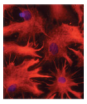
EXTENDED PDF FORMAT
SPONSORED BY

Travel Grants Available
Neuroscience 2014
Application Deadline: July 31st
>Apply Now
R&D systems
a bietechne brand
www.rndsystems.com

Skills, education, and the rise of earnings inequality among the "other 99 percent"

David H. Autor

Science **344**, 843 (2014);
DOI: 10.1126/science.1251868

This copy is for your personal, non-commercial use only.

If you wish to distribute this article to others, you can order high-quality copies for your colleagues, clients, or customers by clicking here.

Permission to republish or repurpose articles or portions of articles can be obtained by following the guidelines here.

The following resources related to this article are available online at www.sciencemag.org (this information is current as of August 6, 2014):

Updated information and services, including high-resolution figures, can be found in the online version of this article at:
http://www.sciencemag.org/content/344/6186/843.full.html

Supporting Online Material can be found at:
http://www.sciencemag.org/content/suppl/2014/05/21/344.6186.843.DC1.html

A list of selected additional articles on the Science Web sites **related to this article** can be found at:
http://www.sciencemag.org/content/344/6186/843.full.html#related

This article **cites 22 articles**, 5 of which can be accessed free:
http://www.sciencemag.org/content/344/6186/843.full.html#ref-list-1

This article has been **cited by** 1 articles hosted by HighWire Press; see:
http://www.sciencemag.org/content/344/6186/843.full.html#related-urls

This article appears in the following **subject collections:**
Economics
http://www.sciencemag.org/cgi/collection/economics

Downloaded from www.sciencemag.org on August 6, 2014

Science (print ISSN 0036-8075; online ISSN 1095-9203) is published weekly, except the last week in December, by the American Association for the Advancement of Science, 1200 New York Avenue NW, Washington, DC 20005. Copyright 2014 by the American Association for the Advancement of Science; all rights reserved. The title *Science* is a registered trademark of AAAS.

of rising or shrinking inequality. Which one dominates depends on the institutions and policies that societies choose to adopt.

REFERENCES

1. S. Kuznets, *Shares of Upper Income Groups in Income and Savings* (National Bureau of Economic Research, Cambridge, MA, 1953).
2. R. J. Lampman, *The Share of Top Wealth holders in National Wealth, 1922-1956* (Princeton Univ. Press, Princeton, NJ, 1962).
3. A. B. Atkinson, A. J. Harrison, *Distribution of Personal Wealth in Britain, 1923-1972* (Cambridge Univ. Press, Cambridge, 1978).
4. A. Daumard, *Les fortunes françaises au 19e siècle. Enquête sur la répartition et la composition des capitaux privés à Paris, Lyon, Lille, Bordeaux et Toulouse d'après l'enregistrement des déclarations de successions* (Mouton, Paris, 1973).
5. A. H. Jones, *American Colonial Wealth: Documents and Methods* (Arno Press, New York, 1977).
6. P. Lindert, *J. Polit. Econ.* **94**, 1127–1162 (1986).
7. L. Soltow, *Distribution of Wealth and Income in the United States in 1798* (Univ. of Pittsburgh Press, Pittsburgh, PA, 1989).
8. T. Piketty, *Les hauts revenus en France au 20e siècle—Inégalités et redistributions, 1901–1998* (Grasset, Paris, 2001).
9. T. Piketty, *J. Polit. Econ.* **111**, 1004–1042 (2003).
10. A. B. Atkinson, *J. R. Stat. Soc. Ser. A Stat. Soc.* **168**, 325–343 (2005).
11. T. Piketty, E. Saez, *Q. J. Econ.* **118**, 1–41(2003).
12. A. B. Atkinson, T. Piketty, Eds., *Top Incomes over the 20th Century—A Contrast Between Continental European and English Speaking Countries* (Oxford Univ. Press, New York, 2007).
13. A. B. Atkinson, T. Piketty, Eds., *Top Incomes—A Global Perspective* (Oxford Univ. Press, New York, 2010).
14. A. B. Atkinson, T. Piketty, E. Saez, *J. Econ. Lit.* **49**, 3–71 (2011).
15. F. Alvaredo, A. B. Atkinson, T. Piketty, E. Saez, *J. Econ. Perspect.* **27**, 3–21 (2013).
16. W. Kopczuk, E. Saez, *Natl. Tax J.* **57**, 445–487 (2004).
17. T. Piketty, G. Postel-Vinay, J. L. Rosenthal, *Am. Econ. Rev.* **96**, 236–256 (2006).
18. J. Roine, D. Waldenstrom, *Scand. J. Econ.* **111**, 151–187 (2009).
19. H. Ohlson, J. Roine, D. Waldenstrom, in J. B. Davies, Ed., *Personal Wealth from a Global Perspective* (Oxford Univ. Press, Oxford, 2008), pp. 42–63.
20. D. Waldenstrom, *Lifting all Boats? The Evolution of Income and Wealth Inequality Over the Path of Development* (Lund University, Sweden, 2009)
21. T. Piketty, *Q. J. Econ.* **126**, 1071–1131 (2011).
22. R. Goldsmith, *Comparative National Balance Sheets: A Study of Twenty Countries, 1688-1978* (Univ. of Chicago Press, Chicago, IL, 1985)
23. T. Piketty, G. Zucman, *Q. J. Econ.* **129**, in press (2014); http://piketty.pse.ens.fr/files/PikettyZucman2013WP.pdf.
24. T. Piketty, *Capital in the Twenty-first Century* (Harvard Univ. Press, Cambridge, MA, 2014).
25. J. Stiglitz, *Econometrica* **37**, 382–397 (1969).
26. M. Nirei, "Pareto Distributions in Economics Growth Models," Institute of Innovation Research Working Paper No. 09-05, Hitotsubashi University, Tokyo (2009)
27. T. Piketty, G. Postel-Vinay, J. L. Rosenthal, *Explor. Econ. Hist.* **51**, 21–40 (2014).
28. J. Davies, S. Sandstrom, T. Shorrocks, E. Wolff, *Econ. J.* **121**, 223–254 (2011).
29. G. Zucman, *Q. J. Econ.* **128**, 1321–1364 (2013).
30. C. Goldin, L. Katz, *The Race Between Education and Technology* (Harvard Univ. Press, Cambridge, MA, 2008).

SUPPLEMENTARY MATERIALS

www.sciencemag.org/content/344/6186/838/suppl/DC1
Supplementary Text
Figs. S1 and S2
References (*31*, *32*)

10.1126/science.1251936

REVIEW

Skills, education, and the rise of earnings inequality among the "other 99 percent"

David H. Autor

The singular focus of public debate on the "top 1 percent" of households overlooks the component of earnings inequality that is arguably most consequential for the "other 99 percent" of citizens: the dramatic growth in the wage premium associated with higher education and cognitive ability. This Review documents the central role of both the supply and demand for skills in shaping inequality, discusses why skill demands have persistently risen in industrialized countries, and considers the economic value of inequality alongside its potential social costs. I conclude by highlighting the constructive role for public policy in fostering skills formation and preserving economic mobility.

Public debate has recently focused on a subject that economists have been analyzing for at least two decades: the steep, persistent rise of earnings inequality in the U.S. labor market and in developed countries more broadly. Much popular discussion of inequality concerns the "top 1 percent," referring to the increasing share of national income accruing to the top percentile of households. Although this phenomenon is undeniably important, an exclusive focus on the concentration of top incomes ignores the component of rising inequality that is arguably even more consequential for the "other 99 percent" of citizens: the dramatic growth in the wage premium associated with higher education and, more broadly, cognitive ability. This paper considers the role of the rising skill premium in the evolution of earnings inequality.

There are three reasons to focus a discussion of rising inequality on the economic payoff to skills and education. First, the earnings premium for education has risen across a large number of advanced countries in recent decades, and this rise contributes substantially to the net growth of earnings inequality. In the United States, for example, about two-thirds of the overall rise of earnings dispersion between 1980 and 2005 is proximately accounted for by the increased premium associated with schooling in general and postsecondary education in particular (*1*, *2*). Second, despite a lack of consensus among economists regarding the primary causes of the rise of very top incomes (*3*–*6*), an influential literature finds that the interplay between the supply and demand for skills provides substantial insight into why the skill premium has risen and fallen over time—and, specifically, why the earnings gap between college and high school graduates has more than doubled in the United States over the past three decades. A third reason for focusing on the skill premium is that it offers broad insight into the evolution of inequality within a market economy, highlighting the social value of inequality alongside its potential social costs and illuminating the constructive role for public policy in maximizing the benefits and minimizing the costs of inequality.

