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Decreasing (and then Increasing) Inequality in America: A Tale of Two Half-Centuries

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Inequality across the twentieth century United States is a tale in two parts. The last half-century is the better known of the two and has been a period of widening inequality. But the first half-century, as we will demonstrate, was a period of *narrowing* inequality. It is the less well understood of the two tales largely because of data deficiencies. The federal population census, which provides much of the evidence on the distribution of material well being, first asked questions on income (and education) in 1940.

We assemble data from a wide variety of sources showing conclusively that there was, during the first half of the century, a substantial decrease in various measures of inequality. The wage structure in manufacturing narrowed, the premium to various white-collar occupations decreased as did that for many craft trades, and the return to years of post-elementary education fell. These declines, moreover, came in two large spurts, both during wartime periods that were subsequently sustained. Not only was there a wage and income compression in the 1940s, about which much has been written, but there was also a narrowing in the late 1910s. Both periods of reductions in the premium to skill and decreases in the pecuniary return to education coincided, as well, with expansions in education, first for secondary schooling and later at the college level.

The more recent portion of the tale is so well known and occupies so much of the current volume that we will simply review a few of the basics to set the stage for our contribution. Economic inequality and the returns to years of education are as high today as they were sixty years ago, at the end of the Great Depression and at the start of World War II. As can be seen in Figure 1, the difference in the log of weekly earnings at the ninetieth percentile and at the tenth plummeted in the 1940s. It bounced back a bit to the 1960s but then soared in the 1980s. By the 1990s inequality, by this measure, was back at its 1939 level. Similarly, the return to a year of college was high in 1939, fell in the 1940s, and rose thereafter with the exception of the 1970s. The return to a year of college is today higher than it was in 1939. Although we have chosen to graph just one measure of the wage structure and another for the return to education, the conclusions are robust to a variety of other measures. Other distributional measures are also as high today as they were sixty years ago. For example the wealth distribution, as measured by the fraction of wealth held by the top 1 percent or 5 percent of the distribution, is about the same today as it

was in the late 1930s (Wolff 1995, 1998). We can say less about the distribution of income because the 1940 census did not inquire of income from self-employment.[1]

As is evident from Figure 1, the wage structure and the returns to education were both high in 1939. But we have not yet introduced any measures for the period before 1940, and there is no reason to believe that 1939 was a normal year in the history of distribution. Thus our challenge is to fill in the empty space in Figure 1 and tell the tale concerning the wage structure, skill premiums, and the returns to education for the first half of the century.

We address what the returns to skill were in the United States prior to 1940 and we piece together a full century of skill premiums, the dispersion of the wage structure, and returns to formal schooling. We begin by demonstrating that 1939 was not an atypical year in terms of the wage structure and that many wage ratios, by skill, in 1939 were similar in magnitude to those in the 1920s. We then turn to an examination of the long-run history of distribution in the United States through the lens of the wage structure, the premium to skill, and the returns to formal education. The wage structure in the early twentieth and late nineteenth centuries was, by our calculations, even wider than it is today and returns to high school and college education, for young men, were higher in 1914 than today. We review many of the historical issues concerning distribution that, not surprisingly, divided the nation in the late nineteenth and early twentieth centuries and conclude with a discussion of the meaning of long-run change in inequality in American history.

Sixty Years of Inequality: 1939 versus 1999

The comparison between 1939 and today is largely made out of necessity and owes little to its potentially interesting chronology. The 1940 census was the first U.S. federal population census to collect information on annual earnings, weeks worked, and education. Thus the 1940 census, and the year

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[1] Reasonably comparable data on the distribution of family money incomes, from the March Current Population Surveys (CPS), are available from 1947 to the present. These data indicate greater inequality of family incomes in the 1990s than in any previous period since 1947 (U.S. Bureau of the Census 1999).

1939, have been the starting points for most long-term discussions of the wage structure, the income distribution by skill, and the returns to education.[2] The 1940 census, however, is a controversial document for its measure of income is noisy, it did not request earnings from self-employment, and its data on highest grade completed have been shown to overstate attainment at various levels.[3]

The first question of relevance here is whether the comparison between 1939 and any later (and more normal) date makes sense. Was 1939 a typical year for the wage structure and the returns to education and skill? After 10 years of record-high unemployment, those at the bottom of the skill distribution might have acceded to extremely low real wages. If so, the wage distribution below the median would have been abnormally and temporarily stretched by 1939. Using this logic, the "great compression" of the 1940s returned the wage structure, by 1949, to its 1929, pre-Depression level. The past two decades would not then be accurately construed as a return to a distant, disturbing, and long-lived period in the history of America's income distribution. Rather, the wage structure of the past two decades would be interpreted, perhaps more frighteningly, as one that has *never* before been experienced in the United States in a time of national prosperity and low unemployment.

Previous work has established a good case for the opposite conclusion. The wage structure in 1939 was not simply a product of the Great Depression, but, rather, had been in place in the mid- to late-1920s (Goldin and Margo 1992). The evidence marshaled to support that contention is a set of wages for occupations that were relatively skilled, such as ordinary white-collar jobs (e.g., clerks) and blue-collar craft positions (e.g., machinists). In each case, the ratio of the hourly, weekly, or monthly wage of the more skilled position to that of a "laborer" in the late 1930s was virtually identical to its level in the late 1920s. The data producing this result came from two separate and consistent series containing no breaks from 1922 to 1952 (one series is for 1923 to 1943).

Considering first the evidence for the white-collar workers, the ratio of the monthly earnings of

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[2] See, for example, Autor, Katz, and Krueger (1998) and Murphy and Welch (1993).

[3] On the issue of the overstatement of high school graduation rates in the 1940 census, see Goldin (1998). The overstatement is larger for older cohorts.

skilled to unskilled workers did rise during the Great Depression, but then declined toward the end of the 1930s. Thus the increase in the ratio during the depths of the Depression was anomalous. The reason for the anomaly is simple. Hours of work per month (or per week) were reduced far more for blue-collar unskilled workers than they were for white-collar skilled employees in the mid-1930s. By the late 1930s, however, hours of work had resumed their more usual relationship for the two skill groups and the ratio returned to its late 1920s level. The ratio of *hourly* wages for the two groups, therefore, rose far less during the mid-1930s than did the ratio of their weekly wages. The hourly ratio, too, returned, by 1939, to its late 1920s level. Similar conclusions result from an examination of the ratio of earnings for skilled to unskilled blue-collar workers from the late 1920s to the late 1930s. In sum, the evidence on the wages or earnings of skilled relative to unskilled workers reveals that the levels in the late 1930s were not anomalous by the standards of the preceding decade of the 1920s.

We should mention at this juncture that even if the wage structure in 1939 returned to its mid- to late-1920s configuration, the *income distribution* must have been radically altered during the Great Depression. The reason is simple. Average economy-wide real wages actually rose during the Great Depression even though real national income declined by one-third from 1929 to 1933. Unemployment was almost 25 percent at its peak in the 1930s and was more than 17 percent even as late as 1939.[4] The decrease in incomes, therefore, was highly uneven.

Even though the entire distribution of income was probably stretched during the Great Depression, the oft-cited income distribution series assembled by Simon Kuznets (1953) reveals a *decrease* in the share at the top. The Kuznets data give the proportion of national income earned by the top 1 percent or top 5 percent of income earners (as calculated from the income tax) from about 1915 to the 1940s. According to Goldsmith's (1967, table 1) extensions of Kuznets's estimates, the share of income received by the top 5 percent of families (consumer units) declined from 30.0 percent in 1929 to

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[4] The unemployment rate was 24.9 percent in 1934 and 17.2 percent in 1939 according to *Historical Statistics* (1975), series D 85. Darby (1976), however, nets out individuals working on federal works projects, and estimates that the net unemployment rate in 1934 was 20.6 percent and in 1939 11.3 percent.

25.8 percent in 1939 to 20.9 percent in 1947.[5] Similar to series on the distribution of wages, earnings, and income, the Kuznets data show a precipitous decline in inequality in the 1940s.

The important point here is that the Kuznets series does *not* rise during the 1930s. Rather, the top portion of the income distribution narrowed during the Great Depression. The Kuznets data, therefore, reveal nothing particularly unusual about the late 1930s in comparison with the 1920s.

All evidence to date, therefore, is in agreement that 1939 is not an oddity or an anomaly with respect to certain measures of inequality, such as the premium to skill and the wage structure. Because there is considerable evidence that both the wage structure and income inequality at the top in 1939 were not unusual in comparison with the late 1920s, we can ask whether the wage structure was even wider earlier in the century and whether the returns to education were yet higher.

Pre-1940 Trends in the Wage Structure

Manual Workers: Existing Literature on Skill Premiums

In the absence of income measures for the pre-1940 period, researchers turned to estimating skill premiums, particularly for the manual trades, to gauge the wage structure and earnings inequality. The literature on the pre-World War II wage structure is extensive and many researchers have produced estimates of the pre-1940 wage premium to skill for manual workers (e.g., Bell 1951; Keat 1960; Lebergott 1947; Ober 1948; Williamson and Lindert 1980; Woytinsky 1953). Most of the literature was written in the immediate post-World War II period, as is apparent from the publication dates, and was largely motivated by the wage compression of the 1940s. Several of the studies (e.g., Keat, Ober, Woytinsky) measure skill premiums by constructing the ratio of the earnings of skilled production

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[5] Goldsmith (1967) and Goldsmith, et al. (1954) revise and extend the Kuznets estimates of the top 1 percent and 5 percent and also produce quintile measures of the distribution of family personal income. Budd (1967, table 1) reports Gini coefficient summary measures of the family income distribution based on Goldsmith's data indicating a decline from 0.49 in1929 to 0.47 in 1935/36 to 0.44 in 1941. Plotnick, Smolensky, et al. (1998) attempt to derive a twentieth century time series of Gini coefficients by extrapolating on the Kuznets income tax data series using information on the relationship between the Gini, the top 5 percent, and the unemployment rate for the more recent period. But they add no new material to the Kuznets measures of distribution, and the time series pattern of their

workers in manufacturing to low-skilled workers, such as "laborers," helpers, janitors, and teamsters. Others (e.g., Bell, Lebergott) examine changes in wages by narrowly defined occupations.[6]

Keat (1960) examined two dates, 1903 and 1956, and found that the wage structure narrowed considerably in the intervening half-century. He concluded that much of the narrowing was the consequence of decreased costs of training and education, in part due to the increase in publicly funded formal education. Ober (1948) used annual information on skilled and unskilled building tradesmen (union wage scales) from 1907 to 1947, and also a more general set of skilled and unskilled occupations for five dates between 1907 and 1947. In both cases, and also in his related work on the printing trades (Woytinsky 1953), Ober uncovered two periods of persistent narrowing, one in the late 1910s and the other from the late 1930s to 1947, the last year of his study. Ober emphasized the roles of inflation, changes in "fairness" norms in setting wages at the lower end, and automation in rendering many unskilled jobs superfluous (see also Jerome, 1934 on mechanization). Lebergott (1947) examined wages by occupation for various industries from 1900 to 1940 and found strong evidence of compression. Lebergott's data not only support the notion that there was compression in the wage structure for manual workers prior to the 1940s, but also that the timing of the change was between 1913 and 1931.[7]

Because the evidence on skill ratios in the manual trades covers a large number of industries and trades, we have graphed several of the existing series in Figure 2, and added one on railroad machinists. Four of the series (the three for the printing trades and one for the building trades) are expressed relative

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estimates of the Gini for 1929 to 1944 is inconsistent with that of the direct measures reported in Budd (1967).

