# The History of Wage Inequality in America, 1820 to 1970

by

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## INTRODUCTION

Since 1970 the distribution of wages in the United States has become substantially more unequal (Katz and Murphy 1992). "Between-group" inequality has risen since 1980, whereas within-group inequality has increased more or less steadily since 1970. Because the rise in inequality has occurred against a back-drop of more or less stagnant real wages on average, various labor market groups experienced a decline in real wages over all, or part of, the post-1970 period.

Economists have written extensively about the post-1970 rise in wage inequality and its causes, with varying degrees of success. It is fair to say, however, that virtually all of this literature treats the post-1970 period as self-contained; or, if historical context is offered, it is usually restricted to the post-1940 period. The purpose of this paper is to place the recent rise in wage inequality in a much longer historical context, one covering essentially the full sweep of American history since the onset of industrialization, defined for my purposes to be the 1820s. In keeping with the literature on the current period, the primary focus is on "skill" based wage inequality – for example, differences associated with occupations, or other indicators of human capital.

Why view the recent rise in wage inequality through a (very) long-term lens? A long-term historical context is useful in assessing whether the recent rise in wage inequality is an unusual event in and of itself, and whether levels of inequality observed today are unprecedented, as some scholars believe them to be. It is also useful in determining whether there have been secular trends in inequality, or whether inequality change has been primarily episodic. The causes of changing wage inequality, as well, may be unique to the institutional setting of each historical period, or there may be continuity in explanatory factors. Answers to such questions have implications for theories of economic development in the short and long run, and possibly for economic policies to address both the causes and consequences of inequality change.

This paper is divided into five sections. Section 2 examines issues of measurement and evidence; it also summarizes the relevant portions of the influential and well-known study by Williamson and Lindert (1980). The remainder of the paper discusses recent research on the history of wage inequality, dividing up the chronology in terms of sub-periods (1820-1860, 1860-1900-1900-1940, and 1940-1970).

## MEASUREMENT AND EVIDENCE

Ideally, measurement of the level (or change) in wage inequality should be based on the full distribution of wages. Due to the influence of the Mincer model in labor economics, numerical measures of the distribution of log wages (eg. the variance) have been widely used in studies of

the post-1970 rise in wage inequality. Also popular are various range statistics that measure the distance (in logs) between various quantiles of the wage distribution, such as the 10-90 spread.

Prior to 1940, however, it is extremely difficult (though not impossible, see below) to analyze wage inequality other than in terms of differences in average wages between various labor market groups.[1] Virtually all analyses of pre-1940 patterns of wage inequality are based on occupational averages; in particular, the ratio of average wages in a skilled occupation, typically blue collar, to average wages in an unskilled occupation (eg. common labor, manufacturing operatives)[2] The implicit—albeit somewhat dubious—assumptions are that occupations are a reasonable proxy for skills and that within and between-group inequality generally have trended together, so that one (or the other) can serve as a proxy for overall inequality.[3]

Students of late 20th century labor markets have an abundance of data on wages, much of it individually-based, with which to study levels and changes in wage inequality. The public use microdata samples (or PUMS) of the 1940 and subsequent decennial censuses provide information on weekly wages in the year preceding the census, as well as data on weeks worked.[4] At annual frequencies trends in wage inequality in recent decades are frequently studied using the Current Population Survey. CPS microdata samples are available continuously since the early 1960s.[5]

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[1] This is because the 1940 census was the first in American history to collect national data at an individual level on earnings and labor supply (weeks worked).

[2]There is also the issue of pay period. Studies of post-1940 wage inequality typically focus on hourly or weekly wages, whereas studies of pre-1900 wage inequality frequently make either explicit or implicit use of daily wages. Hours of work per day have declined substantially since the mid-19th century which, by itself, would not cause any biases. However, there is some evidence that high-wage workers in the late 19th century worked fewer hours than low wage workers, while the reverse is true today (Costa 1998).

[3]Williamson and Lindert (1980, pp. 80-81) report regressions of various overall indicators on income inequality on the skilled-unskilled wage ratio over the period 1913-34; the coefficient of the skill differential is always positive and highly significant statistically.

[4]Because the census is taken only every ten years, it is important to keep in mind the position of the economy in the business cycle when interpreting level and changes in inequality derived from the PUMS., trends in inequality, as derived from the PUMS. The 1940 census, taken at the end of the Great Depression, is an obvious case in point. It is also important to keep in mind inconsistencies of measurement across the various PUMS. For example, wages and weeks worked on so-called "work relief" jobs were counted in 1940, even though relief workers were (according to the Census) unemployed. Work relief wages were determined by the so-called "security wage" concept and, strictly speaking, are not comparable with private sector wages. It is possible to exclude persons on work relief at the time the census taken, as well as some who were so employed in 1939, but it is not possible to exclude everyone who held such jobs in 1939; see Margo (1988).

[5]The CPS was first conducted during World War Two, and then on a regular basis beginning in 1947. However, as far as I am aware, individually-based CPS data are not publically available (and may not survive) prior to the early 1960s.Other commonly used contemporary sources include the National Longitudinal Survey, the Panel Study of Income Dynamics, and the Survey of Income and Program Participation.

As noted earlier, by far the most abundant pre-1940 data on wages are those that correspond to specific occupations. Until recently (see below) most historical studies of occupational wage differentials have made use of various government surveys, or archival records pertaining to specific locations. For example, two government surveys that provide a wealth of 19th century wage data are the so-called Weeks and Aldrich reports. The Weeks reports, named after Joseph Weeks, was conducted as part of the 1880 census whereas the Aldrich report, named after Senator Nelson Aldrich, was conducted in the 1890s as part of congressional debate over tariffs.

The Weeks and Aldrich reports were similar in method and industrial coverage; in particular, both were collections of payroll records of manufacturing firms in existence at the time of the surveys.[6] By arranging the data according to the date of the payroll it is possible to use either source to construct occupation-specific time series of nominal wages.[7] The data are reported as firm averages (by occupation and industry). The pay period varies, but most observations refer to daily or hourly wages.

Notwithstanding their more or less continuous use since the late 19th century, the Weeks and Aldrich reports suffer from a number of serious (and well-known) deficiencies. Because the data are firm-level averages, within-firm differences are unknown. Information on worker and job characteristics is extremely limited. Both samples are biased in terms of geographic coverage: broadly speaking, coverage is best for the Northeast and the East North Central states, and very limited for other census regions.

Perhaps the most important question of bias concerns the retrospective nature of both surveys. Technically, the samples are unbalanced panels, with the length of the panel dependent on when the firm first came into existence and whether it survived long enough to be sampled. On an apriori basis it seems likely that firms that came into existence long before the date or either survey, but surviving to be included in either source, are an unbiased cohort sample of all firms. Even if selectivity were not an issue, sample size is: the number of observations dated 1850 or before falls off drastically, particularly if the samples are stratified by occupation or region.[8]

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[6]The precise methods by which firms were selected into both samples cannot be determined exactly from the published documentation, but it is clear that neither was a random sample in the modern sense.

[7]Both reports also contained abundant data on prices; Coehlo and Shepherd (1974), for example, use the Weeks data to construct regional price indices for the second half of the 19th century.

