

ECONOMIC COMMENTARY

Federal Reserve Bank of Cleveland

The Recent Rise in the Value of Education: Market Forces at Work

by Erica L. Groshen and Colin Drozdowski

In the past decade, higher levels of schooling have become more financially rewarding. Adjusted for inflation, the earnings of college-educated workers rose during the 1980s, while they declined for employees with a high-school diploma or less. This development stands in marked contrast to the 1970s, when college-educated workers actually lost ground relative to those with only a high-school degree.

The bipartisan support accorded to the Higher Education Bill of 1992, which expands access to college loans, and the increasing interest in educational reform recognize the growing economic value of schooling and its importance to our national future.

The wage premium received by educated workers measures the current value their employers place on education. Thus, trends in that premium can be understood by examining shifts in the relative supply and demand for educated workers. This *Economic Commentary* explores possible sources of the recent patterns of education's economic rewards in a market framework and considers several of its myriad implications.

■ The Economic Return to Schooling

How do we know that the value of, or economic return to, education is positive and has increased? One approach is to examine over time the median income of people with different levels of schooling. In figure 1, we plot these values for

young people in 1980 and 1987.¹ For both years, inflation-adjusted income rose with amount of schooling, a strong indication of education's importance in the labor market.

To see whether that value has increased, we compare median income changes of college-educated people to those of persons with high-school degrees or less. Between 1980 and 1987, the average annual income of young high-school dropouts (workers with 9 to 11 years of education) fell 15 percent, while the income of young college graduates rose 7 percent. Thus, the income gap between college- and high-school-educated workers was larger in 1987 than in 1980; schooling became more valuable.

But what is the long-term pattern, considering that a college degree represented the educational dividing line between income-gainers and income-losers in the past decade? Figure 2 tracks the ratio of the median income of college-educated people to that of high-school graduates (or the relative wage premium of the highly educated) from 1967 to 1987. The ratio fell slightly throughout the 1970s, but rose sharply after 1980. Other research indicates that the 1980s' phenomenon of a rising economic return to education not only is strong, but pervades all industries.²

The 1980s' phenomenon of a widening income gap between college graduates and less-educated workers can be understood by examining market trends. The recent growth in the financial benefits of education reflects the failure of the relative supply of highly educated workers to keep pace with increasing demand for their skills. This need has been fueled by foreign competition and by technological change that favors more-skilled workers. Larger schooling-based wage disparities are likely to persist or to widen further unless educational attainment revives—a trend that holds profound implications not only for employers and employees, but more broadly for our regional and national prosperity.

■ The Value of Education in a Supply and Demand Framework

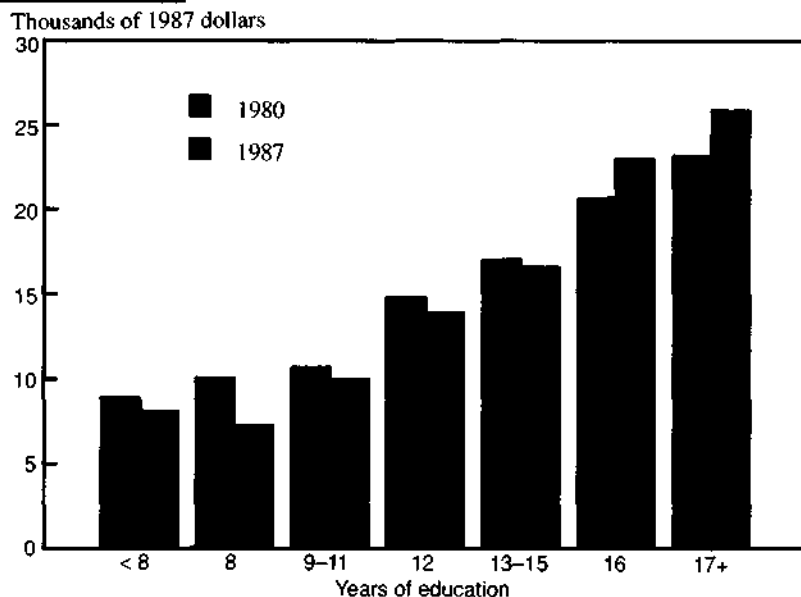
The income disparity between college and high-school graduates depends on the relative demand and supply for their services. Thus, to understand the pattern of the schooling premium shown in figure 2, we need a corresponding measure of the "quantity" of educated labor in the market. Figure 3 tracks such a measure—the proportion of people with a college degree—from 1967 to 1990. The educational attainment of young workers first climbed steadily, then leveled off after 1976.