The rising skill premium is not, of course, the sole cause of growing inequality. The decades-long decline in the real value of the U.S. minimum wage (*7*), the sharp drops in non-college employment opportunities in production, clerical, and administrative support positions stemming from automation, the steep rise in international competition from the developing world, the secularly declining membership and bargaining power of U.S. labor unions, and the successive enactment of multiple reductions in top federal marginal tax rates, have all served to magnify inequality and erode real wages among less educated workers. As I discuss below, the foremost concern raised by these multiple forces is not their impact on inequality per se, but rather their adverse effect on the real earnings and employment of less educated workers.

I begin by documenting the centrality of the rising skill premium to the overall growth of earnings inequality. I next consider why skills are heavily rewarded in advanced economies and why the demand for them has risen over time. I then demonstrate the substantial explanatory power of a simple framework that embeds both the demand and supply for skills in interpreting the evolution of the inequality over five decades. The final section considers the productive role that inequality plays in a market economy and the potential risks attending very high and rising inequality; evidence on whether those risks have been realized; and the role of policy and governance in encouraging skills formation, fostering opportunity,

Department of Economics and National Bureau of Economic Research, Massachusetts Institute of Technology, 40 Ames Street, E17-216, Cambridge, MA 02142, USA. **E-mail: dautor@mit.edu**

and countering the possibility that extremes of inequality erode economic mobility and reduce economic dynamism.

The Critical Role of Skills in the Labor Market

There is no denying the extraordinary rise in the incomes of the top 1% of American households over the past three decades. Between 1979 and 2012, the share of all household income accruing to the top percentile of U.S. households rose from 10.0% to 22.5% (*8*, *9*). To get a sense of how much money that is, consider the conceptual experiment of redistributing the gains of the top 1% between 1979 and 2012 to the bottom 99% of households (*10*). How much would this redistribution raise household incomes of the bottom 99%? The answer is $7107 per household—a substantial gain, equal to 14% of the income of the median U.S. household in 2012. (I focus on the median because it reflects the earnings of the typical worker and thus excludes the earnings of the top 1%.)

Now consider a different dimension of inequality: the earnings gap between U.S. workers with a 4-year college degree and those with only a high school diploma (*11*). Economists frequently use this college/high school earnings gap as a summary measure of the "return to skill"—that is, the gain in earnings a worker can expect to receive from investing in a college education. As illustrated in Fig. 1, the earnings gap between the median college-educated and median high school–educated among U.S. males working full-time in year-round jobs was $17,411 in 1979, measured in constant 2012 dollars. Thirty-three years later, in 2012, this gap had risen to $34,969, almost exactly double its 1979 level. Also seen is a comparable trend among U.S. female workers, with the full-time, full-year college/high school median earnings gap nearly doubling from $12,887 to $23,280 between 1979 and 2012. As Fig. 1 underscores, the economic payoff to college education rose steadily throughout the 1980s and 1990s and was barely affected by the Great Recession starting in 2007.

Because the earnings calculations in Fig. 1 reflect individual incomes while the top 1% calculations reflect household incomes, the two calculations are not directly comparable. To put the numbers on the same footing, consider the earnings gap between a college-educated two-earner husband-wife family and a high school–educated two-earner husband-wife family, which rose by $27,951 between 1979 and 2012 (from $30,298 to $58,249). This increase in the earnings gap between the typical college-educated and high school–educated household earnings levels is four times as large as the redistribution that has notionally occurred from the bottom 99% to the top 1% of households. What this simple calculation suggests is that the growth of skill differentials among the "other 99 percent" is arguably even more consequential than the rise of the 1% for the welfare of most citizens.

The median earnings comparisons in Fig. 1 also convey a key feature of rising inequality that cannot be inferred from trends in top incomes: Wage inequality has risen throughout the earnings distribution, not merely at the top percentiles. Figure S1 documents this pattern by plotting, for 12 Organization for Economic Cooperation and Development (OECD) member countries over three decades (1980 to 2011), the change in the ratio of full-time earnings of males at the 90th percentile relative to males at the 10th percentile of the wage distribution. Although the 90/10 earnings ratio differed greatly across countries at the earliest date of the sample—from a low of 2.0 in Sweden to a high of 3.6 in the United States—this earnings ratio increased substantially in all but one of them (France) over the next 30 years, growing by at least 25 percentage points in 10 countries, by at least 50 percentage points in 8 countries, and by more than 100 percentage points in three countries (New Zealand, the United Kingdom, and the United States).

How much does the rising education premium contribute to the increase of earnings inequality? Although data limitations make it difficult to answer this question for most countries, we do know the answer for the United States. Goldin and Katz (*1*) found that the increase in the education wage premium explains about 60 to 70% of the rise in the dispersion of U.S. wages between 1980 and 2005 and, similarly, Lemieux (*12*) calculated that higher returns to postsecondary education can account for 55% of the rise in male hourly wage variance from 1973–1975 to 2003–2005. Firpo *et al.* (*13*) found that rising returns to education can explain just over 95% of the rise of the U.S. male 90/10 earnings ratio between 1984 and 2004. That is, holding the expanding education premium constant over this period, there would have been essentially no increase in the relative wages of the 90th-percentile worker versus the 10th-percentile worker.

I have so far used the terms education and skill interchangeably. What evidence do we have that it is skills that are rewarded per se, rather than simply educational credentials? The Program for the International Assessment of Adult Competencies (PIAAC) provides a compelling data source for gauging the importance of skills in wage determination. The PIAAC is an internationally harmonized test of adult cognitive and workplace skills (literacy, numeracy, and problem-solving) that was administered by the OECD to large, representative samples of adults in 22 countries between 2011 and 2013 (*14*). Figure 2, sourced from (*15*), plots the relationship between adults' earnings and their PIAAC numeracy scores across these 22 countries. The length of each bar reflects the average percentage earnings differential between full-time workers ages 35 to 54 who differ by one standard deviation in the PIAAC score. The whiskers on each bar provide the 95% confidence intervals for the estimates.

College/high school median annual earnings gap, 1979–2012

In constant 2012 dollars

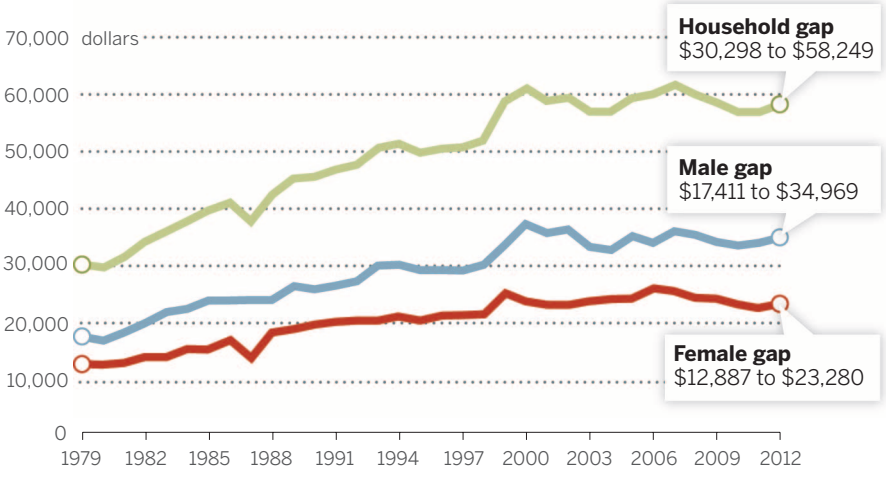


Fig. 1. College/high school median annual earnings gap, 1979–2012. Figure is constructed using Census Bureau P-60 (1979–1991) and P-25 (1992–2012) tabulations of median earnings of full-time, full-year workers by educational level and converted to constant 2012 dollars (to account for inflation) using the CPI-U-RS price series. Prior to 1992, college-educated workers are defined as those with 16 or more years of completed schooling, and high school–educated workers are those with exactly 12 years of completed schooling. After 1991, college-educated workers are those who report completing at least 4 years of college, and high school–educated workers are those who report having completed a high school diploma or GED credential.

