# Collapsing Wages and Rising Inequality: Has Computerization Shifted the Demand for Skills?

David R. Howell

Why would the use of new workplace technologies cause a sharp skill-restructuring between 1980 and 1982 but not between 1983 and 1992, when the latter period was characterized by a far higher rate of investment in computer-based equipment?

nformation technologies began to transform the workplaces of advanced economies in the 1980s-a decade in which large segments of the workforce experienced substantial declines in economic well-being. European workers were confronted by a labor market that produced too few jobs, resulting in high long-term unemployment for low-skill workers. In the United States, workers faced falling real wages, growing shares of low-wage jobs, sharply increasing earnings inequality, and declining job benefits and job security. Not surprisingly, these two developments—technological change and worsening labor market outcomes for low-skill workershave been linked together by both academicians and policymakers to form what may be termed a "technology-induced skill-mismatch" story.

As the recent OECD Jobs Study has put it, labor-market problems on both sides of the Atlantic have "stemmed from the same root cause: the failure to adapt satisfactorily to change. Management skills, education, and training attainments have failed to keep pace with the requirements of a more technologically

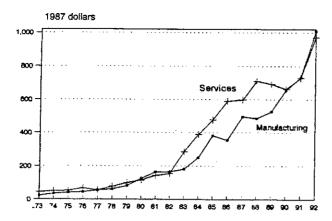
advanced economy. . . . All countries have experienced a shift in demand away from unskilled jobs toward more highly skilled jobs." Concerned with the widening disparity in economic well-being between more and less educated workers, Secretary of Labor Robert Reich has written that "technological changes have diminished the role of labor, especial'y unskilled labor, in the modern facto y. . . . The most striking change has been the brash arrival of the computer."

There is remarkably little direct evidencé in support of pervasive and persistent skill-mismatch.

This demand-side vision of large and accelerating skill-restructuring is widely accepted among labor economists in the United States. It underpins the Clinton Administration's nearly exclusive focus on skillenhancement strategies. Despite this near-consensus, there is remarkably little direct evidence in support of per-

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Figure 1 Computer Investment Per Worker in Manufacturing and Services, 1973–92



Source: U.S. Bureau of Economic Analysis; National Income and Product Accounts.

vasive and persistent skill-mismatch. Focusing on the U.S. experience, the evidence presented below does not suggest that job opportunities for low-skill workers fell precipitously in the 1980s.

Indeed, while substantial shifts in the occupation mix of employment took place between 1973 and 1983, the data show little skill-restructuring after 1983. Crucially, however, it was in this latter period that we observe the highest rates of investment in computer-based technologies. The 1980s and the early 1990s seem to be better described as continuation of a gradual long-run upward trajectory in the demand for skills than as a decade in which there was the kind of radical shift in the demand for skills that would be necessary to explain the remarkable wage restructuring we've experienced since 1979.

# COMPUTERIZATION AND SKILL-MISMATCH

As Figure 1 shows, the intensity of computer-related investments grew sharply in both manufacturing and service industries in the 1980s. This spending rose from about \$150 per full-time equivalent worker in 1982 to about \$1,000 per worker ten years later. Similarly, a recent study by Berman, Bound, and Griliches reports rapid increases in the rate of growth of computer investments as a share of total investment in manufacturing—from 2.79 percent in 1977 to 3.92 percent in 1982, and to 7.49 percent in 1987.

The prevailing view is that skill is complementary to physical capital—particularly so with information-technology-embodied capital. Recent studies have tended to rely upon *indirect* measures of both techno-

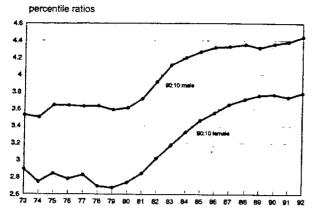
logical change (productivity growth or the residual from wage equations) and skills (educational attainment, potential experience, or relative wages). But there is also considerable case-study evidence which suggests that the effects of information technology on skill composition depends upon the technology, the job, and the objectives of management.

For example, in his study of machine shops in the United States, Jeffrey Keefe found that "the diffusion of numerical controls has had no significant impact on overall machine-shop skill levels." Among clerical jobs, Peter Cappelli found that half "experienced significant upskilling, and the other half had significant deskilling." He concludes that new office technologies appear to be the cause of the deskilling. A dramatic example of deskilling can be found in the effects of electronic scanning systems on the cognitive-skill requirements of cashiers.

