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Why the United States Led in Education: Lessons from Secondary School Expansion, 1910 to 1940

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In the first several decades of the twentieth century, the United States pulled far ahead of all other countries in the education of its youth. It underwent what was then and now termed the "high school movement," a feat most other western nations would achieve some 30 to 50 years later. We address how the "second transformation" of American education occurred and what aspects of the society, economy, and political structure enabled the United States to lead the world in education for much of the twentieth century.[1]

From 1910 to 1940, America underwent a spectacular educational transformation. Just 9 percent of 18-year olds had high school diplomas in 1910, but more than 50 percent did by 1940 (see Figure 1). The transformation was even more rapid in many non-southern states and cities. Secondary-school enrollment and graduation rates, in most northern and western states, increased so rapidly that by the mid-1930s rates were as high as they would be by 1960. The high school movement set the United States far ahead of all other nations in its human capital stock.[2]

Earlier in its history, the United States had also taken a commanding position in education. During the mid-nineteenth century, America surpassed the impressive enrollment levels achieved in Germany and took the lead in primary (grammar, elementary, or common) school education (Easterlin 1981). But by the turn of the twentieth century, various European countries had narrowed their educational gap with the United States (Lindert 2004). As the high school movement took root in America, however, the wide educational lead of the United States reappeared and was expanded considerably to mid-century.

Educational differences between youths in the United States and those in many European countries would not again be reduced for some time and in many cases have been narrowed only

recently. Differences in formal schooling rates for older youths (15 to 19 years old) between various European countries and the United States were substantial in the mid-1950s.[3] As can be seen in Figure 2, the U.S. secondary school enrollment rate for older youths in 1955 was just below 80 percent. No European country, however, had a full-time general schooling rate for youths in this age bracket exceeding 25 percent.

These substantial differences in full-time formal schooling are only slightly reduced by including youths enrolled in full-time technical programs (the two bottom portions of the histogram bar). With this addition, no European country had a general and technical full-time enrollment rate exceeding 40 percent. To make the point even more extreme, the wide U.S. lead in education remains even after including for those in part-time technical programs (the entire histogram bar). The relative stock of educated workers, therefore, was considerably greater in the United States than in most European countries until the 1970s and even to the 1980s.[4]

We examine the expansion of U.S. secondary schooling by exploiting the wide variation in education, income, wealth, and economic and demographic structure across states and cities from 1910 to 1940. In 1928—the approximate mid-point of the period—the ratio of the secondary school graduation rate at the top decile to that at the bottom decile of states was about three, as was the ratio for income per capita.[5] These are large differences and span those found across many of the other countries of the developed world over the same period. The range of schooling rates, incomes, urbanization, demographic composition, and industrial development found in the United States over this period is similar to that found across a wide group of countries.[6] Thus, an analysis of the determinants of differences in secondary schooling across U.S. states and cities may shed light on the reasons the U.S. moved to the forefront of

educational attainment in the first half of the twentieth century. The various factors that account for the variation in schooling rates across U.S. states and cities appear also to have been important in explaining differences between Europe and the United States (and Canada) and possibly in addition within Europe.[7]

The areas of the United States that led in secondary school education, we will show, had higher taxable wealth per capita, greater per capita income, higher proportions of their population that were older, and a tighter distribution of wealth and income.[8] As well, a lower proportion of their total employment was in manufacturing and a lower share was foreign born and Catholic. Homogeneity of economic and social condition and the social stability of community fostered the extension of education to the secondary school level, given a modicum of income or wealth.

Also of importance was the state's prior commitment to publicly funded colleges because the existence of inexpensive and universally available higher education increased the return to high school graduation. The state university system, moreover, took an active interest in both the quality and quantity of secondary school students for they were their potential clients. More school districts per youth also appear to have mattered.

Some of the explanatory variables that we find to be significant are consistent with a simple model of educational investment by families. Where the opportunity cost of schooling was high and family income or wealth was low, education, not surprisingly, lagged. But because education is most often a publicly-supplied private good, an individual choice framework by itself is insufficient. A framework of public choice is also needed. The importance of small districts and many of them, homogeneity of tastes for education, and a narrow distribution of

income or wealth come into focus in the public choice framework.

In order to extend education to the secondary level, schools had to be built and teachers had to be hired. These actions were not based simply on the aggregation of individual family choices concerning whether or not to allow children to attend school. Rather the decision was whether a school district, township, county, or state would tax *everyone* regardless whether they had children who would attend the school. Areas with greater homogeneity of economic condition, higher levels of wealth, and more community stability were the earliest to extend education to the secondary level and experienced the greatest expansion during the initial years of the high school movement.

We begin with a brief description of the high school movement in the United States and then assess what factors explain differences in secondary schooling rates across states and cities during the period of the high school movement.

<A> The High School Movement in the United States: 1910 to 1940

By the first decade of the twentieth century the vast majority of American youth outside the South attended school until they were 14-years old, and those in the northern and western states, as in some European countries, had attained nearly universal "common schooling" of at least six years. America was poised for a transition from the elementary and common schools to the secondary level.[9]

Starting around the 1890s the demand for educated workers to staff ordinary white-collar jobs began to soar. People even in rural areas spoke of having a high school education as a means of succeeding in the business community and parents across diverse communities saw

secondary education as the premier ticket to their children's prosperity. By the 1910s families across America were calling for the expansion of high schools.[10] America was still largely a rural nation and parents recognized that education would enhance economic mobility in part by fostering geographic mobility.

Publicly supported high schools existed in the nation's larger cities beginning in the 1820s and private academies dotted the smaller towns by the mid-nineteenth century. The high school movement does not signify the beginning of secondary schools in America. Instead, the movement marks an enormous expansion in the number and geographic reach of high schools, the spread of a more uniform curriculum, and a replacement of many private high schools with public ones.[11]

The first public high school in the United States was established in Boston in 1821 and most of the larger coastal cities of the East founded public high schools soon after. Smaller cities were not without post-elementary educational institutions as private academies mushroomed in the mid-nineteenth century. Some academies were college preparatory schools but most were secondary schools indistinguishable from their public counterparts, except that academies charged fees. Some academies taught vocational skills such as bookkeeping, mechanical drawing, and navigation that drew on academic courses, although most taught standard subjects.

The aggregate enrollment in academies is difficult to establish given the quality of the surviving records.[12] We do know, however, that the number of academies declined sharply with the arrival of publicly funded high schools. We also know that enrollments in academies were considerably below those of the public secondary schools that replaced them. So even though public secondary schools displaced many private schools, the high school movement led to an

enormous net increase in enrollment.

What had changed in the United States in the late nineteenth century to increase the demand for education beyond the primary years? We have shown elsewhere that the premium to ordinary white-collar employment in the immediate pre-World War I period was high and that it probably had been equally high throughout the latter part of the nineteenth century (Goldin 1999; Goldin and Katz 1995, 2001). The increased scale of firms, the rise of large retail establishments, and the emergence of various segments of the service sector increased the demand for white-collar workers.

Using individual-level data for 1914, we also demonstrate that the return to a high school education was substantial. It was high even within a host of blue-collar occupations and even within farming.[13] That is, the return to education did not accrue only to those who were enabled to shift from manual occupations to white-collar ones. Rather, the high return also existed *within* blue-collar and white-collar jobs. Other work of ours has shown that the newer and technologically innovative industries of the early twentieth century employed a far larger fraction of high school graduates in their blue-collar labor forces than did other industries of the day (Goldin and Katz 1998).

Although secondary schools were present in almost all large U.S. cities and in many smaller towns before 1900, the curriculum was not yet standardized. Secondary schools in large cities often had close connections with local universities or colleges and trained students to pass their entrance exams. Almost half of all high school graduates in 1910 expressed an intention to continue their studies in a four-year college or another form of higher education (e.g., in teaching or normal schools, library schools, and nursing schools). The fraction that actually entered some

degree-granting institution was probably around 35 to 40 percent. Both percentages declined considerably by the mid-1930s as high school enrollments soared (Goldin 1998, table 2).[14] The modern high school that we now know—with its diverse curriculum, vocational courses, tracking, electives, 45-minute periods—was invented in America during the first decades of the twentieth century (see Krug 1964, 1972). The junior high school also originated in this era—in 1909 to be precise—as a means to keep 14-year olds in school for an additional year by offering vocational training and a diploma.[15] Americans devised the secondary school for the masses to train youth "for life" and not just "for college."

Figure 1 shows the extraordinary rise in secondary schooling for the entire United States from 1910 to 1940. But this graph does not reveal the differing patterns across regions. The 1940 U.S. population census, the first to include information on educational attainment, could be used to address the issue. But its schooling data for older cohorts are somewhat suspect and have been shown to substantially overstate the numbers claiming to have graduated from secondary school.[16] To produce state figures and to check the reliability of the national series we have used, instead, the contemporaneous reports of state and federal departments of education to construct the number of students enrolled and graduated. The data were assembled as part of a study of education in the twentieth century (Goldin 1994, 1998).

The schooling data include all students in grades nine through twelve in public and private secondary schools, as well as those in the preparatory departments of colleges and universities.[17] For the state-level data we have two measures: enrollments and number of graduates.[18] Each measure is transformed into a rate by dividing by the relevant demographic group.[19] To conserve on space, we present the information on graduation rates only; the trends

and regional differences in enrollment are similar. We first summarize considerable information by presenting time-series of the graduation rates aggregated by census divisions (Figure 3) and the data for 1928 in map form by states (Figure 4).

As can be seen in Figure 3.A, the increase in the graduation rate in parts of the North and West was so steep that even as early as the 1930s many states had achieved rates equal to those of the 1950s. The national data in Figure 1 give the misleading impression that the increase in graduation rates was more continuous and extended into the 1960s. Because the South lagged far behind the North, the data for the entire country show a more continual increase.

The states of the South were not the only laggards. The Mid-Atlantic was the non-southern region with the lowest graduation rates before 1940. Its three states had a more industrial economy than the other regions included in Figure 3.A and lagging states in other regions were also those that were more industrial (e.g., Michigan). With the onset of the Great Depression and with the passage of National Industry Recovery Act codes (1933 to 1935) making youth employment in manufacturing illegal, teenagers in the industrial states flocked to high school, closing wide educational differentials among the states outside the South.

The South, as can be seen in Figure 3.B, had graduation rates that were initially the lowest in the nation and remained low even during the period of the high school movement. But after the 1940s secondary schooling expanded rapidly. By the 1960s the South had narrowed, although not yet closed, the gap with other regions such as the East North Central (included in Figure 3.B for comparison). The low graduation rates in the South before the 1950s, moreover, were not due solely to the abysmally low education levels of the African-American population. The white population also had far lower rates, as can be seen in the comparison with whites in

the South Atlantic.

