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The Future of Inequality

The Other Reason Education Matters So Much

By Claudia Goldin and Lawrence F. Katz[1]

As almost every economic policy maker is aware, the gap between the wages of educated and less-educated workers has been growing since the early 1980s – and that change has been both large and pervasive even when the measurement is narrowed by gender, industry or occupation. What's not widely known, though, is that expanding wage inequality is a relatively new phenomenon. In fact, inequality actually narrowed from around 1910 to the 1950s, and then remained fairly stable until the 1980s.

Most surprising, perhaps, there is solid evidence that the ups and downs in wage inequality across the century can be explained almost entirely by what amounts to a race between technological change and educational attainment. Technological change has increased the relative demand for skilled and educated workers, while access to education has increased the relative supply of skilled and educated individuals. And here's the kicker: the big variable appears to be changes in the pace of educational attainment rather than changes in technological progress.

The rise and decline of unions plays a supporting role in the story, as do immigration and outsourcing. But not much of a role. Stripped to essentials, the ebb and flow of wage inequality is all about education and technology.

Inequality and Growth in Postwar America

The American economy grew rapidly in the quarter century after World War II. Average family income in real (inflation-adjusted) terms rose by a remarkable 2.6 percent annually from 1947 to 1973. Equally impressive, the rising tide lifted all boats and even slightly favored the have-nots: Incomes for those in the bottom one-fifth of the income distribution rose by around 3 percent annually, compared with about 2.5 percent for those in the top one-fifth. (See Figure 1.)

But during the subsequent three decades, incomes diverged. From 1973 to 2005, the bottom-fifth of families realized almost no growth in real income, whereas the top fifth enjoyed an average annual gain of 1.6 percent. What's more, the top 5 percent of families experienced an

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even-higher 2 percent annual growth in real income.

Measured over the 25 years from 1980 to 2005, the impact of these diverging fortunes was quite impressive. Income for families at the 20th percentile of the distribution grew by a total of just 10 percent, while those at the 50th percentile managed an increase of 22 percent. Meanwhile, those at the 95th percentile averaged a total gain of 50 percent. To paraphrase Billie Holiday, the economy blessed the child that got his own. (See Figure 2.)

However one views widening economic inequality in terms of right and wrong, it tests the social and political stability of a country already rent by deep economic and cultural divisions. Today's anxieties about inequality may not be as extreme as those at the end of the Gilded Age of the 19th century, when Associate Justice Stephen Field of the Supreme Court asserted that an income tax would begin "a war of the poor against the rich." But parallel concerns today are well-grounded, nonetheless.

To understand what has happened over the decades, it is important to recognize that wage inequality is closely linked to differences among individuals in the level and type of education. Increases in the economic returns to investments in education from 1973 to 2005, for example, account for about 60 percent of the rise in wage inequality. That is, much of the rising wage inequality in recent history can be traced to rising differences between the wages of the highly educated and the less educated.

Education, we would emphasize, affects far more than wage inequality. An educated populace is a key source of economic growth both directly, through improved labor productivity, and indirectly, by spurring innovation and speeding the diffusion of advanced technologies. Broad access to education was, by and large, a major factor in United States economic dominance in the 20th century and in the creation of a broad middle class. Indeed, the American dream of upward mobility both within and across generations has been tied to access to education.

Long-term Trends in Inequality and the Returns from Education

Economic inequality, we noted above, changed little from the 1950s through the 1970s, then increased sharply. Figuring out what happened to wage inequality in earlier decades is less straightforward because the federal government surveyed for information on individual incomes only beginning with the 1940 federal population census. Using a variety of sources, though, including a relatively obscure state census for 1915 so detailed that no federal census has come close to the information it includes, we have pieced together a full century of inequality trends.

The new evidence demonstrates that, rather than rising for much of the century, the returns from education and the wage premium for skills actually fell significantly from 1915 to 1950. The premiums linked to added years of high school and college were exceptionally high around 1915 – and they were substantial even within broad occupational groupings. Educated workers appear to have been in high demand at the beginning of the 20th century, even among blue-collar workers.