A recent collection of case studies of the impact of technological change on employment and skills in German manufacturing firms also found evidence of deskilling and polarization. For example, research on the furniture industry found that both the furniture companies and their machine suppliers "concentrate on replacing workers or on reducing the comprehensiveness of worker-skill profiles with the aid of various computer aids. . . . Even in those companies which still have a comparatively high share of skilled woodworkers, more and more skilled handicraft tasks are being split up into individual and unchallenging operations. . . . Traditional handicraft skills and complicated or all-round knowledge of craftwork are losing more and more of their former significance." Summarizing the results of numerous case studies, the authors concluded that "new demands on work which promise higher skills, greater autonomy, more decisionmaking power, and similar developments for the individual worker at the shop-floor level are less foreseeable . . . than polarization tendencies."

In sharp contrast, the skill-bias of computerization is unambiguous in the skill-mismatch story. This bias can be shown with a standard supply and demand graph by a downward shift in the demand curve for low-skill workers. This causes both wages and employment for these workers to fall. And just the reverse takes place in the market for high-skill workers—causing higher wages and growing employment. This is a demand-side story. The recent literature has generally supported the conclusion that, while earnings trends among high-skill workers may have been influenced by a deceleration of growth in the supply





Note: 90:10 indicates the ratio of the wages of those in the 90th percentile (high earners) to those in the 10th (low earners) Source: Derived from Table A1, DiNardo, Fortin, and Lemieux, "Labor Market Institutions and the Distribution of Wages, 1973-92," unpublished manuscript, December 31, 1993.

of college-educated workers in the early 1980s, shifts in supply have played a minor role in the collapse in the real wages of low-skill workers.

This story yields two sets of predictions—one concerning wage trends, the other about employment composition. As computer intensity accelerates, we should see declining real wages of low-skill occupations and rising wages of higher-skill occupations. The college-to-high school wage ratio should persist or increase after 1979 and the rate of increase should rise after 1988 following the pattern of computer intensity. Similarly, earnings inequality should expand in the late 1980s and early 1990s.

Concerning employment trends, the skill-mismatch story predicts a decline in low-skill job opportunities, as computer intensity grows. The share of workers in low-skill occupations should show substantial declines that accelerate after 1982, as low-skill job opportunities disappear with computerization. As lowskill job opportunities disappear, joblessness and unemployment rates should show a secular increase.

# EARNINGS TRENDS AND COMPUTERIZATION

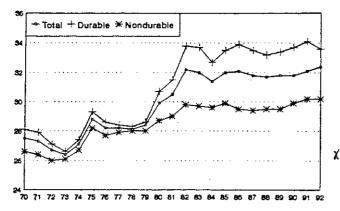
At first glance, male-earnings trends seem broadly consistent with a decline in the demand for low-skill workers. The real earnings of male workers with less than a high school education declined by over 16 percent between 1979 and 1989 (from \$28,181 to \$23,610). These workers saw even more rapid

declines between 1989 and 1992, as earnings fell by 8.4 percent (to \$21,620). Although somewhat less dramatic, the same pattern is shown for male workers with just a high school degree. College-educated male workers, on the other hand, experienced an 8.2 percent earnings increase in the 1980s (from \$47,845 to \$51,746). According to a report of the Federal Reserve Bank of New York, the annual earnings of young men working full-time with a high school diploma-relative to those with a college degree-fell from 88 percent in 1979 to 68 percent in 1989. As Figure 2 shows, the ratio of the wages of those in the 90th percentile (high earners) to those in the 10th percentile grew throughout the decade, rising from 2.7 to 3.8 for women and from 3.6 to 4.4 for men.

A closer look at the timing of these trends suggests that there is no obvious link between rising computer intensity and earnings trends. Interestingly, both the growth in earnings inequality and the rise in the college-to-high school earnings gap shows little change after 1988, just when computerization should have had its greatest impact.