This figure conveys three points. First, cognitive skills are substantially rewarded in the labor market across all 22 economies. The average wage premium corresponding to one "unit" (i.e., one standard deviation) increase in measured cognitive skills is 18%. In addition, cognitive earnings premiums differ substantially across countries. The premium is below 13% in Sweden, the Czech Republic, and Norway. It is above 20% in six countries. The United States stands out as having the highest measured return to skill, with a premium of 28% per unit increment to cognitive ability. Concretely, comparing two U.S. workers who are one standard deviation above and one standard deviation below the population average of cognitive ability, we would expect their full-time weekly earnings to differ by 50 to 60%. Notably, the high return to cognitive ability in the United States does not follow automatically from high levels of U.S. earnings inequality. If U.S. wages were determined mainly by luck, beauty, or family connections, we would expect little connection between workers' cognitive ability and their labor market rewards (*16*). Figure 2 demonstrates that this is not the case.

Of course, these data do not explain why the skill premium has risen over time, nor why the United States has a higher skill premium than so many other advanced nations. The next section considers the supply and demand for skill in the labor market—specifically, why they fluctuate over time and how their interaction helps to determine the skill premium. I focus on the United States in this section to allow a deeper exploration of the data.

Education and Inequality

Workers' earnings in a market economy depend fundamentally (some economists would say entirely) on their productivity—that is, the value they produce through their labor. And in turn, workers' productivity depends on two factors. One is their capabilities, concretely, the tasks they can accomplish (i.e., their skills). A second is their scarcity: The fewer workers that are available to accomplish a task, and the more employers need that task accomplished, the higher is workers' economic value in that task. In conventional terms, the skill premium depends upon what skills employers require (skill demand) and what skills workers have acquired (skill supply). To interpret the evolution of this premium, we need to account for both forces.

Skill Demands: The Long View

A technologically advanced economy requires a literate, numerate, and technically and scientifically trained workforce to develop ideas, manage complex organizations, deliver healthcare services, provide financing and insurance, administer government services, and operate critical infrastructure. This was not always the case. In 1900, 4 in 10 U.S. jobs were in agriculture, 11% of the population was illiterate, a substantial fraction of economic activity required hard physical labor, and workers' strength and physical stamina were key job skills (*17*, *18*). Few citizens would have predicted at the time that a century later, health care, finance, information technology, consumer electronics, hospitality, leisure, and entertainment would employ far more workers than agriculture—which employed only 2% of U.S. workers in 2010. As physical labor has given way to cognitive labor, the labor market's demand for formal analytical skills, written communications, and specific technical knowledge—what economists often loosely term cognitive skills—has risen spectacularly.

The central determinant of the supply of skills available to an advanced economy is its education system. In 1900, the typical young, native-born American had only a common school education, about the equivalent of six to eight grades (*19*). By the late 19th century, however, many Americans recognized that farm employment was declining, industry was rising, and their children would need additional education to earn a living. Over the first four decades of the 20th century, the United States became the first nation in the world to deliver universal high school education to its citizens. Tellingly, the high school movement was led by the farm states.

As the high school movement reached its conclusion, postsecondary education became increasingly indispensable to the growing occupations of medicine, law, engineering, science, and management. In 1940, only 6% of Americans had completed a 4-year college degree. From the end of the Second World War to the early 1980s, however, the ranks of college-educated workers rose robustly and steadily, with each cohort of workers entering the labor market boasting a proportionately higher rate of college education than the cohort that preceded it. This intercohort pattern, which was abetted by the Second World War and Korean War GI Bills (*20*) and by huge state and federal investments in public college and university systems, is depicted in Fig. 3A. From 1963 through 1982, the fraction of all U.S. hours worked that were supplied by college graduates rose by almost 1 percentage point per year, a remarkably rapid gain.

After 1982, however, the rate of intercohort increase fell by almost half—from 0.87 percentage points to 0.47 percentage points per year—and did not begin to rebound until 2004, nearly two decades later. As shown in fig. S2, this deceleration in the supply of college graduates is particularly stark when one focuses on young adults with fewer than 10 years of experience—that is, the cohorts of recent labor market entrants at each point in time. Although the supply of young college-educated males relative to young high school–educated males increased rapidly in the 1960s and early 1970s (and indeed throughout the postwar period), this rising tide reached an apex in 1974 from which

Fig. 2. Cross-national differences in wage returns to skills, 2011–2013. Reproduced with permission from Hanushek *et al.* [(*15*), table 2]. Estimates are obtained by regressing the natural logarithm of workers' weekly full-time earnings on test scores while controlling for sex and labor market experience (both a linear and a quadratic term). Regression estimates are performed separately for each country and test scores are normalized with mean zero and unit standard deviation within each country. Estimates that normalize test scores on a common basis across countries, or that use literacy or problem-solving scores rather than numeracy scores, yield qualitatively similar patterns.

it barely budged for the better part of the next 30 years. Among young females, the deceleration in supply was also unmistakable, although not as abrupt or as complete as for males.

The counterpart to this deceleration in the growth of supply of college-educated workers is the steep rise in the college premium commencing in the early 1980s and continuing for 25 years. Concretely, when the influx of new college graduates slowed, the premium that a college education commanded in the labor market increased. The critical role played by the fluctuating supply of college education in the rise of U.S. inequality is documented in Fig. 3B, which plots the college wage premium from 1963 through 2012 (blue line). This premium fluctuated in a comparatively narrow band during the 1960s and 1970s, as rising demand for educated workers was met with rapidly rising year-over-year increases in supply. In 1981, the average college graduate earned 48% more per week than the average high school graduate—a significant earnings gap but not an earnings gulf. When the supply deceleration began in 1982, however, the college premium hit an inflection point. This premium notched remarkably rapid year-over-year gains from 1982 forward, reaching 72% in 1990, 90% in 2000, and 97% in 2005 (*21*, *22*). Thus, the average earnings of college graduates were 1.5 times those of high school graduates in 1982 but were double those of high school graduates by 2005.

Why is this deceleration in supply relevant to the college premium? After all, although the growth of supply slowed in 1982, it was still rising. A likely answer is that the demand for college workers rose in the interim. Throughout much of the 20th century, successive waves of innovation—electrification, mass production, motorized transportation, telecommunications—have reduced the demand for physical labor and raised the centrality of cognitive labor in practically every walk of life. The past three decades of computerization, in particular, have extended the reach of this process by displacing workers from performing routine, codifiable cognitive tasks (e.g., bookkeeping, clerical work, and repetitive production tasks) that are now readily scripted with computer software and performed by inexpensive digital machines. This ongoing process of machine substitution for routine human labor complements educated workers who excel in abstract tasks that harness problem-solving ability, intuition, creativity, and persuasion—tasks that are at present difficult to automate but essential to perform. Simultaneously, it devalues the skills of workers, typically those without postsecondary education, who compete most directly with machinery in performing routine-intensive activities. The net effect of these forces is to further raise the demand for formal education, technical expertise, and cognitive ability (*23*–*27*).

Bringing the Supply-Demand Framework to the Data

The persistently rising demand for educated labor in advanced economies was first noted by the Nobel Prize–winning economist Jan Tinbergen (*28*) and is often referred to as the "education race" model (*19*). Its primary implication is that if the supply of educated labor does not keep pace with persistent outward shifts in demand for skills, the skill premium will rise. In the words of the Red Queen in Lewis Carroll's Alice in Wonderland, "…it takes all the running you can do, to keep in the same place." Thus, when the rising supply of educated labor began to slacken in the early 1980s, a logical economic consequence was an increase in the college skill premium.

