changes in the wage structure. It was high school, not college and the university, that was responsible for the largest increase in educational attainment during the twentieth century. And because educational advances were an important spur to economic growth, it is high school that must be studied.

An oft-cited statistic demonstrating the importance of human capital to American economic growth comes from the familiar decomposition of the growth residual. From 1929 to 1982 national income per worker grew at a rate of 1.48% average annually. Conventional factors (labor hours, capital) can account for only 5% of this growth, leaving a residual of 95%. Of that residual, according to Edward Denison, 28% can be explained by increases in formal education (Denison 1985, p. 113). The role of formal schooling in economic growth is virtually the same for most other subperiods of this century for which the calculation has been made, including the 1929 to 1948 period which is of particular relevance here.

Although one can quibble with many of the details of the Denison calculation, a fundamental conclusion is likely to be unaffected. Human capital accumulation and technological change were to the twentieth century what physical capital accumulation was to the nineteenth century -- they were engines of growth. In fact, during the 1929 to 1982 period, human capital formation accounted for almost 60% of all capital formation. The increased human capital stock advanced per capita growth in the twentieth century by more than any other single measurable factor. Because much of the residual must owe to advances in knowledge, the role of human capital formation in the economic growth of this century must be extremely large. According to standard estimates, which probably understate the growth of education over time, mean schooling of the male labor force increased from 7.72 years in 1920 to 10.86 years in 1970 or by 41%. The percentage of the male labor force that graduated from high school increased from 23% in 1940 to 55% in 1970, again according to conventional estimates to which I will offer amendments.[1]

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[1] The mean schooling figures are from Smith and Ward (1984). The high school graduation figures are from the census, beginning with 1940.

Less well-known than the statistics just cited is that advances in secondary schooling account for about 70% of the increase in total educational attainment from 1930 to 1970 of men 40 to 44 years old.[2] Holding the fraction going to college (13+ years) at the level of the older cohort but allowing high school graduation and attendance to rise to that achieved by the younger cohort increases mean years of schooling by 2.7 years (see Table 1). Schooling increased by 3.9 years between these cohorts. Therefore 70% of the gap in schooling was due to increases in high school attendance and graduation. Increased high school attendance, not that of college nor elementary school, was responsible for the enormous increase in the human capital stock during much of this century.[3] Increased high school attendance and graduation provide the single most important explanation for increased per capita income during this century.[4]

The spread of high schools is depicted in Figure 1, which graphs total secondary school enrollment as a percentage of 14 to 17 year olds and graduates from public and private high schools as a fraction of 17 year olds.[5] The high school enrollment rate rose from 10% to 90% and the graduation rate increased from 5% to 65% during 1910 to 1960. This paper explores when, where, and, to some degree, why high school attendance, enrollment, and graduation rates advanced. Disaggregating the total U.S. figures by region reveals that the most rapid expansion in the non-South was in the 1920 to 1935 period. The years of the 1920s and 1930s are, therefore, the main focus. Public and private graduation rates more than doubled in the East North

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[2] The figure would be 85% if all of the increased education in the primary grades needed to advance students to the secondary grades was included. It would be reduced to 59% by subtracting the 0.412 years, on average, of education needed to advance those in the grades 5 through 7 to 8th grade.

[3] It should also be noted that only 0.412 years of the increase was due to the increase in 8th grade graduation. College attendance and graduation increase years by 1.60.

[4] Of course if the returns to college are considerably greater than those for secondary school, its role in augmenting income would be far greater than its influence on the stock of human capital.

[5] It should be noted that the numbers underlying Figure 1 use contemporaneous data from the Bureau of Education (later the Department of Education) and amendments to these data, particularly for the pre-1925 period, for which no complete documentation is readily available. I have managed to duplicate the aggregate data in my construction of the state numbers (see Goldin 1994c.).

Central and quadrupled in the Middle Atlantic from 1920 to 1935. Both enrollment and graduation rates reached such high levels in the 1930s that they increased only gradually, when at all, until the early 1960s. The national data in Figure 1 are, then, seriously misleading. Only the South increased its secondary schooling rates to any considerable degree from the 1940s to the 1960s.

Secondary schooling was facilitated in most states by a rich agricultural sector and was hindered by high manufacturing wages and a large manufacturing sector. Until the 1930s, attendance rates were highest in states and cities with the least reliance on manufacturing. Levels were particularly low where industries that traditionally relied on juvenile labor dominated and where the foreign born entered in large numbers before immigration restriction. The high school graduation rate in Idaho, for example, exceeded 35% in 1924 but was just 20% in New Jersey. By 1928 45% were graduating in Idaho but only 25% in New Jersey. One might have expected youths in Idaho to have benefited less from a high school education than those in New Jersey, and one might have expected the provision of high school education to have been more costly in Idaho. The opportunity cost of schooling -- high in New Jersey and low in Idaho -- seems to have been the overwhelming factor. The Great Depression produced vastly higher secondary schooling rates in virtually all of the Northeast, and educational advance may be the one beneficial by-product of its devastating unemployment.

If one travelled west, in the 1920s, along just about any latitude one would have encountered successively higher rates of secondary schooling. The Far West had among the highest, followed by the mountain states, then the plains states, next those of the Midwest, and at the bottom of the non-southern states was the Middle Atlantic region. Although an egalitarian urge, spreading with the frontier, appears to have operated, there were other factors that enabled higher schooling in the West. The existence of prosperous agriculture, and thus taxable property, facilitated education, whereas the presence of manufacturing impeded it. These two factors operated as classic income and substitution effects in their impacts on schooling. There was also the ever-present desire of youths in rural areas to migrate to the city. That they actually did, and in large numbers, may have been a major consequence of the spread of high schools.

The cross-section analysis, just alluded to, can reveal differences across regions, cities, and states. But as long as all Americans were similarly affected the analysis will miss why the high school expanded everywhere during the 1920 to 1935 period. Although the subject is left for other portions of this project, I will speculate on the reasons. Publicly-provided goods are lumpy. As the demand for secondary schooling increased, each district eventually passed a threshold level, established a high school, and decreased the costs of attendance to youths. Thus the sheer availability of public high schools, given the latent demand, increased enrollments substantially.

The demand for secondary schooling increased because of both push and pull factors. Large earnings differences between white-collar and blue-collar jobs developed in the late nineteenth and early twentieth centuries with the growth of offices, business bureaucracies, and retail establishments, all of which increased the demand for greater knowledge and literacy.[6] At the same time, the relative demand for juvenile labor in manufacturing seems to have decreased in response to the influx of foreign-born adults and increased mechanization and capital intensity in manufacturing. High schools and the educational bureaucracy responded to the new demand for education. The curriculum changed substantially from 1910 to 1930, and the provision of vocational, industrial, and manual courses made secondary schooling more attractive to youths particularly in urban areas. In rural America, the consolidation of school districts and the adoption of the school bus brought the high school to sparsely settled areas. The high school movement coincided with an increase in the effectiveness of compulsory education and child labor laws. But empirical tests of the coercion hypothesis cast doubt on it. Laws were almost always strengthened in states with already high enrollment and attendance rates.

Form and Function of Secondary Schools

The high school did not always take the form it does today. Rather, the modern form evolved in the 1910 to 1930 period. It emerged so rapidly that the high school of 1930 bears a

[6] See Goldin (1994b) on the premium to high school education, and Goldin and Margo (1992) for data on the white-collar/blue-collar premium in the 1920s.

far greater resemblance to that of 1990 than it does to that of 1900. Not until 1902 was there a standard format established and prescribed for high schools, requiring fifteen units for graduation.[7] But the model high school took time to diffuse throughout America, and during that time the function of the high school was to change substantially.

Diffusion was hastened by the consolidation of school districts, a process that swept the nation's cities but proceeded more slowly in rural areas, and by the greater density of population in cities. By the 1930s most of America's high school youths were in schools I would characterize as modern. Yet more than half of all public secondary schools in 1934 were one-room affairs that could not possibly have offered a wide range of courses.

Even after high schools began their extraordinary growth in the early twentieth century, a large percentage of youths who completed high school immediately continued in college or in another institution of higher learning (e.g., nursing, library, and teaching schools). A primary reason to attend high school around 1900 was to gain entry to college and most high schools offered the classical (or scientific-Latin) curriculum, demanded by colleges for admission. The classical curriculum generally required Latin and Greek, as well as German, often French, English, history, mathematics, and some science courses. In the 1910s about 50% of all public high school graduates went to college or another institution of higher learning without delay (or had intents to), and 55% of male public high school graduates did or intended to (see Table 2). By 1923 the percentage had slipped to 44%, and by 1933 only 25% were immediately continuing their studies (or had intents to continue). The proportion of all American youths entering college had not decreased. It had expanded. Rather, the proportion of all youths attending high school had increased substantially and fewer of the new entrants treated high school as a prelude to college. Thus the fraction continuing after graduation declined with the rise in high school enrollments. Only

[7] A unit was four to five periods of 45 minutes per week during a 35-week semester (see Krug 1964, p. 153).

in the 1970s did the fraction continuing reach the level attained before 1920.[8]

The flood of students who entered high school around 1910 to 1940 sought an education that would lead directly to employment, not college. The economy had begun producing white-collar jobs that demanded formal education in excess of that provided by the common school but considerably less than that furnished by college.[9]

Then, as now, commissions were formed to study the effects of secondary schools on American competitiveness. One of these, the Douglas Commission headed by Carroll Wright, the former U.S. Commissioner of Labor Statistics, concluded -- in 1906 -- that the current school system was not meeting the needs of industry. European countries, in stark contrast, had extensive industrial and manual training programs. By implication, then, the United States would lose out in world markets unless something were done about training youths for manufacturing jobs (Massachusetts Commission on Industrial and Technical Education 1906). Many looked to the apprenticeship system in Germany, in which students combined academic subjects and industrial training. Oddly enough, many in the United States today -- some ninety years later -- are eyeing a descendant of that system. The German system of continuation schools -- schools for working youths -- was put in place in many states in the 1920s as a requirement of all who left school before the mandatory age and for some who left after but had not met established educational standards.

Increased demand for a high school education by students not bound for college led to a questioning of the classical and scientific-Latin curricula. If high schools were to prepare students for life, rather than for college, the curriculum would have to change from that required by college. The English curriculum was the most popular successor to the classical; it dropped the Greek requirement and gave students more choice in foreign languages. In 1900 51% of all high school

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[8] Smith and Ward (1984, p. 39), using data from the census on educational attainment, show that the actual percent of males who continued to college does not reach that achieved by the 1886-90 birth cohort until the cohort born 1946-50.

[9] It has also been claimed that credentialization -- or what economists would term "signalling" -- began to evolve in this period and that a high school diploma was the first credential of that type.

students were enrolled in Latin and 56% were taking algebra. By 1934 only 16% were taking Latin and 17% were taking algebra. But the debate over curriculum was not settled with the introduction of an alternative to the classical track allowing students to be trained for life rather than college.