[8]For example, the number of usable observations in the Weeks report with which to calculate an average daily wage of unskilled labor in 1832 is exactly two. The Weeks and Aldrich reports do not exhaust 19th century wage data in published government sources.. A large scale survey of Massachusetts wages was conducted by Carroll Wright in the early 1880s, the results of which were published by the Massachusetts State Department of Labor in 1886. Somewhat unusual for 19th century wage surveys, the Wright study includes a relatively wide array of skilled occupations, as well as farm wages. Like the Weeks and Aldrich reports, Wright canvassed firms in existence at the time the survey was taken, and thus the Massachusetts data potentially suffers from selectivity biases analogous to those that afflict the Weeks and Aldrich reports. Unlike the Weeks or Aldrich reports, the Massachusetts data

Because of the deficiencies in these government sources, economic historians interested in the evolution of the wages over the course of the 19th century have supplemented them with archival data. One well-known example would be Walter Smith's (1963) study of wage rates on the Erie Canal. The payroll records of the Canal survive in abundance, such that Smith was able to calculate modal daily wages for common labor, masons, carpenters, and "teamwork".[9] Other important archival studies include those by Adams (1968, 1970, 1982, 1986) and Rothenberg (1992).

By the early 20th century occupational wage data were routinely collected by state and federal agencies. These data have served as the basis for various computations of aggregate nominal and real wage series differentiating between skilled and unskilled workers of various types Most of the relevant series (eg. Douglas 1926; Long 1960; Rees 1961) can be found in the Bicentennial Edition of Historical Statistics of the United States (US Department of Commerce 1975).[10]

Williamson and Lindert (1980)

Although perhaps the majority of economists today are unfamiliar with the pre-World War Two sources discussed above, some may be more familiar with the 1980 book by Jeffrey Williamson and Peter Lindert, American Inequality: A Macroeconomic History. Williamson and Lindert's book had two goals. The first was to present a comprehensive overview of the "stylized facts": namely, what was known quantitatively about changes in inequality over time in the long sweep of American history? The second was to explain changes in inequality over time. Here the organizing principle was the so-called "Kuznets curve", the notion that inequality first rises, and then falls, over the course of economic development. Was there an American Kuznets curve; and, if so, when did the curve rise and when did it fall?

From an explanatory point of view, Williamson and Lindert dispensed with Kuznets' two-sector framework, substituting instead explicit computational general equilibrium (CGE) models. These models were "small" in terms of sectors and factor inputs, but it was still necessary to simulate them. Since many of the relevant parameters for the 19th century could not be calibrated readily from primary sources Williamson and Lindert substituted 20th century parameters in many

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include some information on worker characteristics and seasonality but, unfortunately, no information on the location of the firms within the state.

[9]Although Smith apparently calculated averages, his published series pertained to modes. He noted, however, that there was very little differentiation in pay across workers at the Canal within a given occupation, so that the mode was an accurate summary statistic of central tendency.

[10]Revisions to some of these series, as well as newly constructed series, will be included in the forthcoming Millennial edition of Historical Statistics (Carter and Sutch, et. al., forthcoming).

simulations. An especially important example (see below) concerns capital-skill complementarity, which Williamson and Lindert assumed was true of 19th century manufacturing before the Civil War. For the purposes of the CGE models, "inequality" meant the skill differential, primarily (although not exclusively) defined in "artisanal" (that is, blue collar) terms.

Williamson has been a pioneer in the application of CGE models, and his book with Lindert was the earliest that I am aware of that examined long-term trends in wage inequality in the context of an explicit economic framework. However, it is important to note that the book broke no new ground in terms of data collection. Williamson and Lindert's contribution to the "facts" consisted of assembling together the relevant studies, as well as constructing a variety of long-term inequality series by splicing together shorter series for different sub-periods. The principal such series, giving the ratio of wages of skilled-blue collar workers to those of "common", or unskilled labor covered the period 1816 to 1970.

When this series, among others, were graphed against time, they revealed, according to Williamson and Lindert, a distinct inverse-U pattern – the Kuznets curve. The rising portion of was dated to the period 1820 to 1860 (see Figure 1). Wage inequality drifted upwards after 1860, peaking at some point in the late 1920s, after experiencing a sharp, but transitory, decline during World War One. Inequality fell sharply and more or less continuously between 1929 and 1950, followed by a period of stability (1950 to 1970). We know now, of course, that inequality rose sharply in the 1980s, but it must be remembered that Williamson and Lindert had no way of knowing that at the time.

In terms of the CGE model, the driving forces behind increases or decreases in skill differentials were factor supplies and technical change which caused, shifts in the relative (skilled-to-unskilled) demand for, or supply of, of labor. The explanation for the rising portion of the curve was early industrialization, and high rates of capital accumulation, prompted by falling relative prices of capital goods. Lacking direct 19th century evidence, Williamson and Lindert assumed that the technology of early industrial enterprises was characterized by capital-skill complementarity. Hence, increased capital accumulation led to a rise in the relative demand for skilled labor. Factor supplies were assumed to be relatively inelastic in the aggregate, so the rise in relative demand led to a rise in the skill differential.

At other points in time, technical change was more rapid outside the industrial or service sectors. For example, Williamson and Lindert attributed the decline in skill differentials between 1929 and 1950 to more rapid growth in total factor productivity in agriculture, assumed to be intensive in the use of unskilled labor. Factor supplies also mattered: for example, skill differentials increased in the early part of the 20th century because of high rates of immigration, which swelled the ranks of unskilled labor.

Williamson and Lindert's book has been criticized from both a theoretical and empirical perspective. James and Skinner (1985) argued, on the basis of production functions estimated using mid-19th century census data, that capital and unskilled labor were relative complements, not capital and skilled labor (see also Goldin and Katz 1995). Grosse (1982) suggested a number of reasons why Williamson and Lindert's inference that skill differentials rose between 1820 and 1860 was unwarranted (see also Margo and Villaflor 1987). Goldin and Margo (1992a; see also Goldin and Katz 1999b) questioned whether Williamson and Lindert's "linked" sample of skill differentials adequately measured trends from the 1920s to the 1960s; their paper, as well, implicitly questioned Williamson and Lindert's explanation for declining skill differentials after 1929, focusing instead primarily on factors associated with World War Two (see below). More generally, the CGE approach, by its very nature, has relatively little to say about how institutional aspects of labor markets (eg. unions), government policy, and macroeconomic events have affected wage inequality in American history.[11]

## NEW EVIDENCE ON ANTEBELLUM SKILL DIFFERENTIALS

Largely due to the influence of Williamson and Lindert's work, a new project was launched in the early 1980s to collect additional archival data on wages in the 19th century. Thus far, the data collection phase of the project has been completed for the 1820 to 1860 period.[12] The primary data source was Reports of Persons and Articles Hired, a collection of payrolls stored at the National Archives, perhaps the largest collection of its kind for the 19th century United States.

During the 19th century the United States Army maintained forts and outposts throughout the country. At many (in fact, most) of these installations it proved necessary at various times for the quartermaster at the post to hire civilians from the local labor market to perform tasks for which soldiers could not be spared (or did not have the skills to perform). At the end of each month, quartermasters were required to prepare a summary payroll (the "Report" which the title of the collection refers to) documenting the hiring of civilian workers, including pay and some worker and job characteristics. Approximately 62,000 wage observations have been collected and put into

[11] Government behavior can be considered in the CGE model, however, to the extent that government policies altered factor supplies (for example, the closing of the frontier in the late 19th century, or the cut-off in immigration during World War One) or technical change (for example, through government funded research and development). Because the model is cast in real terms, the effects of nominal shocks or other macro-economic events cannot be readily addressed. However, there is considerable evidence of nominal wage lags well before the Civil War that were non-neutral with respect to occupation; see Margo (1999, ch. 7).

[12] Preliminary analyses of data collected during the first phase of the project were reported in Margo and Villaflor (1987), Margo (1992), and Goldin and Margo (1992a), and the completed analysis is scheduled to appear in book form in Margo (1999). The NSF has recently funded a proposal to complete the second phase of the data collection (1860 to 1900).

machine-readable form.[13] The data cover all regions of the country -- including the far West -- and a wide variety of occupations found in civilian life (as well as a few specific to the military, such as "Indian spy").