Because schooling takes time to acquire, only a certain amount of educated labor is available in the market at any particular time. But what explains supply shifts over time, such as those shown in figure 3? School can be seen as an investment made by individuals (or by their parents or community) that pays off during their working life. Thus, higher expected benefits from education, reductions in schooling costs, or jumps in the number of highly skilled immigrants all raise the share of the labor force who have an education.

Using this information on supply and premiums, figure 4 summarizes the past two decades of changes in the value of a college education by plotting the quantity-premium combinations for the end-years of the data (1967 and 1987) and around the turning point in price (1980). This allows us to envision the supply and demand curves that determined each point. We draw vertical supply curves (shown as S_{67} , S_{80} , and S_{87}) through each point to reflect the fact that the relative quantity of education cannot change quickly.

Next, through each point we draw a downward-sloping demand curve for education in labor (shown as D_{67} , D_{80} , and D_{87}). Employers' willingness to pay more to educated workers is generally attributed to expected increases in productivity. Some industries benefit more than others from an educated

FIGURE 1 MEDIAN ANNUAL REAL INCOME BY EDUCATIONAL LEVEL



NOTE: Data are for persons age 25-34 with income.

SOURCE: U.S. Department of Commerce, Bureau of the Census.

work force, so employers differ in the educational composition of their employees. For any distribution of technologies, the lower the premium for educated labor, the higher the average schooling demanded by employers, as shown in the negatively sloped demand curves in figure 4. The demand curve will shift outward (say, from D_{67} to D_{80} , and then to D_{87}) if technological changes raise the relative productivity of educated labor, or if product demand increases for employers with technologies that benefit most from educated workers.

Thus, explanations for changes in the return to education can start by establishing whether shifts in supply or demand were responsible. The constant economic return to schooling from 1967 through 1980 can be explained by simultaneous growth in the relative supply and demand for educated labor, which kept pace with each other. In contrast, the rising education premium of the 1980s is consistent with a fixed relative supply of education, where employers' growing demand for schooling translated directly into income gains for educated workers.

■ Sources of the Increasing Value of Education

Analysts have offered two leading explanations for the rising demand for education, and a wider range of explanations for why supply kept pace during the 1970s only to stall during the 1980s.

Demand Story 1—Skill-biased Technological Change Recent technological advances may favor more-educated workers. That is, although some innovations increase the productivity (and hence the wages) of all workers equally, many others benefit certain groups more than others. "Skill-biased" changes raise the efficiency of skilled workers more than that of unskilled workers. For example, introducing office phone-mail spares employees the need to check message boxes and saves receptionists the time spent answering calls, but requires the efforts of a computer specialist for its setup and maintenance. Thus, this innovation reduces the demand for receptionists, raises the demand for computer specialists (who are highly skilled), while on average making all those employed more productive.