The new issue regarding curriculum was whether high school should train students for employment by offering them instruction in a host of practical arts. Vocational (including commercial), technical or manual, and industrial courses were rapidly incorporated into most high school curricula. By 1934 10% of all high school students were enrolled in bookkeeping, 17% in typing, and 9% in shorthand. The industrial track, however, was quickly abandoned, a casualty of a lack of cooperation between firms and unions and a suspicion that tax dollars were supporting particular firms and industries. The idea has been recently revived, and the barriers to its adoption are the same now as in the 1920s. Vocational and manual courses are still part of the curriculum, very much as they were at their inception. In many ways, little has changed since the modern high school took shape in the 1920s and 1930s.

The junior high school emerged in the 1920s as a response to the high drop-out rate of youths between 14 and 16 years old and the problem of educating a heterogeneous mass of students in one school.[10] The junior high school was intended to provide academic, vocational, and technical courses to students having no intention of completing the full twelve years. Even today, shop and commercial courses are part of the junior high school curriculum, a curious remnant of an age when youths left school at 14 years old and educators wanted to front-load the vocational track. Junior highs were one part of a complex tracking system that provided a work-oriented curriculum to some, many of whom received a junior high diploma as their terminal degree, and a college preparatory or academic curriculum to the others, who would continue with high school. By 1934 29% of all high schools were of the "reorganized" type, either offering three-year programs or having an adjunct junior high school and offering a six-year program.

Most American youths, in the 1910 to 1920 period, left school before the eighth or ninth

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[10] The first junior high schools were established in two college towns -- Berkeley, CA and Columbus, OH -- both in 1909 (Smith 1932, p. 80).

grades. In 1910 just under 30% of all 14-year olds in the non-South were enrolled in 9th grade, although in 1920 about 50% were. The drop-out rate before 8th or 9th grade was substantial, albeit declining. Those who continued after 9th grade suffered some attrition, although considerably less. The high school graduation rate of those who entered the 9th grade in 1919 was 54% in public schools (61% in private schools). By 1929 it was 66% for the group entering 9th grade and the retention rate for the public schools exceeded that of the private schools. Therefore, students who continued to high school from the 8th grade had remarkably high retention rates during the period considered.[11]

In 1890 fully 32% of those enrolled in grades 9 through 12 were in private schools. By 1900 the figure had decreased to 18%, and it declined further to 11% by 1910 reaching 9% by 1920. Although it dipped to a low of 6% in the 1930s, it has since risen back to the 9% mark. It was the initial influx of the masses into public high schools that reduced the fraction of youths in private schools, although it may have been the building of public schools that accomplished both. For the period under study, therefore, the fraction in private schools was somewhere between 6% and 10%.

Secondary school buildings were constructed at an extremely rapid rate from 1890 to the onset of the Great Depression, and the actual building of schools may account for a large fraction of the increase in enrollments. An increase in enrollments can be met by some combination of increasing (1) the number of schools, (2) the number of teachers per school, and (3) the number of students per teacher. During the 1920s more than 80% of the increase in urban secondary school enrollments was absorbed through the building of new schools. Pupils per teacher actually declined somewhat and teachers per school increased, absorbing the remaining enrollments. During the Great Depression when enrollments soared in the industrial North and Midwest, localities were strapped for educational funds. The building of new schools took up only 42% of the increase in enrollments from 1933 to 1937, whereas crowding in existing schools accounted

[11] The figures are for the entire United States and come from various Biennial Surveys of Education.

for the rest.[12] Of additional interest, but not directly addressed here, is that secondary schooling was expensive schooling. How America graduated from school is also a study in public finance, particularly with the onset of the Great Depression.

High schools in the 1910 to 1940 period were forced to respond to several changes in American society. Enrollments soared, particularly among those who had no intention of continuing their studies beyond secondary school, and many of the new pupils were the children of the foreign born whose Americanization was a stated goal of the high schools of the period.

Educational Statistics

The national figures on high school enrollment and graduation rates in Figure 1 hide important time-series changes. The South had meager high school enrollment and graduation rates early in the century but converged on the rest of the country after 1940. An illusion is thereby created that there was a more gradual and continuous advance in schooling rates from 1910 to 1960 when, in fact, most non-southern regions show a burst of growth from 1920 to 1935 and then exhibit little change until the late 1950s.

The schooling data come from several sources, each revealing different parts of the process of change. There is one main source -- the annual and biennial surveys of the Bureau of Education (later the Department of Education) from around 1900 to the 1950s. These data come from the thousands of schools surveyed and have been supplemented to obtain estimates of public and private enrollments (by grade and sex) and the number of high school graduates by state and region. The public and private secondary school numbers are adjusted using data from the several states and the private school data are adjusted further using Catholic school data and information on preparatory students at colleges and universities (see Goldin 1994c). These are the first secondary schooling data I am aware of to be produced at the state level.

[12] These calculations use a city-level data set for 230 non-southern cities for 1923, 1927, 1933, and 1937. The increase in total enrollments (E) is by definition: $E = S \cdot (T/S) \cdot (E/T)$, where S = number of schools and T = number of teachers. Thus $E^{\cdot} = S^{\cdot} + (T/S)^{\cdot} + (E/T)^{\cdot}$, where $^{\cdot}$ = dlog(•)/dt.

The published federal population censuses prior to 1940 contain information on school attendance by age and nativity for states and cities. These data supplement those from the Bureau of Education to investigate the reasons for differences, particularly across cities. The 1940 and subsequent censuses contain information on highest grade completed (and often attended). These have been used by a large number of researchers to calculate completed grades for cohorts. They are, however, enormously at variance with the data from the Bureau of Education for the older cohorts. I will have something to say on this important topic, although much must be left for another paper.

Two data sets are used here: (1) a state and regional series on enrollment and graduation rates (annually, with some breaks, to 1920 and then biennially) from 1910 to 1960, together with state-level data on income and industrial structure, among other variables; and (2) a cross-section, time-series data set for 230 cities containing attendance rates from the 1910, 1920, and 1930 federal population censuses; various schooling data for 1923, 1927, 1933, and 1937 from the Biennial Surveys of Education; and additional information from the manufacturing censuses, the financial statistics of cities, and the population censuses. The state data are for the entire United States; the city data include 230 cities in the non-South (with populations over 20,000 in 1920).

When and Where Did America Graduate from High School?

Graduation Data

A key indicator of the spread of high schools is the total and public high school graduation rates, constructed here from contemporaneous data on the numbers of youths graduating expressed as a fraction of all 17-year olds. Both public and total (public and private) rates are graphed in Figure 2 for four non-South regions (New England, Middle Atlantic, East North Central, and Pacific) from 1910 to 1958, although the discussion will include reference to all regions.

All non-South regions have public and private graduation rates that begin at or below 10% in 1910. Each rises to 50% or more by the mid-1930s. By 1935 the median 17-year old was a high school graduate, although just 15 years earlier the median 17-year old had only a 20%

probability of having a high school diploma. The increase in graduation rates from 1920 to 1935 was extremely rapid, especially so in the industrial areas of the Northeast and Midwest.

Graduation rates, in all regions, were substantially lowered immediately prior to, and during, American involvement in World War II, although the GI Bill later increased high school rates to abnormally high levels.[13] Even when private schools are added to the total, graduation rates in the 1950s are no higher than those of the late 1930s.[14] In most non-South regions, high school graduation rates did not increase or increased only slightly during the twenty years after 1938. The extraordinarily rapid increase in high school graduation rates in the 1930s is probably the reason.

The reduction in graduation during World War II occurred in all regions but was large in New England and the Pacific states. The decrease was not due primarily to the military recruitment of high school boys. Rather, high school youths moved into civilian jobs as wages rose, particularly at the lower end of the wage distribution. World War I had a similar impact, although it is not very noticeable in Figure 2. Female youths left high school during the World War II in almost equal proportion to male youths in New England, but somewhat less than male youths in other regions, such as the Middle Atlantic and the East North Central (graphed in Figure 4). In all regions girls were attracted by the same factors that enticed boys to leave high school -- the increase in the relative wage of unskilled labor -- although to a lesser degree.

The three western regions -- West North Central, Mountain, and Pacific -- had slightly greater increases in graduation rates than did the regions of the East for the entire period from 1910 to 1940, but the increase was more continuous. Rather than getting off to a slow start and then having a large spurt in high school growth from 1920 to 1940, as did the most eastern regions, the three in the West grew more rapidly during the pre-Depression period.

The reliance on private schools differed across the regions. New England had the highest

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[13] The reason they are increased above normal is because the denominator here is the number of 17-year olds and all returning GI's would have been older than 17.

[14] Private school graduation data are available after 1934 for only a few years in the 1940s and 1950s. Some given in Figure 2 for the 1950s have been constructed from Catholic school data (see Goldin 1994c) which are not readily available for the late 1930s.

fraction of high school students enrolled and graduating from private schools. The Mountain states had a very large fraction in the 1910 to 1920 period, although it later declined with the increase in publicly provided education. The proportion graduating from private schools declined in all regions over time, especially during the Great Depression. In New England during the 1910s and 1920s about 20% of all high school graduates came from public schools, although by 1933 16% did. In the Middle Atlantic region the figure declined from 20% to 10% across the same period. In most other regions the percentage generally began above 10% and declined to about 5% by the 1930s.

The three regions of the South are distinguished from all others in the considerably lower initial secondary schooling levels and their virtually continuous increase to the end date in 1958 (see Figure 3 which compares the South with the East North Central).[15] There is a discernible increase during the Depression in two of the regions, but the timing is different from that in other regions of the country. The high school revolution did not take place in the South during the 1920s and 1930s. Rather it was drawn out over a much longer period of time.

In all years and all regions, although only two (the Middle Atlantic and the East North Central) are shown in Figure 4, the graduation rate for female youths was higher than that for male youths. It was considerably higher in New England, the West North Central, and the Mountain states, somewhat less so in the other three regions. That differences by sex existed in all states suggest that the return to high school education was greater for female than for male youths. A high school education for young women meant entree to jobs in the clerical sector, whereas its absence meant a low-wage manufacturing job as an operative. At a time when physical strength still mattered substantially and jobs with on-the-job training in various crafts were strictly limited to male youths, schooling for females had higher returns than for males. It should be realized, however, that the internal rate of return would have been reduced for girls compared with boys because of their low life-time labor force participation rate (see Goldin 1990).

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[15] Public high school graduation rates are used because they exist for more years than the public and private rates, and the four regions depicted had only a small fraction of the total attending private school for the entire period.