Of course, these data would be of little interest to anyone – except, perhaps, military historians – if wages paid to the Army's civilian employees were arbitrarily set, independent of labor market conditions in the civilian economy. However, there is considerable evidence that the army did not behave this way; rather, it appears to have simply paid the going wage in the local labor market surrounding the fort, conditional on occupation (see Margo and Villaflor 1987; Margo 2000, ch. 2) Thus, for example, a comparison of wages paid to common laborers and teamsters, or carpenters and masons, at the Erie Canal, with workers in employed in these occupations at forts in upstate New York evidences no differences between the two.

Although the size, occupational, and geographic coverage of the sample are a vast improvement over wage data previously available for the antebellum period, the sample is not sufficiently large to estimate, say, annual time series of average wages by occupation at each fort. Few forts were operated continuously over time, and none hired every type of worker in every year. Computation of a wage series – for example, by averaging wages across forts in a given occupation – that ignored these compositional shifts could be highly misleading. To deal with this problem, hedonic (log) wage regressions were estimated, pooling the data over time, within broad occupational groups and census regions. Using the coefficients of the year dummies from these regressions, in conjunction with benchmark wage estimates for 1850, annual time series of nominal daily or monthly wages were constructed for period 1821 to 1860, for three occupational groups (common labor, skilled artisans, and clerks) in each of the four major census regions (Northeast, Midwest, South Atlantic, and South Central) – a total of twelve nominal wage series (Margo 2000, ch. 3).

Using previously collected regional data on prices, real wage series were constructed. With additional cross-sectional information, it proved possible to benchmark regional wage levels in 1850 so that differences in real wage levels across regions could be incorporated into the time series. Finally, making use of revisions to the 19$^{th}$ century labor force statistics recently completed by Thomas Weiss (1992), the regional series were aggregated to the national level. Five year averages of the real wage series, with each occupational series indexed to 100 in 1856-60, are shown in Table 1. Also shown are growth rates ($) of the series, estimated as the coefficient of a linear time trend in a time series regression of the log wage (ln w = " + $t + ,).

It is immediately evident that real wage growth was positive before the Civil War. Rather more significantly, when the occupational series are aggregated into a single overall series the trend

[13]Here, an "observation" refers to the occurrence of a wage – typically, daily or monthly – in a payroll.

growth rate of the aggregate real wage (0.97 percent per year) matches almost exactly the best current estimate of the growth in real output per worker (0.99 percent per year) between 1820 and 1860 (Weiss 1992).

It is also evident from Table 1 (see also Figure 2) that the real wages of skilled artisans did not grow more rapidly than the real wages of unskilled labor, contrary toWilliamson and Lindert's (1980) claim. In Chapter 3 of Margo (1999; see also Margo and Villaflor 1987) I demonstrate that various biases and errors of construction in Williamson and Lindert's series of skill differentals account for their (apparent) finding of an antebellum "surge" in the ratio of wages of skilled artisans and common labor. However, the new data do suggest that the wages of clerks (the major white collar occupation of the period) increased at a moderately faster pace before the Civil War than wages of common labor (see Table 1 and Figure 3). Nineteenth century clerks (almost all of whom were male) were frequently involved with accounting and management tasks of the enterprises; they were, in other words, the "educated" workers of their day, on a fast track to upper levels of management (such as these were). Although the spread of the factory system may not have enhanced the relative wages of skilled artisans, it is entirely plausible that managerial skills and capital were relative complements. The working hypothesis, then, is that the relative demand for educated labor rose before the Civil War; and, because the relative supply of such skills was less than perfectly elastic, the skill differential (measured in white collar terms) increased.

Furthermore, economy-wide estimates of the clerk-to-unskilled wage for the 1850s are similar to estimates for the 1890s (Margo 2000, ch. 7; Goldin and Katz 1999b). As Goldin and Katz demonstrate (see the next section), the expansion of secondary schooling after the turn of the 20th century dramatically reduced the returns to educated labor, and a further reduction took place in the 1940s (Goldin and Margo 1992a; see below). Although much more work needs to be done, a Kuznets-curve in the relative wages of educated labor may be accorded the status of a stylized fact of American economic development.

## THE CIVIL WAR AND POST-BELLUM PERIOD, 1860 TO 1900

The wage history of the Civil War and subsequent post-bellum period has received less detailed scrutiny than either the ante-bellum period or the 20th century – an unfortunate state of affairs, for there are good reasons, as noted earlier, to believe that the standard wage sources for the period – the Weeks and Aldrich reports -- are less than fully satisfactory. Nevertheless, both reports provide the primary evidence from which various scholars have constructed series of skill differentials covering the 1860 to 1900 period.

Figures 4 and 5 graph two such series, one computed by Burgess (1920) covering the 1860 to 1890 period, and the other by Williamson (1975) covering the 1860 to 1900 period. Skill

differentials remained more or less constant during the Civil War but began to drift upwards late in the 1860s. According to the Burgess series, the upward drift continued through the 1870s before tapering off in the 1880s; the Williamson series, however, suggests a much more modest overall increase in skill differentials over the second half of the 19th century.[14]

As noted repeatedly in this paper, almost all wage inequality in 19th century US history rely on trends in aggregate skill differentials. However, for at least a portion of the 1860 to 1900 period it is possible to shed some light on changes in wage differentials at a lower level of aggregation. The focus is on manufacturing over the period 1860 to 1880, a period of substantial change in technology and organizational form that led to increases in firm size and market power -- the beginnings of the rise of the modern corporation (Atack 1985). I use firm-level data from samples collected from the manuscript censuses of manufacturing in 1860 and 1880 by Jeremy Atack and Fred Bateman, as well as data from a special census inquiry – the so-called "Census of Social Statistics" – in 1860 that reported extensive wage information at the level of minor civil divisions.[15] Taking the manufacturing data first, the 1880 sample is straightforward to analyze, because it reported the average daily wage of common labor and the average daily wage of "mechanics", or skilled (blue-collar) labor. In 1860, however, the manufacturing census reported the "average monthly cost of male labor". It is possible to restrict both samples to firms in full-time operation, here assumed to be 12 months, and it is also possible to restrict both samples to firms employing only male workers. Finally, using the data from the 1860 Census of Social Statistics, it is possible to restrict attention to firms that plausibly employed mostly – or totally – unskilled labor, thus rendering comparisons possible between 1860 and 1880.

Panel A of Table 2 shows summary statistics for the distribution of the log of unskilled daily wages in 1860, as computed from the social statistics and manufacturing data, as well as for 1880. The social statistics sample comprises minor civil divisions in eight states, two from each of

[14]Interestingly, if the post-1860 Williamson series is spliced onto the Margo (1999) shown in Figure 2, the artisan-to-common wage ratio rose by about 11 percent from the late 1840s to the late 1890s, but was virtually the same in the 1890s as in the 1820s. However, following the Williamson series into the 20th century, however, skill differentials rose quite markedly between 1900 (a value of 1.825) to 1916 (1.989) – as noted earlier, period of substantial growth in the relatively supply of unskilled labor, due to high rates of immigration.