In one of the few studies that has looked carefully at the effects of technological change on the wage structure, Steven G. Allen found that his measure of technological change accounted for 48 percent of the increase in returns to schooling in the 1980s for workers in manufacturing, but only 7 percent for the entire workforce. But even within the manufacturing sector, Allen points out that his results do not suggest that technological change alone can explain much of the sharp absolute declines in the real earnings of lowskill male workers in the 1980s. He shows that the main effect of technological change, as measured by his proxy for R&D activity, is on the earnings growth of the most highly skilled workers. As he puts it: "Rising R&D activity is associated with higher wages for college graduates, but is completely unrelated to wages of other educational groups." Recent technological change in the workplace may have a greater impact at the top than at the bottom of the wage structure. But other research has shown that much of the increase in the returns to schooling in the 1980s can be attributed to the business and law fields, and that the wages of computer specialists and engineers actually declined relative to the average wages of high school graduates. Lawrence Mishel's and Jared Bernstein's research at the Economic Policy Institute shows convincingly that standard measures of technological change do not account for the growth of the college/high school gap in the 1980s.

Figure 3 The Nonproduction Share of Manufacturing Employment, 1970–92



Sources: 1970–88: Handbook of Labor Statistics, August 1989, Table 72; 1989–92: Employment, Hours, and Earnings; U.S., 1981–93, Bureau of Labor Statistics, Bulletin 2429, August 1993.

#### TRENDS IN SKILL-MIX

The prevailing view is that labor demand within industries has shifted away from low-skill workers, due in large part to computerization. Berman, Bound, and Griliches point out that there was a large increase in the nonproduction share of manufacturing employment in the 1980s. As they put it: "Between 1979 and 1989, the employment of production workers in U.S. manufacturing dropped by a dramatic 15 percent from 14.5 to 12.3 million, while nonproduction employment rose 3 percent from 6.5 to 6.7 million." The authors interpret these trends as evidence that the manufacturing sector experienced substantial skill-upgrading over this decade and that "biased techno-

logical change is an important part of the explanation." It is immediately apparent from the employment trends presented by these authors, however, that virtually all of the "skill-upgrading" they observed took place in just three years—1980, 1981, and 1982. Indeed, their data indicate that the nonproduction share of employment in 1983 was identical to the share six years later.

Figure 3 plots the nonproduction employment shares for durable, nondurable, and total manufacturing for \$\overline{973}\$ It shows that the change in this measure of the skill-mix in manufacturing can be traced largely to developments in the durable manufacturing sector between 1980 and 1982. The share of nonproduction workers in this sector increased sharply, from 28.6 percent in 1979 to 33.8 percent in 1982, and then fluctuated between 33.2 percent and 34.1 percent over the next ten years. Although employers might use recessions to restructure their workplaces, there is no evidence that there was a substantial shift in skill-mix in the 1990-91 downturn.

With Susan Wieler, I have disaggregated the data to provide a more detailed portrait of shifts in skill-composition. We distinguished skilled from unskilled occupations, separately for white-collar and blue-collar occupations in both manufacturing and service industries. Skilled white-collar workers are defined as those employed in managerial, professional, and technical occupations. Low-skilled white-collar workers consist of those in administrative-support occupations. Skilled blue-collar jobs include mechanics and repairers, construction and extractive trades, and precision production occupations, while low-skilled blue-collar

Table 1 Occupation Shares in Manufacturing (1978<del>-9</del>0) White-Collar HS/LS High-Skill Low-Skill High-Skill Low-Skill Blue-Collar High-Skill WC/ White Collar White-Collar Blue-Collar Blue-Collar HS/LS Low-Skill BC (4)(Col 1/Col2) (Col3/Col4) (1)(2)(3)(Col1/Col4) 1978 19.5% 11.6% 21.6% 45.1% 1.68 0.480.43 1979 20.4 21.7 43.9 11.7 1.74 0.49 0.46 21.2 1980 12.0 22.7 41.9 1.77 0.54 0.51 41.7 1981 22.0 21.7 12.2 1.80 0.52 0.53 21.3 1982 23.5 12.6 39.7 1.87 0.54 0.59 20.6 1983 24.1 0.52 12.3 40.0 1.96 0.60 1984 23.8 12.0 21.6 39.7 0.54 1.98 0.60 1985 24.2 21.7 38.9 12.0 0.56 2.02 0.62 1986 24.6 12.2 20.9 39.2 2.02 0.53 0.63 1987 24.2 11.3 40.4 2.14 20.9 0.52 0.60 2.30 1988 24.1 10.5 21.7 40.8 0.53 0.59 1989 25.2 11.2 20.8 39.6 2.25 0.53 0.64 25.8 2.43 1990 10.6 19.7 0.48

Source: March Current Population Surveys.

jobs refer to operators and assemblers, transportation and material-moving occupations, laborers, and guards. Like the Berman, Bound, and Griliches study, these skill-measures refer to the occupational structure in each industry.