Contemporaneous and Retrospective Graduation Data

In comparing educational attainment by cohort across censuses, many researchers have noticed that cohorts gain schooling over time even if they did not go back to school. Individuals, quite simply inflate, that is lie about, their educational attainment. This inflation is larger during periods of substantial gains in schooling. Some have also commented that the retrospective data from the census are at variance with the contemporaneous data from the Commissioner of Education for the period I am considering (Denison 1985; Folger and Nam 1967). It should be apparent from Figure 2 that the 1920 to 1940 period was one of enormous increase in educational attainment. If there ever were a census when subsequent cohorts would have been tempted to lie about their educational attainment, 1940 would have been it.

The 1940 census was the first to request information on educational attainment, and census takers may have been insufficiently trained to elicit accurate responses. Some older Americans had been educated in non-graded schools and many others, particularly in rural areas, attended school for considerably more years than grades. Although the question in the census was framed in terms of grades and not years, it is apparent that there was either fabrication or misunderstanding of the question.

These differences are apparent in Figure 5, for which the Middle Atlantic and the East North Central regions are used as examples. Each graph contains estimates of the graduation rate of males in the years before 1938 as reported in the 1940 population census. The graduation rate is computed as the fraction of males, at some age and born in the region, who stated they graduated from high school. They are assumed to have graduated when they were eighteen, but the results will be unaffected if they graduated at seventeen or nineteen or some other age.

There are three lines in each graph. The top two are from the 1940 census. One gives the graduation rate for males born in the given region and the other (the line directly beneath it) is a lower-bound estimate for the graduation rate of males educated in the region. The difference between the two lines concerns how the foreign born are treated. If one assumes that the foreign born did not continue their formal education once they entered the United States, the upper line

is correct. If, instead, one assumes that all the foreign born in a region were educated there, the lower line is correct. The true line is probably closer to the top one. The third line comes from the contemporaneous Bureau of Education data, which have just been discussed.

The state and regional data I have produced were computed to give an accurate picture of the historical trends in secondary schooling and to be consistent with the aggregate data produced by the Bureau of Education in the 1920s and 1930s. If the data err, they do so on the high side because I have accepted the enrollment and graduation data coming from the states, which are higher than those from the schools.

Because the 1940 census was the first to collect information on educational attainment and is frequently used to produce such estimates for older cohorts, the wide differences between the contemporaneous data and those from the 1940 census bear closer scrutiny. My tentative conclusion is that the graduation rate data from the 1940 census for cohorts that were 18 years old in the 1910 to 1920 period are off by a substantial amount, possibly by a factor of 1.5 or 2. The implications of this finding for the Denison calculation with which I began and for estimates of the returns to education for the older cohorts must await further research.

Enrollment Rates

Another measure of high school participation and attainment is the enrollment rate.[16] Figure 6 contains total and public secondary school enrollment data on four regions -- New England, Middle Atlantic, East North Central, and Pacific. Enrollment rates are computed by dividing by the number of youths 14 to 17 years old. The graphs show similar trends to those on graduation rates.

New England, the Middle Atlantic, and the East North Central had enrollment rates that grew slowly but steadily to the Great Depression when they increased greatly. They levelled off in the 1930s, dropped during World War II, soared with the GI Bill, came back to normal in the

[16] Enrollments are generally given as "first day," although each state could have used its own definition, such as enrollments throughout the year.

early 1950s, and increased in the late 1950s. There were ups and downs from the mid-1930s to the late 1950s. But the truly surprising finding is that the aggregate enrollment rate was not much higher in 1958 than it was in 1938 and in the Middle Atlantic region it was lower.

The Pacific region, and the others of the western United States, had somewhat different enrollment histories. The increase was greater and more continuous during 1910 to 1930. Enrollment rates by 1930 were so high that the Depression, whatever its impact on the area, had little effect on the high school enrollment rate. In 1930 about 80% of 14 to 17 year olds in the Pacific region were enrolled in high schools, whereas 60% in the East North Central were and just 50% in the Middle Atlantic were.

Figure 7 superimposes enrollment rates for four of the regions on one graph. Differences in the levels before the Great Depression and the catch-up during the 1930s are now more apparent. New England and the Pacific states began with the highest enrollments, but the three states of the Far West rapidly advanced, pulling way ahead of the rest. The East North Central began to increase rapidly in the 1910s and nearly overtook New England just prior to the Depression. All non-South regions had enrollment rates that greatly exceeded that of the Middle Atlantic. In the 1930s the very laggard three states of the Middle Atlantic rapidly increased enrollments and by the mid-1930s the three northeastern and midwestern regions had converged. The Far West, however, was still in front.

In sum, all non-South regions had large increases during the 1910 to 1940 period, although those of the more industrial North initially lagged behind. Most northern states experienced an expansion in secondary schooling during the Great Depression that was far greater than that experienced by other regions. Growth was so rapid in all non-South regions that rates of enrollment and even graduation in the 1930s remained in place for more than twenty years. Finally, girls, just about everywhere, graduated at far greater rates than did boys. The next sections confront these facts with economic, demographic, and school district information to understand what fostered these changes and differences.

Accounting for Differences in Secondary Schooling across States and Cities

Variation across the states and in a sample of 230 cities shows the impact manufacturing had in reducing the level of high school education, and thus why the Depression released so many youths to attend school. The state data reveal that higher incomes, particularly those in the agricultural sector, operated differently from higher manufacturing wages. The city data, being more abundant, can show the impact of the percentage foreign born, wealth, and type of manufacturing. Even after controlling for a large number of variables, region, while reduced in explanatory power, is still important. The western states, it appears, were the most egalitarian, whereas northern states were the least, among the non-southern states.

States

The factors that determine schooling at any level concern both the individual and the schooling jurisdiction, which during this time was almost solely the school district. For the individual, these are generally summarized in the expected returns from schooling. Returns should already incorporate the costs of education, most importantly opportunity and transportation costs, which in many of these areas were prohibitive. Parental resources will also determine schooling decisions, to the extent that the capital market is imperfect, which it presumably was for these youths. Finally, the financial resources of the school district will determine its ability to tax and to borrow, necessary to fund and build schools. Just two variables at the state level appear of overwhelming importance in our ability to explain secondary schooling differences before the Great Depression.

Figure 8 contains two graphs. The uppermost is the log of agricultural service income per worker (in 1920) graphed against the graduation rate in 1930.[17] All 48 states are included; the hollow dots are the fourteen states of the North (New England, Middle Atlantic, and East North Central regions). For the states of the non-North, agricultural income per capita appears to be a

[17] Agricultural income per worker is not available for 1930.

powerful variable in determining secondary schooling. As it increases, so does the graduation rate. But the relationship does not appear to hold for the states of the North.

Consider instead the bottom portion of Figure 8 which graphs the log of the manufacturing wage in 1929 against the graduation rate. Here the hollow dots are for the non-North and the northern states are given as abbreviations. For all states there is a somewhat positive relationship between wages and education. But for the North (particularly excluding Rhode Island) the relationship is negative.

These relationships are better summarized in Table 3 in which all states are included and in which there is an interaction between the percentage of the work force in manufacturing and the manufacturing wage. Note that the distinction in Figure 8 was North versus non-North, but that was only for convenience. Table 3 uses the continuous variable, percentage of the work force in manufacturing, instead. Also included in Table 3 are various demographic characteristics of the states' populations: percentages foreign born, urban, and nonwhite.

I am implicitly making two defensible assumptions in the estimation in Table 3. One is that manufacturing wages in general are unaffected by the labor supply decisions of youths. Youths were a very small percentage of this labor market, so the assumption appears reasonable. The second is that the wage of educated workers (say, that of office workers) did not vary across states. Evidence from the 230 cities I have assembled shows that even though manufacturing wages did vary significantly across regions, the wages for more educated workers (clerical workers) did not.[18] Given the two assumptions, the regression in Table 3 traces out the demand curve for schooling as a function of the opportunity cost of school (the manufacturing wage) holding the tax base (agricultural income) and other factors constant.

Both the manufacturing wage and agricultural income per capita have positive coefficients, as does the percentage of the work force in manufacturing. But the interaction term between the

[18] The data are available for 1910, 1915, and 1920, which is a somewhat anomalous year. The ratio of the highest to lowest mean clerical earnings across regions was 2.6%, in 1915, but was 39% for production workers.

two manufacturing variables (percentage and wage) reveals precisely what Figure 8 showed. When the percentage in manufacturing is somewhere above the median (when it is greater than 0.318), the relationship between the graduation rate and the wage is negative. Similarly, when the wage exceeds the median (when it is greater than $1212), the relationship between the graduation rate and the percentage of the labor force in manufacturing is also negative.

I interpret the findings in the following manner. Agricultural income per capita is the single best measure of the tax base for most of the states in this period (total per capita income is less strongly related to education than income from agriculture).[19] Thus, as agricultural income per capita increased, the value of land presumably did and a greater amount of wealth was available for districts to tax. But as the proportion of the work force in manufacturing increased and as the wages of manufacturing workers did, the opportunity cost of schooling was greater. Thus when the manufacturing sector was large enough, an increase in its wage served as a potent drag on the education of youths.

The two variables -- agricultural income per capita and the manufacturing wage -- produce a result, when the manufacturing sector was sufficiently large, akin to that from classic income and substitution effects. But because agriculture was a declining sector, it will be seen that states rich in agriculture, yet weak in manufacturing, schooled their youth to become educated migrants.

Cities

The cross-section, time-series city-level data set is considerably larger than the state-level data set and many of the most promising explanatory variables (per capita wealth, the occupational and industrial distributions, school quality variables) are available by city. The data set I am using contains 230 non-southern cities, all of which had populations in excess of 20,000 in 1920. The education variable is the proportion of 16 and 17-year olds who attended school during the census

[19] Data on taxable property at the state level also exists, although it may not include all property that was taxed at the local level. In several cases states did not tax property, and these states do not have an estimated value of property, just an assessed value.

year.[20] This measure is somewhat different from the secondary school enrollment and graduation rates just discussed for the states. The two variables are highly correlated.

As can be seen in Table 4, there was substantial variation in the attendance rates of 16 and 17 year olds both within and across regions. Attendance rates generally increased, and the variation among cities within a region decreased, as one moved West. Levels increased with time across all regions, although percentage point differences by region widened. The variation within all regions decreased over time, as can be seen from the coefficient of variation.

Regional differences among school attendance for urban teenagers are similar to those found for the regions as a whole, although some differences exist. In both data sets the Middle Atlantic and New England regions lagged in 1920 and 1930, whereas the regions of the West had far higher levels. But the cities of New England have far lower educational rates than the region as a whole. New England was an educationally diverse region in the 1920s with some high education states (Massachusetts) and some very low ones (Rhode Island).

The city-level data set contains extensive information. In each year there is population data, yielding the fraction of the city's population that was foreign born and population density (population/area in acres). The occupational or industrial mix of the work force are also available. In 1920 the data are only for the manufacturing labor force and give the fraction in manufacturing and, among those, the proportions who were in craft, operative, laborer, and managerial positions. There are also variables for the distribution of manufacturing employment by industry. For 1930 the occupational distribution comes from the population census and is more encompassing. For both 1920 and 1930 the Financial Statistics of Cities gives the estimated value of taxable property.