[15]In 1850, 1860, and for a final time in 1870, the US Census Office conducted a special inquiry at the level of minor civil divisions called the "Census of Social Statistics". Data were collected by census enumerators on a wide variety of miscellaneous social indicators (for example, churches by denomination, newspapers, libraries) and, in addition, on wages. In particular, data were collected on the average daily wages of "common" (unskilled) nonfarm labor and carpenters, both without board, and both pertaining to male workers only. However, appearances are somewhat deceiving, for the wage data were not true averages; rather enumerators seem to have asked a few knowledgeable individuals -- most likely, employers -- what the going rate of pay was. At the level of a minor civil division, it is likely that the data are quite similar to firm-level observations, an inference born out by comparison with the manufacturing data for 1860 (see Table 2).

the major census regions; for comparison purposes, the manufacturing samples are limited to firms located in these states. The daily wage of unskilled labor in manufacturing is defined to be:

daily wage, mfg = (Average monthly cost of male labor/number of male workers)/25.8

where "25.8" is the presumed number of days of operation of full-time firms. Crucially for the analysis, the manufacturing wage is constrained to fall between the 1rst and 99th percentiles of the log wage distribution computed from the social statistics sample. As is apparent, the two 1860 distributions match up reasonably well: depending on how the labor input is computed, the sample means are similar, as are the standard deviations (although the variation in the social statistics sample is slightly smaller than across manufacturing firms).[16]

Panel B computes the change in manufacturing wage inequality between 1860 and 1880. It is clear that inequality increased, whether measured by the change in the standard deviation, or in the various range statistics shown. Table 3 repeats the exercise using the full manufacturing samples; the results are substantively unaffected.

Why did manufacturing wage inequality increase between 1860 and 1880? Location is one reason: the South's loss in the Civil War produced an apparent widening in its per capita income gap with the North (Easterlin 1960; Barro and Sali-i-Martin 1992), and it is plausible that this effect was at work in the case of manufacturing wages. Table 4 reports the effect on the standard deviation of the log wage in both years, controlling for various factors reported in the sample, including state, urban-rural status, and industry. Clearly state (and to a lesser extent, urban-rural) differences in wages grew between 1860 and 1880; further analysis of the regression coefficients (not shown) demonstrates that the principal change was, in fact, an increase in the gap in manufacturing wages between the South Atlantic and the rest of the nation (cf. Wright 1986).[17]

Location, however, may not have been the only factor at work. Regressions (not shown) on the 1880 sample reveal a positive effect of capital intensity and firm size on the daily wage of unskilled labor. The variances of both variables increased between 1860 and 1880, suggesting that

[16]Elsewhere (Margo 2000, ch. 4) I have shown that there is no evidence of substantial wage gaps for unskilled labor between the farm and non-farm sectors, whether non-farm refers to manufacturing, or in more general terms, in 1850 and 1860.

[17]It is important to note that a North-South wage gap did not first emerge after the Civil War, but apparently in the 1830s (Margo 2000, ch. 5). The Civil War, in other words, exacerbated a gap already present. The role of region in this instance highlights an important difference between the 19th and 20th centuries; most analyses of wage inequality since 1970 effectively assume an integrated "national" labor market, an assumption that would be less than fully appropriate for the pre-1940 period.

the emergence of large scale, capital intensive firms may have produced a widening dispersion of manufacturing wages.[18]

## CHANGES IN WAGE STRUCTURE, 1900-1970

### 1900 to 1940

Although some features remain murky, there is abundant evidence that the wage structure compressed between the turn of the twentieth century and 1940. Factors that have been suggested to account for the compression include changes in immigration policy, educational expansion, and unionization.

A number of attempts have been made to chart the evolution of the wage structure from the turn of the century to World War. Early studies by Douglas (1926), Lebergott (1947), Ober (1948), Bell (1951) and especially Keat (1960) relied, for the most part, on skill differentials to build a case. As an example, Ober (see also Keat 1960) computed wage ratios using annual data on skilled and unskilled workers in the building trades (all of which were unionized) from 1907 to 1947, along with a broader set of skilled occupations at various dates over the same period. He, like the others cited above, found substantial declines in skill differentials in the 1940s, but also an earlier period of decline ca. World War One. Because of various deficiencies in the data sources used in these studies, however, the timing of change remains unclear.

For white collar occupations, the most comprehensive early studies were made by Paul Douglas. Douglas estimated wage series for low-level managers and "ordinary" clerical workers, such as typists, stenographers, and book-keepers. Using these series in conjunction with others on unskilled labor, Douglas argued that there was a substantial decline in the relative wages of white collar workers before 1930. In explaining this decline, Douglas pointed to educational expansion which, he claimed, substantially increased the relative supply of educated workers after the turn of the century – workers who were well-trained to enter white-collar occupations in the burgeoning service economy of the early 20th century.

Recent work by Goldin and Katz (1995, 1999a, 1999b) has significantly expanded our knowledge of pre-1940 trends in the wage structure, as well as clarify the timing of important changes. First, using industry data from1890 (from the federal census of manufacturing) along with similar data collected by the BLS circa World War Two, Goldin and Katz show that the

[18]Why firm size and capital intensity were positively correlated with wages is unclear. The correlations may indicate that more able workers – albeit "unskilled" – were more likely to be employed in large scale, capital intensive firms; or that the work environment in such firms was undesirable, and to compensate the firms had to pay higher wages; or that such firms competed for workers in a labor market (or markets) that, for whatever reason, was less than perfectly integrated with the general market for unskilled labor, and the supply curve of unskilled labor to large scale, capital intensive firms, in the aggregate, was upward sloping.

distribution of wages compressed among production workers within manufacturing (see Panel A of Table 5) Since there is, at present, no evidence that the inter-industry wage structure changed between 1890 and 1940, Goldin and Katz's result suggest a more general compression in manufacturing wages occurred as well.

Second, Goldin and Katz (see also Goldin and Margo 1992b) re-analyzed the white collar wage data used by Douglas, and also extended and revised standard wage series for college professors and engineers (see Table 5 for highlights). Unlike the Douglas series, which display a decline in the wages of white collar workers relative to unskilled labor just after 1900, the Goldin-Katz series suggests that much of the initial decline occurred ca. World War One. Remarkably, this initial decline remained in place throughout the 1920s and (except for brief increases in the early 1930s) through the Great Depression, before undergoing an additional decline in the 1940s. Also, it is important to note that, as economically and quantitatively significant as the "Great Compression" of the 1940s was (see below), the pre-1940s declines in skill differentials were substantially greater (approximately twice as large), occurring over a much longer period. Goldin and Katz's (1999) have also produced series of annual wages for college professors and engineers; these, two, suggest that a substantial compression took place before 1940 (see Panel B of Table 5).

Third, Goldin and Katz (1999a) have made use of the manuscripts of 1915 Iowa state census which reported information on education and income, the only known pre-1940 census-like survey to do collect both variables. Based on a cluster sample of approximately 60,000 individuals, Goldin and Katz estimate standard earnings functions. These suggest that the returns to schooling were quite high in early 20$^{th}$ century Iowa, roughly on the order of 15 %, depending on age and schooling level. Interestingly, these returns were not confined to the non-farm economy; evidently the productivity of farmers, as well, benefitted from educational expansion. Goldin and Katz estimate similar equations from the 1940 and 1950 PUMS, restricting the sample to Iowa. While the results confirm a decline in the returns to schooling in the 1940s, they also suggest an even larger decline took place between 1915 and 1940.

Which factors account for the post-1890 wage compression in manufacturing, and the decline in the returns to schooling (and closely related decline in the white collar wage premium)? Although the evidence at present is not complete, the wage compression in manufacturing appears to be due to secular declines in immigration (which decreased the relative labor supply of low-skilled labor), unionization, and educational expansion.

In particular, the so-called "high school movement", which began in the late 19$^{th}$ century and which Goldin and Katz attribute to the high returns to education around the turn of the century,

greatly expanded the relative supply of educated labor.[19] Some high school graduates were absorbed into the "high-tech" industries of the day, while others flooded the market for office work. In addition, high education also began to grow, although similar rates of expansion in the relative supply of college-educated labor were a product of the post-World War Two era.