Several other features in the underlying data are also worth mentioning. Although the disaggregated data for the states begin with 1910, by necessity, estimates for the entire nation reveal that change was slow during the preceding four decades. That is, the level in 1910 was not much higher than it was in 1870.[20] The 1910 to 1940 segment in Figure 3, therefore, can be thought of as the rapidly rising portion of a diffusion or logistic function.[21] Another point is that World War II cut deeply into the high school graduation (and enrollment) numbers for regions such as New England and the Pacific largely because of the relatively high wages of young workers, not just because of the draft.[22] Finally, young women went to and graduated from secondary schools at higher rates than did young men, with the possible exception of the 1930s when the rates were almost on par.

At the start of the high school movement in 1910, New England was at the forefront of secondary education, as it had been in elementary education during the nineteenth century. Several states in the mid-section of the country, the West North Central in particular, also had substantial schooling rates. By 1928 New England had been eclipsed by these states and by others across the North and West. The group appears to form an "educational belt" across America, as can be seen in the map of Figure 4. Enrollment and graduation rates in California, Indiana, Iowa, Kansas, Nebraska, Oregon, Washington, the Mountain states, and parts of New England were far higher than they were in Michigan, New Jersey, New York, Pennsylvania, Wisconsin, and, of course, the South. Although there was considerable catch-up by 1938 between the leaders and the more industrial states, the rankings of the states in 1928 and 1938 are similar. We will use data from 1910, 1928, and 1938 in state-level regressions to understand the

correlates of the high school graduation rate.

Comparisons across states over time are facilitated by consulting Table 1, which gives summary statistics for the graduation rate from 1910 to 1938. Both the unweighted and weighted standard deviations of state graduation rates suggest widening dispersion.[23] Table 1 reveals growing gaps in high school education across the nation during the period of the high school movement. Within the non-South, however, the Great Depression produced a narrowing in high school graduation rates (see the weighted results), as the industrial states of the North narrowed the gap between them and the states of the West and Plains.

By 1940 high schools in all regions, except the South, were fairly complete in their geographic coverage. Given their absence in all but the larger cities in 1910, this was a spectacular, but expensive, achievement. Most estimates show that the direct cost of educating a high school student was twice that of an elementary-school pupil (Goldin 1998). Thus an area that moved from universal elementary education (8 years of school) to universal secondary education (12 years of school) doubled its educational tax bill.

An important feature of the story we will soon tell is that the areas to which high schools spread most rapidly were among the more sparsely settled. In 1925 the average farm in Iowa had 160 acres and that in Nebraska, 330 acres (U.S. Department of Commerce 1926). Although Iowa and Nebraska were farm-country, they were also two of the leading states in the high school movement. Given that 50 percent of Americans were still living in rural areas in 1920, the timing of the high school movement may not be surprising given the obvious importance of the internal combustion engine (school buses, cars) and improved roads to the education of rural populations.

The modern U.S. public high school was a quintessential American innovation: generally free, open to all who completed eighth grade, gender neutral in admission, secular, fiscally controlled by local governments, and a guarantor of acceptance to a state college for its graduates, in most states. Nowhere else in the world was that the case when the U.S. high school movement was in its early stages even though similar economic incentives in the form of wage differentials were present in parts of Europe (Phelps Brown 1977; Piketty 2003).[24]

<A> Explaining Differences in High school Participation Rates across the United States

To understand the wide differences in high school attendance and graduation rates across states we investigate the determinants of secondary school rates at the beginning of their steep ascent. We first examine (public and private) graduation rates at the dawn of the high school movement in 1910. We next explore the transformation in education from 1910 to 1928. Finally, we explore the changes that took place from the eve of the Great Depression (1928) to just before World War II (1938). A city-level data set affords a wider range of variables but requires the use of a slightly different measure of the schooling rate.[25] The motivation for all the estimations is a standard model of human capital investment in which the educational return, opportunity cost, and capital constraints affect private decisions. A public-choice framework is then layered on that model.

The simplest form of the investment decision is a two-period model in which a representative individual can either work or attend high school in period 1. If he works, he earns w_1. Attending high school, the alternative, entails a direct cost of C and an opportunity cost of w_1. The individual in period 2 earns $w_2 \geq w_1$ with no high school and $E_2 > w_2$ with high school.

The decision to attend high school, under lifetime income maximization and given discount rate r, hinges on whether the discounted benefits exceed the first period costs (all measured relative to the second period wage):

$$\frac{(E_2/w_2)-1}{1+r} > \frac{C+w_1}{w_2} \ .$$

Expressed in terms of the rate of return calculation, the issue is whether the returns are greater than the discount rate:

$$\frac{E_2-w_2}{C+w_1} > 1+r \ .$$

Thus the schooling decision is negatively related to the opportunity cost of schooling (w_1), the direct cost (C), and the discount rate (r), and positively affected by the high school wage premium (E_2/w_2 or $[(E_2 - w_2)/w_2]$.[26]

This simple formulation of the educational investment decision does not, however, speak to the public nature of most schooling. Public support for secondary school was rarely justified on the basis of the creation of a literate citizenry, the same way that primary school was in the nineteenth century. Public funding was, rather, rationalized on the grounds of capital-market imperfections. Communities were groups of families at different stages of their lifecycle, and publicly funded education was an intergenerational loan, a means of consumption smoothing.[27]

Families (or clans) are not identical, however, and the essence of the public-goods problem is the characterization of the majority-voting equilibrium. Rather than having all adult family or clan members earn w_2, in the absence of high school, a distribution of w_2 can exist. The problem, then, is finding a majority-voting equilibrium with respect to both public education and the size of the (income) tax to fund it. Under many reasonable scenarios, the greater the

variance of w_2, given its mean, the less support there will be for public secondary education and the lower the probability that public secondary schooling will be approved by voters.[28]

Thus the level of income or wealth and the distribution of each should have been important determinants of public high school education. The extent to which individuals consider themselves members of the same community is another element of the public choice framework. Greater social cohesion, intergenerational propinquity, and community stability should all have increased the support for publicly funded education.[29]

We postulate a reduced-form equation for the high school enrollment (or graduation) rate (HS) in a jurisdiction that include the following elements:

$$HS = f\,[(C + w_1)/w_2, (E_2/w_2), r, \overline{Y}, \sigma_Y, X]\ ,$$

where $\overline{Y}$ and σ_Y measure the mean and dispersion of income (or wealth), and X is a vector of variables relating to the stability, cohesion, and intergenerational propinquity of the community. Other terms are defined as before.

<B> State-level Regressions

In the empirical analysis at the state level we analyze the correlates of the public and private high school graduation rate in 1910 and 1928 and of changes in the graduation rate from 1910 to 1928 and 1928 to 1938. The variables approximate the key determinants of family-level education decisions and those factors relevant in a public choice framework.

All youth are assumed to face the national market for white-collar employment conditional on receiving a high school degree. In fact, the earnings of white-collar workers were far more similar across the United States in the 1909 to 1919 period than were the earnings of

production workers.[30] Thus, we do not include a variable for the earnings of white-collar workers (E_2). We do, however, include variables to account for the opportunity cost of schooling (w_1) and the (locally determined) blue-collar earnings of adults without high school education (w_2). Since employment opportunities for older youth in this period were likely to be found in manufacturing, we approximate the opportunity cost of high school education by both the fraction of the work force in manufacturing and the manufacturing wage.

Various measures of income and wealth (state income per capita, taxable wealth per capita, and agricultural income per agricultural worker) proxy the household capital-constraints and the consumption demand for education. The return to high school was probably greater where publicly supported colleges were available and we therefore include, in the change regression for 1910 to 1928, a variable for the public university enrollment rate in the base year.

The decision by the municipality to build and staff high schools is more complicated. The frameworks we have cited emphasize the distribution of wealth, the stability of community, and social distance or propinquity. The social stability of communities can be inferred, in part, from the proportion elderly in the state. Social distance or propinquity might be proxied by variables relating to fraction foreign born or Catholic.[31]

The distribution of income or wealth is a difficult variable to obtain for the period in question. An estimate of automobile registrations per capita is a good substitute for more obvious, but unavailable, measures. Automobile registrations per capita may seem an odd variable given the nearly ubiquitous ownership of cars today, but in the 1920s automobile ownership required a much higher relative level of income or wealth. Consider two income distributions each having the same mean but different variance and for which the cutoff point for

automobile ownership is somewhere below the mean. The narrower distribution will have a higher fraction of car owners among the population. Thus under certain conditions, and given the mean of income (or wealth), the variable "automobile registrations per capita" is a good proxy for the variance of income (or wealth). The number of automobile registrations per capita, therefore, is an indication of the share of voters likely to be wealthy enough to favor financing an expensive public good, such as a high school.

With just 48 states in each year we must be judicious in our inclusion of variables. A further constraint is that many of the variables are highly correlated. The fraction of the population that is urban, foreign born, and Catholic are all strongly collinear, and each of these variables is also collinear with the fraction of workers employed in manufacturing. Similarly, per capita wealth, income, agricultural income, and automobile registrations are all collinear. We use a subset of each of these groups in the regressions. Where only one of the many variables mentioned is included, the results are robust to the inclusion of the others.[32]

The number of districts per youth was mentioned in the discussion of the provision of local public goods as being potentially important. Numerous, small, fiscally independent districts can foster secondary school expansion in its early phase. The cross-state correlation of school districts per youth in 1932 and the high school graduation rate in1928 is 0.56. This significant positive relationship between the density of school districts and the high graduation rate is reflected in high school graduation regressions that control for population density or the urban share of the population and the relationship is also maintained for states outside the South. But the number of school districts per youth is closely related to wealth, automobile registrations per capita, and agricultural income per farm worker. Therefore the variable is not statistically

significant in regressions that include these variables.

The estimations are admittedly of the reduced-form variety, but they are as a group suggestive of the forces that both encouraged and impeded secondary-school education. Table 2 summarizes the main results. The first three of its columns give regressions where the dependent variable is in levels for 1910 (col. 1) and 1928 (cols. 2, 3). The next three columns (cols. 4, 5, 6) report the regressions where the dependent variable is in first-differences.[33] The last two columns report the means of the variables for 1910 (col. 7) and 1928 (col. 8).

The association between the key factors of our framework and high school graduation rates at the start of the high school movement in 1910 is summarized in col. (1). Per capita wealth (in 1912), the proportion older than 64 years (in 1910), the percentage of the labor force in manufacturing (in 1910), the percentage Catholic (in 1910), and dummy variables for the South and New England are strong predictors of high school graduation and together they account for almost 90 percent of the cross-state variation.

Wealth per capita (or state income per capita, or agricultural income per capita), not surprisingly, is positively related to the high school graduation rate and the impact is reasonably large—a shift from the 25th percentile to the 75th percentile increases the graduation rate by about 1.5 percentage points in 1910 (or by 16 percent of the mean). Having more manufacturing, on the other hand, was a drag on education; moving from the 25th to the 75th percentile reduces the graduation rate by 1 percentage point in 1910 (or by 12 percent of the mean). The larger the proportion older than 64 years, the higher is the graduation rate. This strikingly strong positive relationship at the dawn of the high school movement between high school graduation rates and fraction of older persons in the population (a raw correlation of 0.79) is illustrated in Figure 5.A.