FIGURE 2 COLLEGE INCOME PREMIUM^a

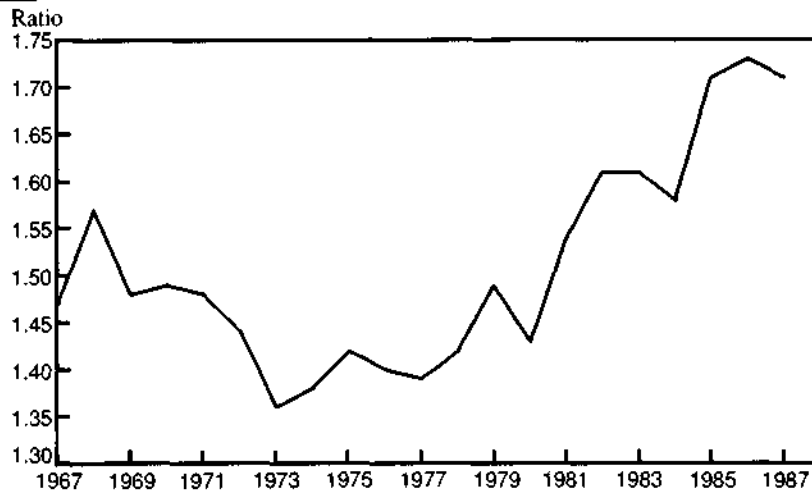


FIGURE 3 EDUCATIONAL ATTAINMENT^b

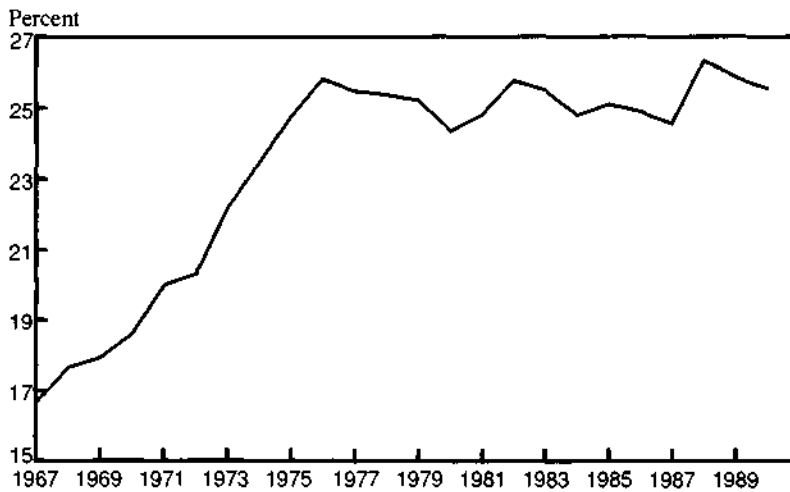
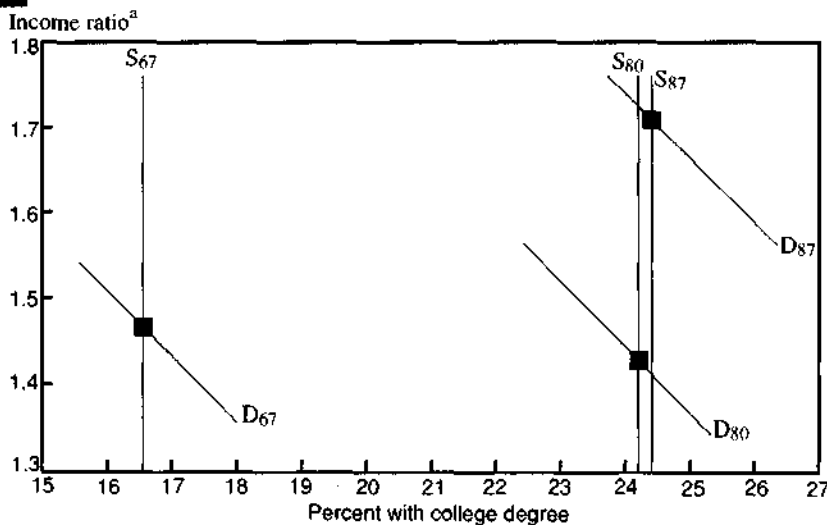


FIGURE 4 CHANGING EDUCATIONAL SUPPLY AND DEMAND TRENDS



a. Ratio of median income of college graduates to median income of high-school graduates.

b. Share of young persons (age 25-34) with four or more years of college.

NOTE: Data for all figures are for persons age 25-34 with income.

SOURCE: U.S. Department of Commerce, Bureau of the Census.

Even if such biased technological change lies at the root of the increased demand for schooling, what is surprising is the strength, persistence, and pervasiveness of the bias toward skilled labor. Is there a single kind of innovation that could cause the return to schooling to grow dramatically for at least 20 years in all sectors of the economy?

The prime candidate for a single source of skill-biased change is the computerization of the workplace. From 1984 to 1989, the share of businesses using computers rose from 8 to 36 percent, while the proportion of workers using them (predominantly the college-educated) grew from 25 to 37 percent. One study of the impact of computer use on wage levels estimates that between one- and two-thirds of the increased return to schooling is directly attributable to this source.³ Perhaps workers need education to use computers effectively, or to endow them with the flexibility required for the rapid pace of technical and product change found in computerized workplaces.

But the influence of automation on the workplace extends far beyond its direct impact on computer users. Another study finds that the ratio of high-tech to total capital stock in manufacturing has dramatically increased, from approximately 1 percent in 1976 to 26 percent in 1986.⁴ High-tech capital includes computers, instruments, and communications equipment, whose introduction would clearly increase the relative demand for highly educated workers.⁵

The major argument against the skill-bias explanation is that U.S. productivity gains actually slowed during the 1970s and 1980s. Could innovations that so profoundly changed the structure of labor demand fail to boost overall productivity growth? Perhaps the benefits of the innovations have not yet been fully realized, or our measure of productivity somehow misses their impact, or some independent factor has depressed productivity.