**The Great Compression and the Post-WWII Experience: 1940 to 1970**

Williamson and Lindert's (1980) analysis of the American "Kuznets Curve" suggested a sharp decline in skill differentials between 1929 and 1950. Because this decline appeared (to Williamson and Lindert) to be a smooth one, they emphasized secular forces rather than episodic ones. More recent work on this period, however, suggests that the decline in wage inequality after 1929 was concentrated in the 1940s, and had much to do with events surrounding World War Two (Goldin and Margo 1992b).[20]

Precise dating and magnitudes of the so-called "Great Compression" have been difficult to ascertain because of inconsistencies in the 1940 and 1950 published census volumes. An early study by Herman Miller (1966) concluded, for example, that there was no decline in the ratio of earnings of college-to-high school graduates between 1940 and 1950. But, in a clever paper, Bartlett (1978) showed that Miller was mistaken. Using the public use sample of the 1970 census Bartlett constructed pair-wise consistent measurements of wage inequality between 1970 and preceding censuses. She found no change between 1950 and 1970 but concluded there must have been a decline in the returns to schooling between 1940 and 1950. However, Bartlett was unable to measure the magnitude of the decline precisely.[21]

Goldin and Margo (1992b) extended Bartlett's work by making use of extracts from the public use samples of the 1940, 1950, and 1960 censuses. Table 6 shows various summary measures of the distribution of log (weekly) wages from Goldin and Margo's extracts. Significant wage compression is immediately apparent comparing 1940 and 1950. It is also clear that the wage structure "bounced back" somewhat in the 1950s, but wage inequality was still much lower in 1960 than in 1940.

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[19]However, the apparently similarity of clerk-to-unskilled wage ratios in the 1890s and the 1850s (see also Soltow and Stevens 1981) suggest that the rate of return to schooling was quite high long before the high school movement began – which raises the question as to which factors evidently inhibited widespread educational expansion prior to the late 19th century.

[20]For additional discussion of the wage structure covering the interwar period and World War Two, see Ferguson and Galbraith (1998).

[21]Doing so would have required Bartlett to have access to microdata samples from the 1940 and 1950 censuses, which were not available when she wrote her paper.

The PUMS, then, clearly suggest a substantial reduction in wage inequality in the 1940s. But, the compression could have merely been the continuation of a trend that began long before the 1940s, or possibly a response to a temporary disequilibrium induced by the Great Depression.

Although a complete, or nearly so, reconstruction of the evolution of the wage structure in the 1920s and 1930 remains to be done, Goldin and Margo (1992b) were able to produce several new series of skill differentials. One such series, pertaining to clerks and common labor employed on Class I steam railroads (see Figure 6), suggests that wage inequality increased in the early years of the Depression, but by 1939 had returned to 1929 levels, suggesting that the "Great Compression" really was an episode associated with World War Two.[22]

Goldin and Margo's explanation of the Great Compression emphasizes "demand-supply" factors as well as government intervention. To take the latter first, compression was at least partly the result of wartime price controls. First instituted in 1942, the price controls were under the purview of the National War Labor Board (NWLB). The NWLB adopted a number of rules of thumb when deciding whether to allow wage increases in particular industries; many of these clearly compressed the wage structure at the left tail (for example, exceptions were most frequently granted for cases in which the NWLB thought that "substandard" wages were being paid).

In addition, the war expanded the relative output of industries that were relatively intensive in the use of less-educated labor (eg. manufacturing) and reduced the relative output of industries that were intensive in the use of educated labor (such as college teaching). It is hard to factor out the precise effect of wartime demand and the NWLB, but Goldin and Margo attempted to do so by examining wage distributions of war and non-war related industries, before, during, and after the war. These distributions do suggest that the NWLB controls tended to compress left tails; however, it is also clear that compression continued after the war; and that the relative earnings of high skilled workers – the right tail – also compressed during, and after the War.

Why, then, did compression continue after the war? Goldin and Margo (1992b) examined trends in the relative demand for workers by education level between 1940-80; the 1940s were relative to the other decades, a decade of substantial increases in the relative demand for less-educated workers (see also Autor, Krueger and Katz, 1998). But this shift in demand was short-lived; the 1950s and 1960s were decades of substantial increases in the relative demand for educated workers. This suggests that certain supply shifts may have been were important: (1) there was an unexpected increase in the supply of educated labor after the war, caused the GI Bill, which financed the educations of soldiers and (2) there was a narrowing of geographic differences

[22] This is somewhat surprising, because unemployment rates were still very high in 1939, and unemployment was more prevalent among the less-skilled. A high level of unemployment might be expected to reduce the wages of the currently employed, ceteris paribus; and thus cause the skill differential to rise; see Blanchflower and Oswald (1994).

in the quality of schooling during the first half of the twentieth century, which also probably was a source of some compression. Other factors that functioned on the demand side were increases in the level and coverage of the federal minimum wage, level and coverage, and growth in unions.

In sum, the "Great Compression" of the 1940s was a unique episode caused by factors that were largely specific to the 1940s. The compression continued after the war for sometime but was beginning to unravel by the early 1950s. However, little further change in wage inequality took place in the 1960s, and in the 1970s wage differentials by education and experience actually declined, due to the entrance into the labor of the (relatively) highly educated "baby-boom" generation. From the point of view of the early 1970s, then, it would have seemed that, for the post-World War Two period – and, except for the 1930s, the pre-1940s portion of the 20th century – the general trend in wage inequality was downward. No wonder, then, that economists were unprepared for the marked rise in wage inequality in the 1980s, for this was a phenomenon evidently foreign to the history of wage inequality in America, at least as far as the 20th century was concerned.

Although skill-based wage inequality today appears to be similar in levels to that experienced on the eve of World War Two, it also appears to be somewhat lower than levels in the early 20th century. Further, the (percentage) increase in the relative supply of educated labor since the early 20th century been much larger than the (percentage) decrease in skill differentials. Thus, the relative demand for educated labor must have risen secularly over the full sweep of the 20th century, perhaps because, unlike their 19th century counterparts, the new production techniques that emerged in the early 20th century – as well as today – were characterized by capital-skill complementarity (Goldin and Katz 1995).

## CONCLUSION

This paper has surveyed recent research on the history of wage inequality in the United States over the period 1820 to 1970. There are several conclusions:

1. Over the course of the 19th century, the ratio of wages of skilled blue collar workers to common labor did not follow an inverted U pattern, as conjectured by Williamson and Lindert. If anything, the ratio declined before the Civil War. However, after the Civil War, the ratio climbed to a level in the late 1890s similar to the level in the 1820s, and continued to increase until World War One.

2. The ratio of wages of white collar workers to common labor did increase over the course of the 19th century. A significant portion of the increase took place before the Civil War, suggesting a key role for the influence of early industrialization on the demand for "managerial" skills.

3. There is some evidence that wage dispersion among unskilled labor in manufacturing increased between 1860 and 1880. While some of the increase was a consequence of a widening North-South wage gap, increased dispersion in capital intensity and firm size – both aspects of the rise of the modern corporation -- probably played a role.

4. Except for a brief period early in the century due to rapid increases in unskilled immigration, wage inequality declined between 1900 and 1940. By substantially boosting the relative supply of educated labor, educational expansion drove down the rate of return to schooling between World War One and World War Two, and further erosion in returns took place in the 1940s. Despite the recent rise in wage differentials by educational attainment, the returns to schooling today is probably somewhat lower than in the early 20th century, indicating that the relative demand for educated labor has risen secularly over the full sweep of the 20th century.

5. The early years of the Great Depression witnessed a sharp rise in wage inequality. But this increase dispersed by the end of the decade such that, on the eve of World War Two, inequality was probably no higher than in the late 1920s.

6. The "Great Compression" of the 1940s resulted in a substantial narrowing of wage inequality within and between groups. Although long-term supply side forces played a role in generating wage compression, much of the decrease in inequality was associated with the effects of World War Two on the relative demand for less-skilled labor, as well as government policies specific to the War.