We attribute the effect to the stability of community and not to differential fertility or immigration, for neither of those variables reduces the positive impact.

Our finding that educational attainment is positively related to the fraction of older persons in the state, and thus to the persistence of population, is the reverse of the conclusion from several studies using current data (e.g., Poterba 1997). There is good reason for the difference. Older citizens today are highly mobile as a group. A large fraction live far away from their community of origin and as a political unit they appear to have far less interest in the use of public resources to enhance education than did those early in the twentieth century who continued to reside in their communities.[34]

In col. (2) of Table 2 we examine the determinants of high school graduation rates in 1928 and find results similar to those for 1910, when converted into elasticities. But for 1928 we can include variables that we cannot for 1910 and they add substantially to the story. The most interesting of the new variables is automobile registrations per capita (in 1930).

Automobile registrations per capita exhibits a strong positive relationship to the high school graduation rate, even when a direct measure of per capita wealth is included. The specification in col. (2) implies that increasing auto registrations per capita from the 25th percentile to the 75th percentile increases the graduation rate by 5 percentage points (or by 17 percent of the mean level in 1928).[35] Automobile registrations per capita is a key explanatory variable and speaks to the importance of a more equal distribution of wealth, given its mean, in the provision of education as a public good.[36] The states with the most automobile registrations per capita in 1930—California, Iowa, Kansas, Nebraska, and Nevada —were all at the high end of the educational distribution in 1928 (see Figure 5.B).[37]

Also of interest are manufacturing as a share of employment, the manufacturing wage, and their interaction as shown in Table 2, col. (3). The 1910 results show that a large manufacturing sector was a potent deterrent to high school graduation. For the 1928 regression we can add the manufacturing wage and the interaction between it and the size of the manufacturing sector. Having a greater percentage of the labor force in manufacturing, given the manufacturing wage, was a drag on education, as we found in the 1910 analysis. But in the 1928 analysis we can see that the relationship holds only when the wage is high enough, in this case above the mean. Similarly, a higher manufacturing wage was not an impediment to education until the percentage of the labor force in manufacturing exceeded its mean. The lowest graduation rates, outside the South were found in the industrial states with relatively high manufacturing wages such as New Jersey, New York, and Pennsylvania. The opportunity cost of education in these states was high and the availability of manufacturing jobs was substantial enough to deter education.

We have also estimated a state fixed-effects model (not shown) that pools data from 1910, 1920, and 1930. We find results similar to the levels regressions in cols. (1), (2), and (3).[38] Auto registrations per capita and the percentage older than 64 years remain strongly and positively related to the state graduation rate. Percentage Catholic and the manufacturing employment share variables have coefficients similar to those in the cross-section regressions but are not as precisely estimated due to persistent differences by state.

The first difference regression for 1910 to 1928, given in col. (4), reinforces the interpretation of many of the variables that featured in the levels regression—with one addition and one exception. The independent variables for the difference regressions capture the *initial*

conditions in a state. More wealth in 1910, for example, hastened the growth of high schools from 1910 to 1928 and a greater share of the labor force in manufacturing (in 1910) slowed it. The positive relationship between (log) per capita wealth at the start of the high school movement and the expansion of high schools from 1910 to 1928 can be seen in Figure 5.C.

We add to the levels results (see col. 4) the fraction of youth in the state who attended public colleges and universities in 1910, which is a predetermined variable in the difference regression and has a strong positive effect on the high school graduation rate. It appears that the returns to high school were higher in states with large publicly funded institutions of higher education (see also Figure 5.D), although we cannot entirely rule out an explanation based on differences in tastes for education. The only variable to change signs in the difference regression compared with the levels regression is the percentage older than 64 years.

Lastly, we analyze the change during the 1930s. The estimation in col. (5) is configured similarly to that in col. (4) for the 1910s and 1920s. Much appears to have been altered by the 1930s. Wealth remains an important determinant, but the fraction of the labor force in manufacturing no longer has a strong negative effect. The sparse specification in col. (6) focuses on factors unique to the Great Depression and adds the change in the unemployment rate from 1930 to 1940.[39] High school graduation rates during the Great Depression increased the most in states that underwent the largest increases in unemployment, given the level of income, and they also increased the most for the leading manufacturing states. The 1930s produced greater educational homogeneity among non-southern states, as was seen previously in Table 1, by eliminating jobs that had once employed teenagers. Ironically, the Great Depression may have spurred educational attainment in industrial America.

We have not yet mentioned state legal constraints, such as compulsory education and child labor laws, the expansions of which during the Progressive Era are considered by many to have been crucial in extending education into the teenage years. These laws were highly complex. The maximum age of compulsory education was often not the binding constraint. Rather, youths in most states were excused from school if they were employed and met age and education requirements.[40]

Recent work on whether these laws spurred the high school movement has concluded that compulsory education laws were by themselves ineffective in increasing years of schooling, but when combined with child labor laws they had a positive, albeit modest, effect.[41] A prior literature had argued similarly that compulsory education laws were passed in states that already had extensive school attendance.[42] The econometric evidence to date leads us to conclude that although the laws had some impact on the education of teenagers, their influence on high school *graduation* was small.[43]

Less attention has been paid to another set of state laws that enabled early high school expansion. A somewhat forgotten group of laws, often labeled "free tuition" legislation, appear to have been instrumental in the early expansion of high schools in the more sparsely settled states of the Midwest and West. These laws mandated that school districts that did not maintain their own secondary schools pay the tuition of resident youths to attend school in neighboring districts that did. Prior to the adoption of these laws, parents had to pay tuition to these schools. Many western states adopted free tuition laws of various types from 1907 to the 1920s, some of which applied to all districts in the state whereas others constrained only the districts of counties that approved the laws (e.g., Nebraska in 1907 and Iowa in 1913 were both statewide; California

in 1915 was at the county level).[44]

<B> City-level Regressions

At the start of the high school movement in 1910, Americans were still a predominantly rural people. Half lived in places that were either unincorporated or had fewer than 1,000 persons. Just one-third lived in cities of more than 25,000. The remaining sixth lived in small cities and villages. Young people who lived in towns and villages had the highest school rates in both 1910 and 1920. Somewhat lower were the school rates youth in the open country and in small cities, and lower still were those of youth residing in cities with populations exceeding 25,000. Lowest of all were the school rates of youth in the largest cities.[45]

Cities provide another laboratory to study the transition to mass secondary school. Our data contain a wider group of variables than that for the states, and the number of observations is almost five times as large. Our data set contains the 289 cities with populations exceeding 10,000 in 1910.[46] As in the state-level analysis, a simple human-capital model motivates the selection of variables and the estimation is, once again, of a reduced-form nature. The dependent variable, which is from the U.S. population census, differs from the one we used in the state-level analysis and refers to the attendance of youth (15 to 17, or 16 to 17-years old) in any school. Thus the dependent variable does not include attendance in secondary schools alone and could include sporadic attendance in various types of schools. Even though these data generally overstate the actual rate of school attendance among youths, they provide reasonable measures of differences across cities.[47]

The city-level regressions (Table 3) contain results that are similar in many respects to

those at the state-level. Manufacturing, measured by the fraction of production workers in the population, has a strong negative effect on school going, and the importance of particular industries (e.g., textiles, clothing) known to have hired the less skilled and child workers add to the effect. The variable indicating the percentage child workers in manufacturing in 1910, speaks to the effect of certain industries on the opportunity cost of youth, the capital-constraints of parents, and possible myopia regarding education common in certain industrial settings.

The fraction foreign born for 1910, and Catholic for the other two years, are strongly and negatively related to attendance.[48] Because the dependent variable includes all schools, parochial as well as public, the effect cannot be due to the use of private schools by Catholics and some ethnic groups.

The role of race is complicated. In 1910 and 1920 the fraction of youth attending school was similar by race in southern cities, where the majority of blacks lived. But the quality of education for blacks in the South was considerably lower than for whites and it is likely that the fraction attending school by age greatly overstates the grades eventually attained.[49] By 1930 many non-southern cities had substantial black populations and the large effect of race in the 1930 regression derives primarily from the impact of blacks on non-southern school attendance rates.[50]

Population density, reflecting the greater poverty of the denser cities, is negatively related to school attendance whereas wealth per capita is positively related. High school density, a variable we cannot construct at the state level, has a strong positive effect, showing the importance of proximity to schools, even in cities.[51] The average city in 1930 had 7,000 acres and three secondary schools. If a city doubled its secondary schools, it would increase

attendance by 5 percentage points. Interestingly, the 1930 regression suggests a much larger response of attendance rates to an additional vocational, rather than regular, high school.

<A> Implications for Cross-Country Differences and for Economic Growth

Secondary schooling spread rapidly in the United States from 1910 to 1940. When the United States entered World War II, the median 18-year old was a high school graduate and secondary schooling had become part of mass education. The same was not true of Europe, not even of its economically leading nations.

What factors can explain the extraordinary spread of secondary education in the United States? Can they also help us understand why Europe lagged? In other words: Why did the United States lead in secondary school education?

Schooling differences within the United States suggest the importance of the level as well as the distribution of wealth, and the level as well as the composition of manufacturing employment. They hint to the importance of cultural and religious homogeneity among people and stability of community. And they suggest that state expenditures on public colleges and universities created a powerful incentive for youths to graduate from high school. We do not know, however, what stronger state or national control relative to the local governments would have achieved, for educational funding was mainly at the local level in the period under consideration.[52] In 1925, for example, localities raised 84 percent of the revenue for primary and secondary education; states, counties, and the federal government together funded just 16 percent (U.S. Department of Education *Biennials* 1924-1926). We find that the number of school districts is positively correlated with educational outcomes, although the relationship is not

robust to the inclusion of certain other factors.

Thus many of the features of America that made it an egalitarian haven in the first part of the nineteenth century allowed it to expand its system of education in the twentieth, even after economic inequality had greatly increased. In the 1910s when inequality of non-agricultural income was probably at one of its heights for the century, local governments began to fund an expensive transition that would soon lead to nearly universal secondary school education.[53]

The aristocratic features of Europe that led many to abandon it for America, on the other hand, hindered the spread of secondary education. In England and Wales, education beyond grammar school was, until 1944, either privately provided and funded or only partially funded by the government. Secondary schooling was, most often, preparatory training for university, but higher education was not publicly funded. Students in Germany, France, and Great Britain were tracked before their teenage years and only some were allowed to go on to secondary school and then university.