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[20] The census question inquired whether the individual attended any school during any period of the previous census year. Thus, if an individual had attended night school for even one day, the answer was supposed to be in the affirmative. I also have Commissioner of Education data giving the numbers of pupils in different types of secondary schools (e.g., junior highs, vocational schools, regular four-year high schools). The data are much in agreement with the census information but differ in important ways that make them less useful. The unit of analysis for the Bureau of Education data is the school district. Youths from the smaller cities could have gone to school in a neighboring district, and since some districts had no high schools, they probably did. The Bureau of Education data also do not include students living in a city who went to private school.

Finally, there are school quality variables from the Biennial Reports of the Commissioner of Education which yield teacher salaries, the density of secondary schools, the number of pupils per teacher, and the number of teachers per school. The school quality variables come from a data set that includes 1923, 1927, 1933, and 1937. Only school density is used here.[21]

Differences by region in school attendance can be due to factors correlated with the region, such as percentage foreign born, the percentage of the work force in manufacturing, per capita wealth, and population density. Table 5, col. (1), includes these factors and shows that in 1920 the foreign born as a percentage of the population and employment in the manufacturing sector both lowered school attendance whereas wealth increased it. The population density of the city (people per acre) has a negative impact on attendance, a likely consequence of the greater poverty of denser areas. Regional differences are thereby reduced, but remain. The Middle Atlantic still trails, but New England's less than outstanding educational performance is greatly explained.

Of particular interest are the findings in column (2), which adds the percentage of all manufacturing workers in different occupational groups (laborer, semiskilled operative, craft, and manager), industry percentages, and school density. An increase in the percentage of all manufacturing workers who were operatives, given the percentage of the population employed in manufacturing, decreases schooling more than an increase in the percentage who were laborers. Where production jobs were unavailable, particularly semiskilled operative positions, schooling was more likely to flourish. Operative positions, it seems, were the encouragement to leave school. Type of industry also mattered. Not surprisingly, the greater the fraction of manufacturing workers in textiles and clothing, the lower was school attendance. Part of the relationship between schooling and manufacturing came from the migration of families less willing to educate their children to areas with high demand for youths.[22] But a large part of the drag of industry on schooling must have come from the pull of employment opportunities.

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[21] Most of the school quality variables are jointly determine with the attendance variable and should not be included in the estimation.

[22] See the evidence on this point in Parsons and Goldin (1989).

Important changes occurred between 1920 and 1930. Attendance rates for the states of the Middle Atlantic and New England were greatly surpassed by those of the Far West and East North Central regions. The percentage foreign born in 1930 no longer reduced attendance rates, as can be seen in columns (3) and (4) of Table 5. European immigration restriction meant that the foreign-born had resided in the United States for more years in 1930 than in 1920 and apparently learned to take greater advantage of the public school system. Another possibility is that schools were built during the 1920s in cities with many foreign born who were previously constrained by the absence of schools. The proportion of the population in manufacturing employment had an equivalently strong effect in reducing school attendance in 1930 as in 1920.

Also of interest is that the coefficients on the regional dummies for the northeast increase from 1920 to 1930. Holding the other factors constant, the states of New England and the Middle Atlantic had school attendance rates for 16 and 17 years olds that were between 22 and 26 percentage points lower than were those of the Far West, and they were about 12 percentage points lower than those of the midwest. Because the school attendance rates (from the census) for 16 and 17 year olds in the northeast in 1930 were about 55% (see Table 4), these corrected differences are extremely large.[23]

Convergence in Schooling across Cities, 1920 to 1930

Convergence equations have been estimated (see Table 6) to understand why change occurred during the 1920s. The difference in the log of the attendance rate between 1920 and 1930 is regressed on the attendance rate in 1920. Column (1) contains only regional dummies and shows that 0.46 of the gap was closed every decade. The cities of New England and the Middle Atlantic converged on the lowest level and those of the East North Central and the Pacific converged on the highest level. Column (2) adds the percentage foreign born in 1920, the fraction

[23] The addition of the various factors does not narrow the difference across regions in 1930, although it does in 1920. Therefore, the raw differences in Table 4 are approximately those that are revealed in columns (3) and (4) of Table 5.

in manufacturing employments in 1920, and the distribution of manufacturing workers in 1920. All increase the level of attendance on which the city was converging.

Although the (log) attendance rate in 1920 is included in the equation, the percentage foreign born in 1920 has an independent effect. Cities with low attendance rates in 1920 but high fractions foreign born had larger catch-up than cities with low fractions foreign born but with equivalently low attendance rates. The children of the foreign born, as was also seen in Table 5 had assimilated during the 1920s in terms of the educational attainment measure used.

A similar story can be told with regard to the composition of the manufacturing work force. The percentage of the population in manufacturing in 1920 does not have a separate impact, but the composition of the manufacturing work force does. Although the demand for operative workers in 1920 reduced school attendance, some of the decrease was reversed by 1930. The reversal, though, is not evident in the states of New England and the Middle Atlantic.

Prior to the Depression, then, the urban and industrial areas of the northeast were left behind in the high school revolution. Various states in the East North Central, however, became educational leaders. Ohio, Michigan, and Wisconsin pioneered in progressive curriculum, schools, and laws. Several independent variables (e.g., percentage foreign born, percentage in manufacturing, per capita wealth) greatly reduce the differences among regions in 1920, but by 1930 they have less of an effect. Local governments and individuals may have become set in their ways regarding educational decisions, and thus it took the Great Depression to catapult much of the North into the high school revolution.

Education and Economic Growth across States

I motivated this paper with the notion that secondary schooling was responsible for a large fraction of economic growth in America during this century. The calculation treated the increase in income as resulting from the greater earnings of educated persons. But schooling can also have positive external effects in a state or city, and a large literature has concerned the impact of education in some base year on the rate of growth of income or population in a geographic area

(see, e.g., Glaeser 1994; Glaeser et al. 1994).

There was strong convergence in per capita income across states during the period from the 1920s to the 1950s (see also Barro and Sala-I-Martin 1991). And, as shown in Table 8, part A, states with greater levels of secondary schooling in the 1929 to 1947 period converged to higher levels of income. Education, by itself, did not have a positive effect on income growth because of the strength of income convergence. It was precisely the laggards in both the educational and development processes that grew most rapidly. But given convergence in income, education mattered for the level.[24]

States with high levels of education also endowed their citizens with the means to move to better places. But the relationship between education and migration is quadratic. People fled the states with low levels of income and education at the same time they moved out of rich agricultural states that had high levels of schooling but little manufacturing activity.

Thus the relationship between education and migration is complicated by that between income and education -- that is the impact on schooling from high agricultural income versus that from high manufacturing wages. Those states with moderate to high agricultural income per capita but small urban and manufacturing sectors -- e.g., Kansas, Nebraska, Nevada -- exported educated workers to the rest of America. And states with poor agricultural and manufacturing sectors -- e.g., much of the South -- exported their populations, who were relatively poorly educated. But states in the middle -- e.g., California, Ohio, Wisconsin -- were the net receivers and thus the relationship is quadratic, as revealed in Table 8, part B.

Why America Graduated from High School

This exploration of where and when secondary schooling increased hints to why change occurred. Although the issue is the subject of another part of this project (see Goldin 1994b), the

[24] Balfanz (1993) contains results that suggest greater secondary schooling caused increases in value added per worker at the state level, although the current model may have a specification problem.

argument and some of the evidence can be summarized as follows. At the inception of the high school movement around 1890 to 1915, the earnings of the educated, relative to the less-well educated, were substantial. Male clerical (office) workers in manufacturing, for example, in the Northeast and Midwest earned 1.5 times what production workers did in 1910 and 1915. The ratios were even higher for female clerical workers relative to female production workers.[25] Male clerical and supervisory workers as a group earned about 2 times what production workers did around 1890 to 1915. Very few Americans had secondary schooling in 1890 and most youths across the country could not easily and cheaply obtain it. The large returns to high school must have been an important factor in the expansion of secondary schools across the nation in the subsequent decades. But the relationship between the demand for educated workers and the expansion of high schools is a complicated one. Because the ratios just presented are for all workers, not just juveniles, opportunity costs could have remained high even in areas having apparently large returns to education. Decisions regarding schooling depended critically on the generosity of parents and the foresightedness of youths.

Because most of the return to high school education came from switching sectors -- from manufacturing to service-sector jobs -- many youths whose entire lives were spent in the shadow of the factory might not have been able to comprehend the benefits of secondary schooling. School propaganda, about which so much has been written, may have been beneficial advertising informing the sons and daughters of blue-collar workers that education was a benefit to them too (see Tyack 1974).

Even though the ratio of the earnings of educated workers to manufacturing operatives remained high through the 1910s, the real impetus to educational change was probably the decline

[25] The data on both clerical (office), supervisory, and production workers in manufacturing come from the U.S. census of manufactures for 1890, 1910, and 1915. Wage data are not given separately for males and females in 1910 and 1915, and they have been estimated using regression analysis on the city-level sample. Clerical workers cannot be separated from supervisory and managerial employees in 1890, although comparisons can be made between 1890 and 1910 (or 1915) by combining two categories of white-collar workers in 1910 (or 1915). See Goldin 1994b.

in the demand for juveniles in manufacturing. The demand for juvenile workers began to decrease in the early 1900s particularly in industries that mechanized and substituted adult foreign-born labor plus capital for craft workers plus juveniles (see, e.g., Osterman 1980).

The declining manufacturing demand for juveniles is explored in Table 7, which gives the percentage of all employed males youths who were manufacturing workers in nine industrial and large cities. In all cities the percentage of employed youths working in manufacturing declined from 1900 to 1910 absolutely and relative to that for adults (columns 6 and 7).[26] The evidence suggests that the high school movement was given a stimulus by the decreased demand for juveniles in their most significant employment sector apart from agriculture.[27] That stimulus was greatly increased during the Great Depression.

If much of the impetus to educational change at the secondary level was due to the large returns to education, the enormous increase in high school attendance and graduation in the decades after 1910 should have lowered the educational premium. There is evidence that the premium decreased around the mid-1910s and early 1920s (see Goldin 1994b). But the timing is somewhat odd since the decrease in the premium is somewhat in advance of the largest increase in education. The premium, it appears, then remained stable -- yet still high -- until the 1940s. One possibility is that increased demand for educated workers managed to outstrip increased supply even from 1920 to 1940, similar to what is suspected regarding the recent increase in the relative earnings of college-educated workers.

Greater school accessibility, better school quality, and more relevant curriculum must also have increased the enrollment of youths. Teens in many rural areas, and even some cities, during the first several decades of this century had no high schools in their district nor in any neighboring district. The simple provision of schools and school bus transportation increased enrollments by

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[26] The figures for 1920 show a sharp increase, but reflect, I believe, heightened labor demand for less-skilled manufacturing workers during World War I.