[6] Bell (1951) created a distribution of wages by industry where each wage is an average for an occupation. He did this for different years and measured percentage changes at points in the distribution. Oddly enough, Bell gave only his conclusions and no data. Lebergott (1947) had earlier done about the same thing for two years, 1900 and 1940, and looked at the degree to which there was convergence in wages for specific industries. He chose occupations in each industry that did not change significantly during the 1900 to 1940 period.

[7] Williamson and Lindert (1980, appendix D, series 5) construct a long-run series similar in spirit to Ober's and, in fact, use Ober's series for the critical 1907 to 1920 period. Although the Williamson and Lindert series shows compression in the 1940s, it does not reveal persistent narrowing from the late nineteenth century to the 1940s. The finding, however, is entirely explained by an error that was made in copying Ober's data point for 1920, a year of importance since it was used as the splice point to the National Industrial Conference Board data (see Williamson 1975, table 11). The 1920 Ober data point should have been 166 but was, apparently, mistakenly copied by Williamson as 186. When that error is corrected, the series has virtually identical properties to Ober's original series. The series decreases during World War I and never regains its high pre-war level, although it recovers

to the earnings of lesser-skilled workers in the same industry, whereas the series for machinists is relative to the average annual earnings of manufacturing employees. The series clearly show a downward trend from the pre- to the post-World War I period. This downward trend, we will soon see, is considerably more distinct in the various white-collar worker series.

The important point of this summary is that the literature on the wage structure for the manual trades is in agreement in finding compression in the structure of wages during the 1940s. Virtually all researchers also report a narrowing of the wage structure before 1940, and the timing of the decline appears to be the late 1910s.

Manual Workers: Extensions Regarding the Wage Structure

We have uncovered new and superior evidence supporting the notion that the wage structure for manual workers compressed sometime between 1890 and 1940. The data give the wage structure for production workers in 1890 and c.1940 in various manufacturing industries matched between the two years.[8] Rather than estimating the ratio of wages for craft workers to those for laborers or for a range of occupations in particular industries, as was done in much of the previous literature, we produce summary statistics for the *full distribution* of wages for manual workers in manufacturing.

The data for 1890 come from special tabulations of the 1890 Census of Manufactures. The 1890 schedules included a question on the number of employees by weekly wage brackets, but the data were not published in the volumes containing the national data by industry. Instead, the wage distribution data were published in a volume on urban manufacturing (covering the 165 largest cities in 1890) and in the special industry reports.

The data for c.1940 were derived from studies comprising the "wage and hours" series, which have been executed by the Bureau of Labor Statistics (B.L.S.) ever since the 1890s.[9] The series changed form over the years, shifting in 1907 to union wage scales and then in the 1930s to all workers. At some

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somewhat in the early 1920s. The series again decreases in the 1940s.

[8] We use c.1940 rather than 1940 because we draw on a large number of Bureau of Labor Statistics reports that range in date from 1938 to 1942.

point in the 1930s the surveys began to report the full distribution of weekly or hourly wages by industry. In the years just after passage of the Fair Labor Standards Act (1938), the reports often noted the impact of the minimum wage on the bunching of employment by wages. During and after World War II the surveys occasionally provided information on the impact of war industries, collective bargaining, and extensions of the minimum wage.

In most respects, the comparability between the data for 1890 and c.1940 is fairly good. In both years we have the distribution of wages, given in relatively narrow brackets, for male workers (older than sixteen years in 1890).[10] The one potentially important difference is that data for 1890 refer to weekly wages, whereas those for 1940 are for hourly earnings. Because workers with lower hourly earnings often worked more hours than did those with higher hourly earnings, the bias should make the 1890 distribution *more*, rather than less, compressed in comparison with c.1940.[11] We have located twelve reasonably similar industries with data for both years.[12]

An important complication in using these data is that for most industries in 1890, the wage distributions include both production (e.g., operatives, craft workers) and non-production workers (e.g., officers, managers, clerical workers), whereas in c.1940 the data include only production workers. We cannot add non-production workers to the c.1940 data, but we can try to subtract them from the 1890

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[9] The B.L.S. publication *Employment and Earnings* is the modern version of this series.

[10] Earnings brackets by industry in 1890 almost always had the same width. The earnings brackets for weekly wages generally had a width of $1 below the median wage in an industry, and $2 to $3 above. The median weekly wage in 1890 (by industry, unweighted) was about $10. There appears to have been no set rule for the earnings brackets in the various c.1940 B.L.S. reports. In general, the width of the earnings brackets for hourly wages in 1940 was 2.5 cents below the median, and 5 cents, or more, above. The median hourly wage (by industry, unweighted) was 55 cents. See also Appendix Table 1.

[11] On the relationship between earnings and hours worked for the past and present, see Costa (1999, forthcoming). There are two industries in the c.1940 data that have the distribution of weekly, in addition to the hourly, earnings: soap and shipbuilding. For the soap industry, the distribution of weekly earnings is more compressed than that for hourly wages. The reverse occurs for shipbuilding, particularly below the median. But the weekly earnings distribution for shipbuilding in c.1940 is not as dispersed as it was in 1890.

[12] There are minor differences between the two years in coverage. The 1890 data exclude piece-rate workers whereas those for c.1940 include them. Men are less affected by this exclusion than would be women in 1890. The industries having the highest fraction of male production workers paid by the piece in 1890 are furniture and silk. Product lines across the half-century changed in some industries. "Soap and candles" in 1890 becomes soap in c.1940; silk in 1890 becomes "silk and rayon" in c.1940. The two tobacco industries change their most important products between the two years. In 1890 "cigars and cigarettes" is mainly cigars and thus we compare it with cigars

data. To construct a wage distribution for only production workers in 1890, we assume that each non-production worker was paid more than the highest paid production worker. That is, we subtract *all* non-production workers from the *top* of the wage distribution, an assumption that biases the results toward a narrower distribution of wages in 1890 particularly at the upper end. The extent of the bias will depend on the fraction of non-production workers in the industry, as well as the degree of overlap in the wage distributions of production and non-production workers. The non-production employment shares for 1890 are given in Appendix Table 1 and range from 2.6 percent in cotton goods to 40 percent in cigars.

Our matched-industry data set for 1890 and c.1940 contains unique evidence on the wage structure. We know of no other data set that has full distributions of manufacturing employee wages by industry for a year both before World War I and for 1940. The matched-industry data has additional virtues. It represents a large fraction of all male production workers in manufacturing in either 1890 or 1940. The twelve industries in the sample contained 28 percent of all male (time-rate) manufacturing production workers in 1890 and 25 percent of all manufacturing wage earners in 1940.[13] Furthermore, we are able to link nine of the twelve industries to B.L.S. surveys for 1950 and can, therefore, compare the magnitude of the change from 1890 to 1940 with that from 1940 to 1950.

In almost all cases, see Table 1, the wage structure in our sample was wider in 1890 than in c.1940. This finding is most apparent using the 50/10 measure, but also holds for most of the other summary statistics – 90/50, 90/10, and 75/25. The 75/25 and 90/50 statistics change the least with time, and in several industries these measures are virtually unchanged between the two years. One or two industries actually reveal some widening.[14] But on average, using 1940 employment weights, the

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in c.1940, whereas in c.1940 "chewing, smoking, and snuff" is mainly cigarettes and we compare it with the 1890 category of "chewing, smoking, and snuff" which excludes the less important cigarette category.

[13] For 1890, the source is U.S. Census Office (1895). The hand-trades (e.g., carpentering, plumbing, plastering, blacksmithing) are subtracted from the 1890 total to make it comparable with the later definition of manufacturing. For 1940, see U.S. Bureau of the Census (1942).

[14] The "flouring and grist mill products" industry is the one exception across the board, and possibly for good reason since the industry changed radically after 1890. In 1890, there were almost 18,500 flour-mill establishments in the United States. With the diffusion of reduction milling and the invention of methods to grind hard spring wheat, enormous economies of scale resulted (James 1983). Each of the several thousand flour mills in the earlier era had just a few workers most of whom were highly paid, whereas after the concentration of the industry, the

distribution narrows for all measures considered. In judging these results, it should be recalled that we made various assumptions to exclude white-collar workers from the 1890 sample. These adjustments, by necessity, bias the upper end of the distribution to be more compressed in 1890 than in actuality. Thus it is not surprising that the measures that place more weight on the upper end show the least compression.

The important point made by this review of previous studies and the new evidence on the manufacturing wage structure is that the wage distribution compressed for production workers sometime between 1890 and 1940.[15] Several factors served to increase the relative supply of educated and skilled workers. Of most importance are the reduction of immigration flows beginning in the late 1910s and the increase in secondary schooling starting in the first decade of the twentieth century, a subject to which we will soon return. Another potentially importance reason for the narrowing of earnings differentials, emphasized in the work of Jerome (1934), concerns compositional changes. Factory electrification of the late 1910s and the 1920s and the installation of hoisting and moving equipment eliminated many low-wage positions, such as "common laborers" and others who hauled goods around the factory floor.

How large was the narrowing in the wage structure of production workers from 1890 to 1940? In putting together the story of wage compression in the United States for the full pre-1960s period, it will be useful to consider how the narrowing in the 1890 to 1940 period compares with that of the "great compression" from 1940 to 1950. Not only do we have evidence on the wage distribution in 1890 and c.1940, we also have information for nine of the twelve matched industries for the late 1940s or early

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fraction of less-skilled mill employees increased.

Note that fully 16% of the male workers in the industry were white-collar workers, many of whom were probably owner-operators (see Appendix Table 1). The 90/10 measure in 1890 inclusive of the non-production workers was 2.94 and it exceeds that in c.1940 of 2.69.

[15] The evidence presented in Table 1 concerns changes in the dispersion of wages of male production workers *within* detailed manufacturing industries. A full analysis of changes in the overall dispersion of production workers in manufacturing requires knowledge of changes in the dispersion of mean industry wages for detailed manufacturing industries. In fact, the available evidence suggests no widening of inter-industry wage dispersion in manufacturing over the period studied. For example, Cullen (1956) finds that inter-industry wage dispersion among 84 manufacturing industries narrowed from 1899 to the mid-1930s, widened in the late 1930s, and narrowed again in the 1940s. Cullen's estimates indicate that overall inter-industry wage dispersion, as measured by the interquartile range, was quite similar in the 1899 to 1904 and 1937 to 1939 periods. Accounting for changes in inter-industry wage dispersion is unlikely to have much effect on our conclusions concerning the substantial compression of the wage distribution for manufacturing production workers from 1890 to 1940 and the further

1950s (see Goldin and Margo 1991).

On average, the narrowing in the 90-10 log wage difference from 1890 to c.1940 was more than twice that from c.1940 to the early 1950s. The weighted average for the change in the 90-10 log wage difference is 27.9 log points for the 1890 to c.1940 period, whereas the weighted average for the c.1940 to early 1950s period is 11.6 log points.[16] The 90-10 log wage differences for the nine industries that can be matched across the three samples from 1890 to 1950 are shown in Figure 3, and the thickness of the line in that figure indicates that relative importance of the industry's employment in the 1940 twelve-industry sample. Although there are several anomalous cases, all but one industry (flour) shows a decline from 1890 to 1940 and all but two (tobacco and lumber) decrease from 1940 to 1950.

The conclusions from the existing literature and from this extension are evident. The wage structure in manufacturing for manual employees narrowed in two periods in the first half of the twentieth century. The timing of the second period is clearly the 1940s. That of the first narrowing appears to be the late 1910s judged on the basis of the various skill ratio series for the building trades, the printing trades, and machinists, among others.