We have noted that wage inequality rose from 1980 to the present, yet declined rapidly before 1950. But he previous cycle was equally striking: The returns from years of college and high school around 1915 were as high as the returns from college have been in recent years. Indeed, if the wage premium garnered by those attending college is our benchmark, economic inequality appears to have come full circle across the century. Is there a single explanation for the long decline in inequality followed by the long growth of inequality?

One common-sense explanation is that "computers did it" – more broadly, technological change that increased the demand for workers with skills greatly accelerated in the past several decades, but had been sluggish before. The problem here is that technological change, measured in a variety of ways, was just as rapid and just as likely to increase the demand for high-skilled workers at the start of the 20th century as it has been in the recent past.

Electricity replaced far less efficient sources of light and power in factories and offices. The radio and automobile rapidly diffused and airplanes took to the sky. Factories were transformed by continuous production machinery. As a consequence, more-educated workers were in great demand in clerical work, managerial positions and even in blue-collar positions that required sophisticated knowledge of how to assemble, use and maintain complex machinery. Indeed, in the early 20th century, employers often stated that they wanted operatives familiar with formulas, algebra, blueprints, chemistry and electricity. "Skill-biased" technological change is thus not new, and it did not greatly accelerate toward the end of the 20th century.

The Race

If computers are not to blame, what can account for the decline followed by the sharp rise in wage inequality?

The title of our book, *The Race between Education and Technology,* was taken from a remark by Jan Tinbergen, the first Nobel laureate in economics. Inequality, he said, is the outcome of a race between education and technology. When technological advance vaults ahead of educational change, inequality generally rises. By the same token, when increases in educational

attainment speed up, economic inequality often declines.

Technology, probably skilled-biased technology, proceeded apace and fairly continuously during the last century. Educational attainment also increased rapidly for much of the century but slowed toward its end.

Average years of schooling increased rapidly and continuously for Americans born from 1875 to 1950 (and educated in the United States). Indeed, America led the world in universal education in the first half of the 20th century, beginning with the movement in 1910 to1940 to expand free compulsory education to the high school years and continuing with the transition to mass college attendance.

No other nation in the world enjoyed so complete a shift to mass secondary school education before 1940, and in the United States the average educational attainment of the work force sharply increased. The high school movement was so swift that by 1940 more than half of all 18-year-olds completed secondary school – a gain from less than 10 percent a mere 30 years earlier.

On average, educational attainment increased by almost one year per decade for cohorts born from 1875 to 1950. The increase in educated Americans was so great that the relative supply of educated workers outran or kept pace with demand, and continued to do so until fairly recently.

But something happened in the 1970s. A sharp slowdown in the increase in educational attainment and high-school graduation rates occurred for those born after 1950. College graduation rates began to slow and high school graduation rates reached a plateau. The United States, once the world leader in the proportion of people graduating from high school, has fallen to near the bottom of the (rich and relatively rich) nations that belong to the Organization of Economic Cooperation and Development. And while the United States is still a leader in college attendance, its college-completion rates for recent cohorts are lagging other nations.

To understand the evolution of economic inequality over time, we must measure the "educational stock," or the educational attainment of all workers in the United States, over time. To do this, we combined our measures of educational attainment across age cohorts and then folded in the education of foreign-born (and educated) residents. Our estimates nicely capture the rapid increase in educational attainment during the first eight decades of the 20th century, as well as the slowdown after 1980.

The changes in the educational attainment of the work force are stark. From 1915 to 1960, the relative supply of college educated workers increased by an average annual rate of 3 percent, and by a whopping 3.8 percent from 1960 to 1980. But from 1980 to 2005, the increase was just 2

percent per year.

The slowdown in relative skill supplies in the latter period largely explains the increase in the rate of return from education from those who did get a lot of it, and much of the rising wage inequality in the post-1980s. Similarly, the large increase in educational attainment from 1900 to the 1970s was largely responsible for the decrease in the return from education and the reduction in inequality for so much of the century. Putting it another way, the 20th century's two inequality tales are largely the result of changes in the supply of educated workers rather than changes in the demand.