Although the U.S. economy had become quite unequal by the early twentieth century, several factors encouraged publicly funded secondary school education. One was local provision. The poor were distinct regionally (southern incomes were half those nationally in 1920) and they were also distinct within regions (the foreign born, particularly from the newer sending countries, were far more urbanized than were native-born whites). Thus the average school district, with the exception of those in large urban areas, contained a relatively homogeneous citizenry. In most European countries, on the other hand, where decision-making was at the national, state, or provincial level, the broader distribution of income and wealth militated against publicly funded secondary school education. Inequality of material condition

appears to have perpetuated Old World institutions that, for some time, reinforced the existing distribution. As in various models of educational finance, this appears to be a classic case of the "ends against the middle" (Epple and Romano 1996; Fernandez and Rogerson 1995).

But there is another factor, far harder to identify, that in the early twentieth century set U.S. education apart from that in Europe. America had a stronger tradition of egalitarian institutions and impulses emphasizing equality of opportunity and these survived the rise in economic inequality. Among these institutions were the public colleges and universities of the Midwest and West, and they were a contrast not just to the elite institutions of Europe but also to their counterparts in the northeastern states, such as New York, Connecticut, and Massachusetts.

But what did the high school movement signify for economic growth within the United States and between America and Europe? A large literature links economic growth to a more educated population either because educated people are more productive or because education indirectly increases growth through a variety of routes (Barro 1997). Our state-level data allow a suggestive, although not conclusive, exploration of the relationship.

Per capita income converged markedly across the states, particularly after the 1930s (Barro and Sala-I-Martin 1991). Convergence forces were so powerful that they appear to leave little else to account for differences in per capita income growth. Yet, in a convergence equation framework for the 1929 to 1947 period, the public high school enrollment rate in 1928 has a significant, positive, and strong effect on the growth of income, whereas the proportion urban or manufacturing has a negative effect. In the 1920s, the per capita incomes of high-education states grew faster, given initial levels.[54] We do not yet have an answer to a related question of larger significance, whether the substantial differences between education in the United States

and in Europe are part of what differentiated the interwar and post-World War II growth experiences of these economies.

The increase in secondary school education is the largest component of the increase in the educational stock of Americans over the twentieth century.[55] It was high school and not college that dominated the rapid expansion of educational attainment before the 1970s. Many of the "super-education" states of the high school movement era (e.g., Iowa) have continued to be among the top educational performers today, with the regrettable exception of California.

Why the United States has fallen behind many countries in the quality of its secondary-school education may be rooted, ironically, in some of the characteristics that are considered to have been virtuous earlier in the twentieth century. These characteristics include small, numerous, and fiscally independent districts; public funding and provision; an absence of uniform standards for advancement; and an open, forgiving, and second-chance system. These virtues once led to the expansion of high schools but have increasingly come under attack for a variety of reasons.[56]

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Table 1
High School Graduation Rates, Summary Statistics by State

	Unweighted			*Weighted*		
	Mean	*Standard deviation*	*Coefficient of variation*	*Mean*	*Standard deviation*	*Coefficient of variation*
			48 States			
1910	0.088	0.049	0.557	0.086	0.043	0.500
1920	0.180	0.085	0.472	0.162	0.069	0.426
1928	0.300	0.117	0.390	0.270	0.100	0.370
1938	0.504	0.145	0.289	0.482	0.130	0.270
			32 Non-southern States			
1910	0.112	0.043	0.384	0.111	0.033	0.297
1920	0.223	0.069	0.309	0.199	0.056	0.281
1928	0.361	0.093	0.258	0.321	0.086	0.268
1938	0.581	0.097	0.167	0.559	0.075	0.134

Notes and Sources:

State-level high-school graduation data from various sources; see Goldin (1994, 1998). Weighted data use the number of 17-year olds in the state. The coefficient of variation is the (standard deviation/mean).

Table 2
Explaining Total (Public and Private) Secondary-School Graduation Rates Across States

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Levels			*Differences*			*Means (s.d.)*	
	1910	*1928*	*1928*	*1928-1910*	*1938-1928*	*1938 -1928*	*1910*	*1928*
Log per capita taxable wealth, 1912 or 1922, × 10^{-1}	0.236 (0.0901)	0.852 (0.368)		0.857 (0.260)	1.25 (0.345)		7.471 (0.451)	7.926 (0.386)
% ≥ 65 years, 1910 or 1930	2.13 (0.260)	1.423 (0.788)	1.846 (0.774)	-1.749 (0.737)	-0.527 (0.866)		0.0414 (0.0143)	0.0547 (0.0142)
% of labor force in manufacturing, 1910 or 1930	-0.0673 (0.0335)	-0.144 (0.0972)	0.989 (0.481)	-0.0495 (0.0947)	0.126 (0.0934)	0.203 (0.0723)	0.248 (0.124)	0.255 (0.103)
% Catholic, 1910 or 1926	-0.0913 (0.0305)	-0.377 (0.0867)	-0.274 (0.0849)	-0.265 (0.0900)	0.0595 (0.0841)		0.150 (0.121)	0.151 (0.123)
South	-0.0449 (0.00932)	-0.0935 (0.0272)	-0.131 (0.0294)	-0.0735 (0.0267)	0.0375 (0.0306)			
New England	0.0444 (0.0121)	0.100 (0.0310)		0.0811 (0.0333)				
Middle Atlantic			-0.0635 (0.0338)		0.0620 (0.0188)			
Males in public colleges/17-year olds, 1910				1.09 (0.384)				0.0316 (0.243)
Wage in manufacturing, 1929, × 10^{-1}			0.0241 (0.00974)					1191 (254)
Wage × % in manufacturing, × 10^{-1}			-0.0827 (0.0375)					
Auto registrations per capita, 1930, × 10^{-2}		0.0568 (0.0230)	0.0449 (0.0218)					0.224 (0.648)
Log agricultural income per agricultural worker, 1920						0.0985 (0.0174)		

Change % unemployment, 1930 to 1940, $\times 10^{-1}$						0.0900 (0.0306)
Constant	-0.136 (0.0709)	-0.468 (0.273)	-0.0962 (0.115)	-0.324 (0.199)	-0.814 (0.276)	-0.541 (0.104)
R^2	0.895	0.874	0.864	0.758	0.679	0.708
Root MSE	0.172	0.0451	0.0476	0.0474	0.0400	0.0368
Mean (unweighted) of dependent variable	0.0882	0.291	0.291	0.212	0.204	0.204

Notes: Standard errors are in parentheses; ordinary least squares regressions, unweighted except for the 1928 to 1938 change regressions (cols. 5, 6). Weight for state *i* is $(S_{i,28} \cdot S_{i,38})/(S_{i,28} + S_{i,38})$ where $S_{i,t}$ = share of state *i* 17-year olds in U.S. total in year *t*. Weighting does not affect results in cols. (1) to (4). The 1928 to 1938 regressions are weighted due to two outliers (DE and NV). Number of observations is 48 in all columns; DC is excluded. AZ and NM were territories until 1912 but are included with the 1910 states.

Dependent variable:
Total (public and private) graduation rate by state: Goldin (1998); the number of graduates divided by the number of 17-year olds in the state.

Independent variables:
Variables listed as percent (%) are entered as fractions. Note that in the change equations of columns (4), (5), and (6) the explanatory variables are those at the beginning of the period and reflect starting conditions.

Per capita taxable wealth, 1912 or 1922: Taxable wealth/population, U.S. Department of Commerce (1926), *Statistical Abstract*.
% ≥65 years, 1910 or 1930: U.S. Bureau of the Census (1975), series A 195-209.
% in manufacturing, 1910 or 1930: U.S. Bureau of the Census (1932, 1912).
% Catholic, 1910 or 1926: U.S. Department of Commerce (1930), *Religious Bodies: 1926*, Vol. I, table 29. The 1910 numbers are extrapolated from those for 1906 and 1916. All are expressed per state resident.
South: South includes the census divisions South Atlantic, East South Central, and West South Central.
New England: census division New England.
Middle Atlantic: census division Middle Atlantic.
Males in public colleges/17-year olds, 1910: U.S. Bureau of Education (1910), table 31, p. 850. Military academies receiving public support are excluded. The denominator contains both males and females.
Wage in manufacturing, 1929: Kuznets, et al. (1960), table A 3.5, p. 129.
Auto registrations per capita, 1930: U.S. Department of Commerce (1940), *Statistical Abstract*, table 467.
Agricultural income per agricultural worker, 1920 (mean = $943): Kuznets, et al. (1960), table A 4.3, p.

187. The variable is agricultural service income per agricultural worker.
% unemployment, 1930 (mean = 5.74%), *1940* (mean = 8.83%): U.S. Bureau of Commerce, *Statistical Abstract*, (1932) table 341, (1948) table 203. Unemployment for 1930 refers to April 1930 and is the sum of Class A (non-layoff) and Class B (layoff).

Sources: For complete notes regarding the sources see Goldin and Katz (1997), from which this table derives.

Table 3
Explaining School Attendance of 15, 16 and 17-Year Olds across Cities: 1910, 1920, and 1930

	1910 *(15 to 17-year olds)*		*1920* *(16 to 17-year olds)*		*1930* *(16 to 17-year olds)*	
% production workers, in year	-0.642	(0.0806)	-0.340	(0.0690)	-0.380	(0.110)
% child in mfg., 1910 or 1920[a]	-2.07	(0.262)	-0.493	(0.277)	-0.738	(0.438)
Log city population in year × 10^{-1}	-0.174	(0.0512)	-0.141	(0.0597)	0.0215	(0.0814)
% foreign born in year	-0.189	(0.0582)	0.0359	(0.0763)	0.287	(0.109)
% non-white in year	-0.0126	(0.0707)	0.0718	(0.0772)	-0.556	(0.144)
% Catholic, 1926			-0.147	(0.0419)	-0.188	(0.0511)
Log per capita wealth, 1925 or 1930			0.0498	(0.0150)	0.0649	(0.0220)
Population density in year × 10^{-2}			-0.256	(0.0911)	-0.579	(0.128)
School density, 1923 or 1933			70.6	(31.6)	118.2	(36.9)
Vocational school density, 1933					218.8	(87.7)
% managers in mfg., 1920			0.628	(0.139)		
% textiles & clothing in mfg., 1920			-0.0998	(0.0515)		
% chemicals in mfg., 1920			-0.722	(0.363)		
% white collar in labor force, 1930					0.805	(0.176)
% bldg. trades in labor force, 1930					-0.852	(0.355)
Dummies for census divisions	yes		yes		yes	
Constant	0.897	(0.0599)	0.377	(0.119)	0.305	(0.160)
R^2	0.636		0.667		0.664	
Root MSE	0.0659		0.0677		0.0847	
Mean of dependent variable	0.442		0.407		0.623	
Number of observations	225		261		235	

[a] The 1910 and 1920 estimations use the 1910 values; the 1930 estimation uses the 1920 values.

Notes:

Standard errors are in parentheses. Ordinary least squares estimation used with no weighting (weighting by population does not affect the results). Cities include all with more than 10,000 persons in 1910. The few cities that merged with another or divided into two were kept as one unit, either merged or separated, throughout the sample period.