Non-Manual Workers: Existing Literature and Extensions

The literature on the non-manual trades is less abundant than that on the manual occupations. Douglas (1930) presents the earliest series on the wages of "ordinary white-collar workers," by which is meant most clerical employees (e.g., clerks, typists, stenographers, secretaries, bookkeepers) and lower-level managers, but not sales workers. In related work, Douglas (1926) used these data to explore the premium to white-collar work and reported a large decrease in the earnings of ordinary white-collar workers relative to manual workers at least since 1900. Douglas's work, unlike that on the wage structure for manual occupations, preceded the wage compression of the 1940s and was motivated, instead, by an

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compression in the 1940s.

[16] The weights are the production-worker shares of the industries in 1940. Of the nine industries, two (lumber; tobacco: cigarettes) experienced no compression in the 1940s and one (flouring) may not have for the 1890 to c.1940 period. For the remaining six that did experience compression in both periods, the weighted mean for the log differences is 36.3 log points for 1890 to c.1940 and 20.6 log points for c.1940 to the early 1950s.

interest in the trend in real wages before and just after World War I.

According to Douglas, persons eligible for these white-collar jobs comprised a "non-competing" group before the expansion of secondary schools. But with the "high school movement" of the early 1900s and the vast increase in proprietary commercial schools, the market became flooded with literate and numerate young people who had skills applicable to the commercial workplace. Thus, the decrease in the wage premium to various white-collar positions in the late 1910s was due to the increase in both formal education and technical training. Douglas also discussed the fact that technical change in the 1900 to 1920 period raised the demand for machinery in the factory, office, and home, and thereby increased the demand for skilled blue-collar workers. This effect, too, served to raise the relative earnings of many in the blue-collar sector.

But various factors complicate Douglas's data and his story of the wage structure. There was, during the years 1900 to 1925, a substantial increase in the proportion female among ordinary white-collar workers. In 1890, women were just 20 percent of all office workers, but in 1930, they were 50 percent of the group.[17] There were, as well, large changes in the composition of office jobs. High-ranking secretaries, the keepers of the officers' "secrets," became less numerous and lower-level clerks, typists, and stenographers proliferated. Hand-bookkeepers gave way to machine-operators armed with "comptometers." The Douglas series does not separate the clerical group by sex nor does it present data on separate office occupations. Thus the series could well overstate the decrease in relative wages due to compositional changes by sex and occupation. Furthermore, the findings Douglas reported could have been transitory. The wage structure among the manual trades in the late 1910s experienced large changes due to the increased relative demand for unskilled workers during World War I and the large wartime inflation. But these effects were generally not maintained through the 1920s. Since Douglas's data do not extend beyond 1926, the question is whether the pre-war premium to ordinary white-collar workers was later reinstated.

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[17] Goldin and Katz (1995), table 1. Clerical workers are defined here as those in three groups: (1) bookkeepers,

In an earlier work, we constructed several ordinary white-collar earnings series and produced earnings data by sex as well as for detailed occupations (Goldin and Katz 1995). We used virtually all the sources Douglas consulted, added quite a few to the list, and extended the data forward in time to 1940. In Table 2 we report the results from that work, and expand the series yet further in time to 1959 using the public-use micro-data samples for 1940, 1950, and 1960 federal population censuses.

Rather than overturning Douglas's conclusions, the additions from our earlier work served to confirm, extend, and only slightly modify them. The earnings of ordinary white-collar employees declined relative to those of production workers in manufacturing and the decreases are evident by sex and by occupation. Even though clerical occupations became feminized and even though the clerical occupational distribution changed, the earnings of each of these groups separately declined relative to those of production workers, by sex, in manufacturing.

Although we are in agreement with Douglas on the broad outlines of the pre-1930 period, some of the details change with our extensions. The decline in the earnings of ordinary white-collar workers relative to manual workers in the Douglas series occurs just after 1900 and the ratio may even have increased from 1890 to 1900. In our series – for males and females separately – the decline in the relative earnings of ordinary clerical workers occurs in the late 1910s and early 1920s. The resulting lower level then persists to 1939, after which it declines once again. The results are robust to distinctions by sex and by separate occupations, even for tasks that did not experience much change due to technical advances during the period.

The conclusions from our extensions to 1959 serve to place the earlier results in a longer-term perspective. The decrease in the premium to ordinary white-collar work that occurred in the early part of the twentieth century (1895 to 1939) was of a somewhat greater magnitude than that which occurred later (1939 to 1959). Taken together both periods resulted in a decrease in the premium to ordinary white-collar workers of about 42 log points for female clerical workers and 53 log points for male clerical

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cashiers, and accountants; (2) clerks, except those in stores, and (3) stenographers, typists, and secretaries.

workers.[18] The decrease in the premium from 1939 to 1959 was 19 log points for females and 15 log points for males.

There are only a few other white-collar occupations for which data can be compiled from the early 1900s to the immediate post-1940s period. They include college professors and engineers.[19]

The data on college professors were originally compiled by Boothe (1932) and later extended by Stigler (1956). We have made further extensions, revisions, and robustness checks to the Boothe-Stigler series using the original data collected by the U.S. Office of Education.[20] The findings, given in Table 3, part A, reinforce those in Table 2 concerning ordinary white-collar workers. Relative to production employees in manufacturing, the earnings of college professors were reduced in the late 1910s to early 1920s and the reduction persisted throughout the 1920s and even into the 1930s (see also Figure 4)**.**[21] The premium to professors then declined again in the 1940s. These findings hold for all ranks of professors.

Full professors around 1910 earned 3.75 times what the average manufacturing employee did. In the 1920s, however, full professors earned less than 3 times that of the manufacturing employee, and in the 1950s they earned slightly in excess of 2 times. Across the half-century from 1910 to 1960, full professors saw their relative earnings cut almost in half.[22]

The series on engineers is the least complete of the group and contains a break in the 1920s. The Bureau of Labor Statistics, in conjunction with several professional societies, surveyed engineers in 1935

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[18] The two series are spliced using the overlap at 1939, assuming that the ratio of the two measures in that year applies proportionality for subsequent years in the table. The estimate for females uses the log of the average wage ratio from 1890 to 1914; that for males uses the log of the average wage ratio from 1895 to 1914.

[19] Earning data also exist for ministers of various Protestant denominations and for public school teachers. The series for ministers also decreases, relative to production workers, before 1940, but the factors causing that decrease are probably be different from those for other white-collar groups since the demand for religious training decreased. The series for teachers is subject to various forces, such as the increased demand for high school instructors in the era of the high school movement.

[20] The Boothe-Stigler data are for land-grant institutions and refer to the 9 to 10 month salaries. See also the notes to Table 3.

[21] Note that in Figure 4 the earnings of professors relative to wage and salary earners in manufacturing rises considerably in the depths of the Great Depression but then resumes its former level. As in the earlier discussion, this feature is related to changes in hours of work and is a characteristic of other relative wage series by skill.

[22] The ratio of the earnings of full to assistant professors was virtually constant from 1910 to 1960. We divide the professor earnings by those for all (wage earnings) manufacturing workers. The production worker series, used in the clerical work comparison, does not exist for all years. Note that the manufacturing worker series includes

on their earnings beginning with 1929. The B.L.S. also conducted a survey in 1946. Prior to 1929, however, the data are retrospective and come from a survey of an engineering society. Several series, therefore, can be produced and are given in Table 3, part B. Although there is a break in the series between 1924 and 1929 and the data from 1904 to 1924 are retrospective, the results are similar to those for the other white-collar series. There is a decrease in the premium from 1904 to the 1920s and then, possibly, another decrease in the 1940s. The relative decline in engineering salaries is less apparent in the data for "starting engineers (cols. 1 and 2) than it is for the "all engineers" series (col. 5).

Summary on Trends in the Wage Structure: 1890 to 1960

There appears to be convincing evidence that the wage structure compressed in several stages from the late nineteenth century to the mid-twentieth century. Among manual or blue-collar workers, the evidence on the entire wage structure suggests that there was compression sometime between 1890 and 1940. Skill ratios in the manual trades pinpoint the period of narrowing around the late 1910s. Another compression of the wage structure occurred during the 1940s. Of the two, the first appears to have been twice as large in terms of the 90-10 log wage differential, although the second narrowing took place in a considerably briefer time frame.

There were, as well, two periods of compression for the three white-collar series presented. One occurred just before the 1920s and the other was situated, once again, in the 1940s. Figure 4 summarizes the various findings for the white-collar occupations relative to production workers in the manufacturing sector (or all wage and salary earners in manufacturing). With the exception of the increase in the relative earnings of professors during the height of the Great Depression, all series decrease in two giant steps and are level in between. The two periods of compression, moreover, are both during wartime and blue-collar union activity. Even though some of the relative gains by the lower-skilled eroded, particularly after World War I, most remained in place. The two compressions, therefore, had persistent effects.

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clerical workers in the manufacturing sector.

Returns to Formal Schooling: 1914 to 1995

The return to years of schooling is another aspect of inequality differences by skill and has generally, though not always, tracked changes in the wage structure. The return to years of college decreased in the 1940s, rose in the 1950s and 1960s, fell in the 1970s, and has, since then, increased substantially (Figure 1).[23] Because the 1940 federal population census was the first to ask highest grade attained and also the first to inquire of wage and salary income, there have been few estimates of education returns for the period prior to 1940 and none for a large representative sample.

The "High School" Movement: 1910 to 1940

In the period from 1910 to 1940, known in the educational history literature as the era of the "high school movement," secondary schools sprouted clear across the nation and youths began to go to high school to learn skills "for life" rather than "for college." Secondary schools in the 1910s and 1920s greatly increased the number of terminal degrees they granted and their graduates immediately took up a host of office and factory jobs. At the start of the high school movement about half of all high school graduates continued with some form of post-secondary school education. But as graduation rates climbed, the fraction of graduates who continued to higher education dropped in half (Goldin 1998). The "masses" entered and graduated from high schools in the early decades of the twentieth century as never before, and "mass" secondary school education was unique to the United States at that time. Most European countries did not have mass non-vocational, non-industrial secondary school education that was fully publicly funded until the post-World War II era (Goldin and Katz 1997).

Certain regions of the country led in this "movement." In 1910, the New England states attained the highest secondary school enrollment and graduation rates in the nation. But subsequently, the "movement" took root in the Pacific states and in those of the West North Central. In those regions, school building and staffing campaigns enabled enrollment and graduation rates to soar, and these rates

[23] The decrease in the 1970s is one instance in which the returns to college education do not track changes in the

remained the highest in the nation until the 1950s when the enrollment and graduation rates of all states, even those in the South, began to converge. The increase in the educational stock caused by this rapid increase in the flow of youths into secondary schools was the most important single factor enhancing educational attainment in the United States in the first three-quarters of the twentieth century (Goldin 1998). The public and private high school graduation and enrollment rates for the nation as a whole and the West North Central states, a region on which we will focus here, are given in Figure 5. The era of the "high school movement" is evident in the figure, especially for the West North Central.

The rapid increase in secondary school enrollment and graduation in the 1910 to 1940 period raises two questions. First, what was the impact of the large increase in the stock of educated Americans and, second, why did the "movement" begin around 1900 to 1910? That is, what was the return to high school (and college) around 1910 and how did this return change over the course of the twentieth century as cohorts of educated Americans entered the labor force?

Educational Returns in Iowa, 1914 to 1959

We have already addressed the question of the return to education to some degree if the premium to ordinary white-collar work is a proxy for the return to secondary school. As Douglas noted, clerical and other office workers, prior to advances in secondary school, formed a "non-competing group." Prior to 1900 the youth who graduated high school most likely came from a family with sufficient means, geographic proximity to a public high school, and foresight. The increase in high school enrollments and graduation served to flood the market with literate and numerate workers whose skills enabled them to move into white-collar office jobs. It also increased the supply of those capable of filling blue-collar positions that required the reading of manuals, deciphering of blue-prints, computing of formulae, and use of elementary science (Goldin and Katz 1998).