Demand Story II—International Trade

The second demand-side theory (which is not exclusive of the first) notes that the U.S. labor force has been well educated compared to the rest of the world for many years. In the absence of extensive foreign trade, the domestic demand for relatively scarce low-skilled labor (and its products) supported wage levels for uneducated workers that were high by international standards. The recent advent of lower trade barriers and the expansion of trade could be expected to boost export-based demand for the products created by our educated labor. Simultaneously, freer trade would also expand low-cost imports of the goods made by low-skilled labor abroad, effectively increasing the competition faced by uneducated labor and stifling their wages.

Although this explanation is compelling in both its logic and its consistency with the facts, most empirical research has been unable to identify a large effect of trade on wages.⁶ The theory either may be unimportant, or we may be unable to detect it at work. The latter possibility arises because much of our international trade involves exchanging products within the same industry, while empirical tests are limited to inter-industry effects, relying on trade data for broad industry aggregates. Therefore, it is possible that the effect of international trade on the wage structure will never be measured with certainty.

Supply Factors—Costs and Expected Benefits Why did the expansion of educational attainment shown in figure 3 stall in the late 1970s? One would expect that as the financial return to education began to rise during the 1980s, a greater number of people would have entered and eventually graduated from college. However, other factors, such as rising real costs, may have influenced the relative supply of college graduates.

On the cost side, higher education became much more expensive in the past decade. Expenses (tuition, fees, and room and board charges) rose by two times the rate of inflation in public institutions and by three times inflation at private institutions. Meanwhile, the average size of most federal student grants and loans increased less than the rate of inflation. Even if costs have not risen as much as future benefits, higher costs and lower subsidies mean that more young high-school graduates may face borrowing constraints for unsecured student loans.

On the benefit side, student deferments from the military draft provided a powerful institutional incentive for college enrollment that has since been eliminated. Alternatively, potential students may have been dissuaded from attending college by the falling financial return to schooling witnessed during the 1970s or by uncertainty about the permanence of the current rewards. If so, attainment may begin climbing again as news of the increased financial benefits of a college degree spreads. Recent hikes in the percentage of the population entering and graduating from college may reflect such a response.⁷

Finally, the number of low-skilled immigrants to the United States surged in the 1980s. However, the estimated direct effects of both legal and illegal immigration on overall educational levels are fairly small.

Other Explanations Additional theories, such as the impacts of declining unionization and internal migration, have been proposed, but have found only limited empirical support.⁸ Similarly, some analysts suggest that a decline in the quality of a high-school education could have widened the wage gap between college- and high-school-educated workers. Leaving aside the question of whether high schools could have deteriorated so rapidly and uniformly across the country, the fact that the return to education also rose strongly for older workers argues against this explanation.

■ Conclusion and Implications

The weight of current research suggests that increasing financial benefits from schooling throughout the 1980s probably stem from steadily rising relative demand for educated labor, fueled by skill-biased technological change and foreign trade.

However, the contrast between the 1970s (when the value of education fell) and the 1980s (when it rose) stems not from a previous absence of these powerful demand trends, but from the failure of the relative supply of educated workers to keep pace with increasing demand during the past decade. Possible explanations for the stagnant relative supply of labor during the 1980s include spiraling real costs of education, cuts in educational subsidies, the end of Vietnam-era student draft deferments, and increases in low-skilled immigration.

These findings have profound social implications at many levels. Employers have already faced widening internal wage structures—a trend that is likely to persist. In addition, large wage disparities based on schooling mean that seniority alone will no longer be enough to move low-wage workers into more lucrative positions. Rather, such promotions will hinge on the attainment of new skills, such as through the use of in-house training or tuition reimbursement plans. With or without such programs, employers may find that market factors will encourage them to spin off some especially high- or low-wage jobs to outside contractors, subsidiaries, or other offices.

Second, these results tell us that the prosperity of any group, region, or country will depend on its commitment to education. National discussions of test scores and the level and efficacy of educational subsidies have become politically charged. On a regional basis, this means that local income will increasingly depend on local education policy. For example, Ohio ranks 43rd among states in spending on education as a percentage of gross state product, is 34th in the percentage of citizens who graduated from high school (73 percent), and holds 39th place in the

percentage with some college attendance (17 percent)—all facts that are worrisome for Ohioans' future earnings. In all areas of the country, as schooling grows more valuable, the efficiency and effectiveness of our educational system must be continually evaluated and improved in order to maximize the benefits it bestows.