[27] The question, then, is whether rural areas within a state had a much lower rate of increase in high school attendance.

decreasing the costs of attending schools.

Curriculum changes instituted in the 1920s added vocational, manual, and commercial classes to the menu of junior and senior high school courses. These courses were established to make school relevant, keep youths in school, and create better workers. The impact of the changed curriculum can be proxied in the city data set by the density of vocational high schools in a district.[28] The cross-section regression in Table 5, column (4), reveals that a greater density of vocational schools increased the attendance rate given the overall density of high schools, including vocational schools. That is, exchanging a vocational high school for a regular high school, holding other factors constant, would increase attendance rates, but the impact is small.

The role of legal compulsion has not yet been discussed. Both compulsory schooling and child labor laws were significantly strengthened in the 1920s. Before the 1920s such laws contained a number of exemptions and may not have been enforced as zealously as they were after. Thus, legal change has been viewed as providing a large impetus to change. But careful investigation has thus far revealed that legislation lagged rather than led. States that had large increases in educational attainment were those that later increased the age of compulsory education or eliminated various exemptions. Although the jury is still out on the issue, evidence is mounting that legal change was not the spur it appears to be (see Goldin 1994a).

Concluding Remarks

The period 1910 to 1940 witnessed the second great transformation of American schooling -- the rise of the high school. The first transformation involved the spread of the common school in the nineteenth century and the third was the rise of college education in the post-World War II period. Neither was as spectacular in its increase as was the rise of the public high school. In 1938, the median eighteen-year-old male in the East North Central region, for example, was a high school graduate, but he had stood only a 15% chance of having his diploma in 1920.

[28] I have not yet found data at the city level that reveal the number of schools offering the non-traditional courses.

Virtually the entire gain in educational attainment in the 1900 to 1970 period came from advances at the high school, not college, level. High school enrollment and graduation rates in the north and west rose rapidly between 1920 and 1935. Rates achieved by the mid-1930s were maintained for the next fifteen to twenty years before increasing again to today's levels.

At the state level, higher agricultural income per capita had a strong positive effect on schooling at the secondary level, a likely result of a strong tax base. But manufacturing labor demand, mainly the availability of operative positions in certain industries, was a significant drag on the education of youths, and the Great Depression provided an ironic fillip to schooling through its elimination of many jobs, particularly those for young men. Although the presence of the foreign born in cities depressed attendance in 1920, it had no effect by 1930. Manufacturing demand decreased schooling in both 1920 and 1930 and had a long-lasting impact in both the New England and Middle Atlantic regions.

The rapid increase in high school enrollments and graduation rates was, apparently, the response of a latent demand to the building of public schools in both urban and rural districts and to a decrease in transport costs. The returns to education in 1890 were high, although the rewards came mainly from intersectoral shifts from manufacturing to office work. School propaganda campaigns cannot be ruled out as an influence, but they probably operated more like informative, rather than deceptive, advertising. The demand for juveniles in manufacturing declined substantially just prior to the rapid increase in high schools. But it is also the case that the demand for white-collar workers rose, particularly in the female-dominated office work positions.

The subject that motivated this paper was the role of education in economic growth. States that pulled ahead of the pack in secondary schooling were most often rich agricultural states and those with high per capita income but moderate manufacturing activity. Such states converged on higher levels of income, and they often endowed their youths with the necessary education to migrate out of agriculture and thus out of the state.

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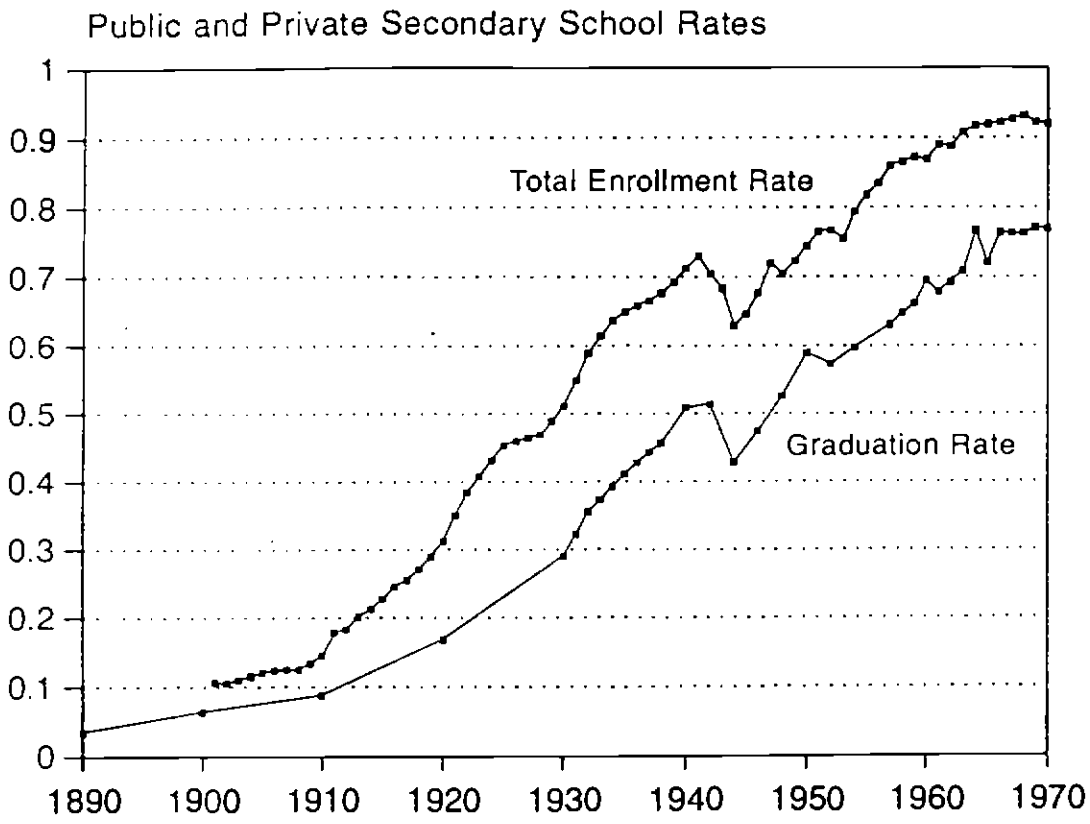


Figure 1: Secondary School Enrollment and Graduation Rates: Entire United States

Notes: Enrollment figures are divided by the number of 14 to 17 year olds; graduation figures are divided by the number of 17 year olds. Total includes both males and females in public and private schools.
Sources: U.S. Department of Education, 120 Years of American Education: A Statistical Portrait. Washington, D.C.: US GPO (1993).

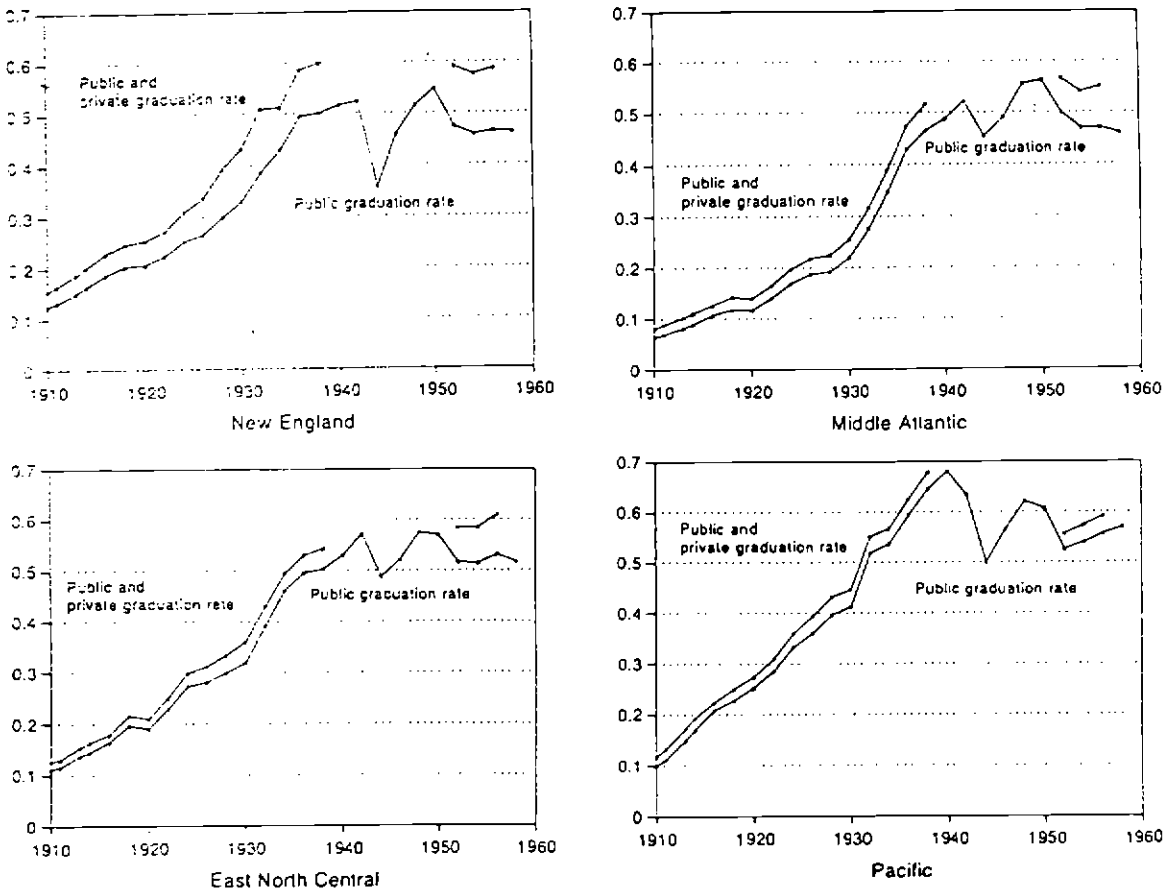


Figure 2: Total and Public High School Graduation Rates for Four Regions

Notes: Males and females are combined. The number of graduates is divided by the approximate number of 17-year olds in the state. Interpolations are made between census years. See Appendix for details on the construction of the underlying education data.

Sources:

Commissioner of Education, Report of the Commissioner of Education (various years); Commissioner of Education, Biennial Survey of Education (various years).