7. The wage compression that occurred in the 1940s was sustained for some time after World War Two ended, but by 1960 inequality had begun to creep back towards pre-World War Two levels. The baby boom, however, kept wage inequality from rising further in the 1970s.

8. With respect to the reasons posed in the Introduction for exploring historical context, it would appear that the history of wage inequality in the United States is one of both episodes and secular trends. Broadly speaking, both the episodes and secular trends can be explained by shifts in the relative demand and supply of labor of different skills. Some factors that shifted demand and supply have exhibited some continuity over time – for example, immigration and technical change—while others—for example, the Civil War or government policies adopted during World War Two – were specific to the era. As far as government policy is concerned, there is compelling

historical evidence that long-term expansion of educational opportunity has been a potent factor in narrowing wage differentials.[23]

Although I believe these conclusions to represent a reasonable statement of the "stylized facts" of the history of American wage inequality prior to 1970, there is still considerable room for further research. As noted repeatedly throughout the paper, most of what we know about wage inequality prior to 1940 -- especially before 1900 -- is really about inequality between groups, not within groups. This paper has provided some suggestive evidence on trends in wage dispersion in manufacturing during a portion of the second half of the 19th century, and it may be possible to extend the analysis to other sectors and other time periods, albeit in a (very) limited way with presently available data sources. A good deal of additional work on explaining historical changes in wage inequality needs to be done – some, perhaps, along the lines of the CGE models pioneered by Williamson and Lindert (1980) as well as exploring how various institutional (and non-skill related) factors affected changes in wage inequality over time.[24]

[23]This presumes that expansion of the relative supply of educated labor does not alter the bias of technical change in favor of educated labor; see Acemoglu (1998).

[24]As is surely obvious to all readers of this paper, I have had nothing to say about long-term trends in wage differentials by race and gender, matters of great concern to labor economists. On long-term trends in gender-based wage differentials, see Goldin (1990); on racial differences, see Higgs (1977), Margo (1990), and Donohue and Heckman (1991).

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**Table 1**

**Real Wage Indices, 1821-1860 (1856-60 = 100)**

| | Common Labor | Artisans | Clerks |
|---|---|---|---|
| 1821-25 | 70.9 | 73.5 | 64.6 |
| 1826-30 | 81.5 | 89.1 | 79.4 |
| 1831-35 | 80.5 | 88.6 | 75.3 |
| 1836-40 | 78.7 | 81.9 | 81.0 |
| 1841-45 | 116.0 | 112.3 | 120.6 |
| 1846-50 | 107.7 | 102.8 | 115.3 |
| 1851-55 | 101.1 | 97.5 | 111.6 |
| 1856-60 | 100.0 | 100.0 | 100.0 |
| Growth Rate | 1.04% | 0.73% | 1.52% |

Source: Margo (1999, ch.3)

**Table 2**

**Log of Unskilled Daily Wage, 1860 and 1880: Eight State Sample**

A. *Distributional Statistics*

| Sample | CSS | MFG | MFG | MFG |
|---|---|---|---|---|
| Year | 1860 | 1860 | 1860 | 1880 |
| Entrepreneur Counted? | na | Yes | No | na |
| N | 2,892 | 415 | 631 | 616 |
| Mean | -0.042 | 0.042 | -0.121 | -0.016 |
| F | 0.196 | 0.240 | 0.261 | 0.381 |
| q(10) | -0.288 | -0.255 | -0.542 | -0.693 |
| q(50) | 0.000 | 0.099 | -0.057 | 0.000 |
| q(90) | 0.223 | 0.328 | 0.215 | 0.405 |

B. *Change in Wage Inequality, 1860 to 1880*

| Sample | MFG | MFG |
|---|---|---|
| Entrepreneur Counted? | Yes | No |
| )F | 0.141 | 0.120 |
| ) 10-50 | 0.339 | 0.208 |
| ) 50-90 | 0.176 | 0.133 |
| ) 10-90 | 0.515 | 0.341 |

*Notes*: CSS: manuscript census of social statistics, eight state sample (MA, PA, MI, IA, VG, NC, KY, TN; see Margo 2000); MFG, Atack-Bateman manufacturing samples; N = sample size (CSS, minor civil divisions; MFG, firms); F, standard deviation; q(j), value of log wage at quantile j

Definition of unskilled wage: CSS, log of average daily wage of common labor without board; MFG, 1860 = [average monthly cost of male labor/#male workers]/25.8; MFG, 1880: average daily wage of unskilled labor

Sample restrictions: MFG,1860: firms with at least 2 male workers and NO female or child workers, located in one of eight states listed above; full time operation (12 months), log of daily wage, computed as above, must fall within 1-99th quantiles of distribution of log of common wage, CSS sample [-0.693, 0.405]; MFG, 1880: same as 1860 except log wage is not restricted to 1-99th quantiles of 1860 CSS distribution.

Entrepreneur Counted?: if Yes, number of male workers is reduced by one; if No, number of male workers is as reported.

## Table 3

### Log of Daily Unskilled Wage, 1860 and 1880: National Samples

A. *Distributional Statistics*

| Sample | MFG | MFG | MFG |
|---|---|---|---|
| Year | 1860 | 1880 | 1880 |
| Entrepreneur Counted? | Yes | No | na |
| N | 1,120 | 1,921 | 1,815 |
| Mean | 0.090 | -0.070 | 0.050 |
| F | 0.234 | 0.250 | 0.364 |
| q(10) | -0.235 | -0.437 | -0.511 |
| q(50) | 0.151 | -0.032 | 0.000 |
| q(90) | 0.370 | 0.256 | 0.405 |

B. *Change in Wage Inequality, 1860 to 1880*

| Sample | MFG | MFG |
|---|---|---|
| Entrepreneur Counted? | Yes | No |
| )F | 0.130 | 0.114 |
| ) 10-50 | 0.125 | 0.106 |
| ) 50-90 | 0.186 | 0.117 |
| ) 10-90 | 0.311 | 0.223 |

*Note:* Sample restrictions are same as Table 1 except sample is no longer restricted to firms in eight states listed in Table 1.

**Table 4**

**Explaining the Change in Manufacturing Wage Inequality, 1860-1880**

| Dummy Variables Included in Regression | F, 1860 | F, 1880 | ) F, 1880 - 1860 |
|---|---|---|---|
| None | 0.234 | 0.364 | 0.130 |
| Urban | 0.232 | 0.348 | 0.116 [ 12.1%] |
| State | 0.230 | 0.323 | 0.093 [ 28.5%] |
| Industry | 0.230 | 0.348 | 0.118 [ 10.2%] |
| Urban + State | 0.229 | 0.312 | 0.083 [ 36.2%] |
| Urban + State + Industry | 0.225<br>{0.225} | 0.307<br>{0.306} | 0.082 [ 36.9%]<br>{0.081}[ 37.7%] |
| Partial, Urban + State + Industry | 0.227 | 0.309 | 0.082 [ 36.9%] |

*Notes*: Figures in columns 2 and 3 are standard deviations of log of daily mfg. wage, controlling for various combinations of dummy variables listed in column 1 in OLS log wage regression. Figures in [ ] give percent of change in standard deviation explained by the combinations of dummy variables.
Urban = 1 if firm located in urban area (citycode < 999).
Industry dummies refer to 3-digit categories.
Partial: excludes dummies that are insignificant at the 10 percent level.
{}: adds dummy for

## Table 5: Changes in Wage Structure, 1890-1940

A. Ratio of Earnings of Professionals to Wage and Salary Earners in Manufacturing (Males)

| | Bookkeepers | Full Professors | 2nd Year Engineers |
|---|---|---|---|
| 1895 | 2.278 | | |
| 1901 | | | 2.104 |
| 1908 | | 4.159 | |
| 1911 | | 3.747 | 1.899 |
| 1916 | | 3.406 | 1.598 |
| 1921 | | 2.686 | 1.486 |
| 1924 | | 2.809 | 1.472 |
| 1926 | 1.604 | 2.786 | |
| 1938 | | 3.212 | |
| 1939 | 1.268 | | |
| 1940 | | 2.964 | |