Dependent variable:

Percentage of 16 (or 15) to 17-year olds who attended any school during some time in the year preceding the census: U.S. Bureau of the Census (1912, 1923, 1932).

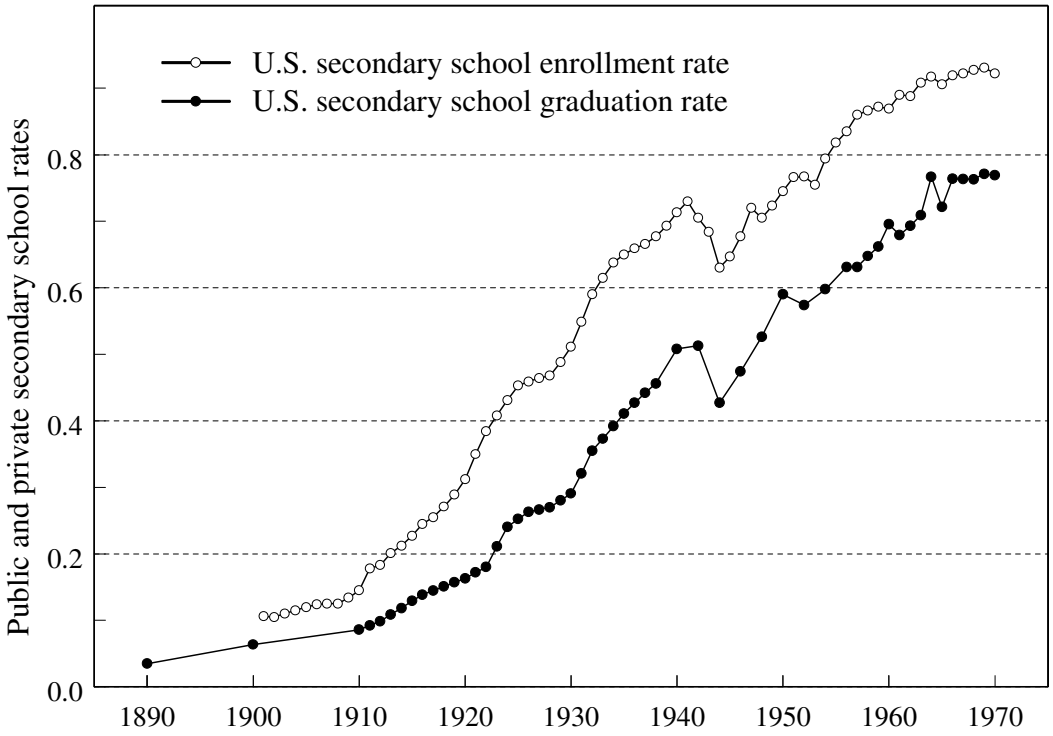
Independent variables: All variables are from the U.S. Bureau of the Census, census of population or manufactures for the relevant years, except where noted. Unless specified as the census of manufactures, the source is the population census in the relevant year. Population censuses are U.S. Bureau of the Census (1912, 1923, 1932); censuses of manufactures are U.S. Bureau of the Census (1913, 1923a, 1933).

% production workers, in year: production workers in manufacturing as a percentage of the city population. Production worker data are from the census of manufactures.
% child in mfg., 1910 or 1920: child workers in manufacturing as a percentage of all production workers in manufacturing in the city. Production worker and child worker data are from the census of manufactures for 1909, and 1919.
Log city pop. in year: log of the city population in either 1910, 1920, or 1930.
% foreign born in year: percentage of city population that is foreign born in 1910, 1920, or 1930.
% non-white in year: percentage of the city population that is non-white in 1910, 1920, or 1930.
% Catholic in year: percentage of the city population (average of 1920 and 1930) who are members of the Roman Catholic church in 1926. U.S. Department of Commerce (1930).
Log wealth, 1925 or 1930: log of the estimated true value of per capita wealth of the city. U.S. Bureau of the Census (1927, 1932a). The 1920 estimation uses the 1925 per capita wealth value and the 1930 value × (mean 1920 value/1930 value = 0.8823) for cities not listing one in 1925.
Population density in year: population in year divided by the area (in acres) of city. Area data are mainly from U.S. Bureau of the Census (1932a).
School density: number of secondary schools in 1923 (or 1933) divided by the area (in acres) of the city in 1925 or 1930. Number of secondary schools = number of high schools + (0.3) · number of junior high schools. U.S. Bureau of Education, *Biennial Surveys* (various years).
Vocational school density: number of vocational high schools in 1933 divided by the area (in acres) of the city in 1930. U.S. Bureau of Education, *Biennial Surveys* (various years).
% managers in manufacturing: percentage of all manufacturing workers who are managers; obtained from Robert Whaples.
% textiles & clothing in mfg.: percentage of all manufacturing workers employed in the textiles and clothing industries; obtained from Robert Whaples.
% chemical in mfg.: percentage of all manufacturing workers employed in the chemicals industry; obtained from Robert Whaples.

% white collar in labor force: professional, clerical, trade, public service workers/all in labor force in city.
% bldg. trades in labor force: workers in the building trades/all in labor force in city.

Sources: For complete references to the sources, see Goldin and Katz (1997). We have not listed all the source references in this paper. The current sample includes southern cities, which were excluded from our previous paper.

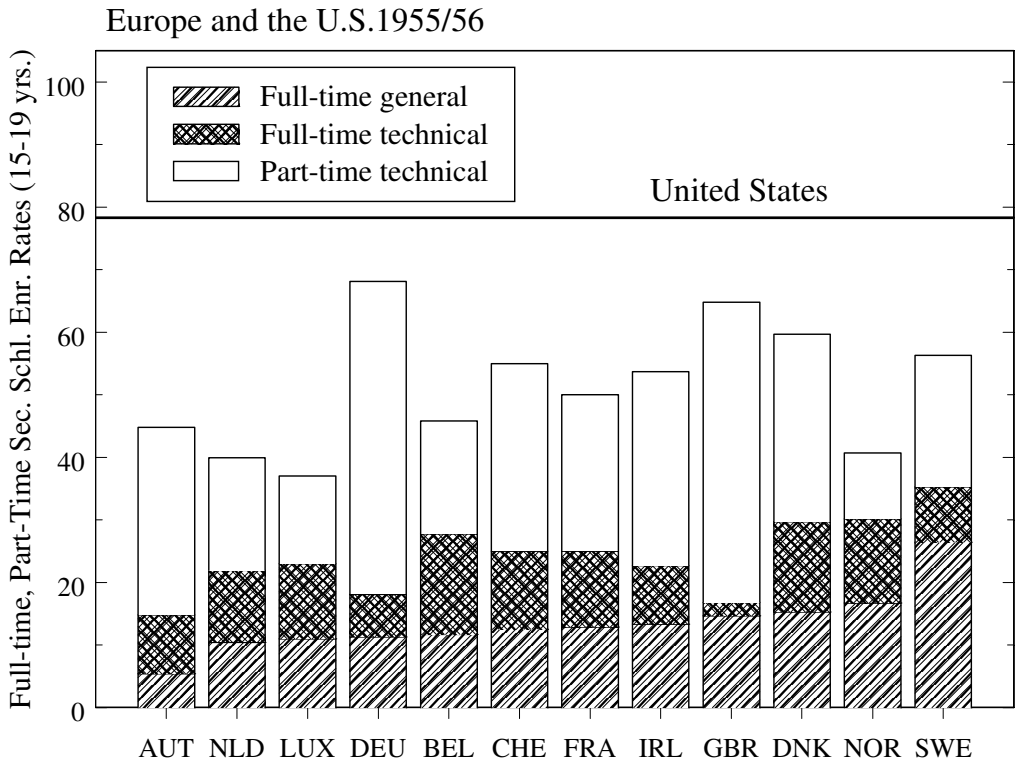
Figure 1: Secondary School Enrollment and Graduation Rates: Entire United States, 1890 to 1970



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. The data include both males and females in public and private schools (excluding preparatory departments in colleges and universities). Year given is end of school year.

Sources: U.S. Department of Education (1993) and Goldin's calculations for graduation rate data from 1910 to 1930.

Figure 2: Secondary School Enrollment Rates for European Nations and the United States, c.1955



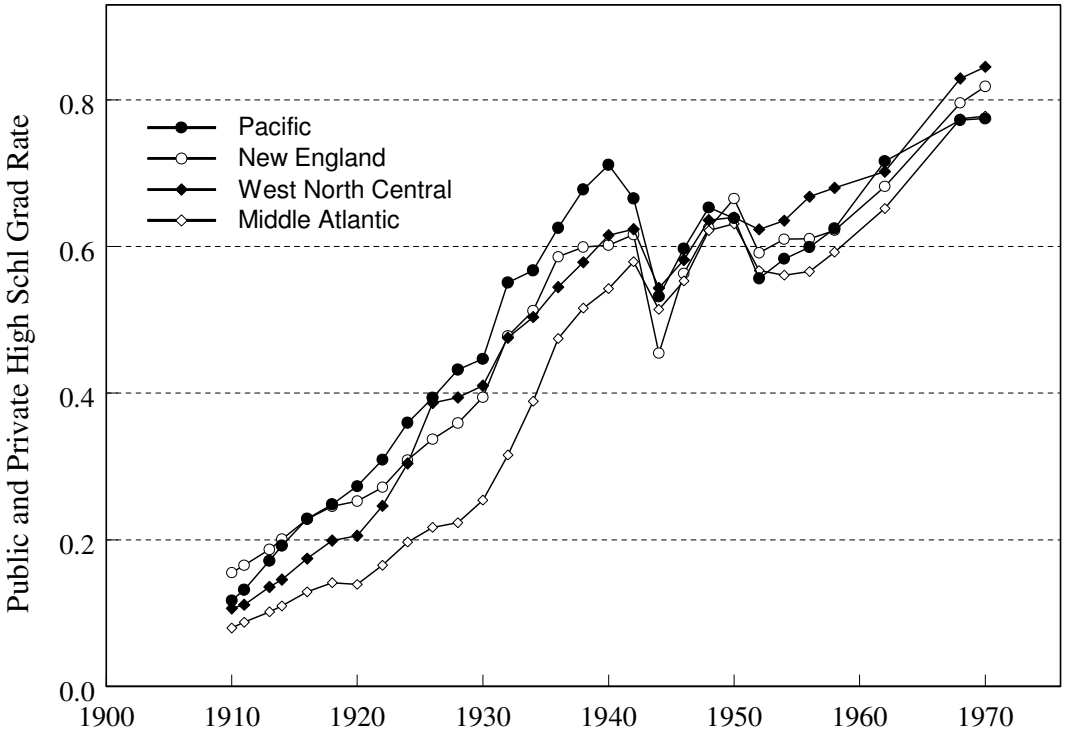
Notes: The data refer to the number of youths in public and private upper and lower secondary schools (of the types listed) ranging from those who turned 15-years old during the school year to those who turned 19-years old during that year. Thus, the age group under consideration is approximately all 15- to 18-year olds, plus one-half of 14- and 19-year olds. No youths in elementary schools or colleges and universities are included even if they were in the included ages. The procedure ensures consistency but implicitly favors countries, such as the Nordic nations, that have late starting ages and penalizes those, such as France and the United States, that have earlier starting ages. The computation for the United States assumes 100 percent enrollment for the 14-year olds and then adds all enrolled in ninth through twelfth grades and divides by the age group given above. All data are for c.1955.