Finally, for individuals, prosperity will be more fundamentally tied to their educational achievements than ever before. Young people need to understand that most of them will require more schooling than their parents had, just to attain the same standard of living. And, since the quality and extent of education increasingly determine a child's fate, equal access to high-caliber schooling more than ever before will be the key to true equal opportunity, and an essential tool for breaking the cycle of poverty.

Our findings suggest that the new wage disparities between the poorly and highly educated are likely to persist or to widen further unless educational attainment begins to rise again. Ultimately, the future path of the educational premium depends on reform of this industry and on whether the current cap on schooling attainment is a short-run phenomenon—easily lifted by spreading the news of the higher rewards of education—or a long-run constraint.

■ Footnotes

1. The analysis in this *Economic Commentary* uses a data series that ends in 1987, but that allows us to make comparisons back to 1967, further than is possible by using other series. To compare the trends reported here with those in other data series, and to see more current years, see Frank Levy and Richard J. Murnane, "U.S. Earnings Levels and Earnings Inequality: A Review of Recent Trends and Proposed Explanations," *Journal of Economic Literature*, 1992, forthcoming.
2. See Kevin M. Murphy and Finis Welch, "The Role of International Trade in Wage Differentials," in Marvin H. Koster, ed., *Workers and Their Wages: Changing Patterns in the United States*. Washington, D.C.: American Enterprise Institute, 1991, pp. 39–69.
3. See Alan B. Krueger, "How Computers Have Changed the Wage Structure: Evidence from Microdata, 1984–1989," National Bureau of Economic Research, Working Paper No. 3858, October 1991.
4. See Ernst A. Berndt, Catherine J. Morrison, and Larry S. Rosenblum, "High-tech Capital Formation and Labor Composition in U.S. Manufacturing Industries: An Exploratory Analysis," National Bureau of Economic Research, Working Paper No. 4010, March 1992.
5. A higher proportion of college graduates now take jobs in occupations where a college degree is not required (see Daniel E. Hecker, "Reconciling Conflicting Data on Jobs for College Graduates," *Monthly Labor Review*, vol. 115, no. 7 [July 1992], pp. 3–12). These individuals are nonetheless paid a rising premium for that degree, possibly indicating changes in technical requirements within those occupations.
6. The major exception is a study concluding that international trade has increased the wages of college-educated persons by 9 percent while decreasing the wages of high-school graduates by almost 3 percent. See Kevin M. Murphy and Finis Welch, "The Role of International Trade in Wage Differentials."
7. For college enrollment, see U.S. Department of Labor, Bureau of Labor Statistics, News Release USDL 92-395, June 30, 1992. For college graduation rates, see Kristina J. Shelley, "The Future of Jobs for College Graduates," *Monthly Labor Review*, vol. 115, no. 7 (July 1992), pp. 13–21. On the basis of admittedly speculative projections, Shelley

argues that supply increases may exceed demand increases in the 1990s.

8. For an analysis of the impact of declining unionization, see John Bound and George Johnson, "Changes in the Structure of Wages in the 1980s: An Evaluation of Alternative Explanations," *American Economic Review*, vol. 82, no. 3 (June 1992), pp. 371–92. The internal migration hypothesis is refuted in Erica L. Groshen, "Rising Inequality in a Salary Survey: Another Piece of the Puzzle," Federal Reserve Bank of Cleveland, Working Paper 9121, December 1991; and in Patricia E. Beeson and Erica L. Groshen, "Components of City-Size Wage Differentials, 1973–1988," Federal Reserve Bank of Cleveland, *Economic Review*, vol. 27, no. 4 (Quarter 4 1991), pp. 10–24.

Erica L. Groshen is an economist and Colin Drozdowski is a research assistant at the Federal Reserve Bank of Cleveland. The authors thank Patricia Beeson, Michael Bryan, and Randall Ebevts for helpful comments.

The views stated herein are those of the authors and not necessarily those of the Federal Reserve Bank of Cleveland or of the Board of Governors of the Federal Reserve System.

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Structural Changes in U.S. Labor Markets

The papers in this book, *Structural Changes in U.S. Labor Markets: Causes and Consequences*, edited by Randall W. Eberts and Erica L. Groshen, were presented and discussed at a conference held at the Federal Reserve Bank of Cleveland in October 1989. The purpose of the conference was to identify and analyze recent developments in personnel policy and worker compensation practices, which may have led to less wage inflation during the 1980s and may continue to affect wage behavior in the 1990s. Also considered were possible consequences that these changes might have on the formulation of macroeconomic policy. The contributors—academic and research economists in labor economics—provide a comprehensive assessment of the current state of the wage-setting process in the U.S. labor market.

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