To more formally account for the impact of the fluctuating growth rate of supply of college-educated workers on the college wage differential, Fig. 3B depicts the fit of a simple regression model that predicts the college wage premium in each year as a function of two factors: (i) the contemporaneous supply of college graduates, and (ii) a time trend, which serves as a proxy for the secularly rising demand for college-educated

The supply of college graduates and the U.S. college/high school premium, 1963–2012

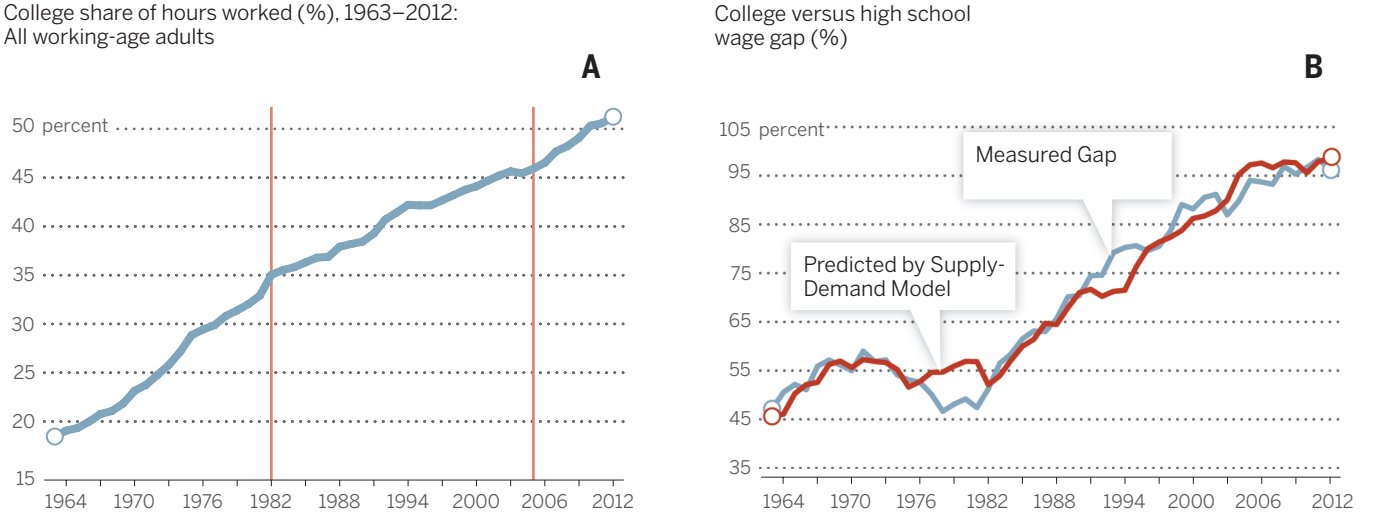


Fig. 3. The supply of college graduates and the U.S. college/high school premium, 1963–2012. (**A**) College share of hours worked in the United States, 1963–2012: All working-age adults. Figure uses March CPS data for earnings years 1963 to 2012. The sample consists of all persons aged 16 to 64 who reported having worked at least 1 week in the earnings years, excluding those in the military. Following an extensive literature, college-educated workers are defined as all of those with four or more completed years of college plus half of those with at least 1 year of completed college. Non-college workers are defined as all workers with high school or less education, plus half of those with some completed college education. For each individual, hours worked are the product of usual hours worked per week and the number of weeks worked last year. Individual hours worked are aggregated using CPS sampling weights. (**B**) College versus high school wage gap. Figure uses March CPS data for earnings years 1963 to 2012. The series labeled "Measured Gap" is constructed by calculating the mean of the natural logarithm of weekly wages for college graduates and non–college graduates, and plotting the (exponentiated) ratio of these means for each year. This calculation holds constant the labor market experience and gender composition within each education group. The series labeled "Predicted by Supply-Demand Model" plots the (exponentiated) predicted values from a regression of the log college/noncollege wage gap on a quadratic polynomial in calendar years and the natural log of college/noncollege relative supply. See text and supplementary material for further details.

workers (*29*). Comparing the fitted values (red series) from this simple supply-demand model alongside the actual data (blue series) reveals an extremely tight correspondence over the course of five decades and three distinct eras: a declining skill premium in the 1970s; an explosive rise in the premium during the 1980s, 1990s, and early 2000s; and, most recently, a plateau commencing after 2005. A key implication of this figure is that a central causal factor behind rising inequality in the United States has been the slowdown in the accumulation of skills by young adults almost 30 years ago. Had the supply of college graduates risen as rapidly in the decades after 1980 as it did in the decades immediately before, it is quite plausible that there would have been no sustained rise in the skill premium in the U.S. labor market.

Of course, this set of facts raises another puzzle: If slackening college supply sparked rising inequality, what caused rising U.S. postsecondary achievement to grind to a sudden halt in 1982? Work by Card and Lemieux (*30*) highlights that one critically important factor was the United States' involvement in the Vietnam War. Because draft-eligible males in the Vietnam era were often able to defer their military service by enrolling in postsecondary schooling, the war artificially boosted college attendance. This created something of a glut of college enrollments in the late 1960s and early 1970s, which in turn depressed the college earnings premium in the 1970s (see Fig. 3) and likely reduced the attractiveness of college-going absent the military draft. Thus, when the war ended in the early 1970s, college enrollment rates dropped sharply, particularly among males. The fall in enrollment produced a corresponding decline in college completions half a decade later, and a surge of inequality followed.

This supply-demand explanation for the rise of U.S. inequality may appear almost too simple to be credible. After all, we are comparing just two economic variables: the college wage premium and the supply of college graduates in the U.S. workforce. But a host of rigorous studies commencing with Katz and Murphy (*31*) confirm the remarkable explanatory power of this simple supply-demand framework for explaining trends in the college versus high school earnings gap over the course of nine decades of U.S. history, as well as across other industrialized economies (most notably, the United Kingdom and Canada) and among age and education groups within countries (*19*, *31*–*36*). The United States was far from the only Western country to experience this surge.

Present discounted value of college relative to high school degree net of tuition, 1965–2008

College/high school difference, 2009 dollars

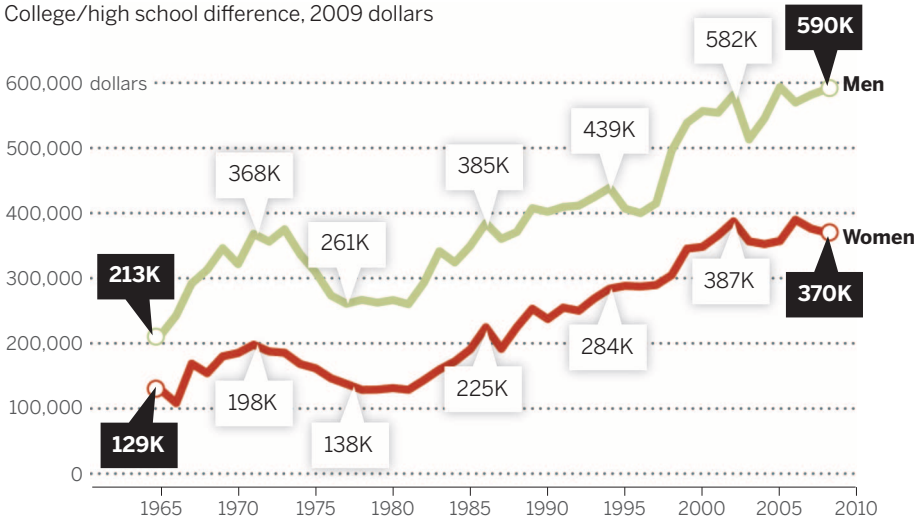


Fig. 4. Present discounted value of college relative to high school degree net of tuition, 1965–2008. Reproduced from Avery and Turner with permission of the American Economic Association (*39*). Expected earnings are calculated from the March Current Population Survey files for full-time, full-year workers using sample weights. The estimates equal what a man or woman would expect to earn working full-time, full-year over a career of 42 years, with a discount rate of 3%, assuming that college graduates delay the start of earnings for 4 years while in school. Earnings expectations are formed in each year by assuming that future high school and college graduates will have future earnings at each age equal to the average earnings of high school and college graduates (respectively) currently observed at each age; for example, expected earnings in 1980 are based on data across ages for 1980. Results for college-educated workers are net of 4 years of tuition and fees associated with appropriate year-specific values for public universities. Plotted points show the difference between expected earnings for college graduates and for high school graduates.