The impact of education on the relative supply of skilled workers is not a simple function of years of school. A more-educated person today (one who is college-educated) is different from a more-educated person in the past (one who had a high school diploma). Both the high school and college wage premiums are important. Here we examine changes in the college wage premium.

The framework we employ has a demand curve for skills moving outward through time (to reflect skilled-biased technological change) at a constant rate and a supply-of-skills function shifting out at a changing rate. We found that the relative earnings of college to non-college workers accurately tracks shifts in the relative supply of educated workers over the 90 years from 1915 to 2005. Indeed, as shown in Figure 3, the wage gap predicted by the relative supply of skills fits almost perfectly once we make allowances for the distortion caused by World War II.

The big changes, both up and down, in the returns from education were due to shifts in the relative supply of educated workers. The relative supply of college workers increased at an average annual rate of 3.8 percent from 1960 to 1980, but at just 2 percent annually from 1980 to 2005. The most important factor accounting for the soaring college wage premium of the post-1980 period was the slowdown in the growth of educational attainment. (See Figure 4.)

Our analysis has thus far brushed aside two potentially important factors: labor unions and immigration. A closer look suggests that they have both played roles, but not nearly as large as many policy advocates have thought.

Most estimates of the impact of declining unionization on wage inequality show that about 10 to 20 percent of increased wage inequality for men (and almost none for women) can be explained by the ebbing strength of unions. The union wage premium – that is, the extra wages going to union members doing the same work as non-union members – is about 15 percent. But over the period examined, union membership declined from a peak of 33 percent of the nonagricultural labor force to just 12 percent. Therefore, declining union representation of less-

skilled workers could not have had a large effect on the college wage premium; simply plugging in the numbers suggests that this factor accounts for just three percentage points out of the total increase in the college wage premium of 23 percentage points.

The other factor is immigration. As noted earlier, the ratio of college- to high-school-educated workers increased at just a two percent rate from 1980 to 2005 – hardly one-half the pace of earlier decades. And since immigration increased greatly after 1970, and a large fraction of the newly arrived came with little education, it is certainly plausible that the recent sluggishness in educational gains could be due to changes in the numbers and educational attainment of immigrants.

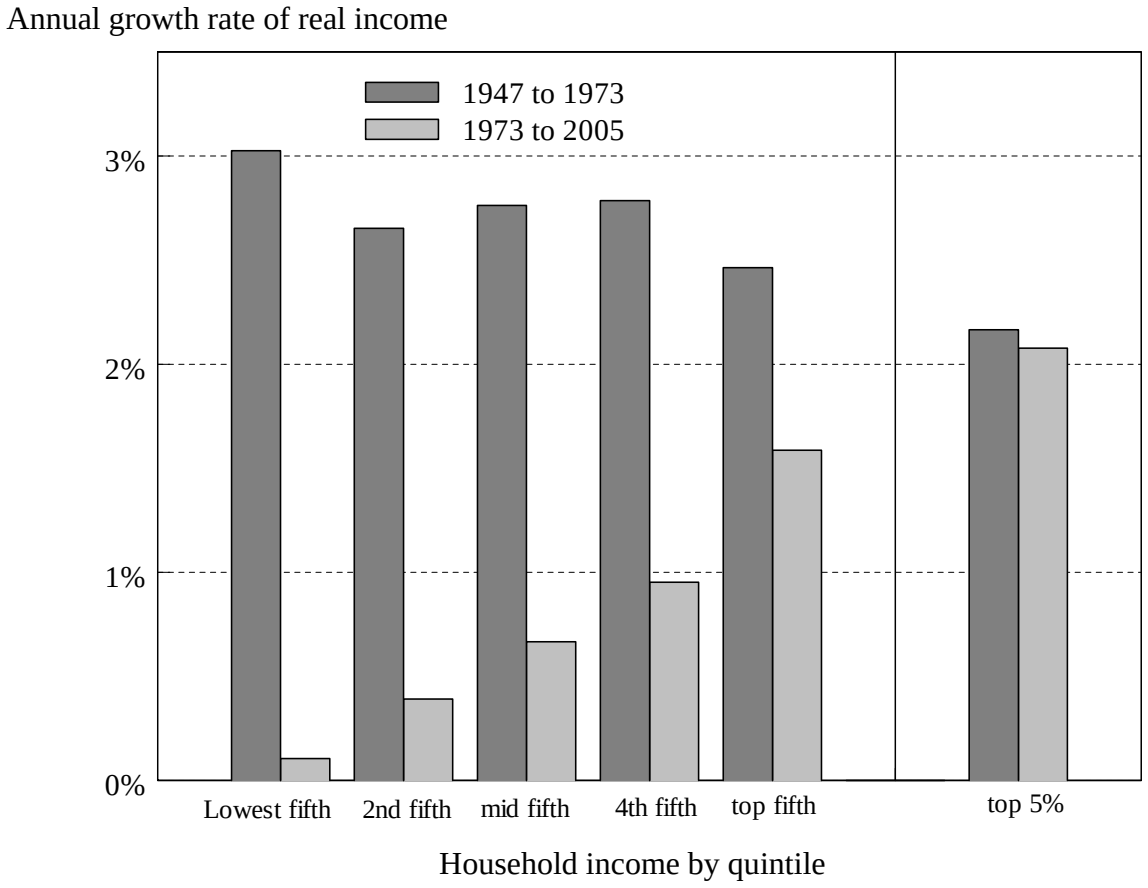
Could be – but it is not. Most of the slowdown in college attainment has been due to a slowdown in attendance by the native-born population. In the absence of immigration, the college-high school wage premium would have increased by 20 percent after 1980, as opposed to the 23 percent actually recorded. Strikingly, even the slowdown in the change in the high-school-graduate-to-dropout ratio is still largely due to the native-born population and not to immigrants (including both the legal and illegal populations).