B. 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 |
|---|---|---|---|---|---|---|
| Cotton goods | 1.64 | 1.33 | 1.67 | 1.48 | 2.75 | 1.97 |
| Furniture | 1.75 | 1.43 | 1.63 | 1.68 | 2.85 | 2.40 |
| Iron&Steel | 1.41 | 1.25 | 2.04 | 1.48 | 2.88 | 1.85 |
| Soap | 1.97 | 1.51 | 1.48 | 1.33 | 2.90 | 2.01 |
| Tobacco | 2.01 | 1.48 | 1.54 | 1.66 | 3.11 | 2.48 |

*Source:* see Goldin and Katz (1999b)

**Table 6: Summary Measures of Wage Structure, 1940 to 1960**

| | 1940 | 1950 | 1960 |
|---|---|---|---|
| **Log of Weekly Wages** | | | |
| 90-10 | 1.447 | 1.181 | 1.250 |
| 90-50 | 0.654 | 0.504 | 0.567 |
| 50-10 | 0.793 | 0.677 | 0.723 |
| $F^2$ | 0.325 | 0.259 | 0.275 |
| College/High School (6-10 yrs. exp.) | 1.728 | 1.369 | 1.522 |
| White Collar/All Non-farm | 1.256 | 1.177 | 1.192 |
| Blue Collar/All Non-farm | 0.860 | 0.891 | 0.876 |
| Professional/All Non-farm | 1.474 | 1.254 | 1.222 |
| Laborer/All Non-farm | 0.630 | 0.750 | 0.736 |
| Residual Variance (from log wage regression) | 0.197 | 0.177 | 0.171 |

*Source*: Goldin and Margo (1992b)

**Figure 1: Skill Differential, 1821 to 1860 (Williamson and Lindert 1980)**

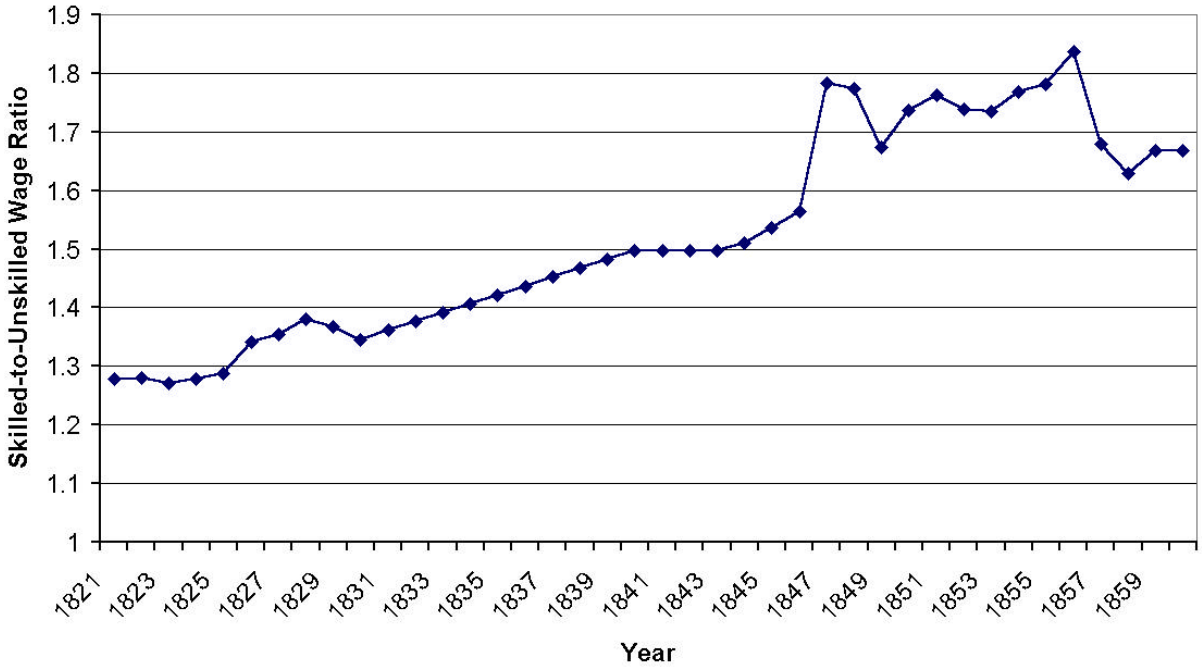

**Figure 2: Ratio of Daily Wage of Skilled Artisans to Daily Wage of Common, Nonfarm Labor (Margo 1999)**

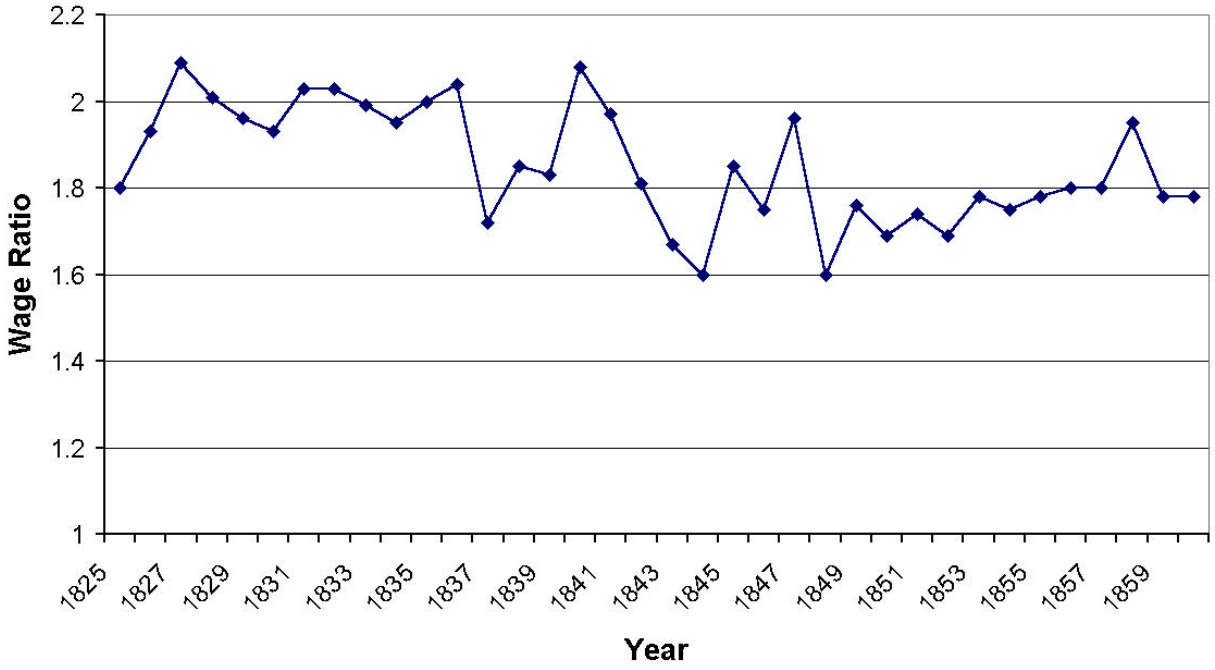


**Figure 3: Ratio of Monthly Wage of White-Collar Workers to Estimated Monthly Wage of Common, Nonfarm Labor (Margo 1999)**