One should not, of course, take this model as irrefutable. A puzzling pattern evident in the data is that the rising demand for skilled workers appears to have slowed in the early 1990s, a phenomenon that is not anticipated by the "education race" model (*37*). This discrepancy underscores that the supply-demand model is necessarily incomplete—in part for the sake of expositional clarity and, in larger part, because our understanding of macroeconomic phenomena is typically imperfect. Nevertheless, the data speak sufficiently clearly to warrant two economic inferences. The first is that although popular accounts frequently assert that the United States is in the midst of a "college bubble"—too many students going to college at too high a cost—abundant economic evidence strongly suggests otherwise. Yes, college tuitions have risen far faster than inflation, and indeed, student debt has risen rapidly, with more than $100 billion in federal student aid dollars loaned in 2012–2013 alone (*38*). But the doubling of the college weekly wage differential over the past 30 years also implies that there have been sizable increases in the lifetime earnings of college graduates relative to high school graduates. How large are these gains? Figure 4, reproduced from (*39*), reports the estimated lifetime college earnings differential net of tuition for cohorts of students entering the labor market between 1965 and 2008. For both males and females, the expected net present value of a college degree relative to a high school diploma roughly tripled in this period, with the fastest gains accruing during the 1980s and 1990s. Note that this growing college/high school gap reflects the rising payoff to the 4-year college degree, the even steeper rise in the premium associated with graduate and professional degrees (see below), and the growing fraction of college graduates who obtain higher degrees; thus, an additional payoff to the college degree is that it opens the door to further specialization. This lifetime earnings differential would, of course, have risen further still if college tuitions had held steady rather than rising. But the inevitable sticker shock that households feel when confronting the cost of college should not obscure the fact that the real lifetime earnings premium to college education has likely never been higher (*40*).

The second positive economic news implied by Fig. 3 above is that the ongoing rise of skill differentials is not inevitable. Prior cohorts of U.S. students, particularly males, were slow to react to the rising return to education during the 1980s and 1990s, but the message appears to have finally gotten through. During the first decade of the 21st century, the U.S. high school graduation rate rose sharply after having been essentially stagnant since the late 1960s (*41*). This unanticipated rise was followed just a few years later by a surge in college completions. Between 2004 and 2012, the supply of new college graduates to the U.S. labor market rose at a rate not seen in several decades (Fig. 3A). As this influx of supply took hold, the college wage premium halted its enduring rise (Fig. 3B). What these observations and our simple

supply-demand model suggest is that the flattening of the college premium after 2005 is in large part a consequence of the quickening pace of educational attainment.

Inequality: Causes for Concern?

A market economy needs some inequality to create incentives. If, for example, students were not ultimately rewarded for spending their early adulthoods pursuing undergraduate, graduate, and professional degrees, or if the hardest-working and most productive workers were paid the same as the median worker, then citizens would have little incentive to develop expertise, to exert effort, or to excel in their work (*42*). Having acknowledged that some inequality is necessary, however, how can we gauge whether there is too much of it? I offer two analytical perspectives on this question.

Earnings Mobility

One metric by which to evaluate the consequences of inequality is via its relationship with economic mobility—that is, the degree to which individual economic fortunes change over time. Of particular interest is the degree of intergenerational mobility, meaning the likelihood that children born to low-income families become high-income adults and vice versa. High levels of economic inequality at a given point in time are not intrinsically inimical to economic mobility; a society with high inequality may be dynamic, with lots of movement up and down the economic ladder, and one with low inequality may be dynastic. But a natural concern is that high inequality at a point in time may serve to reduce mobility over time. If, for example, adults who became wealthy through hard work are able to "buy" success for their children through outsized investments and personal connections, while adults who are unproductive or unlucky in their careers are unable to muster the resources to foster their children's potential, then inequality of incomes could become self-perpetuating even if it originally emanates from high market returns to skill (*43*).

To understand the importance of high and rising U.S. inequality, it is therefore useful to ask how U.S. economic mobility compares to that of other developed countries, and whether U.S. mobility has fallen as inequality has risen. The answers to both questions will surprise many. Contrary to conventional civic mythology, U.S. intergenerational mobility is relatively low. The left panel of Fig. 5, reproduced from (*44*), which plots the relationship between cross-sectional inequality (x axis) and earnings mobility (y axis) among a set of 13 OECD member countries for which consistent data are available, documents that the United States has both the lowest mobility and highest inequality among all wealthy democratic countries. The right panel of Fig. 5, also sourced from (*44*), suggests one proximate explanation for this pattern: Countries with high returns to education tend to have relatively low mobility. Why, if education is "the great equalizer" in the words of Horace Mann, do high educational returns predict low mobility? A key reason is that educational attainment is highly persistent within families. Indeed, two of the strongest predictors of children's ultimate educational attainment are parental education and parental earnings (*45*, *46*). Hence, when the return to education is high, children of better-educated parents are doubly advantaged—by their parents' higher education and higher earnings—in attaining greater education while young and greater earnings in adulthood. Figure 5 therefore lends credence to the concern that rising inequality may erode economic mobility.

Has this erosion occurred? Surprisingly, the best evidence to date suggests that it has not. Evidence from Chetty *et al.* (*46*), documented in the supplementary material, underscores the message from Fig. 5 that there is substantial economic immobility in the United States. Children born three deciles apart in the household income distribution are on average one decile apart in the earnings distribution at age 29 or 30. Similarly, children born three deciles apart in the household income distribution differ by 20 percentage points in their probability of attending college at age 19 (relative to a mean of approximately 55%). Yet these data offer no evidence that mobility has appreciably changed among children born prior to the historic rise of U.S. inequality (1971–1974) and those born afterward (1991–1993). As far as we can measure, rising U.S. income inequality has not reduced intergenerational mobility so far. These findings, which also appear to hold over a longer historical time frame (*47*), suggest that U.S. mobility has not trended downward as many social scientists would have anticipated, and as

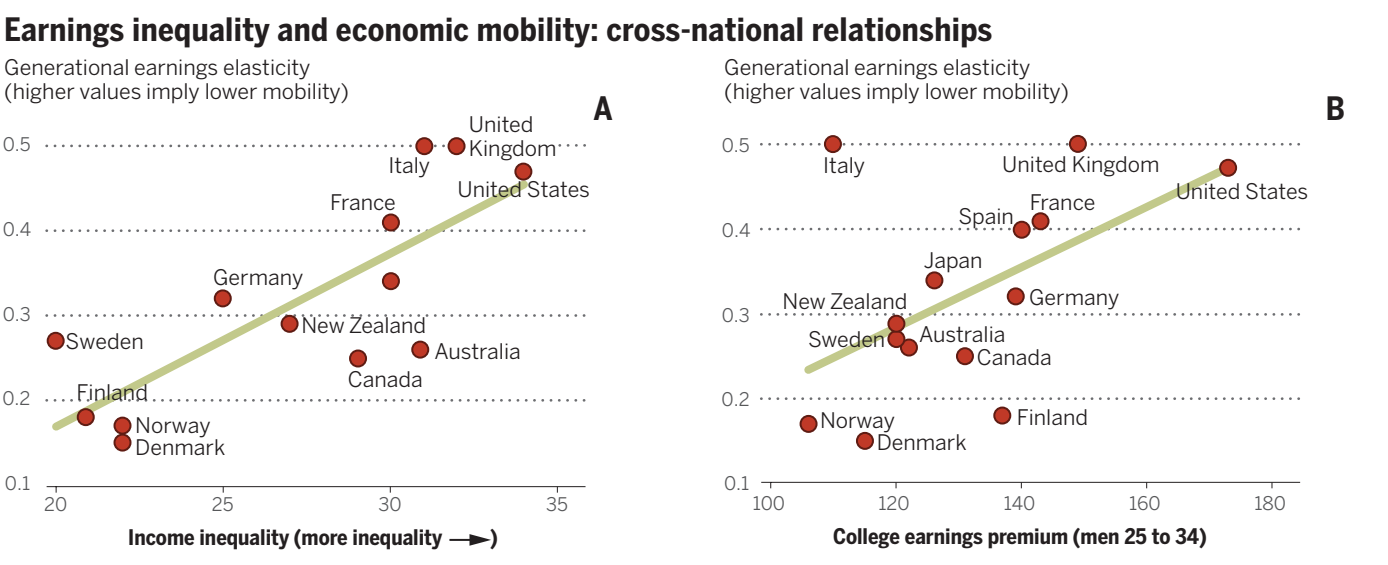


Fig. 5. Earnings inequality and economic mobility: Cross-national relationships. Reproduced from Corak [(*44*), figs. 1 and 4] with permission of the American Economic Association. In both panels, the mobility measure is equal to the intergenerational earnings "elasticity," meaning the average proportional increase in a son's adult earnings predicted by his father's adult earnings measured approximately three decades earlier. A higher intergenerational earnings elasticity therefore implies lower intergenerational mobility. In the left panel, cross-sectional income inequality is measured using a "Gini" index that ranges from 0 to 100, where 0 indicates complete equality of household incomes and 100 indicates maximal inequality (all income to one household). In the right panel, the college earnings premium refers to the ratio of average earnings of men 25 to 34 years of age with a college degree to the average earnings of those with a high school diploma, computed by the OECD using 2009 data. See (*44*) for further details.

many policymakers and popular accounts frequently assume.