The Future of Inequality

The bottom line here is that labor-market-based efforts to reduce inequality depend on increasing the supply of educated workers. The big questions, then, are why the rise in educational attainment has slowed and what policies could reverse the trend. This is not the place to find detailed answers. But clearly, one important factor in the slowdown has been the rapid increase in tuition in both public and private colleges. Another is the stagnation of secondary-school graduation rates and the fact that too many high school graduates are inadequately prepared to pass college courses.

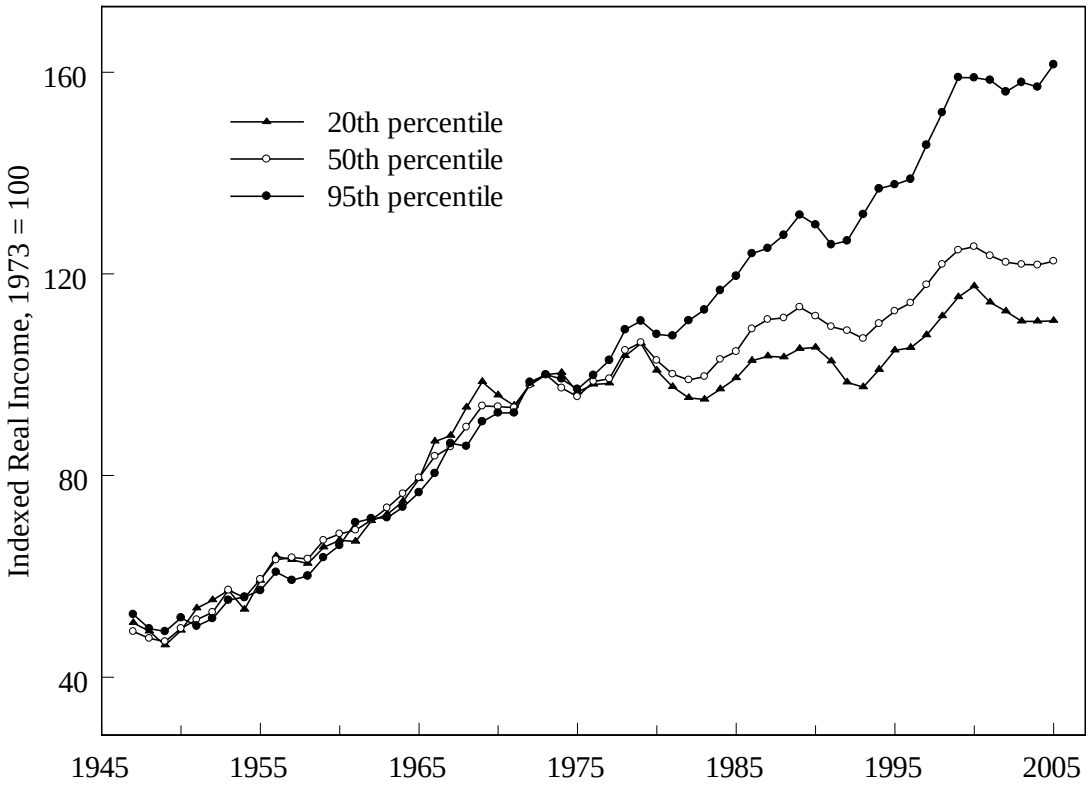
Not so long ago, the American economy grew rapidly and wages grew in tandem, with education playing a large, positive role in both. The United States led the way in mass education and was, until fairly recently, many decades ahead of even the rich nations of Europe. The challenge now is to revitalize education-based mobility. For without it, it appears that the technological advances that largely drive economic growth will increasingly divide the nation.