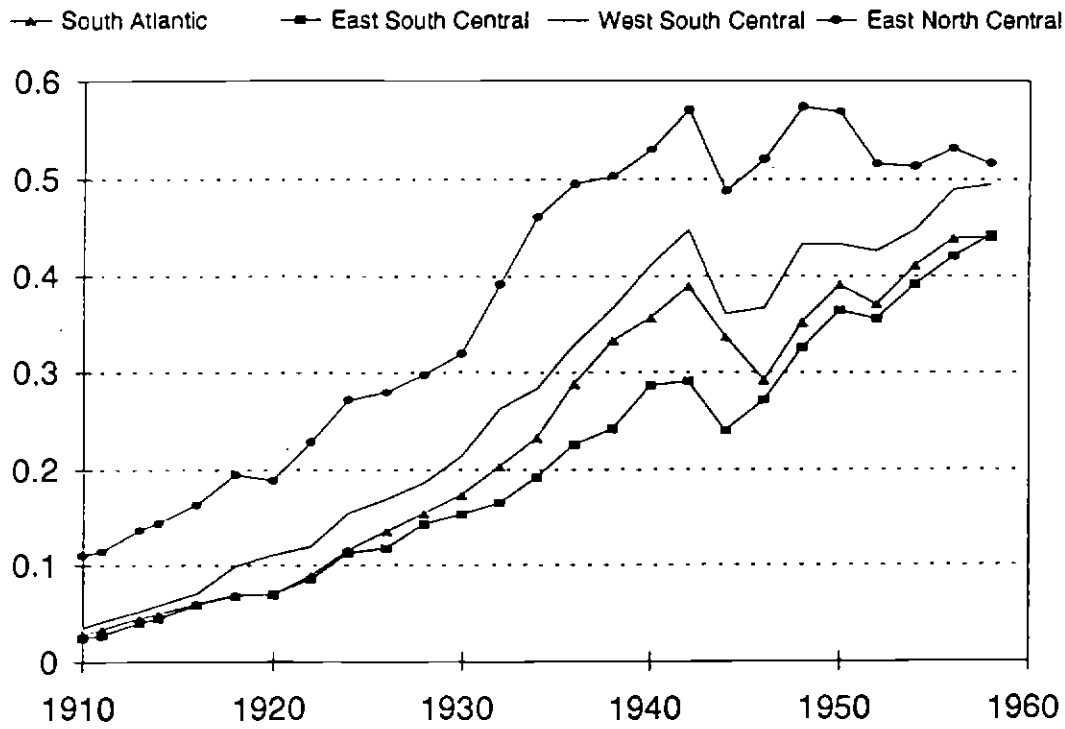
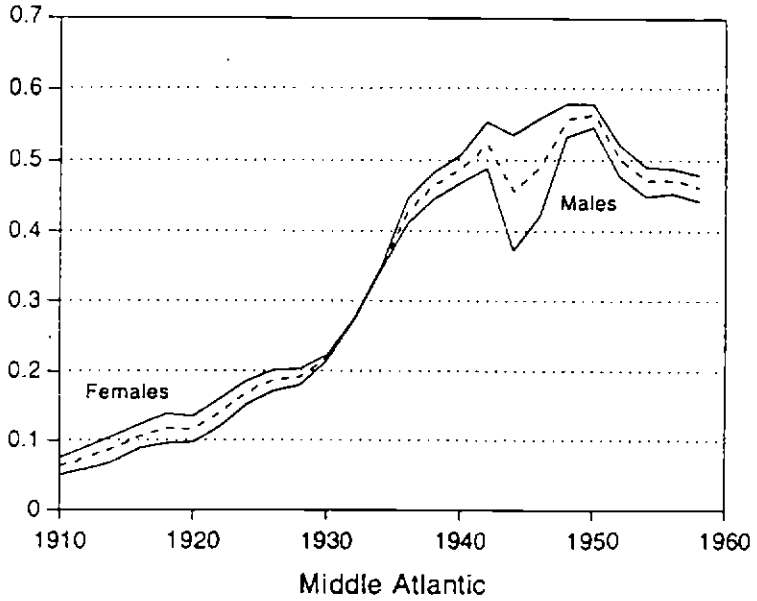


Figure 3: Public High School Graduation Rates for the South and the East North Central

Notes: Males and females are combined. The number of graduates is divided by the approximate number of 17-year olds in the state. Interpolations are made between census years. See Appendix for details on the construction of the underlying education data.
Sources:
Commissioner of Education, Report of the Commissioner of Education (various years); Commissioner of Education, Biennial Survey of Education (various years).



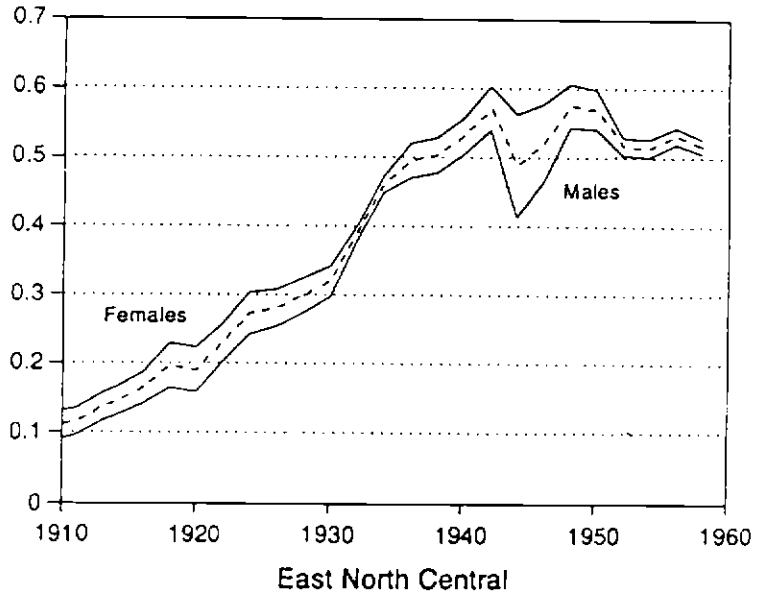
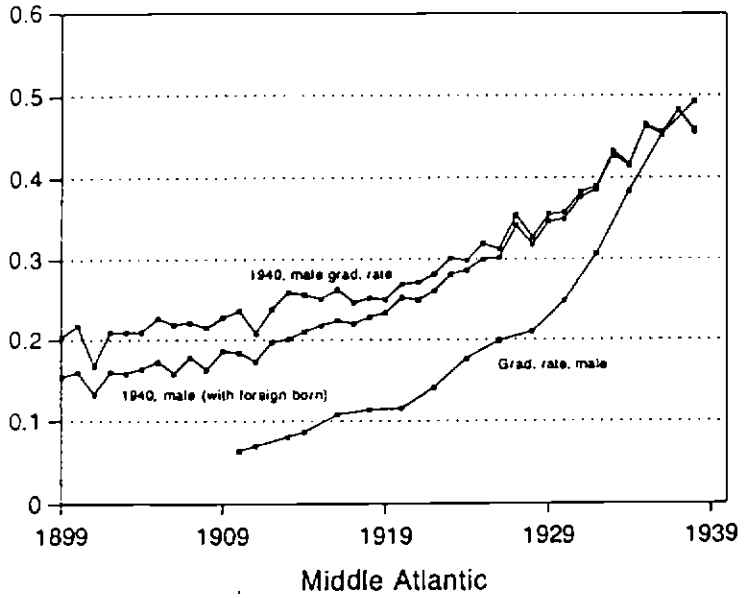


Figure 4: Public High School Graduation Rates by Sex: Middle Atlantic and East North Central Regions

Notes: Graduates are divided by the number of 17-year olds in the state. Interpolations are made between census years. See Appendix for details on the construction of the underlying education data.
Sources:
Commissioner of Education, Report of the Commissioner of Education (various years); Commissioner of Education, Biennial Survey of Education (various years).



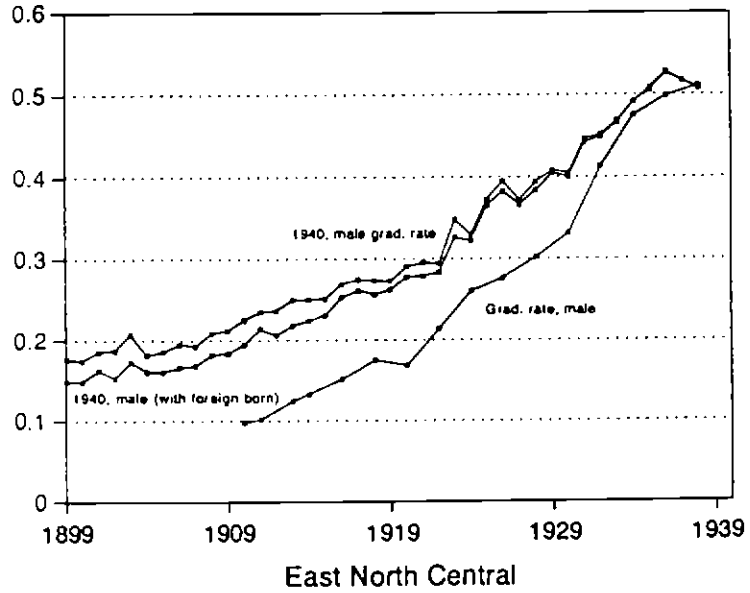


Figure 5: Educational Attainment Data from the Bureau of Education and the 1940 Population Census: Middle Atlantic and East North Central Regions

Notes:
1940, male grad. rate: proportion of men born in the given region who reported graduating from high school in the 1940 population census. The year given is (1940 - age + 18).
1940, male (with foreign born): same as 1940, males, but includes the foreign born in their region of residence in 1940.
Grad. rate, male: number of male graduates from public and private high schools in the region divided by the number of 17 year olds from Commissioner of Education data.
Sources:
Commissioner of Education, Report of the Commissioner of Education (various years); Commissioner of Education, Biennial Survey of Education (various years). 1940 PUMS, 1/100 sample.