We have included only those countries for which we have data for all three educational types. Abbreviations are: Austria (AUT), Netherlands (NLD), Luxemburg (LUX), Germany (DEU), Belgium (BEL), Switzerland (CHE), France (FRA), Ireland (IRL), Great Britain (GBR), Denmark (DNK), Norway (NOR), and Sweden (SWE). The countries are arrayed in increasing order of their full-time general schooling rate, given by the bottom portion of the histogram bar.

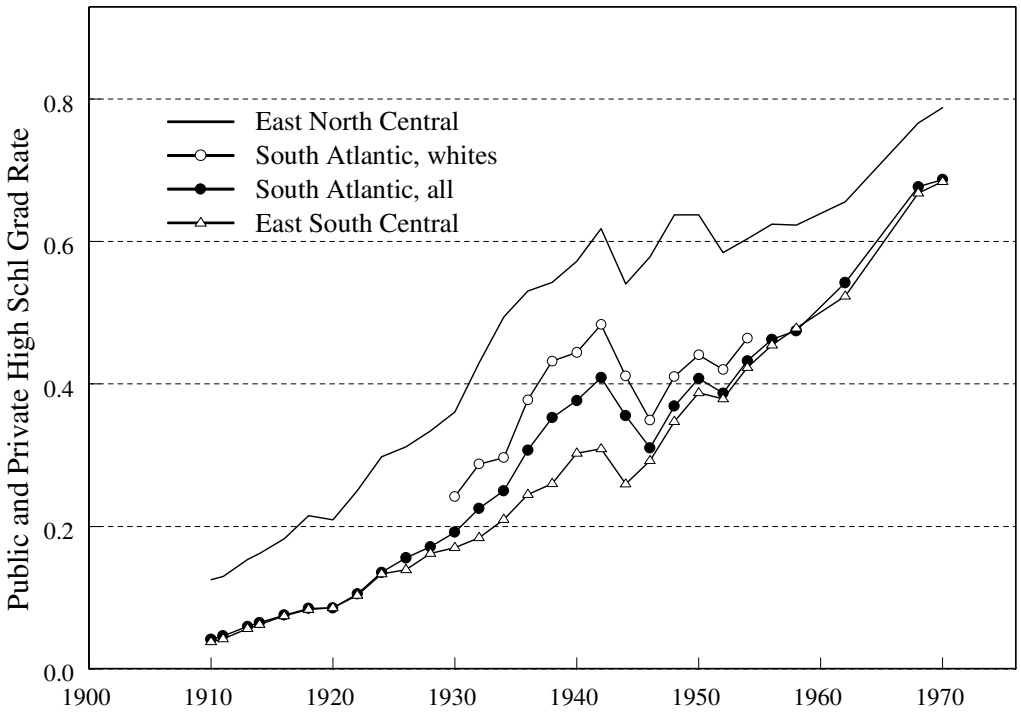
Sources: European nations: Dewhurst, et al. (1961). The Dewhurst et al. data for England and Wales, France, Germany (including the Saar and West Berlin), and Sweden, have been checked against the original administrative records and small errors have been corrected. United States: U.S. Department of Education (1993), tables 1 and 9.

Figure 3: Public and Private High School Graduation Rates, 1910 to 1970

Panel A: Four Regions of the North and West



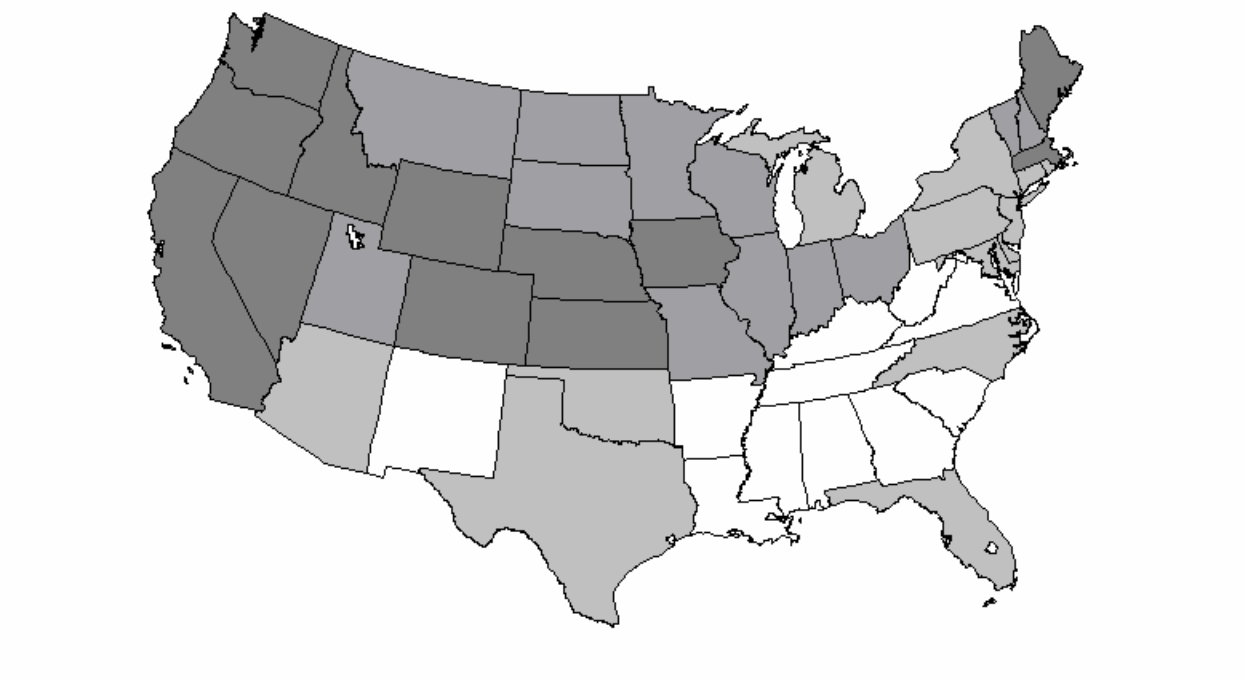
Panel B: Two regions of the South and the East North Central for comparison



Notes: Includes both males and females in public and private schools (including preparatory departments of colleges and universities). Graduates are divided by the approximate number of 17-year olds in the state. Constant growth rate interpolations of population data are made between census years.

Sources: State-level high school graduation data set from various sources; see Goldin (1994, 1998).

Figure 4: Public and Private High School Graduation Rates by State, 1928

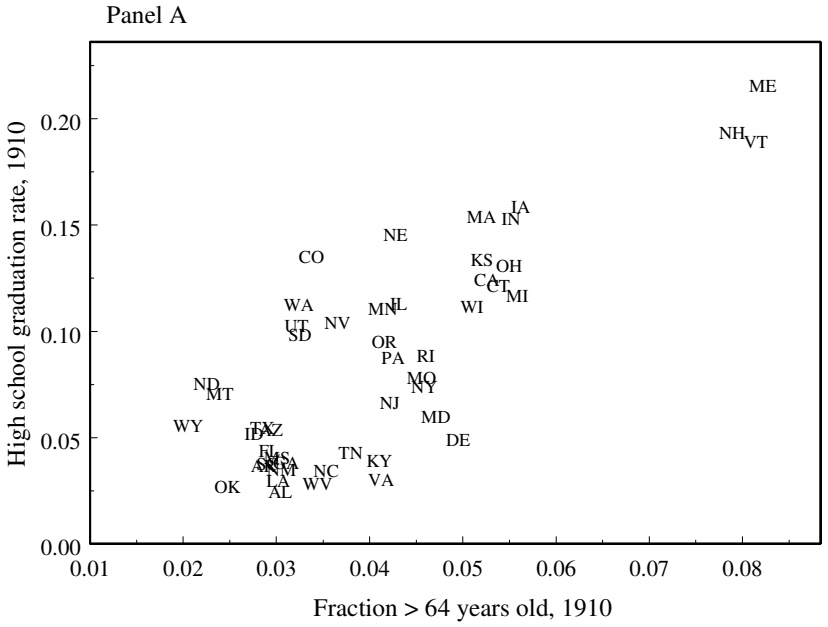


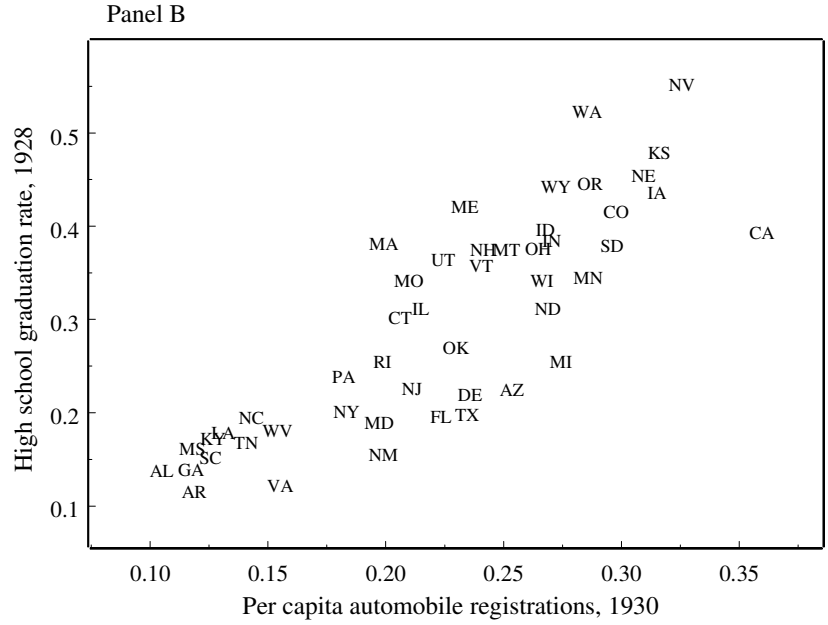
Shading	Graduation Rate Ranges
	11.8 < 18.4%
	18.4 < 31.5%
	31.5 < 38.8%
	38.8 < 55.6%

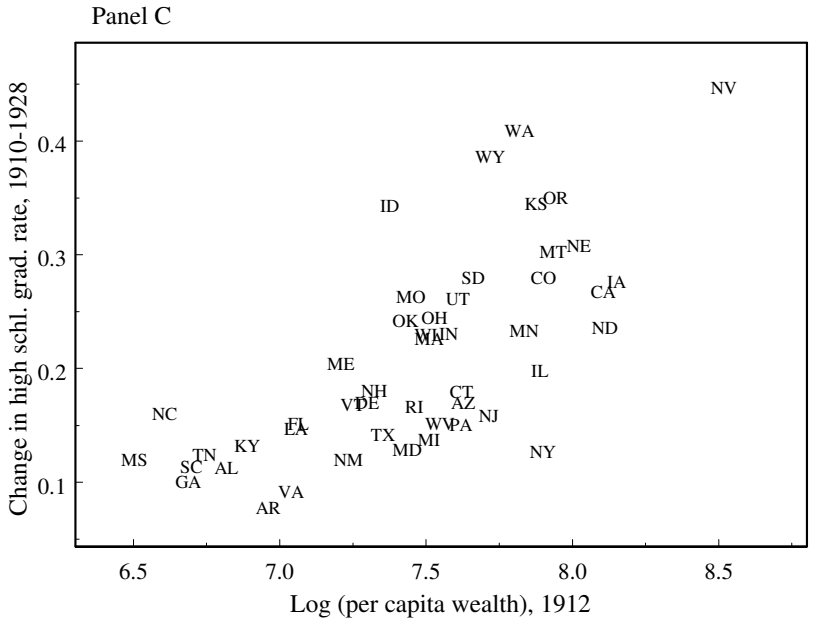
Notes: The public and private graduation rate is the number of graduates from all public and private secondary schools, including preparatory divisions of colleges and universities, divided by the number of 17-year olds in the state. Constant growth rate interpolations of population data were made between census years. Shading divides states into four, approximately equal, groups.