Even though the federal census did not ask highest grade completed until 1940, states also took censuses, generally at the mid-point between the federal decennial censuses. Just two states (Iowa and

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wage structure generally.

South Dakota) asked a question on educational attainment in their state censuses prior to 1940, and Iowa also asked income from occupation. It is probably not surprising that two states in the West North Central region, a region that led in the high school movement, would also have pioneered in surveying their citizens regarding educational attainment.

There are many fortunate aspects regarding the Iowa State Census of 1915. It was taken just on the cusp of the high school movement, and it requested information on income in 1914, just before the large increase in industrial demand due to the Great War. Also fortunate is that the manuscripts from the census survived – on more than 2 million separate index cards – and that they were microfilmed (in 1986) by the Genealogical Society of Salt Lake City. The census requested detailed information from Iowa's residents concerning educational attainment, current schooling, income, wealth, occupation, unemployment, and church affiliation, to mention a few of the questions. No federal population census – not even the Current Population Survey – has asked the range of questions requested by the 1915 Iowa State Census. That regarding educational attainment, moreover, is exceptionally detailed. Individuals were asked to give their educational attainment, in years, by type of school: common, grammar, high school, and college.

We have collected a cluster sample of almost 60,000 individuals, about equally divided between Iowa's "large" cities (Davenport, Des Moines, and Dubuque) and ten "rural" counties, where "rural" indicates that the counties did not have a city of more than 25,000 people (see Goldin and Katz 1999, Appendix). Iowa in 1915 was dotted with tiny towns and villages, and was at the time as "urban" as was the entire United States, if those in incorporated towns and cities constitute the "urban" population. The "rural" sample, therefore, contains both farm and town people. The data set is large and representative and is an approximately 1 in 40 sample of Iowa's 1915 population.

We have, in related work, used the Iowa data to estimate the return to years of formal education using a standard ("Mincerian") log annual earnings function augmented to allow the returns to vary for

different types of schooling (see Goldin and Katz 1999, 1999a).[24] Because the 1915 Iowa State Census offers considerable detail regarding education we were able to explicitly separate years of formal schooling by type of school. We found that for males 18 to 65 years old, the return to a year of high school was about 10 percent; for the younger group, 18 to 34 years old, the return was about 12 percent. Returns to college years were also high and were similarly higher for the younger group, 15 percent as opposed to 10 percent. The return to a year of high school or college was about the same in the non-farm occupations as in all occupations. One of the most revealing of the results in our study was that the return to a year of post-elementary schooling was substantial for those engaged in farming occupations.

To make further sense of the value of education in Iowa in 1914 we explored the change in the return to a year of high school and college in 1939, 1949, and 1959 using the IPUMS for 1940, 1950, and 1960.[25] For comparability across the years we restricted the 1940, 1950, and 1960 samples to full year, non-farm, male workers residing in Iowa.[26]

An important complication in making comparisons across the four years is that the 1940 census inquired about wage and salary income, not income from self-employment, whereas the 1915 Iowa State Census asked about income from one's occupation, which included that from self-employment.[27] The 1950 federal population census, on the other hand, asked for both wage and salary income and that from self-employment, given separately. We were able, therefore, to compare the returns to a year of schooling for wage and salary earners in 1940 and 1950 (also 1960), and then make an adjustment for those with self-employment income in 1940.

After making these adjustments, we found that the return to a year of post-elementary education

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[24] By "returns to education" we do not mean the internal rate of return, but, rather, the coefficient on years of education in a (log) earnings regression. That is, the usual assumptions of Mincer's (1974) framework apply – that there are no direct costs of education to the individual and that all persons are in the labor force for the same number of years independent of educational attainment.

[25] The census years are 1940, 1950, and 1960, but the income is for the previous year. In the discussion, we will often use the decennial year for convenience, similarly for the 1915 Iowa State Census.

[26] The 1915 data were restricted to non-farm male workers.

[27] Income from farming was the most important source of self-employment income in the 1915 Iowa data. In comparing the farm income data from the Iowa State census with that on gross agricultural income from the agricultural census, we have concluded that the 1915 Iowa data are, by and large, net income measures.

was higher in 1915 than in 1940, particularly for the younger (18 to 34 year old) group. The decrease in educational returns from 1940 to 1950 is well known and is a feature of our results for Iowa residents as well. The decrease in returns to years of secondary education, moreover, are not due to greater selectivity into the higher grades on the basis of ability in 1915 compared with in 1940 or 1950. The existing literature on sorting by "ability" into secondary and higher education suggests just the opposite (see Bishop 1989, Taubman and Wales 1972))

Educational Returns over the Long Run in the United States

The data for Iowa on educational returns are valuable because Iowa was a leading state in the high school movement. But national data are, obviously, of greater interest. By combining national estimates of returns to schooling from 1939 to 1995 with our case study of Iowa for 1914, we obtained reasonably comparable estimates of returns to a year of high school or college from 1914 to 1995 for the entire nation. We did so by creating two 1914 variants of the national estimates that differ slightly for the high school calculation and not at all for the college calculation. One of the variants (I) uses the change in the Iowa estimates from 1914 to 1939 to construct the national estimate for 1914; the other variant (II) uses the change from 1914 to 1959. The results of these calculations are given in Table 4 and those for young men are graphed in Figure 6.

The justification for our assumption that the change in educational wage differentials in Iowa from 1914 to 1939 is a reasonable proxy for that nationally is as follows. Estimated changes in returns to years of high school and college for Iowa in later periods, such as 1940 to 1960, move closely with national trends. In addition, occupational wage differentials for Iowa from 1914 to 1939 show a pattern of declining white-collar wage differentials similar to, albeit slightly muted than, national estimates such as those depicted in Figure 4.[28] The higher educational attainment in Iowa than in the nation in 1914 suggests that the estimated decline in educational wage differentials in Iowa from 1914 to 1939 may, if

[28] The estimates to which we refer use the 1915 Iowa State Census sample and the 1940 IPUMS.

anything, understate the national decline in the educational wage premium.[29]

Returns to a year of high school or college plummeted in the 1940s, as we knew already. But they also fell, or in the case of the returns to college for all men were fairly constant, from 1914 to 1939. The full twentieth century story of the returns to a year of schooling is that they were rather high at the start of the century. With increased educational access, markedly reduced returns were apparent by the 1950s when, despite enhanced access to college, returns increased, although not to the levels achieved before or more recently. As in the findings on the wage structure, the return to schooling around the turn of the twentieth century was as high, or higher, than it is today. The return to a year of secondary schooling was higher than today and that to college was higher or about the same. We can now fill in the blank portion of Figure 1, and we do so in Figure 6. The substantial returns to skill in 1940 were not anomalous; in fact, they were lower, not higher, than those twenty-five years before.

Why Inequality Mattered in the Past and Why It Matters Today

Most agree that regard for the poor, and for those who remain at the bottom of the distribution, accounts for our preoccupation with inequality today. But what were America's concerns a century ago when, as we have shown, various measures indicate inequality was as great as it is today, and, of course, the proportion poor war far higher?

Even the most exaggerated allegations today on the impact of rising inequality do not approach the claims made at the close of the nineteenth century. Few today allege that rising inequality endangers democracy or that a war between the rich and poor is imminent. These were, however, just some of the assertions made a century or more ago by a wide variety of individuals.

Important commentary on the distribution on income and wealth began with the economic downturns of the 1870s and 1880s. Edward Bellamy's overnight best-seller *Looking Backward* (1888) was an indictment of inequality and presented a vision of a futuristic egalitarian society with benign and

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[29] In Goldin and Katz (1999a) we demonstrate that average years of education among Iowa's adult residents in

efficient socialism. Bellamy's gruesome portrait of the lower classes physically oppressed by capitalists was given real meaning by the events of the following decade. The Homestead (1892) and Pullman (1894) strikes, and the Haymarket (1886) riot that preceded them, were not simply tragic instances of labor unrest and expressions of labor's demands for shorter hours and higher wages. They were important cases in which the military intervened to protect capital. Mounting divisions between labor and capital were codified in *Pollock v. Farmers Loan* (1895), invalidating the income tax law of 1894. Speaking for the majority, Associate Justice Stephen Field, asserted that the income tax would be the beginning of "a war of the poor against the rich." The decade of the 1890s was one of growing fear of anarchists, later of syndicalists. These were moments of real concern regarding the creation of "classes" in America and the growing distance between them. America was beginning to look more like Europe, not just in terms of the distribution of income and wealth, but also in terms of the potential for political upheaval.

The era was also one of third party movements, often a sign of upheaval and discontent. Although neither the Populists nor the Progressives had proposals directly concerned with inequality, their platforms were both motivated by growing differences in economic and political power among economic classes. Progressives were concerned with government corruption, the trusts, and unfair labor practices, and they championed maximum hours laws, worker safety, and the minimum wage.

The timing of social and political concern with inequality – the turn of the twentieth century – coincides with the period we have identified as a likely high point for the wage structure and the returns to post-elementary schooling. But we have less evidence regarding income and wealth for this early period. Concern with the social consequences of inequality was most often directed at class divisions and the accumulation of great wealth by the few, rather than the distribution of labor earnings. We do know, for example, that among the top 200 federal income tax payers in 1925 a disproportionate number either made their fortunes around the 1890s or had a father (or husband) who did.

1914 was approximately equal to that for the nation in 1940.

Paul Douglas recognized that the increased demand for educated workers with the rise of big business gave those fortunate enough to have received post-elementary schooling a large competitive edge and that such individuals formed a "non-competing group." Even though such individuals would not be in the very top of the income distribution, they formed an upper middle class to which the ordinary American could aspire. An ameliorative policy, in the form of the "high school movement," was embraced by thousands of individual school districts in one of the grandest grass-roots movements in U.S. history. Perhaps it was mass secondary school education that checked the more extreme forms of socialism later embraced by Europe.

Some Speculation Concerning Why the Wage Structure Changed

We have focused in this paper on documenting aspects of the wage structure and the returns to skill in the United States across the twentieth century, but we cannot resist the temptation to speculate on the causes of change. Much research has suggested that long-run change in the distribution of earnings is shaped by a race between the demand for skill, driven largely by industrial shifts and technological advances, and the supply of skill, altered by changes in educational investments, demographics, and immigration.[30]

Despite enormous increases in the relative supply of educated workers, the relative earnings of the more-educated today are similar to that which prevailed in the early twentieth century. The share of the work force with at least a high school degree increased five-fold between 1890 and 1940 (Goldin and Katz 1995, table 8) and almost three-fold since 1940 (Autor, Katz, and Krueger 1998, table 1). Even more rapid changes have altered the relative supply of college graduates since the 1940s. Given the facts on relative earnings by skill in the face of the large increase in relative skill supply, there must have been a rapid secular growth in the relative demand for more-skilled workers.

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[30] The roles of shifts in the demand and supply of skills in wage structure changes from 1890 to 1940, and from 1940 to the 1996, are examined by Goldin and Katz (1995) and Autor, Katz, and Krueger (1998), respectively. See also Juhn (1999), Katz and Murphy (1992), and Murphy and Welch (1992, 1993) for supply-demand analyses of

Throughout the twentieth century the industrial and occupational distribution of employment shifted in favor of more-educated workers (Autor, Katz, and Krueger 1998; Goldin and Katz 1995; Murphy and Welch 1993). But measured between-industry demand shifts can explain at most two-fifths of overall growth in the relative demand for more-skilled workers. Substantial within-industry demand shifts must also have been a major factor. Skill-biased technological change, therefore, has played an important role in the growing demand for highly educated labor across the twentieth century.