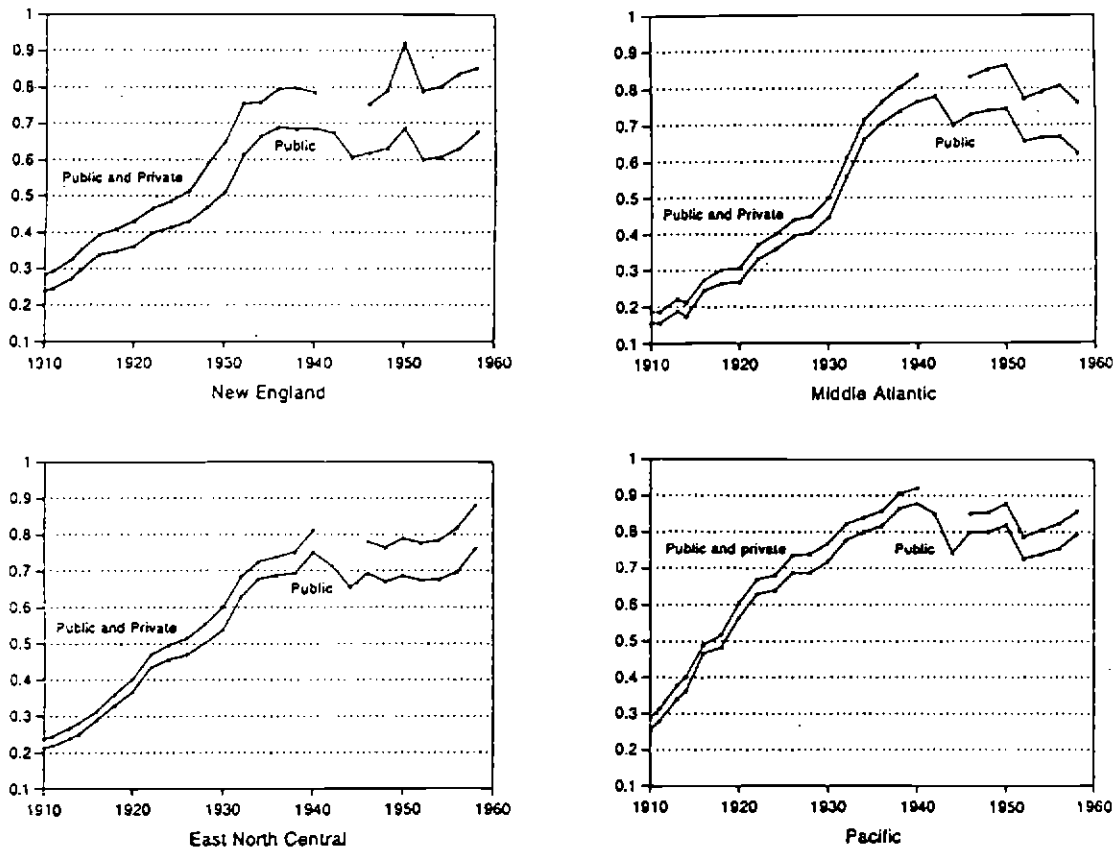


Figure 6: Total and Public Secondary School Enrollment Rates in Four Regions

Sources:
Commissioner of Education, Report of the Commissioner of Education (various years); Commissioner of Education, Biennial Survey of Education (various years).
Notes: Males and females are combined. Enrollment is divided by the approximate number of 14 to 17-year olds in the state. Interpolations are made between census years. See Appendix for details on the construction of the underlying education data.

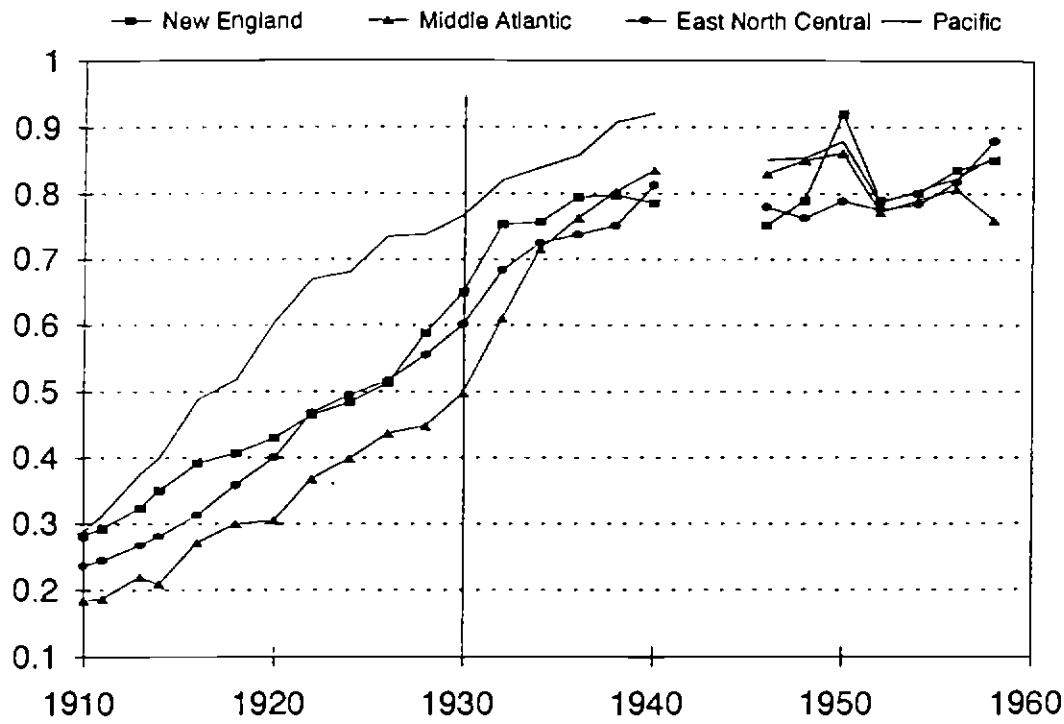
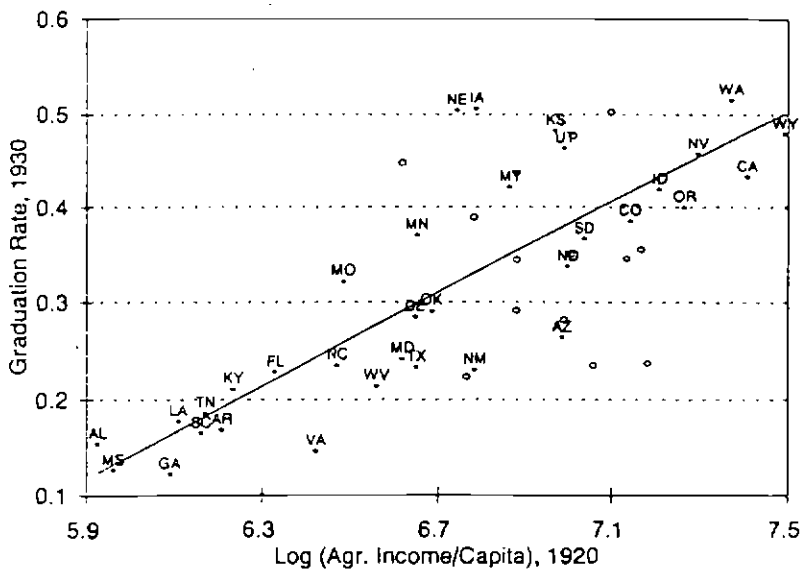


Figure 7: Total Secondary School Enrollment Rates for Four Regions

Sources:
Commissioner of Education, Report of the Commissioner of Education (various years); Commissioner of Education, Biennial Survey of Education (various years).
Notes: Males and females are combined. Enrollment is divided by the approximate number of 14 to 17-year olds in the state. Interpolations are made between census years. There are no private school data for 1940 to 1946. See Appendix for details on the construction of the underlying education data.

Notes: The line at 1930 is intended to mark the possible impact of the Great Depression.



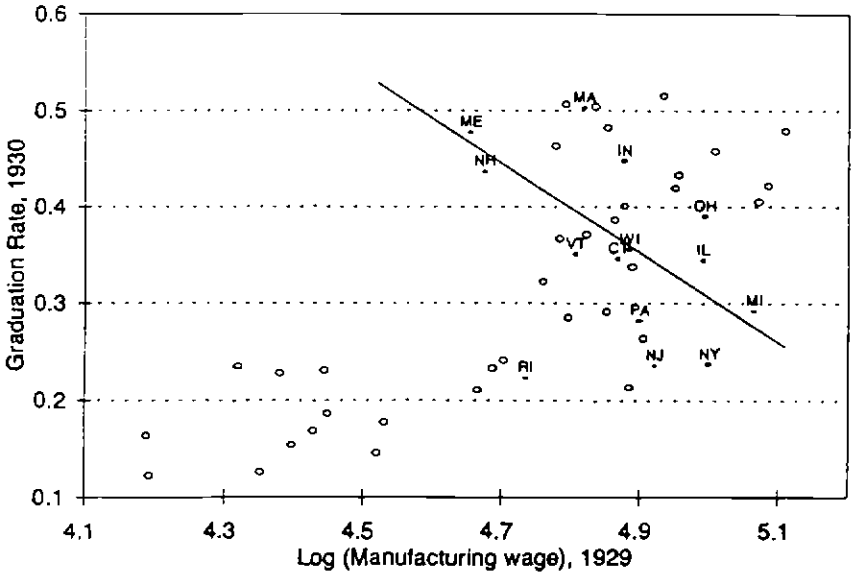


Figure 8: Agricultural Income, Manufacturing Wages, and Graduation Rates in 1930 by State

Sources:
Graduation rates: Commissioner of Education, Report of the Commissioner of Education (various years); Commissioner of Education, Biennial Survey of Education (various years).
Agricultural income, 1920: Kuznets, et al. (1960), table A 4.3.
Manufacturing wages per worker, 1929: Lee, et al. (1957), table M-5.
Notes: The regression line in part A is estimated over all non-northern states. That in part B is estimated over only the northern states, except Rhode Island.

Table 1
Computing the Impact of High School on Educational Attainment
for 3 Cohorts

Males Cohort born in year	≤ 8	9-11	12	> 12
	% in Grade Interval			
1946-50 (40-44 yrs. in 1990)	6.6	12.5	45.6	35.3
1926-30 (40-44 yrs. in 1970)	17.4	21.2	42.3	19.1
1886-90 (40-44 yrs. in 1930)	72.5	10.7	8.3	8.6

	Approx. Mean Years in Interval				Computed Mean
1946-50 (40-44 yrs. in 1990)	7.7	11.5	12.0	15.3	12.82
1926-30 (40-44 yrs. in 1970)	7.2	10.5	12.0	15.2	11.46
1886-90 (40-44 yrs. in 1930)	5.8	9.8	12.0	15.2	7.56

Counterfactual:

	Mean	Mean Without Increase to 8th Grade
If 1886-90 cohort had high school attainment of 1926-30 cohort	10.27	9.86
If 1886-90 cohort had high school attainment of 1946-50 cohort	11.36	10.47

Source: Percent completing grades for cohorts born 1926-30 and 1946-50 from Smith and Ward (1984); approximate mean years in interval computed from distributions in Smith and Ward to be consistent with the actual means and with data from the 1940 census. Computed means differ from actual means in Smith and Ward by about 2%. Percent completing grades and mean years in interval for the cohort born 1886-90 from 1940 PUMS (entire sample). Smith and Ward's percentile distribution for the 1886-90 cohort has too low a percentage ≤ 8th grade and too high a percentage with 12 years of schooling compared with the 1940 census. Smith and Ward average various census and CPS data, and thus their numbers for the early cohort reveal even more "creep" than in the 1940 census.