Figure 1: Which Households Have the Fastest Growing Incomes?



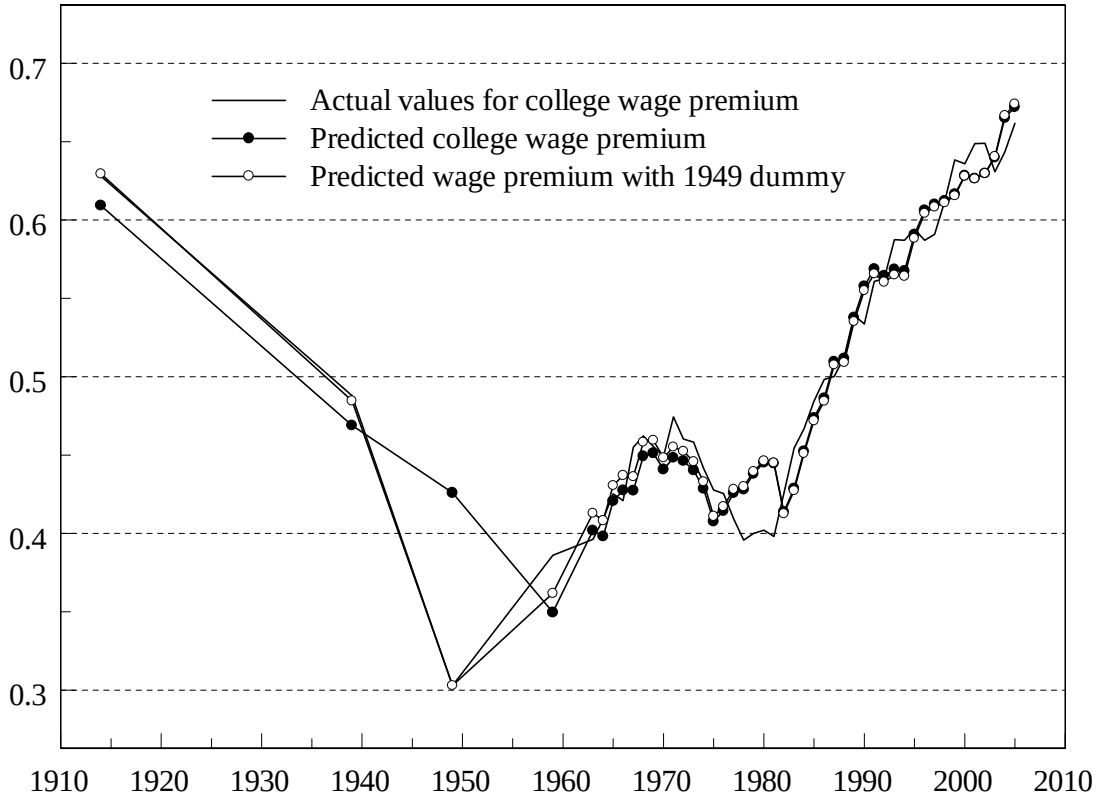
Source: U.S. Census Bureau, Historical Income Tables, table F3, http://www.census.gov/hhes/www/income/histinc/f03ar.html, updated September 15, 2006.