Cross-industry patterns of skill upgrading reinforce the notion that skill-biased technological changes, such as the adoption of electric motors in the early twentieth century and computerization in recent decades, have been important. For example, Goldin and Katz (1998) find a strong positive association between changes in the use of purchased electricity and shifts in employment towards more-educated labor (non-production workers) from 1909 to 1929. Similarly for the more recent period, Berman, Bound and Griliches (1994) and Autor, Katz, and Krueger (1998) find a substantial positive association between skill upgrading and computer investments, employee computer use, and research and development intensity. Increased capital intensity at the industry and plant levels is also associated with greater utilization of more skilled workers throughout the twentieth century. Thus technological change and capital deepening have both served to increase the demand for more skilled-labor over the long run

The ameliorative role of the supply of skill is illustrated by various episodes of rapid acceleration in the numbers of more educated workers, first with the high school movement in the 1910s to 1920s and later with the labor market entry of the baby boom cohorts in the 1970s. In both periods there were substantial reductions in educational and skill wage differentials. A more difficult issue is the extent to which expansions in the relative supply of educated labor have had long-run effects by altering the skill bias of technological change (Acemoglu 1998) and by changing the work organization to utilize the more-educated.

An obvious and striking feature of the wage structure changes summarized in Figures 2, 3, 4, and

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U.S. wage structure changes from the 1940s to the 1980s.

6 is the timing. The two largest and most persistent periods of wage structure narrowing (the late 1910s and the 1940s) were also ones of world war, inflation, tight labor markets, strong demand for manual workers, rising union strength, and substantial government intervention in the labor market.[31] Both episodes strongly suggest the importance of labor market institutions and the role of wars in the erosion of customary wage differentials. But many war-time and inflation-related effects on the labor market turn out to be short lived. These, however, appear not to have been. The narrower wage structure possibly engendered by World War I stayed in place throughout the 1920s despite the rapid erosion of union power directly following the war. In contrast, the wages of British white-collar workers relative to those in manual trades, remained at their high pre-World War I until at least the late-1930s (Brown 1977).

A comparison of the American and British experiences can help sort out the roles of market forces from institutional ones. The expansion of secondary schooling in the United States began early in the twentieth century, but did not appear in Britain until the late 1940s, with the passage of the Education Act of 1944 guaranteeing a publicly financed high school education for all. The timing and speed of the "first compression" in the United States may have been related to the special circumstances of World War I, but market forces driven by the rapid expansion of high school graduates in the United States appear to have kept the narrower structure in place. In Britain, however, it was only after World War II that the narrowing of the wage structure remained in place only after World War II, although the new Labour government may also have been an important factor independent of educational advances.

Inequality over the Long-Run: Summary of the Evidence from Wages and Returns to Education

In this paper we have extended the data on the wage structure and the returns to education back to the early part of the twentieth century and for some series to the late nineteenth century. We use large, representative samples, including one from a newly retrieved set of manuscripts of a state census in 1915 and others from less obscure documents that have somehow eluded investigators. We find, in all of the

[31] See Goldin and Margo (1992) for a detailed study of the roles of both institutional and supply and demand

data we have unearthed, that the wage structure and the returns to education and skill all moved in the direction of greater equality considerably before the better known "Great Compression" of the 1940s. The wage structure narrowed, skill differentials were reduced, and the return to education decreased sometime between 1890 and 1940, most likely in the late 1910s. The entire compression of the wage structure across the twentieth century, therefore, was larger in magnitude, more drawn out in time, and more complicated in its reasons than has previously been recognized. Similarly, the widening of the wage structure and the increase in the returns to education in the post-1970s period, when we have considerably better data, have been shown to be abundantly complex. Thus inequality in the twentieth century is a complicated tale in two parts – first declining and then rising.

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factors in the narrowing of the U.S. wage structure in the 1940s.

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"Earnings and Hours in the Rayon and Silk Industry, 1940," (August 1941).
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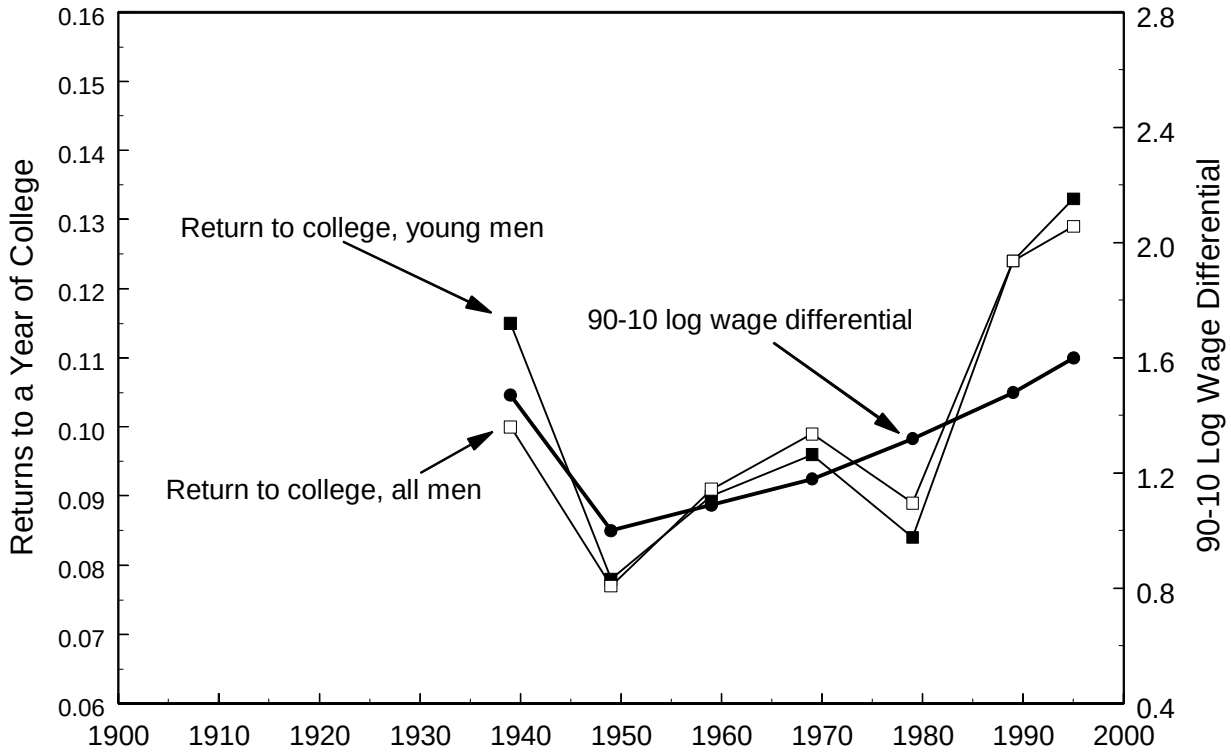
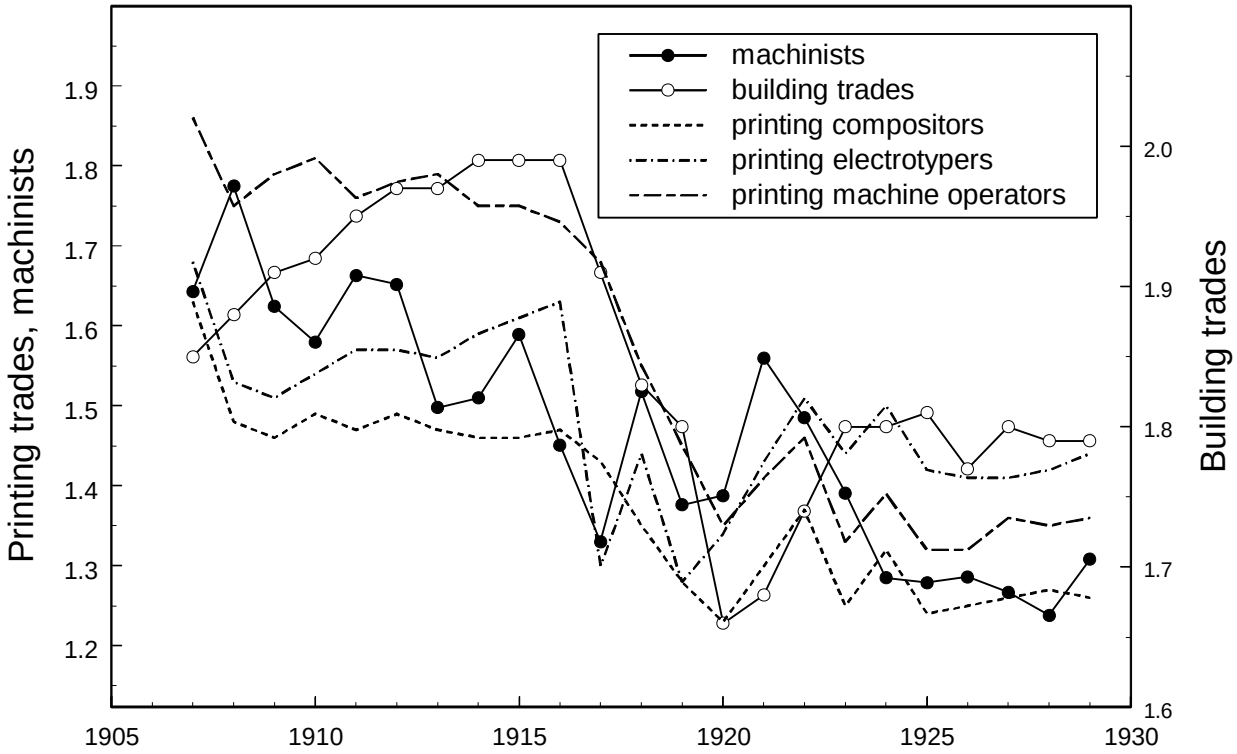
Figure 1: The Wage Structure and Returns to Education, 1939 to 1995