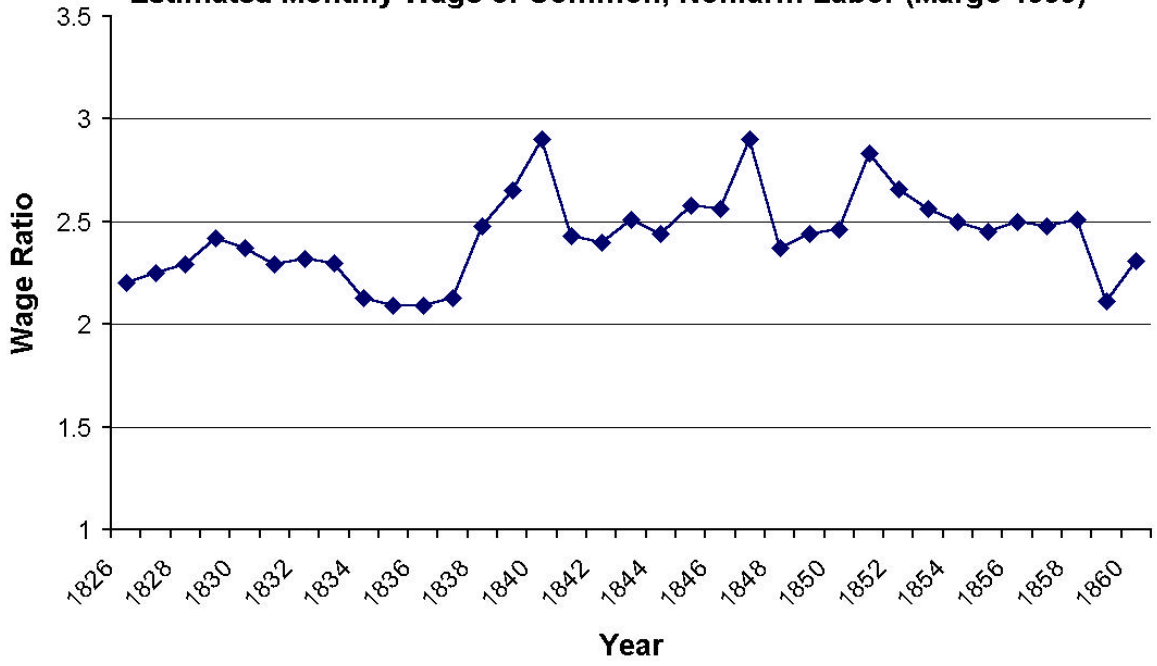

**Figure 4: Ratio of Wages of Artisans to Common Laborers, Burgess (1920)**

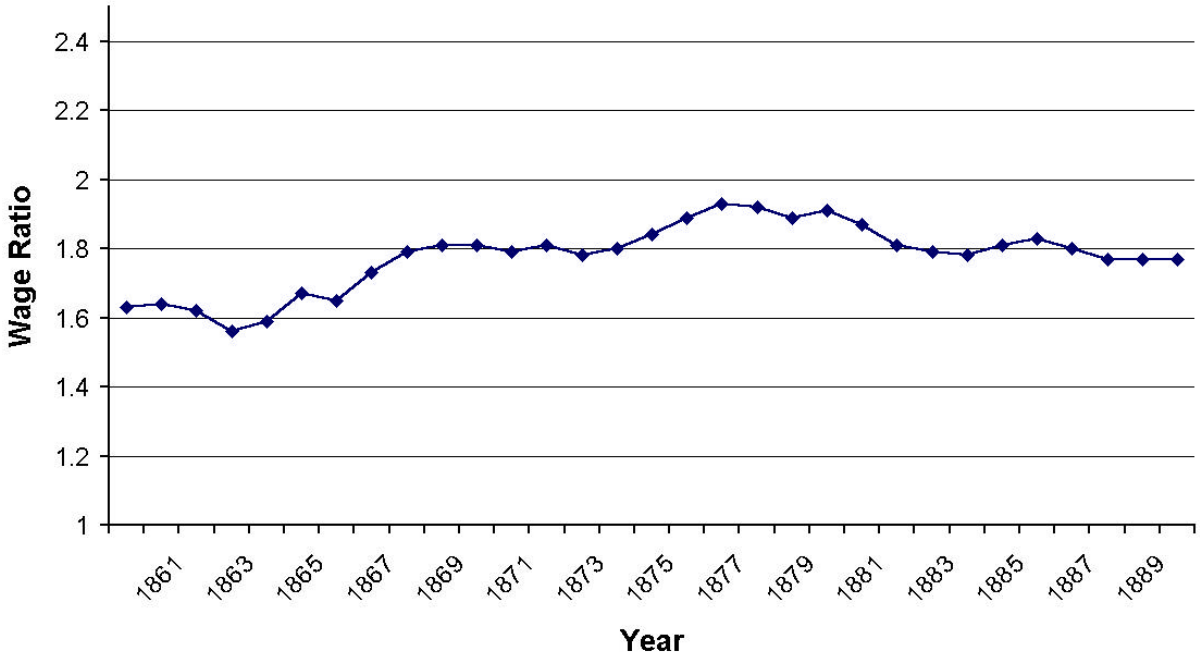


**Figure 5: Ratio of Wages of Skilled Blue Collar Workers to Non-Farm Common Laborers, Williamson and Lindert (1980)**

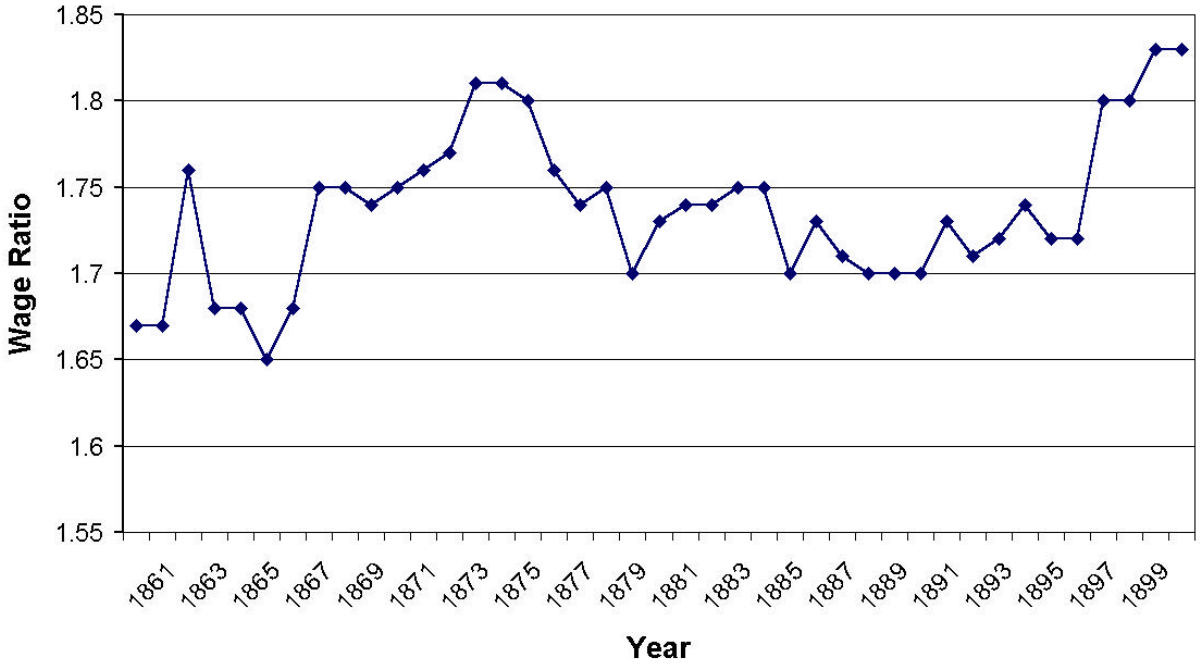

**Figure 6: Ratio of hourly wages of clerks/laborers (male), Class I Railroads**