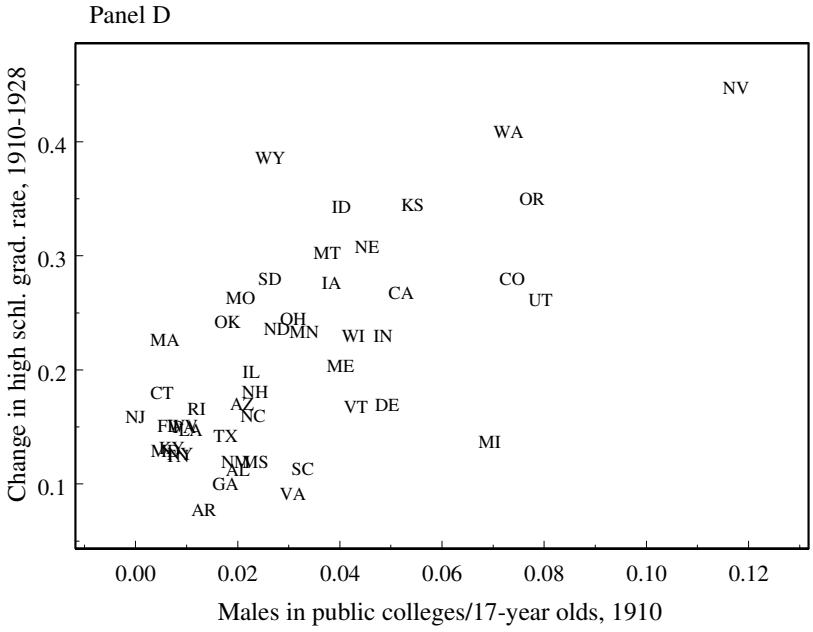
Source: Goldin (1998).

Figure 5: High School Graduation Rates and State Characteristics: 1910 to 1930









Notes and Sources: See Table 2.

Endnotes

[1] The first transformation was the achievement of widespread public primary-education accomplished in the mid-nineteenth century. The third transformation, still in motion, is the rise of higher education that swiftly increased after World War II. By "education" we mean years of formal schooling rather than the content of schooling and training.

[2] Canada underwent a similar, but slower, increase in secondary schools at the same time. See Urquhart and Buckley (1965).

[3] We use enrollment by age rather than by type of school because of the lack of comparability across educational institutions. Secondary schooling began at age 14 in some countries but at age 11 in others.

[4] This point does not necessarily follow from the previous statements on educational flows since the educational stock (meaning average years of school) of Americans was often diluted by the arrival of lower-educated immigrants. But because the level of education of the native-born population was so high, compared with that in Great Britain for example, the dilution effect does not overturn the statement that the educational stock of the American workforce was greater than that in European countries.

[5] These are the numbers for ratio of the state at the ninetieth percentile to that at the tenth percentile. The ratio of the highest to the lowest state was 4.6 for the 1928 graduation rate and about 4 for income per capita in 1929.

[6] Although we have assembled schooling rates by age for a large number of European nations in 1955, we cannot do so for various years in the first half of the twentieth century.

[7] See Engerman, Mariscal, and Sokoloff (2002) on factors, similar to those we identify, that help

explain differences within the Western Hemisphere, such as wealth distribution, income and wealth level, bureaucratic decentralization, rapid growth in income, and the need to attract immigrants.

[8] One might have expected a *lower*, not higher, proportion older in the population in areas that led in secondary school education. Today, in contrast to the past, citizens without children do *not* generally support educational expenses as much as they support those for pensions and healthcare.

[9] Of all native-born, white men 40 to 49 years old in 1940, 27 percent had not completed eighth grade, and of those born outside the South 19 percent had not. Just 7 percent of this latter group had not completed 6 years. Those who were 40 to 49 years old in 1940 would have been about 14 years old from 1905 to 1914. Source: 1940 PUMS 1/100 sample.

[10] World War I did much to solidify these notions. According to the Iowa Commissioner of Education, "Those who have a high school education have risen in rank [during World War I] .. The business world is also more and more demanding young men and women of high school training" (Iowa Department of Public Instruction 1916-1918, p. 45). Most of the reports of educational commissioners in the more progressive states speak to this point, but these documents might be considered suspect since state bureaucracies had interests in propagandizing. The aspirations of ordinary Americans can also be gleaned from the literature of the day. Theodore Dreiser, O.Henry, Sinclair Lewis, Sherwood Anderson, Willa Cather, and John Dos Passos all wrote of the high school educated. In Dreiser, O.Henry, Lewis, Cather, and Anderson a high school education gave their characters the ability to leave rural America. For all these writers high school was associated with respectability and success. It also signified, as

in Sinclair Lewis's feminist novels, potential independence for women.

[11] See Reese (1995) on the early history of secondary schools in the United States.

[12] The social statistics portions of the 1850, 1860, and 1870 U.S. population censuses collected information on public and private schools. These data have often been cited as evidence on the large number of students who attended academies. But the data often include the lower elementary grades as well and are, in consequence, unusable for many parts of the nation particularly the South.

[13] Direct evidence from individual-level data on earnings and education from the Iowa State Census of 1915 yields a return to a year of high school in Iowa of 11 percent for males and 10 percent for females (these returns are higher for young adults). These estimates are from log annual earnings regressions that include, among other variables, a quartic in potential experience, foreign-born status, years in the United States, and race. Note that these estimated returns do not include the potential for additional returns from migrating out of Iowa to areas with higher income for the more educated. See Goldin and Katz (2000).

[14] The 35 to 40 percent figure can be derived in two independent ways. One uses the reports of high school principals concerning what graduating seniors claimed they would do after graduation. In 1910, 35 percent of all public and private high school graduates (not including those in the preparatory divisions of colleges and universities) claimed they would continue to college, whereas 50 percent said they would continue with some form of higher education. Another source for the statistic comes from taking the total number of secondary school graduates in 1910 (156,000 for public and private) and dividing it by the number of entrants to degree-granting institutions of higher learning, which we estimate to have been 60,975. There

were 174,213 students in collegiate programs (excluding graduate and professional students but probably including those in teachers' colleges). We use our estimate that 35 percent were in their first year. See U.S. Bureau of Education, *Biennials* 1928-1930, p. 338.

Ravitch (2000), citing an article by Edward Krug, is critical of estimates regarding the fraction of high school graduates who continued to college, asserting that the numbers are inflated because data on entering undergraduates are too high. Our calculations are consistent with reasonable college figures and are also consistent with Krug's own estimates.

[15] The first junior high school appeared in 1909 in two college towns: Berkeley, CA and Columbus, OH. By 1923, 47 percent of cities (with populations exceeding 10,000 in 1910) outside the South had at least one junior high school and 70 percent did by 1927 (based on U.S. Bureau of Education, *Biennials* various years).

[16] For evidence concerning why the 1940 federal population census contains suspect data overstating the educational attainment of older cohorts, see Goldin (1998). Only two states, prior to 1940, had censuses that inquired of educational attainment (Iowa in 1915 and 1925; South Dakota in 1915). Various U.S. federal population censuses inquired as to the attendance of individuals in school at any time during the preceding year. We use these data in the city-level analysis, but the statewide levels for this variable do not appear reasonable, especially for the South.

[17] The data include those in 2-, 3-, or 4-year public and private high schools, in the final year of junior high, and in the preparatory departments of colleges and universities. They do not generally include students attending common schools beyond eight years, although in some states they may. Students in the preparatory departments of colleges and universities have been

omitted from all other series we know of despite the fact that they accounted for about one-third of all private-school students in the 1910s.

[18] Attendance data cannot be easily obtained for all states and all years in our sample. For the states we have been able to find, the average daily attendance is generally more than 80 percent of enrollment. We have average daily attendance data in our city-level sample. There is no apparent reason for an overstatement of enrollment since the states provided little to localities. Graduation data, however, are generally cleaner in the sense that the concept is less ambiguous than is enrollment. States, then as today, set their own requirements for graduation.

[19] We divide by 17-year olds for the graduation rate, and by 14- to 17-year olds for the enrollment rate.

[20] See U.S. Department of Education (1993, table 19).

[21] It is an odd logistical function, however, because it later rises again. High school graduation rates increased in much of the nation after 1960.

[22] One indication that many high school males left school to take the relatively well-paying unskilled jobs in the wartime economy is that young women did as well.

[23] The coefficient of variation of the state's graduation rate, in contrast, shows convergence across states. But there is good reason to prefer the standard deviation. Because the log of income, according to substantial evidence, is approximately linear in years of schooling, the standard deviation of education in years (alternatively, as here, the standard deviation in high school graduation rates) is a sensible proxy for the standard deviation in (log) permanent income. This measure is, therefore, a reasonable one for the impact of education on income inequality.

[24] North America, not just the United States, was the distinctive part of the world. Canadian

secondary school (public and private) enrollment rates by province are similar to, though far lower than, those in the states just South of the border. In 1941, for example, the contemporaneous secondary school enrollment rate for Ontario was 40.3 percent; that for the Mid-Atlantic was 83.6 percent. The rate for British Columbia was 55.3, whereas for the Pacific states it was 92.0 percent. The Maritimes and Quebec look more like the American South in this comparison. See Urquhart and Buckley (1965).