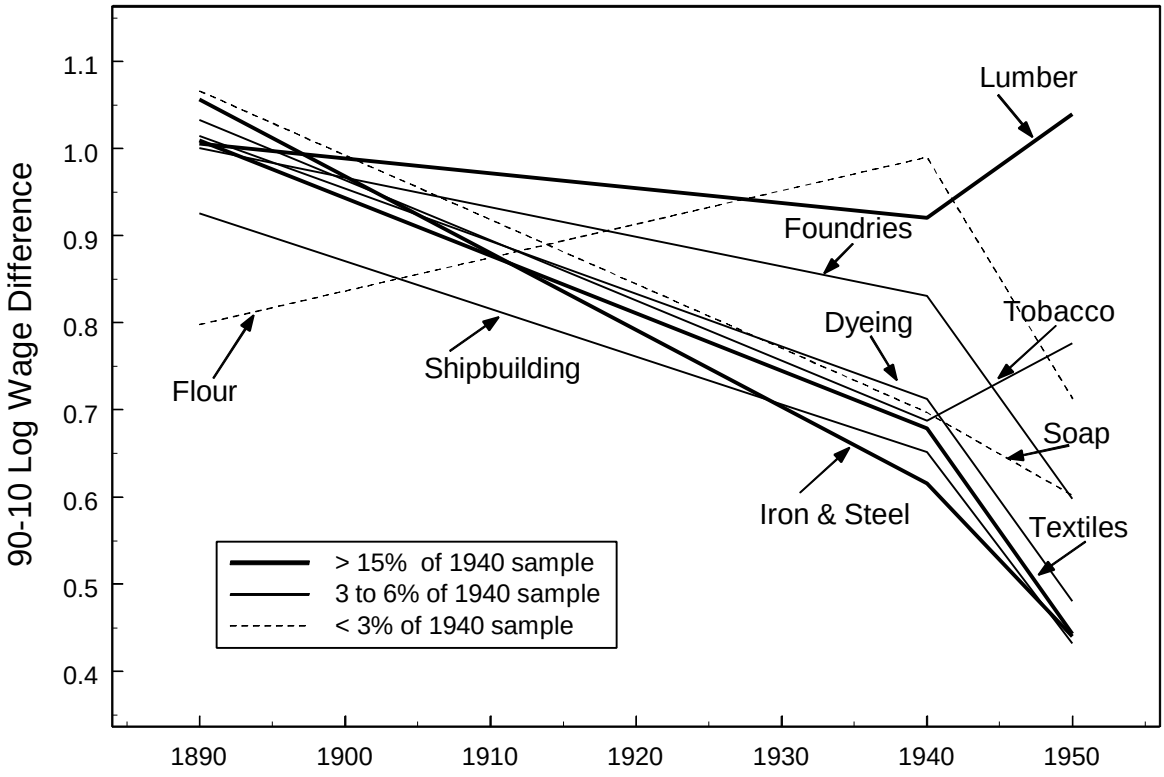
Source and Notes:
90-10 log wage differential: 1940 to 1990 IPUMS, and 1990 and 1996 March CPS from Katz and Autor (1999, forthcoming, table 8 and figure 4), uses weekly wages for full time, full year, non-agricultural male wage and salary workers, 19 to 65 years old. Full time, full year workers are those working 35 hours or more per week and working at least 40 weeks in the previous calendar year.
Return to college: 1940 to 1990 IPUMS, and 1990 and 1996 March CPS. "Young" means 0 to19 years of potential work experience. "All" means 0 to 39 years of potential work experience. The estimates are derived from (composition-adjusted) mean log weekly wages of full time, full year, non-agricultural (white) males with exactly 12 years of schooling and exactly 16 years of schooling in four experience groups (0-9, 10-19, 20-29 and 30-39 years of potential experience). The composition adjustments account for changes in the distribution of years of experience and the regional distribution of employment within each of the 8 education-experience groups. The returns to a year of college for each experience group equals the difference in (composition-adjusted) mean log wages for those with exactly 16 and exactly 12 years of schooling divided by 4. The estimates of returns to college for "young" and "all" men are weighted averages of the returns for the relevant experience groups using a fixed set of weights (the 1980 share of total hours worked for each experience group). See Katz and Autor (1999, forthcoming) for details.

Figure 2: Skill Ratios in the Manual Trades, 1907 to 1929



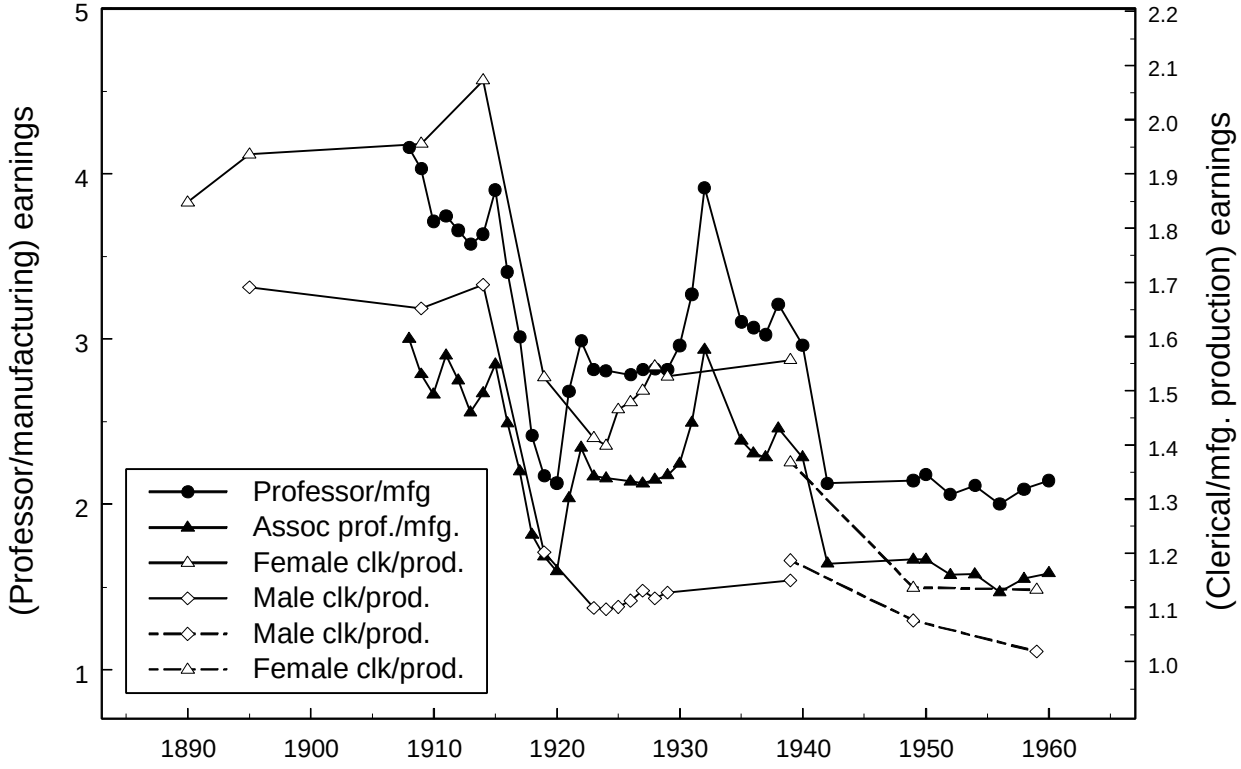
Sources and Notes:
Building trades: Ober (1948), table 3, union wage scales of journeymen relative to those of laborers and helpers in the building trades.
Printing trades: compositors, electrotypers, machine operators. Data are from Harry Ober's chapter in Woytinsky (1953), table 117, and are ratios of the union wage rates of various skilled workers to those of press assistants and feeders in the book and job printing trades. The entire series is for 1907 to 1946.
Machinists: Full time annual earnings of machinists in railroad shops divided by annual earnings per full time employee in manufacturing. 1907 to 1922 data are for machinists working in railroad shops and are from U.S. Department of Labor (1934), table I-26. We use data for all cities listed, ranging from 4 to 12, without weighting. Full time annual earnings are computed as (hourly wage H weekly hours H 52). 1923 to 1940 data are also for machinists working in railroad shops and are from the Interstate Commerce Commission reports. See data and citations in Goldin and Margo (1991; see also 1992). Annual earnings per full time employee in manufacturing are from *Historical Statistics* (1975), series D 740. Manufacturing workers include both production and non-production employees.

Figure 3: 90-10 Log Wage Difference for Nine Industries



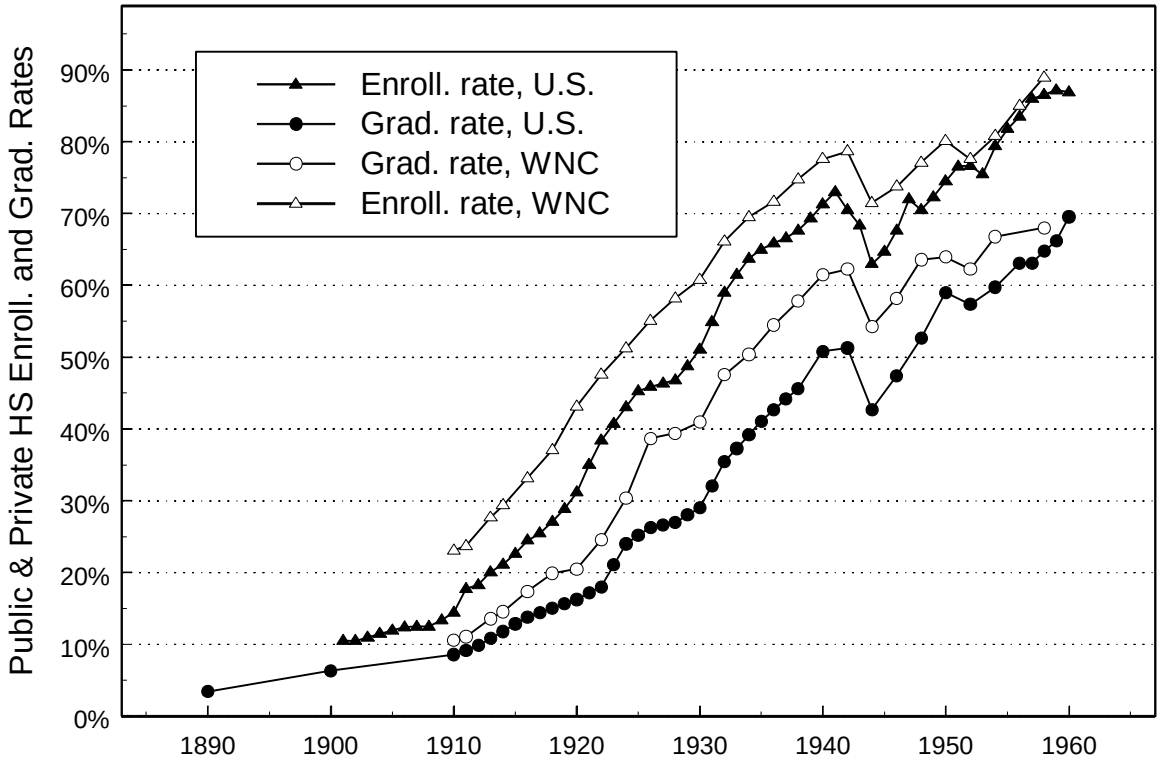
Sources and Notes: For 1890 and 1940, see Table 1. The 90-10 ratios have been transformed into log wage differences for the graph. For the 1950 sources and data, see Goldin and Margo (1991). Tobacco is "chewing, smoking, and snuff" in 1890 and includes cigarettes in 1940 and 1950. The thickness of the line indicates the relative importance of the industry by employment in the 1940 twelve-industry sample.

Figure 4: Ratios of White-Collar to Blue-Collar Earnings



Sources and Notes: See Tables 2 and 3.

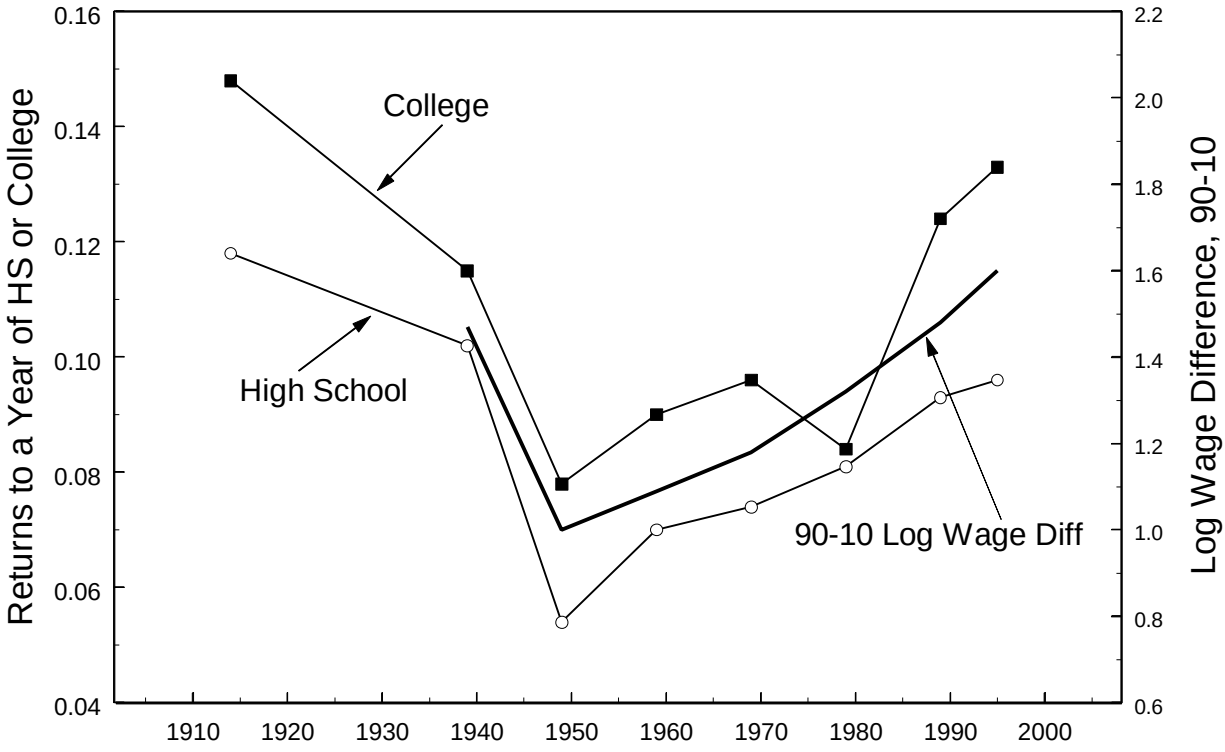
Figure 5: High School Enrollment and Graduation Rates, United States and West North Central



Source: U.S. Department of Education (1993); Goldin (1998).