It is important to interpret these results in context. The most recent birth cohorts whose adult outcomes can be observed at present were born no later than the early 1990s, which is still relatively early in the rise of U.S. inequality. Another 10 years of data, focusing on children born since 2000, may suggest a different conclusion. Moreover, the fact that mobility has stayed constant while inequality has risen means that the lifetime relative disadvantage of children born to low- versus high-income families has increased substantially; concretely, the rungs of the economic ladder have pulled farther apart but the chance of ascending the ladder has not improved. Finally, it is possible to interpret the fact that mobility has remained unchanged as evidence that U.S. mobility would have declined had it not been for the other compensatory steps taken by the federal government during this period, including, for example, expanding the Earned Income Tax Credit for low-income workers in the 1980s, enlarging the early childhood education Head Start program in the 1990s, and increasing federal student grant and loan programs to support college-going (*48*). Declines in racial and gender discrimination during this period likely also complemented these policies (*49*). A cautious read of the evidence is that although the United States is not a "land of opportunity" by conventional economic mobility metrics, it has not become less so in recent decades.

Real Earnings

A second gauge of economic health is the trajectory of earnings and employment. Here, the data present substantial cause for concern. Although the substantial college wage premium conveys the positive economic news that educational investments offer large returns, this wage premium also masks a discouraging truth: The rising relative earnings of workers with postsecondary education is not simply due to rising real earnings among college-educated workers but is also due to falling real earnings among non–college-educated workers. Between 1980 and 2012, real hourly earnings of full-time college-educated U.S. males rose anywhere from 20% to 56%, with the greatest gains among those with a postbaccalaureate degree (Fig. 6A). During the same period, real earnings of males with high school or lower educational levels declined substantially, falling by 22% among high school dropouts and 11% among high school graduates. Although the picture is generally brighter for females (Fig. 6B), real earnings growth among females without at least some college education over this three-decade interval was extremely modest.

Accompanying the fall in real wages among less educated workers has been a pronounced drop in their labor force participation rates, particularly among less educated males. Between 1979 and 2007, prior to the onset of the Great Recession, the fraction of working-age males in paid employment fell by 12 percentage points among high school dropouts and 10 percentage points among those with exactly a high school diploma. Conversely, employment rates were generally stable for males with postsecondary education and rose for females of all education levels except for high school dropouts.

The causes for the sharp falls in real earnings among non–college-educated workers are multiple. One likely force, as noted above, is the ongoing substitution of computer-intensive machinery for workers performing routine task-intensive jobs. This has depressed demand for workers in both blue-collar production and white-collar office, clerical, and administrative support positions, and has reduced the set of middle-skill career jobs available to non–college-educated workers more generally (*25*). A second factor is the globalization of labor markets, seen particularly in the greatly increased U.S. trade integration with developing countries. Globalization has become particularly important for U.S. labor markets since the early 1990s, when China began its extremely rapid integration into the world trading system. The influx of Chinese goods lowered consumer prices but also fomented a substantial decline in U.S. manufacturing employment, contributing directly to the decline in production worker employment (*50*). A third factor impinging on the earnings of non–college-educated males is the decline in the penetration and bargaining power of labor unions in the United States, which have historically obtained relatively generous wage and benefit packages for blue-collar workers. Over the past three decades, however, U.S. private-sector union density—that is, the fraction of private-sector workers who belong to labor unions—has fallen by approximately 70%, from 24% in 1973 to 7% in 2011 (*51*, *52*).

Notably, these three forces—technological change, deunionization, and globalization—work in tandem. Advances in information and communications technologies have directly changed job demands in U.S. workplaces while simultaneously facilitating the globalization of production by making it increasingly feasible and cost-effective for firms to source, monitor, and coordinate complex production processes at disparate locations worldwide. In turn, the globalization of production has increased competitive conditions for U.S. manufacturers and U.S. workers, eroding employment at unionized establishments and decreasing the capability

Changes in real wage levels of full-time U.S. workers by sex and education, 1963–2012

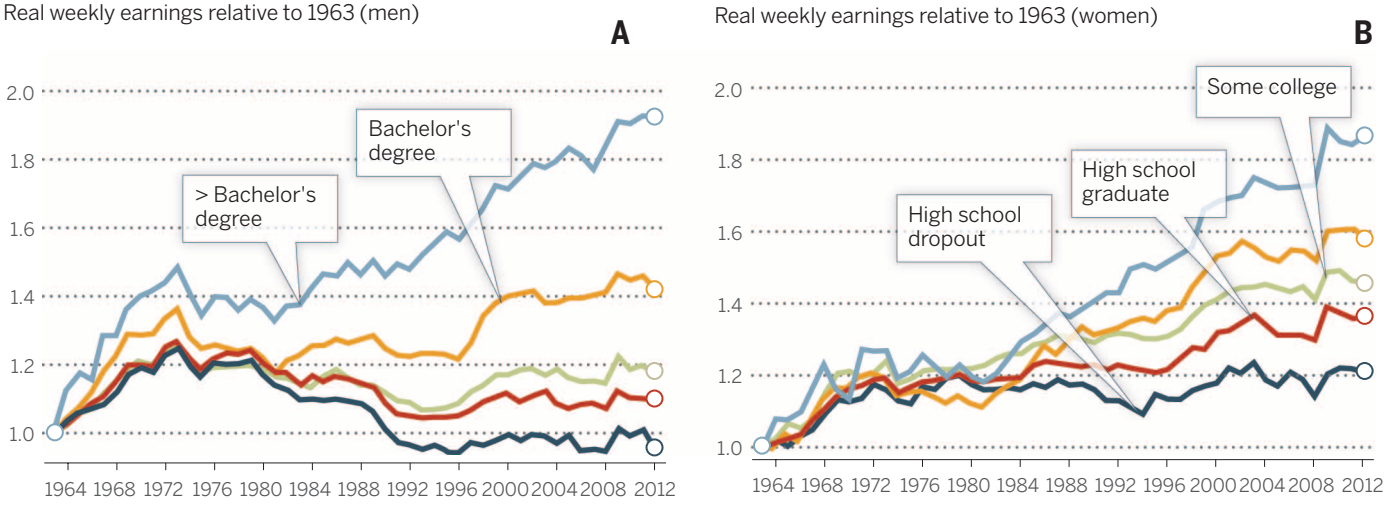


Fig. 6. Change in real wage levels of full-time workers by education, 1963–2012. (**A**) Male workers, (**B**) female workers. Data and sample construction are as in Fig. 3.

of unions to negotiate favorable contracts, attract new members, and penetrate new establishments.

In all cases, the foremost concern raised by these multiple forces impinging on the earnings of workers at different skill levels is not their impact on inequality per se, but rather their adverse effect on the real earnings and employment of less educated workers. These declines in both earnings and employment bode ill for the welfare of non–college-educated U.S. adults and are likely to have broader detrimental social consequences that frequently accompany non-employment: greater criminality, increased social dependency, and (more mundanely) reduced tax receipts.

Do Supply and Demand Make Policy Irrelevant?