[25] Rather than using administrative data for the contemporaneous schooling data, we must use U.S. population census data on whether youths, at particular ages, attended school during the year. The administrative data cannot be easily used because youths from outside city boundaries attended school in the city and thus we have no reliable denominator for some of the smaller cities. Although the enrollment data given in the population census provide an inflated measure of the high school enrollment rate for rural youth in this period, they seem more consistent with administrative secondary school enrollment data for urban youth in large cities.

[26] Individual high school enrollment decisions are also likely to depend positively on family wealth endowments both through an income effect on the consumption demand for schooling and the easing of capital market constraints (i.e., increased wealth effectively lowers r). Note that we express the wage premium relative to the second period wage because the absolute difference is less meaningful.

[27] Becker and Murphy (1988) make a similar point. They go one step further and suggest that the intergenerational loan was paid back in the form of social security. We, on the other hand, are conceptualizing the intergenerational loan as being shifted within the community from one group of grandparents to the next.

[28] See Epple and Romano (1996), who analyze the level of support, and Fernandez and Rogerson (1995), who investigate the existence of public education.

[29]Alesina, Baqir, and Easterly (1999) show in a majority-voting model that an increase in the polarization of preferences concerning spending on public goods (formally an increase in the median distance from the median) reduces the amount of public goods provision. They find, using a cross-section of U.S. cities c.1990, a negative relationship between spending on "productive" public goods (schooling, roads, and libraries) and the city's degree of ethnic fragmentation.

[30] The coefficient of variation of city-level mean clerk wages is smaller than that for production workers in a sample of 227 non-southern cities in 1919. Similar patterns are apparent in 1909 and 1914. See Goldin and Katz (1995) for a description of the data, which come from the U.S. census of manufactures.

[31] We have also divided non-Catholics into two other groups: non-hierarchical religions that encourage the reading of the bible by the laity (e.g., Lutherans, New England Protestants) and non-hierarchical ones that did not (e.g., most evangelical religions). Only the percentage Catholic is of statistical and economic significance. Race is another important factor in U.S. educational history. But given the large percentage of blacks living in the South during the 1910 to 1940 period, there is little systematic relationship between percentage non-white and graduation rates once measures of income and wealth and a South dummy are included in the state-level regressions.

[32] In constructing Table 2, we chose variables from these groups to illustrate the role of each.

[33] The estimates in cols. (1) to (4) are unweighted, but these results are not very sensitive to

weighting by state population. Cols. (5) and (6) are weighted by the population of 17-year olds in each state because unweighted estimates of models to explain the change in graduation rates from 1928 to 1938 are greatly influenced by two extreme outliers (DE and NV). Thus we present the more robust, weighted estimates.

[34] Today's elderly can, and do, escape the higher taxation that comes with more and better quality education. In the period we are examining, the elderly generally did not, or could not, move from places with more expensive educational public goods. Grandparents who lived in towns and villages at the turn of this century often boarded their grandchildren who lived on farms to enable them to attend high school. This interpretation is consistent with the findings in Hoxby (1998) concerning the impact of the elderly on expenditures across the twentieth century.

[35] If the (log) per capita wealth were omitted from col. (2), the role of automobiles per capita would greatly increase. A shift from the state at the 25th percentile to that at the 75th percentile would increase the graduation rate by 8 percentage points or by 27 percent of the mean graduation rate in 1928.

[36] The strong positive impact of automobile registrations per capita on graduation rates is robust to the inclusion of controls for population density, percentage urban, and access to improved roads.

[37] Lindert (1994, 1996), in two cross-country studies of the twentieth century, finds that greater equality fosters more social spending (e.g., transfer programs) and that a greater percentage of Catholics lowers it.

[38] The fixed-effects regression for 1910, 1920, and 1930 is:

Dependent variable: *Public and private graduation rate*

Independent variables:	Coefficient	Standard error
Auto registrations per capita × 10	0.0765	(0.0126)
Fraction ≥ 65 years	3.093	(0.980)
Share of labor force in manufacturing	-0.0994	(0.163)
Fraction Catholic	-0.196	(0.0257)

Notes: Includes a full set of state and year dummies. Number of observations = 144; $R^2 = 0.959$.

Sources: See Table 2.

[39] Agricultural income (natural log of) per agricultural worker in 1920 is used here instead of the (log) wealth variable. The results are virtually unchanged if (log) wealth in 1922 is used.

[40] In 1917, for example, although 30 states had a maximum age of compulsory school of 16 years, all but four granted labor permits at or before age 14 and the remaining four granted them at age 15. The education required for a labor permit was nowhere more than 8 years and was exactly 8 years in just five states. In 1928 the maximum age of compulsory schooling had increased to 18 in five states and to 17 in another five states. But labor permits were still issued to those under 16 years of age in all but two states and the education required for a labor permit was no where greater than 8 years. The laws, therefore, do not appear to have effectively constrained youths to remain in high school, let alone mandated graduation from high school. See Keesecker (1929); U.S. Bureau of Education, *Biennials* 1916-1918.

[41] See Lleras-Muney (2002), who uses the 1960 U.S. population census to estimate the impact of the laws on the educational attainment of individuals who were 14-years old at some year from 1915 to 1939.

[42] See, for example, Edwards (1978), Landes and Solmon (1972), Margo and Finegan (1996),

and Schmidt (1996). Margo and Finegan, using the 1900 census, find some impact of compulsory education laws on the schooling of 14-year olds, but only when combined with child-labor legislation.

[43] See, as well, Acemoglu and Angrist (2000) and Goldin and Katz (2003).

[44] An interesting question is why voters in districts that already had high schools cared that other districts in their state did not. There are various possibilities. One is ideological. Another is that town and village high schools were crowded with youth from the "open country" who boarded with relatives to avoid tuition payments. Yet another is that districts that imposed higher taxes to support their schools wanted to prevent their older residents from escaping higher rates by moving across districts. This possibility seems less likely. By 1925 virtually all non-southern states had a form of "free tuition" legislation (Hood 1925).

[45] We use the 1910 and 1920 PUMS to construct estimates of the school attendance rates of 16 and 17-year olds. School attendance is defined here to include only those who attended school and who were *not* also employed for pay or by their families. The restriction eliminates many who went to school for brief periods or who did not attend day schools. We find the following for areas outside the South:

Percentage of 16 and 17 year olds attending school, non-South U.S.

	1910	*1920*
Rural [unincorporated or < 1,000]	37.7%	38.7%
Town [1,000 < 10,000]	40.5	43.9
Small city [10,000 < 25,000]	36.9	35.1
All large cities [> 25,000]	26.1	31.7

Medium cities [25,000 < 100,000]	31.5	35.9
Larger cities [> 100,000]	24.0	30.1

The 1910 sample contains 9,607 observations and that for 1920 has 11,955. A similar pattern is apparent, but modestly attenuated, in a linear probability model of full-time enrollment (enrolled but not employed) with controls for census division and dummy variables for race, sex, foreign-born status, parents' foreign-born status, and father's occupational group. See Goldin and Katz (1999) for a more detailed analysis of this issue.

[46] The main constraints on sample size for the various regressions are: 226 cities have data on schooling for 1910, 229 have wealth data for 1925, and 259 have data on school density in 1933.

[47] The U.S. federal population census in 1910, 1920, and 1930 asked whether an individual had attended school at least one day during the preceding year. Attendance could have been at a night, correspondence, industrial, music, commercial, private, parochial, or regular-day school, among others. Another measure is available for our group of cities. It is similar to our state-level measure and gives average daily attendance in the school district, which was almost always the entire city. The problem with this variable is that families living outside the city, in areas without a high school, often went to the schools in the city (tuition was sometimes paid by the student's school district or parents). To convert the attendance data into a rate, the city's population of 14 to 17-year olds must be used, but the population will, on occasion, omit some who went to the school. Over time, we can observe large changes in the rates of some cities, possibly reflecting the opening of high schools in neighboring communities and thus the reduction in attendance in the city. Empirical findings concerning the correlates of city high school attendance rates and city characteristics are quite similar for both the census enrollment

rate measure and the city average daily attendance rate measure for the sub-sample of cities with reasonable average daily attendance data.

[48] Following Alesina, Baqir and Easterly (1999), we have explored the relationship between city enrollment rates and ethnic fragmentation (measured by 1 minus the Herfindahl index of ethnic group population shares) in 1920 using a decomposition of each city's population into 14 ethnic groups based on race and parents' birthplaces. Ethnic fragmentation is strongly and negatively correlated with enrollment rates for 16 to17-year olds in northern cities in 1920. But it is also highly correlated with the fraction foreign born and Catholic and is insignificant when either is included in the enrollment model.

[49] In a previous draft of this paper (Goldin and Katz 1997), we omitted southern cities for these reasons. The results with and without southern cities are similar overall.

[50] Many southern urban school districts did not report to the federal government in the 1930s and the reasons for their apparent noncompliance were not recorded in the *Biennials*. Of the 36 cities that drop from the sample between 1920 and 1930, 30 must be excluded due to missing information on school density. Of those, 28 are in the South.

[51] We cannot construct the variable at the state level because some states, often those with low schooling rates, included elementary schools as giving high school instruction.

[52] In most southern states, counties controlled tax rates and per student allotments. Thus, the region that provides the exception to the rule concerning the large numbers of fiscally independent districts had far lower schooling rates. But the roles of race, income, and the rural economy figure in as well.

[53] On economic inequality in the twentieth century see Goldin and Katz (2001).

[54] The estimates are robust to weighting and to the inclusion of other measures of initial education such as the graduation rate, public or total. We admit, though, that any of the strong explanatory variables for education (such as automobile registrations per capita) are also equally good predictors of the residual variance in the convergence equation. A representative convergence regression follows. The relationship, although weaker, remains for the longer 1929 to 1959 period.

Dependent variable:

Log(income per capita 1947/income per capita, 1929); weighted mean = 0.660

Independent variables:	Coefficient	Standard error
Log (per capita income, 1929)	-0.357	(0.0710)
Public enrollment rate, 1928	0.317	(0.0819)
Percent urban, 1930	-0.219	(0.126)
Constant	2.96	(0.377)

Notes: Number of observations = 48; $R^2 = 0.912$. Regression is weighted by the state's adult population in 1930.

Sources: *Public enrollment rate, 1928*: Goldin (1994, 1998). *Per capita income 1929, 1947*: U.S. Department of Commerce (1984). *Percent urban, 1930*: U.S. Bureau of the Census (1975).

[55] DeLong, Goldin, and Katz (2003), using data from the 1940 to 1990 U.S. population censuses and the 1999-2000 Current Population Surveys, find that mean educational attainment of U.S. natives (adjusted to age 30) increased by 6.75 years from the birth cohort of 1880 (7.07 years) to the birth cohort of 1970 (13.82 years). This increase of 6.75 years of schooling, for those who were young adults from the beginning of the twentieth century to nearly its end, is made up of

1.4 years of elementary school (grades 1 to 8), 3.13 years of secondary school (grades 9 to 12), and 2.22 years of higher education.

[56] See Goldin (2001) and the discussion in Goldin and Katz (2008, chapter 9).