Notes: The public and private graduation rate is the number of individuals graduating from public and private secondary schools, and the preparatory departments of colleges and universities, divided by the number of 17-year olds. The public and private enrollment rate is the number of individuals enrolled in public and private secondary schools (grades nine through twelve), and the preparatory departments of colleges and universities, divided by the number of youths between 14 and 17 years old. The West North Central census division includes the states of Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, and South Dakota.

Figure 6: Returns to a Year of Schooling for Men 18 to 34 Years Old



Sources and Notes: Table 4; the average of variant I and variant II is used for 1914. See also Goldin and Katz (1999,1999a).

Table 1
Wage Structure Changes for Male Production Workers in Manufacturing, 1890 and 1940:
50/10, 90/50, and 90/10 Wage Ratios

Industry	*1890 50/10*	*c.1940 50/10*	*1890 90/50*	*c.1940 90/50*	*1890 90/10*	*c.1940 90/10*	*1890 75/25*	*c.1940 75/25*
cotton goods	1.64	1.33	1.67	1.48	2.75	1.97	1.63	1.46
dyeing & finishing textiles	1.71	1.47	1.61	1.39	2.76	2.04	1.59	1.51
flouring & grist (grain, 1940) mill products	1.47	1.69	1.51	1.60	2.22	2.69	1.43	1.90
foundry & machine shop products	1.72	1.51	1.58	1.52	2.72	2.30	1.93	1.55
furniture, factory product	1.75	1.43	1.63	1.68	2.85	2.40	1.70	1.67
iron and steel	1.41	1.25	2.04	1.48	2.88	1.85	1.72	1.40
lumber & planing mill products (no logging)	1.80	1.30	1.52	1.93	2.73	2.51	1.91	1.97
shipbuilding (private shipyards, c.1940)	1.72	1.45	1.47	1.32	2.52	1.92	1.74	1.46
silk & silk goods (& rayon, c.1940)	2.06	1.38	1.61	1.62	3.32	2.23	1.80	1.62
soap (& candles, 1890)	1.97	1.51	1.48	1.33	2.90	2.01	1.55	1.35
tobacco: chewing, smoking, & snuff (& cigarettes, 1940)	1.55	1.37	1.81	1.46	2.81	1.99	1.79	1.54
tobacco: cigars (& cigarettes, 1890)	2.01	1.49	1.54	1.66	3.11	2.48	1.70	1.68
Weighted average (using 1940 employment weights)	1.66	1.35	1.71	1.60	2.81	2.15	1.74	1.60

Sources and Notes: See Appendix Table 1. The Spring 1937 figures are used for "cotton goods." The "gray and malleable iron foundries" are used for c.1940. The 1941 figure is used for "furniture. An average of the two 1890 figures (with and without white-collar workers) is used for "tobacco: cigars." Cigarettes were unimportant in 1890 and were included with cigars for that year. By 1940, "cigarettes" had a majority of tobacco industry employment.

Table 2
Ratios of Clerical Worker Earnings to those of Production Workers in Manufacturing:
by Sex and Occupation, 1890 to 1959

	Ratio of earnings of clerical group to those of production workers in manufacturing							
	All clericals		*Clerks*		*Typists and stenographers*		*Bookkeepers and cashiers*	
Year	*Females*	*Males*	*Females*	*Males*	*Females*	*Males*	*Female*	*Male*
1890	1.848	–	–	–	–	–	–	–
1895	1.936	1.691	1.798	1.388	2.099	1.638	2.001	2.278
1909	1.956	1.652	–	–	–	–	–	–
1914	2.073	1.696	–	–	–	–	–	–
1919	1.525	1.202	–	–	–	–	–	–
1923	1.413	1.099	–	–	–	–	–	–
1924	1.399	1.097	–	–	–	–	–	–
1925	1.466	1.101	–	–	–	–	–	–
1926	1.480	1.113	1.177	1.084	1.641	1.319	2.205	1.604
1927	1.501	1.131	–	–	–	–	–	–
1928	1.546	1.117	–	–	–	–	–	–
1929	1.527	1.128	–	–	–	–	–	–
1939	1.557	1.150	1.499	1.088	1.652	1.100	1.613	1.268
	All clericals				*Typists, stenographers, and secretaries*		*Bookkeepers, cashiers, and accountants*	
1939	1.369	1.187			1.430	1.288	1.309	1.341
1949	1.137	1.076			1.166	1.333	1.131	1.236
1959	1.133	1.019			1.171	1.168	1.097	1.188

Sources: 1890 to 1939: Goldin and Katz (1995), tables 5 and 6.
1939 to 1959: Integrated Public Use Micro-data Samples (IPUMS) of the U.S. federal population censuses.

Notes: "All clericals" excludes supervisors. "Clerks" includes all clerks, except chief and senior clerks, file clerks, and mail clerks for 1895 and 1926. "Typists and stenographers" in 1895 includes secretaries, but excludes male secretaries with very high earnings. "Bookkeepers and cashiers" includes chief and senior clerks, accountants, and assistant bookkeepers for 1895 and 1926, and includes tellers in 1939. Occupational categories for the 1939 to 1959 series use the census definitions in each of the years given. "All clericals" excludes "clerks working in stores" in 1939. The production worker wages for the 1939 to 1959 series use only those working in the manufacturing sector. The wage ratios for 1939 to 1959 are for annual earnings of full time, full year workers (those working 35 or more hours per week and 50 or more weeks in the previous calendar year). Weekly wage ratios for all full time workers produce similar estimates in all cases for 1939 to 1959.

Table 3
Ratios of the Earnings of Professionals (College Professors and Engineers)
to Wage and Salary Earners in Manufacturing or to Low-skilled Workers, 1900 to 1960

Part A: College Professors						
	Annual earnings (professors/ average worker in manufacturing)			*Annual earnings (professors/ average low-skilled worker)*		
Year	*Full professor*	*Associate professor*	*Assistant professor*	*Full professor*	*Assistant professor*	*Highest full professor salary*
1908	4.159	3.004	2.648	4.460	2.840	5.765
1909	4.032	2.788	2.386	4.658	2.756	5.939
1910	3.713	2.668	2.209	4.539	2.700	–
1911	3.747	2.902	2.362	4.675	2.948	–
1912	3.659	2.751	2.309	4.616	2.913	5.961
1913	3.575	2.559	2.193	4.544	2.788	–
1914	3.635	2.675	2.251	4.694	2.907	6.460
1915	3.903	2.849	2.396	4.845	2.975	6.659
1916	3.406	2.491	2.156	3.713	2.350	5.035
1917	3.014	2.202	1.866	3.098	1.919	3.972
1918	2.418	1.818	1.548	2.468	1.580	3.364
1919	2.175	1.688	1.366	2.360	1.482	3.319
1920	2.129	1.597	1.320	2.511	1.557	3.310
1921	2.686	2.039	1.734	3.566	2.302	4.868
1922	2.989	2.344	1.936	3.778	2.447	5.408
1923	2.817	2.173	1.816	3.548	2.287	4.994
1924	2.809	2.161	1.786	3.578	2.274	5.060
1925	–	–	–	–	–	5.256
1926	2.786	2.141	1.782	3.543	2.266	5.017
1927	2.816	2.128	1.781	3.594	2.273	4.914
1928	2.821	2.150	1.786	3.622	2.293	5.102
1929	2.818	2.177	1.744	3.564	2.206	5.349
1930	2.962	2.248	1.865	4.025	2.534	6.094
1931	3.272	2.497	2.056	4.672	2.935	7.055
1932	3.917	2.938	2.435	6.222	3.867	8.559
1935	3.104	2.387	2.014	4.121	2.674	–
1936	3.070	2.310	1.932	3.951	2.486	–
1937	3.028	2.285	1.858	3.718	2.281	–
1938	3.212	2.461	2.000	4.028	2.508	–
1940	2.964	2.285	1.819	3.551	2.179	–
1942	2.127	1.643	1.307	2.569	1.580	–
1949	2.145	1.667	1.363	–	–	–
1950	2.183	1.670	1.361	–	–	–
1952	2.061	1.577	1.283	–	–	–
1954	2.115	1.579	1.281	–	–	–
1956	2.003	1.472	1.197	–	–	–
1958	2.093	1.551	1.258	–	–	–
1960	2.145	1.585	1.277	–	–	–

Part B: Engineers					
	Annual earnings (engineers/manufacturing workers)				
Year	*(1) Starting engineers*	*(2) Starting engineers*	*(3) First year engineers*	*(4) Second year engineers*	*(5) All engineers, median monthly H 12*
1900	–	–	1.643	–	–
1901	–	–	–	2.104	–
1904	1.338	–	–	–	–
1905	–	–	1.604	–	–
1906	–	–	–	2.080	–
1909	1.202	–	–	–	–
1910	–	–	1.382	–	–
1911	–	–	–	1.899	–
1914	1.149	–	–	–	–
1915	–	–	1.513	–	–
1916	–	–	–	1.598	–
1919	1.005	–	–	–	–
1920	–	–	1.175	–	–
1921	–	–	–	1.486	–
1922	1.029	–	–	–	–
1923	1.026	–	1.283	–	–
1924	1.034	–	1.261	1.472	–
1929	–	1.037	–	–	2.248
1932	–	1.037	–	–	2.452
1934	–	1.024	–	–	2.186
1939	–	1.008	–	–	2.439
1943	–	0.997	–	–	1.706
1946	–	0.985	–	–	1.950
1947	1.048	–	–	–	–
1948	0.987	–	–	–	–
1949	1.012	–	–	–	–
1950	0.945	–	–	–	–
1951	0.898	–	–	–	–
1952	0.955	–	–	–	–
1953	0.962	–	–	–	1.534
1954	1.004	–	–	–	–
1955	0.994	–	–	–	–
1956	1.030	–	–	–	–

Sources and Notes:
The year given is the end of the academic year.
Professors
Full, Associate, Assistant: All are 9 to 10 month salaries and are the average of the medians for land-grant institutions. 1908 to 1934: 26 land-grant institutions from Stigler (1950, table 28), which relies on Boothe (1932) but makes various revisions; 1935 to 1942: 51 land-grant institutions, from Stigler (1950, table 28); 1949 to 1960: American Association of University Professors (various years), 6 or 7 land-grant institutions, 5 in 1960. The maximum salary figures for full professors ("highest full professor salary") are from Boothe (1932, table IV) for 1914 to 1932, and from U.S. Bureau of Education (various years) for 1908 to 1912. The maximum figures are also given because Boothe constructed the median figures for 1914 to 1921 by extrapolating from the relationship between the maximum and the median for the period after 1922. All of the Boothe data are derived from those in the U.S. Bureau of Education publications.
Manufacturing employees
Historical Statistics (1975), series D 740, due to S. Lebergott, average annual earnings per full time employee (wage and salary earners).
Low-skilled workers
1908 to 1920, *Historical Statistics* (1975), series D 778, due to Coombs; 1921 to 1948, *Historical Statistics* (1975), series D 841, due to N.I.C.B., agrees with Coombs data for 1914 and 1920.
Engineeers
1900 to 1924: cols. (1), (3), (4), starting, 1 year, and 2 year salaries (where years refer to engineering job experience) from Blank and Stigler (1957, table A-4).
1947 to 1956: col. (1) starting salaries, Blank and Stigler (1957, table A-14) monthly times 12.
1929 to 1946: col. (2), Blank and Stigler (1957, table A-8), gives an index of starting salaries (less than 1 year of engineering job experience). We have spliced this series to that in col. (1) such that the 1929 ratio is approximately equal to that in 1924.
1929 to 1946: col. (5), Blank and Stigler (1957, table A-1), median monthly salaries for all engineers; the 1943 figure excludes overtime.
1953: col. (5), Blank and Stigler (1957, table A-2).