One potential interpretation of the evidence above is that, because rising inequality is substantially a consequence of the impersonal forces of supply and demand, public policy has no role to play in shaping the trajectory of inequality or its social impact. This conclusion is incorrect for two reasons. First, there are multiple channels by which policy has contributed to the rise of U.S. inequality, many of which are not fully evident in the education earnings premium. These include the fall over several decades in the real value of the U.S. minimum wage (*7*); the declining prevalence and bargaining power of U.S. labor unions; mounting international competition that places particular pressure on the wages and employment of less educated workers; and sharp reductions in top federal marginal tax rates that have raised after-tax inequality and increased the incentive of highly paid workers to seek still higher compensation. As discussed in the companion paper by Piketty and Saez, there is also disagreement among economists about whether the rising share of household incomes accruing to the top few percentiles of households in numerous developed countries over the past several decades is also primarily a market phenomenon, or instead reflects changing social norms, growing corporate misgovernance, slackening regulatory oversight, or increasing political capture of the policymaking process by elites (*3*–*6*). It would therefore be a vast overstatement to conclude that the rise of U.S. inequality is exclusively due to conventional market forces, or that public policy has not played a role.

But let us assume for the sake of argument that the rise of income inequality is entirely a market phenomenon. Would this imply that there is no role for public policy? A moment's reflection suggests otherwise. As the economist Arthur Goldberger once famously observed, the fact that nearsightedness is substantially a genetic disorder has no bearing on whether doctors should prescribe eyeglasses (*53*). What is relevant is whether the benefits of addressing myopia exceed the costs. In the case of myopia, the availability of eyeglasses make this an easy call.

Although there is no "remedy" for inequality that is as swift or cheap as eyeglasses, prosperous democratic countries have numerous effective policy levers for shaping inequality's trajectory and socioeconomic consequences. Policies that appear most effective over the long haul in raising prosperity and reducing inequality are those that cultivate the skills of successive generations: excellent preschool through high school education; broad access to postsecondary education; and good nutrition, good public health, and high-quality home environments. Such policies address inequality from two directions: (i) enabling a larger fraction of adults to attain high productivity, rewarding jobs, and a reasonable standard of living; and (ii) raising the total supply of skills available to the economy, which in turn moderates the skill premium and reduces inequality (*54*).

Of course, building skills is a multigenerational process and thus has little impact on inequality in the short term. There are, however, numerous nearer-term levers that moderate inequality directly without imposing substantial economic costs: applying progressive tax and transfer policies that fund public investments and foster opportunities for children of all socioeconomic backgrounds; applying well-crafted labor regulations that ensure safe and non-exploitive working conditions; providing wage subsidies such as the Earned Income Tax Credit that increase the payoff to employment for those with limited skills; setting modest but nonzero minimum wage rules; and offering numerous social insurance policies (health and disability insurance, flood insurance, disaster assistance, food assistance) that buffer misfortune for the unfortunate. Although it is outside the scope of this article to evaluate these policies, it is critical to underscore that policy and governance has played and should continue to play a central role in shaping inequality—even when a central cause of rising inequality is the changing supply and demand for skills.

REFERENCES AND NOTES

1. C. D. Goldin, L. F. Katz, *Brookings Pap. Econ. Act.* (fall), 135 (2007).
2. Goldin and Katz (*1*) found that the increase in the education wage premium, particularly the college premium, explains about 60 to 70% of the rise in wage inequality (variance) between 1980 and 2005.
3. F. Alvaredo *et al.*, *J. Econ. Perspect.* **27**, 3–20 (2013).
4. J. Bivens, L. Mishel, *J. Econ. Perspect.* **27**, 57–78 (2013).
5. A. Bonica *et al.*, *J. Econ. Perspect.* **27**, 103–124 (2013).
6. S. N. Kaplan, J. Rauh, *J. Econ. Perspect.* **27**, 35–56 (2013).
7. D. Autor *et al.*, *The Contribution of the Minimum Wage to U.S. Wage Inequality over Three Decades: A Reassessment* (NBER Working Paper 16533, Cambridge, MA, 2010).
8. T. Piketty, E. Saez, *Q. J. Econ.* **118**, 1–41 (2003).
9. These calculations use data from (*8*), with data updated to 2012 available at http://elsa.berkeley.edu/saez/~Tab-Fig.2012prel.xls. Average U.S. household incomes, including the top 1%, rose by 20.2%, while the average household income of the bottom 99% of households rose by only 3.5%.
10. Thus, the top 1% maintains its share of household income at a constant 10.0% while average household incomes rise by 20.2%, as actually occurred.
11. This point is due to Lawrence Katz of Harvard University, who offers these calculations in his graduate labor economics lecture notes.
12. T. Lemieux, *Post-Secondary Education and Increasing Wage Inequality* (Working Paper 12077, National Bureau of Economic Research, 2006).
13. S. Firpo *et al.*, Decomposition methods in economics. In *Handbook of Labor Economics*, D. Card, O. Ashenfelter, Eds. (Elsevier-North Holland, Amsterdam, 2011), vol. 4, pp. 1–102.
14. See www.oecd.org/site/piaac/surveyofadultskills.htm for more information. The PIAAC program will encompass 33 countries, but data for only 22 were available at this writing.
15. E. A. Hanushek, G. Schwerdt, S.Wiederhold, L.Woessmann, *Returns to Skills Around the World: Evidence from PIAAC* (NBER Working Paper 19762, Cambridge, MA, 2013).
16. Hanushek *et al.* (*15*) also found that the correlation between numeracy skills and years of schooling is 0.45. When including both numeracy skills and years of schooling in an earnings regression, they found that both are substantial and significant predictors of earnings, although each is attenuated relative to a model where only one factor is included at a time. This pattern of results suggests, logically, that neither test scores nor years of schooling is a complete measure of labor market skills.
17. T. D. Snyder, *120 Years of American Education: A Statistical Portrait* (National Center for Education Statistics, U.S. Department of Education, 1993).
18. L. D. Johnston, "History lessons: Understanding the decline in manufacturing." *MinnPost*, 22 February 2012; www.minnpost.com/macro-micro-minnesota/2012/02/history-lessons-understanding-decline-manufacturing.
19. C. Goldin, L. F. Katz, *The Race Between Education and Technology* (Harvard Univ. Press, Cambridge, MA, 2008).
20. M. Stanley, *Q. J. Econ.* **118**, 671–708 (2003).
21. B. Pierce, in *Labor in the New Economy*, K. G. Abraham, J. R. Spletzer, M. Harper, Eds. (Univ. of Chicago Press, Chicago, 2010), pp. 63–98.
22. These comparisons hold labor market experience and gender constant. This doubling of the college premium very likely understates the magnitude of the increase in inequality between college-educated and non–college-educated workers. Alongside higher hourly earnings, college-educated workers enjoy greater job stability, lower rates of unemployment, more generous fringe benefits, and better working conditions; Pierce (*21*) found that these differentials have generally increased in the same time period.
23. D. H. Autor *et al.*, *Q. J. Econ.* **118**, 1279–1333 (2003).
24. D. Acemoglu, D. H. Autor, Skills, tasks and technologies: Implications for employment and earnings. In *Handbook of Labor Economics*, D. Card, O. Ashenfelter, Eds. (Elsevier-North Holland, Amsterdam, 2011), vol. 4, pp. 1043–1171.
25. D. H. Autor, D. Dorn, *Am. Econ. Rev.* **103**, 1553–1597 (2013).
26. M. Goos *et al.*, www.aeaweb.org/forthcoming/output/accepted_AER.php
27. Extensive recent literature, commencing with Autor *et al.* (*23*) and summarized in Acemoglu and Autor (*24*), considers the role of technological change in displacing workers performing routine tasks and complementing workers performing nonroutine tasks. An additional implication of this framework is that an increasing share of employment will be found in comparatively low-skill nonroutine manual tasks that require situational adaptability, visual and language recognition, and in-person interactions but limited formal education (e.g., janitors and cleaners, home health aides, construction laborers, and security personnel). See Autor and Dorn (*25*) and Goos *et al.* (*26*) for evidence that employment in the U.S. and among OECD member countries has increasingly polarized into high-paid, abstract-intensive occupations and low-paid, manual-intensive occupations.
28. J. Tinbergen, *Kyklos* **27**, 217–226 (1974).
29. Details of this model are given in the online supplement.
30. D. Card, T. Lemieux, *Am. Econ. Rev.* **91**, 97–102 (2001).
31. L. F. Katz, K. M. Murphy, *Q. J. Econ.* **107**, 35–78 (1992).
32. L. Katz, D. H. Autor, Changes in the wage structure and earnings inequality. In *Handbook of Labor Economics*, D. Card, O. Ashenfelter, Eds. (Elsevier-North Holland, Amsterdam, 1999), vol. 3, pp. 1463–1555.
33. D. Card, T. Lemieux, *Q. J. Econ.* **116**, 705–746 (2001).
34. D. H. Autor *et al.*, *Rev. Econ. Stat.* **90**, 300–323 (2008).
35. E. Crivellaro, "College wage premium over time: Trends in Europe in the last 15 years." University Ca' Foscari of Venice, Department of Economics Research Paper Series no. 03/WP/2014 (2014); http://dx.doi.org/10.2139/ssrn.2383795.
36. Summarizing evidence on the college premium in 12 European countries between 1994 and 1999, Crivellaro (*35*) found a pattern of increasing skill differentials except in countries that have had a large increase in the relative supply of college