Notes: The figure of 10.12 years for the 1886-90 cohort, for example, is computed by using the % 9-11th grade from the 1926-30 cohort, and that for % ≥ 12th grade (61.4%). The % > 12th grade is held at its 1886-90 cohort level (8.6%) and the means for the ≤ 8th grade and > 12th grade are also held at their 1886-90 levels. That is, the only factors that change are those having to do with high school attendance and graduation -- the percentages in the 9-11 and 12 groups and mean years for the 9-11 group. Increasing those in the 9-12 grades, of course, necessitates decreasing the group in ≤ 8 grade. Because 31.3% of the 1886-90 cohort had already completed the 8th grade, the increase in elementary grades that this entails increases years of schooling by only 0.412. Because those who completed grades 5-8 are moved up to high school, a mean for ≤ 8 grades of just 2.3 years. The corresponding figure for the 1946-50 calculation is 0.7 years. The increase for the 1946-50 counterfactual among those in the elementary grades is 0.884 years. These years are subtracted in the calculation of the counterfactual mean without the increase in years to the 8th grade.

Table 2
High School Graduates Continuing to College and Other Institutions

	% Continuing, among High School Graduates[a]					
	1901	1910	1914	1923	1933	1937
to college only						
total, public	31%	34%	35%	31%	21%	24%
males, public	40	45	45	37	23	26
total, public & private	33	35	35	32	23[b]	n.a.
to college & other institutions[c]						
total, public	n.a.	49%	50%	44%	25%	29%
males, public	n.a.	55	55	46	25	30
total, public & private	n.a.	49	50	46	25[b]	n.a.

[a] "Percentage continuing" is reported by the Commissioner of Education from the reports of school principals. It is the percentage who intended to continue, probably in the immediate future. Some did not eventually do so, whereas a far larger group went back to school at a later date having never indicated an intent to continue their education.
[b] Private school graduation numbers are for 1932.
[c] Other institutions probably include normal, nursing, and library schools.

Notes: These figures probably do not include students in the preparatory departments of colleges and universities and in normal schools. Their inclusion would increase the continuation percentages for earlier years.

Sources: Commissioner of Education, Report of the Commissioner of Education (various years); Commissioner of Education, Biennial Survey of Education (various years).

Table 3
Explaining Graduation Rates across States, 1930

Dependent variable: Total Graduation Rate in 1930 (mean = 0.322)

	Coefficient	t-statistic	Mean
% of labor force in manufacturing, 1930	1.757	2.41	0.255
Manufacturing wage, 1929/1000	0.396	2.35	1190.8
% in manufacturing × manufacturing wage	-0.0145	-2.41	31.0
Agricultural income per agr. worker, 1920/1000	0.116	2.09	942.5
% foreign born, 1930	-0.141	-0.772	0.141
% urban, 1930	0.0450	0.404	0.460
% nonwhite, 1930	-0.376	-2.57	0.087
Constant	-0.215	-1.13	

corrected R^2 = 0.58
Number of observations = 48

Sources:
Graduation rate, 1930: Commissioner of Education, Commissioner of Education, Biennial Survey of Education. See text.
% of labor force in manufacturing, 1930: U.S. Population Census, 1930.
Manufacturing wages, 1929: Kuznets, et al. (1960), table A 3.5, p. 129.
Agricultural income, 1920: agricultural service income per worker from Kuznets, et al. (1960), table A 4.3, p. 187.
% foreign born, % urban, % nonwhite: Historical Statistics (1975), series A195-206.

Table 4
Means and Coefficients of Variation of School Attendance by Region
for Cities, 1920 and 1930

	School Attendance of 16 and 17 Year Olds			
	Mean		Coefficient of Variation	
Region (# cities)	1920	1930	1920	1930
New England (48)	0.378	0.539	0.323	0.222
Middle Atlantic (64)	0.334	0.546	0.282	0.213
East North Central (73)	0.405	0.675	0.263	0.171
West North Central (21)	0.452	0.640	0.173	0.120
Mountain (6)	0.585	0.722	0.163	0.137
Pacific (18)	0.574	0.847	0.113	0.085

Sources:
U.S. Federal Population Censuses, 1920 and 1930.

Table 5
Explaining Variation in School Attendance Across Cities, 1920 and 1930

Dependent variable: School attendance rate of 16 and 17 year olds

	(1) 1920	(2) 1920		(3) 1930	(4) 1930
Regional Dummies					
New England	-0.090	-0.097		-0.242	-0.268
	(3.60)	(3.91)		(7.87)	(9.04)
Middle Atlantic	-0.157	-0.147		-0.232	-0.229
	(6.64)	(6.59)		(7.93)	(8.29)
East North Central	-0.120	-0.119		-0.110	-0.094
	(5.30)	(5.56)		(3.82)	(3.32)
West North Central	-0.123	-0.119		-0.192	-0.198
	(4.61)	(5.12)		(5.68)	(6.30)
Mountain	-0.012	-0.010		-0.091	-0.075
	(0.31)	(0.29)		(1.78)	(1.70)
Pacific (omitted)					
Population Variables					
% foreign born	-0.155	-0.038		0.027	0.252
	(3.30)	(0.83)		(0.39)	(2.39)
population density ÷ 100	-0.144	-0.281		-0.234	-0.533
	(2.05)	(3.45)		(2.68)	(4.75)
School and City Variables					
property value ÷ 10,000	0.401	0.178		0.382	0.324
	(4.00)	(1.90)		(3.51)	(2.89)
school density		74.8			97.7
		(2.43)			(2.92)
vocational school density					197.7
					(2.22)
Labor Force Variables					
% manufacturing	-0.490	-0.161	% manufacturing	-0.519	0.314
	(6.53)	(2.32)		(5.00)	(2.85)
% laborers, in mfg.		-0.769	% transportation		0.540
		(5.08)			(3.26)
% operatives, in mfg.		-0.836	% trades		1.34
		(5.48)			(4.17)
% craft, in mfg.		-0.636	% white collar		0.989
		(4.22)			(4.35)
% managers, in mfg. (omitted)			% lower skilled (omitted)		
among production workers (1920)					
% in textiles		-0.206			
		(3.42)			
% in clothing		-0.490			
		(3.26)			
% in chemical		-1.08			
		(2.59)			
% in clay, glass		-0.265			
		(1.36)			
% in metal		-0.084			
		(1.56)			

Constant	0.593	1.25	0.811	0.199
	(19.2)	(9.03)	(22.2)	(1.81)
Adjusted $\bar{R}^2$	0.55	0.67	0.51	0.58
Number of observations	218	215	211	215

Notes: In all cases % is entered as a fraction. t-statistics are in parentheses. Ordinary least squares estimation used.

% foreign born = % foreign born of males ≥ 20 years.
population density = total population in either 1920 or 1930/area of city for closest date available.
property value = estimated value of taxable property in the city.
school density = adjusted number of all high schools in 1923 or 1933/area of city for closest date available. The number of schools is weighted by the fraction of secondary students in them (e.g., junior high schools receive less than a 1/3 weight, regular and senior high schools receive a weight of 1).
vocational school density = number of vocational schools/area of city.
% manufacturing = for columns (1) and (3), (number of production workers in manufacturing)/(total population of city); for column (2), (number of workers in the manufacturing sector)/(total population of the city); for column (4), (number of male workers in manufacturing sector)/(total number of male workers in city).

Sources: City-level data set from the U.S. federal population and manufacturing censuses, Financial Statistics of Cities, and the Biennial Report of the Commissioner of Education.

Table 6
Explaining the Change in Urban School Attendance,
Convergence Equations: 1920 to 1930

Dependent variable: Log(attendance rate of 16 and 17 year olds in 1930/same in 1920)

	(1)	(2)	(3)
Log(attendance rate in 1920)	-0.463	-0.394	-0.410
	(15.39)	(10.79)	(11.27)
Region Dummies			
New England	-0.227	-0.269	-0.187
	(6.26)	(7.01)	(3.79)
Middle Atlantic	-0.154	-0.127	-0.042
	(4.20)	(3.47)	(0.87)
East North Central	-0.034	0.007	-0.032
	(1.00)	(0.21)	(0.88)
West North Central	-0.151	-0.097	-0.107
	(3.81)	(2.45)	(2.75)
Mountain	-0.172	-0.170	-0.151
	(3.01)	(3.17)	(2.85)
Pacific (omitted region)			
Population density ÷ 100 in 1920			-0.197
			(1.98)
% foreign born in 1920		0.472	0.474
		(4.32)	(4.29)
% manufacturing workers in 1920		0.011	0.456
		(0.09)	(2.86)
% manufacturing workers × New England			-0.607
			(2.98)
% manufacturing workers × Middle Atlantic			-0.570
			(2.83)
Among manufacturing workers in 1920			
% factory laborers (omitted)			
% semiskilled operatives		0.344	0.375
		(3.15)	(3.48)
% craft workers		0.273	0.313
		(2.58)	(2.98)
% managers, supervisors		0.077	0.227
		(0.35)	(1.05)
Constant	0.132	-0.134	-0.216
	(3.98)	(1.52)	(2.47)
Adjusted R^2	0.59	0.62	0.64
Number of observations	229	222	222

Sources: City-level data set from the U.S. federal population and manufacturing censuses.
Notes: % foreign born = % foreign born of total population.

Table 7
Juvenile Workers in Manufacturing and Mechanical Trades for Selected Cities, 1900 and 1910

Fraction of all Employed Males in Manufacturing and Mechanical Trades

	10-15 years		14-15 yrs.	All Ages			
	1900	1910	1910	1900	1910		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
City						(1)/(4)	(2)/(5)
Boston	0.26	0.18	0.19	0.34	0.30	0.76	0.60
Buffalo	0.45	0.22	0.24	0.40	0.37	1.13	0.59
Chicago	0.36	0.23	0.23	0.37	0.39	0.97	0.66
Cincinnati	0.51	0.28	0.30	0.44	0.35	1.16	0.80
Cleveland	0.51	0.22	0.25	0.46	0.38	1.11	0.58
New York	0.33	0.20	0.20	0.38	0.37	0.87	0.54
Philadelphia	0.50	0.31	0.31	0.46	0.40	1.09	0.78
Pittsburgh	0.41	0.22	0.23	0.40	0.40	1.03	0.55
St. Louis	0.49	0.32	0.33	0.39	0.35	1.26	0.91

Source: 1900, 1910 federal population census.

Table 8
Role of Secondary Schooling in Income Convergence and Migration across States

A. Income Convergence

Dependent variable: Log(income per capita 1947/income per capita 1929)

	Coefficient	t-statistic
Log(income per capita 1929)	-0.505	-11.93
Graduation rate, 1930	0.488	3.54
Constant	3.80	15.14

Corrected R^2 = 0.76
Number of observations = 49

B. Migration

Dependent variable: Net migration between 1930 and 1940/Average population between 1920 and 1930

Graduation rate in 1930	1.36	2.67
Graduation rate in 1930 squared	-1.82	-2.34
Constant	-0.208	-2.74

Corrected R^2 = 0.15
Number of observations = 49

Sources:
Income per capita, 1947, 1929: state personal income from U.S. Department of Commerce, Bureau of Economic Analysis (1984), table 2.
Graduation rate: Commissioner of Education, Biennial Survey of Education. See text.
Net migration and average population: Lee, et al. (1957), table P-1.