Figure 2: Low, Middle and High Family-Incomes, 1947 to 2005



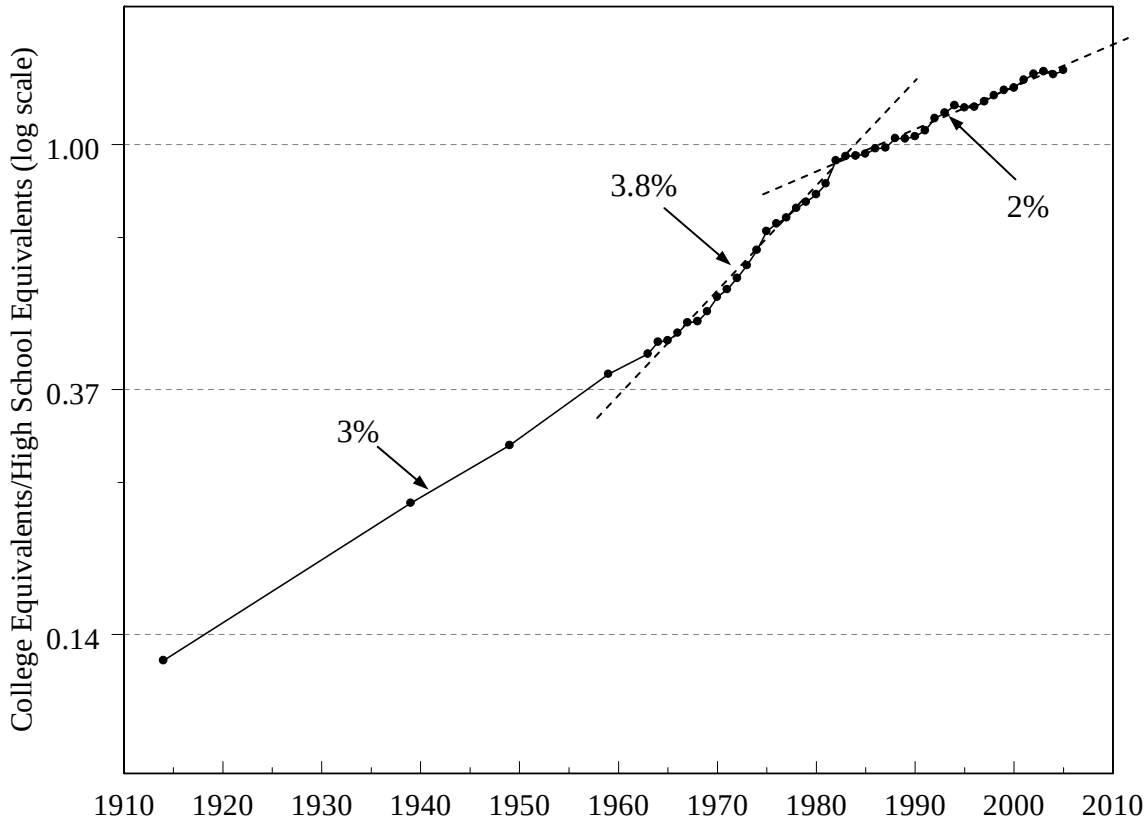
Source: U.S. Census Bureau, Historical Income Tables, table F3, http://www.census.gov/hhes/www/income/histinc/f03ar.html, updated September 15, 2006.

Figure 3: College Wage Premium, 1915 to 2005



Source: The actual values for the college wage premium are from chapter 8, *The Race between Education and Technology*. The predicted college wage premium comes from the statistical regression analysis found in table 2, chapter 8 of the book.

Figure 4: Ratio of College to High School Workers, 1915 to 2005



Source: *The Race between Education and Technology*, chapter 8, table 1.
Note: Growth rates for various segments (1915 to 1960, 1960 to 1980, and 1980 to 2005) are given.