graduates, a pattern consistent with the conceptual model laid out below.
37. Although this deceleration is not evident from Fig. 3, it is detected by the regression equation, as discussed in the online supplement.
38. College Board, *Trends in Student Aid: 2013* (College Board, New York, 2013).
39. C. Avery, S. Turner, *J. Econ. Perspect.* **26**, 165–192 (2012).
40. Three sources of uncertainty should be kept in mind when interpreting these estimates. First, they encompass substantial heterogeneity. Although the average college graduate earns substantially more than the average high school graduate, the least successful college graduates may earn substantially less than the median among high school graduates, and the most successful high school graduates may earn substantially more than the median among college graduates. Second, for students who acquire substantial student debt but do not complete the college degree, it is far from certain that college will prove a good investment. Finally, these calculations assume that the lifetime profile of earnings observed in the year of college graduation will persist throughout the career. As Fig. 3 indicates, this premium has changed substantially over time, so this assumption is only a rough approximation. However, the college premium is so high at present that even with a substantial decline, college would remain an attractive financial proposition on average from a lifetime earnings perspective.
41. R. J. Murnane, *J. Econ. Lit.* **51**, 370–422 (2013).
42. D. Acemoglu, J. Robinson, Why Nations Fail (Crown, New York, 2012).
43. As with cross-sectional inequality, there is no economically "ideal" level of intergenerational mobility. Even in a society with perfect equality of opportunity, one would expect children of successful parents to have above-average success as adults, simply because many attributes that contribute to success (appearance, intellect, athleticism) are partly heritable.
44. M. Corak, *J. Econ. Perspect.* **27**, 79–102 (2013).
45. S. F. Reardon, The widening academic achievement gap between the rich and the poor: New evidence and possible explanations. In *Whither Opportunity? Rising Inequality, Schools, and Children's Life Chances*, G. J. Duncan, R. J. Murnane, Eds. (Russell Sage Foundation, New York, 2011), pp. 91–115.
46. R. Chetty *et al.*, *Is the United States Still a Land of Opportunity? Recent Trends in Intergenerational Mobility* (NBER Working Paper No. 19844, Cambridge, MA, 2014).
47. C.-I. Lee, G. Solon, *Rev. Econ. Stat.* **91**, 766–772 (2009).
48. Between 2002–2003 and 2012–2013, the sum of federal Pell Grants and loans for higher education increased by 105%, from $83 billion to $170 billion in constant 2012 dollars [(*38*), table 1].
49. C.-T. Hsieh *et al.*, *The Allocation of Talent and U.S. Economic Growth* (NBER Working Paper No. 18693, Cambridge, MA, 2013).
50. D. H. Autor *et al.*, *Am. Econ. Rev.* **103**, 2121–2168 (2013).
51. D. Card *et al.*, *J. Labor Res.* **25**, 519–559 (2004).
52. B. T. Hirsch, *J. Econ. Perspect.* **22**, 153–176 (2008).
53. A. S. Goldberger, *Economica* **46**, 327 (1979).
54. The extensive involvement of state and federal government in education at all levels also underscores the fact that the distribution of education and skills today is in no sense a "free market" outcome; it is a consequence of both individual and public choices.

ACKNOWLEDGMENTS

I thank D. Acemoglu, L. Katz, J. Van Reenen, M. Tatsutani, and two anonymous referees for valuable comments and advice, and C. Patterson and B. Price for expert research assistance. Supported by NSF grant SES-1227334, Russell Sage Foundation grant 85-12-07, and Alfred P. Sloan Foundation grant 2011-10-12. All data and code that are unique to this article (Figs. 1, 3, and 6; fig. S2) are available from the author. All other figures (Figs. 2, 4, and 5; figs. S1 and S3) are reproduced from other publications, as noted, with permission of the authors.

SUPPLEMENTARY MATERIALS

www.sciencemag.org/content/344/6186/843/suppl/DC1
Supplementary Text
Figs. S1 to S3
References (*55*–*61*)

10.1126/science.1251868

REVIEW

Income inequality in the developing world

Martin Ravallion

Should income inequality be of concern in developing countries? New data reveal less income inequality in the developing world than 30 years ago. However, this is due to falling inequality between countries. Average inequality within developing countries has been slowly rising, though staying fairly flat since 2000. As a rule, higher rates of growth in average incomes have not put upward pressure on inequality within countries. Growth has generally helped reduce the incidence of absolute poverty, but less so in more unequal countries. High inequality also threatens to stall future progress against poverty by attenuating growth prospects. Perceptions of rising absolute gaps in living standards between the rich and the poor in growing economies are also consistent with the evidence.

Development economics emerged as a subdiscipline of economics in the 1950s, and its initial focus was on economic growth, with inequality as a secondary concern. The prevailing orthodoxy for many decades was that a period of rising inequality was to be expected in growing poor countries. Rising inequality was seen to be more or less inevitable and not something to worry about, particularly if the incidence of poverty was falling. Another commonly held view was that policy efforts to reduce inequality were likely to impede growth and (hence) poverty reduction.

The existence of high inequality within many developing countries, side by side with persistent poverty, started to attract attention in the early 1970s. Nonetheless, through the 1980s and well into the 1990s, the mainstream view in development economics was still that high and/or rising inequality in poor countries was a far less important concern than assuring sufficient growth, which was the key to poverty reduction. The policy message for the developing world was clear: You cannot expect to have both lower poverty and less inequality while you remain poor, and, if you choose to give poverty reduction highest priority, then focus on growth.

Other objections could still be raised to high income inequality. The classical utilitarian formulation—whereby social welfare is judged by the sum of utilities, assuming diminishing marginal utility of income—pointed to social welfare losses from high inequality at a given mean. But that did not persuade those who believed that there was a trade-off between equity and growth. A moral defense could also be mounted for the view that inequality is not an important issue for a growing developing country by appeal to John Rawls's "difference principle" that (subject to assuring liberty and equal opportunity) higher inequality can be justified as long as it benefits the worst-off group in society (*1*).

The period since 2000 has seen a deeper and more widespread questioning of this long-standing view of pro-poor inequality. New concerns have emerged about the instrumental importance of equity to other valued goals, including poverty reduction and human development more broadly. It appears more likely today that high inequality will be seen as a threat to future development than as an inevitable and unimportant consequence of past progress. The long-standing idea of a substantial growth-equity trade-off has come to be seriously questioned.

This paper reports new estimates of the levels and changes in income inequality measures for the developing world. The new estimates take us up to 2010, embracing the period of higher growth rates in the developing world since the turn of the millennium. In the light of these new data, I revisit past and ongoing debates on inequality in developing countries and the trade-offs with growth and poverty reduction.

Income Inequality Measures

To measure inequality in the developing world as a whole, one ignores country borders—pooling all residents and measuring inequality among them. This overall measure will naturally depend on the inequality between countries as well as that within them. Thus, its evolution over time will depend on whether poorer countries are seeing lower growth rates as well as the things happening within countries—economic changes and policies—that affect inequality.

If we are comparing country or regional performance, then we want to isolate the within-country component of inequality as distinct from that between countries. Although there are many inequality measures, not all of them allow a clean separation of the between and within components. For example, such a decomposition is

Department of Economics, Georgetown University, Washington, DC 20057, and National Bureau of Economic Research, Cambridge, MA 02138, USA. **E-mail: mr1185@georgetown.edu**