Table 4
Returns to Education for Full Year, Non-farm, Male Workers in the United States:
1914 to 1995

	Returns to a year of:			
	High school		*College*	
Year	*Young men*	*All men*	*Young men*	*All men*
1914, variant I	0.110	0.112	0.148	0.097
1914, variant II	0.125	0.098	0.148	0.097
1939	0.102	0.085	0.115	0.100
1949	0.054	0.051	0.078	0.077
1959	0.070	0.054	0.090	0.091
1969	0.074	0.059	0.096	0.099
1979	0.081	0.066	0.084	0.089
1989	0.093	0.078	0.124	0.124
1995	0.096	0.081	0.133	0.129

Notes and Sources:
"Young" means 0 to 19 years of potential work experience. "All" means 0 to 39 years of potential work experience. The estimates of returns to high school and college refer to composition-adjusted log weekly wage differentials by years of schooling for full time, full year male wage and salary workers. The approach to estimating these educational wage differentials from 1939 to 1995 is the same as the methodology described for estimating returns to college in the notes to Figure 1. See Katz and Autor (1999, forthcoming).

Returns to High School: 1915 Iowa sample (see Goldin and Katz 1999, tables 6 and 7); 1940 to 1970 IPUMS; and 1970 to 1996 March CPS. The estimates from 1939 to 1969 equal the composition-adjusted log weekly wage differential between workers with exactly 12 and exactly 9 years of schooling divided by 3, using data from the 1940 to 1970 IPUMS. The changes in returns from 1969 to 1995 equal one-half times the change in the composition-adjusted log weekly wage differential of workers with exactly 12 years of schooling (or exactly a high school degree) and exactly 10 years of schooling using data from the 1970 to 1996 March CPS. The 1914, variant I estimate for each group equals the sum of our 1939 national estimate for that group and the corresponding estimated change in returns to a year of high school in Iowa from 1914 to 1939. The 1914, variant II estimate equals the sum of our 1959 national estimate for that group and the corresponding estimated change in returns to a year of high school in Iowa from 1914 to 1959.

Returns to College: 1915 Iowa sample; 1940 to 1990 IPUMS; and 1990 and 1996 March CPS. The methodology for the estimates from 1939 to 1995 is described in the notes to Figure 1. The 1914, variant I and variant II estimates of returns to college use the same methodology as used for the analogous 1914 estimates for returns to high school. The 1914, variant I estimates add the corresponding 1914 to 1939 changes in college returns for Iowa from Goldin and Katz (1999, table 6) to our 1939 national estimates. The 1914, variant II estimates similarly add the corresponding 1914 to 1959 changes in college returns for Iowa to our 1959 national estimates.

Appendix Table 1
Wage Distribution for Male Production Workers in Twelve Manufacturing Industries, 1890 and c.1940

Industry	*Date month, year*	*Wage at 10%*	*Wage at 25%*	*Wage at median*	*Wage at 75%*	*Wage at 90%*	*number blue-collar (sample)*	*number white-collar (1890 sample)*	*% white-collar*
cotton goods	1890	4.71	6.09	7.74	9.94	12.94	43,187	1,184	2.6
	Spring 1937	30.19	34.50	40.21	50.47	59.52	56,453		
	1940	32.50	32.60	38.10	48.30	56.02	56,117		
dyeing & finishing textiles	1890	5.42	7.34	9.27	11.68	14.94	8,978	447	4.7
	Sept. 1940	35.99	42.90	52.90	64.88	73.41	24,560		
flouring & grist mill	1890	7.42	9.25	10.93	13.25	16.49	9,108	1,734	16.0
grain mill products[a]	Feb. 1941	30.00	35.76	50.54	67.79	80.71	19,100		
foundry & machine shop	1890	6.56	7.60	11.29	14.68	17.84	150,219	11,368	7.0
foundries (gray iron) (gray & malleable iron)	late 1938-early1939	41.86	51.53	64.22	81.32	99.11	36,749		
		42.83	52.46	64.58	81.08	98.31	42,906		
furniture, factory product (1890), mass produced (c.1940), mainly wood[a]	1890	6.17	8.21	10.77	13.93	17.58	36,735	2,248	5.7
	Oct. 1937[c]	30.14	35.00	44.34	58.93	74.77	33,199		
	Oct. 1937[c]	30.21	35.18	45.32	60.25	75.97	9,690		
	Feb. 1941	31.29	35.18	44.66	58.86	75.14	10,430		
iron and steel	1890	7.08	8.27	10.01	14.19	20.38	168,943	[d]	
	Apr. 1938	62.50	67.13	78.13	93.80	115.71	80,711		
lumber & planing mill	1890	6.48	7.69	11.65	14.66	17.72	50,064	3,870	7.2
lumber & timber products without logging	1939-1940	30.53	31.69	41.31	65.11	82.16	105,362		
		30.48	31.55	39.68	62.22	76.60	84,351		
shipbuilding: private ship yards c.1940	1890	7.56	9.56	13.01	16.62	19.08	23,499	1,112	4.5
	Aug. 1936[e]	50.95	60.14	73.89	87.96	97.83	25,324		
silk & silk goods	1890	5.61	8.44	11.58	15.15	18.63	7,526	900	10.7
silk & rayon goods	Sept. 1940	32.50	35.58	44.83	57.73	72.40	9,914		
soap & candles	1890	4.90	7.55	9.64	11.71	14.23	5,454	1,228	18.4
soap	Jan. 1938	48.28	61.93	72.82	83.58	96.88	6,087		
tobacco: chew, smoke, & snuff	1890	4.54	5.28	7.04	9.43	12.76	6,363	948	13.0
tobacco: cigarette, chew, smoke, & snuff	Dec. 1940	41.13	46.88	56.25	72.22	81.87	16,339		
tobacco: cigars & cigarettes[b]	1890	4.70	6.70	8.97	10.60	11.53	12,460	8,307	40.0
	1890	5.29	8.16	11.12	14.89	19.92	20,767	0	0
tobacco: cigars	Winter 1940	30.51	35.94	45.54	59.96	75.63	9,577		

(continued)

Appendix Table 1 *(continued)*

Industry	*Date month, year*	*50/10*	*90/50*	*90/10*	*75/25*
cotton goods	1890	1.641	1.672	2.745	1.632
	Spring 1937	1.332	1.480	1.972	1.463
	1940	1.175	1.470	1.724	1.482
dyeing & finishing textiles	1890	1.711	1.613	2.759	1.591
	Sept. 1940	1.470	1.388	2.040	1.512
flouring & grist mill	1890	1.472	1.508	2.221	1.433
grain mill products[a]	Feb. 1941	1.685	1.597	2.690	1.896
foundry & machine shop	1890	1.721	1.580	2.720	1.931
foundries (gray iron)	late 1938-	1.534	1.543	2.368	1.578
(gray & malleable iron)	early1939	1.508	1.522	2.295	1.546
furniture, factory product	1890	1.745	1.632	2.848	1.697
(1890), mass produced	Oct. 1937[c]	1.471	1.686	2.481	1.684
(c.1940), mainly wood[a]	Oct. 1937[c]	1.500	1.676	2.514	1.713
	Feb. 1941	1.427	1.683	2.401	1.673
iron and steel	1890	1.414	2.036	2.879	1.716
	Apr. 1938	1.250	1.481	1.851	1.397
lumber & planing mill	1890	1.797	1.521	2.734	1.905
lumber & timber products	1939-1940	1.353	1.989	2.691	2.055
without logging		1.302	1.930	2.513	1.972
shipbuilding: private ship	1890	1.721	1.467	2.524	1.738
yards c.1940	Aug. 1936[e]	1.450	1.324	1.920	1.463
silk & silk goods	1890	2.062	1.609	3.318	1.795
silk & rayon goods	Sept. 1940	1.379	1.615	2.228	1.623
soap & candles	1890	1.967	1.476	2.903	1.550
soap	Jan. 1938	1.508	1.330	2.007	1.349
tobacco: chew, smoke, & snuff	1890	1.551	1.811	2.809	1.786
tobacco: cigarette, chew, smoke, & snuff	Dec. 1940	1.368	1.455	1.990	1.541
tobacco: cigars & cigarettes[b]	1890	1.909	1.286	2.455	1.582
	1890	2.102	1.792	3.766	1.826
tobacco: cigars	Winter 1940	1.492	1.661	2.479	1.683

Sources:
1890: All industries except "iron and steel" and shipbuilding from U.S. Bureau of the Census (1895a); "iron and steel" and shipbuilding from U.S. Bureau of the Census (1895b).
c.1940: Bureau of Labor Statistics, *Monthly Labor Review* (various issues).
Notes:
Wages are expressed in current dollars/week for 1890 and current cents/hour in c.1940. Data include male employees only, except where noted. For 1890 the data (except for "iron and steel" and shipbuilding) are from a sample of the 165 largest cities (but note that all twelve industries were not represented in all 165 cities). In 1890 all white-collar male employees (firm officers, supervisors, etc. and clerks) are subtracted from the distribution from the top down. If the lowest group (less than $5) exhausts the bottom 10 percent (as it did in the cases of cotton goods, soap, and tobacco) we assume the range is [4 to 5). A uniform distribution within all groups is assumed. In no case was there a problem with the (open-ended) highest group. In only one case (cigars) was there good reason not to subtract the white-collar workers since 40 percent of the total male employees are in the non-production group and it is likely that many were owner-operator cigar makers. For c.1940 there was a binding spike at the first decile in furniture and grain mill products.

[a] There were very few women working in grain mill products (cereals employed some women, few were in flour milling) and furniture. The 1941 data for both these industries are for all workers.
[b] Both with and without white-collar workers distributions are given because 40 percent of male employees are white-collar workers in this industry.
[c] The smaller sample (second set of numbers) of the Oct. 1937 data are for the same plants as in Feb. 1941; the larger sample (first set of numbers) is the entire Oct. 1937 sample.
[d] The wage distribution for "iron and steel" is for the entire United States and is given without officers, clerks, and other non-production workers.
[e] Hourly basic rate without drafting and supervisory employees.