The share of total manufacturing employment in each of these four skill-groups is shown in the left panel of Table 1. The dotted line marks the transition to the current occupational classifications by the Census Bureau. Part of the change from 1981 to 1982 may reflect this transition. Consistent with the Berman, Bound, and Griliches results, the 1978-82 figures show shifts in skill-composition away from low-skill blue-collar employment (-3.4 percentage points) toward skilled white-collar jobs (+2.5 points). The ratio of the two (the last column) shows an increase from 0.43 in 1978 to 0.6 in 1983.

The trends look very different for the 1982-90 period. The skilled white-collar share held steady between 1983 and 1988, then jumped from 24 percent to almost 26 percent from 1988 to 1990. Neither of the blue-collar skill-groups shows much change between 1982 and 1990. The big change was in the share of low-skill white-collar workers, which declined fairly steadily from 12.6 percent in 1982 to 10.6 percent in 1990. Consistent with the growth in computer intensity (see Figure 1), almost all of this change occurred after 1986.

These results indicate that there was significant restructuring away from low-skill blue-collar jobs between 1978 and the early 1980s and away from low-skill white-collar jobs at the end of the 1980s. Since the unskilled blue-collar worker share of manufacturing employment was about the same in 1990 as

in 1980, and even the ratio of high-skill white-collar to low-skill blue-collar employment shows little movement (see the last column), these trends do not suggest strong effects of computers on low-skill male employment. Rather, it is primarily the decline of female low-skill white-collar employment in the late

Declining job quality may reflect management practices, government policies, or supply-side developments, and not declining skill-levels of workers.

1980s that seems most consistent with the timing of computer investments.

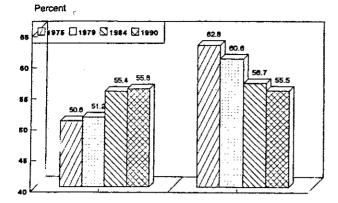
The skill-composition of service industries shows even less change over the decade. Table 2 reports that the number of skilled white-collar workers increased by just .07 percentage points and the number of lowskill white-collar workers decreased by the same 0.7 points from 1983 to 1990. The result was an increase in the high-skill to low-skill ratio from 1.73 to 1.83 over these eight years. If we ignore the suspiciously large shifts between 1981 and 1982, there was virtually no change in the share of low-skill white- and blue-collar jobs in the service sector between 1978 and 1990.

The question for the technology-induced skill-mismatch hypothesis is: Why would the use of new workplace technologies cause a sharp skill-restructuring between 1980 and 1982 but not between 1983 and 1992, when the latter period was characterized by a far higher rate of investment in computer-based equipment?

Table 2	Occupation Shares in Services (1978–90)						
	High-Skill	Low-Skill	High-Skill	Low-Skill	White-Collar	Blue-Collar	High-Skill WC/
	White Collar	White-Collar	Blue-Collar	Blue-Collar	HS/LS	HS/LS	Low-Skill BC
	(1)	(2)	(3)	(4)	(Col 1/Col2)	(Col3/Col4)	(Cot1/Col4)
1978	37.1%	21.7%	10.0%	21.8%	1.71	0.46	1.70
1979	37.3	21.8	10.4	21.4	1.71	0.49	1.74
1980	37.8	21.9	9.7	21.5	1.73	0.45	1.76
1981	37.6	21.8	9.6	21.3	1.72	0.45	1.77
1982 1983 1984 1985 1986 1987 1988 1989 1990	34.9 35.8 35.5 35.8 36.4 36.7 37.4 36.6 36.5	21.7 20.7 20.9 20.8 20.7 20.4 19.5 20.1 20.0	8.8 8.5 8.5 8.1 8.0 8.0 8.0 7.7 8.0	20.9 21.8 21.2 21.0 20.9 20.8 20.8 21.1 21.5	1.61 1.73 1.70 1.72 1.76 1.80 1.92 1.82 1.83	0.42 0.39 0.40 0.39 0.38 0.38 0.38 0.36 0.37	1.67 1.64 1.67 1.70 1.74 1.76 1.80 1.73

Source: March Current Population Surveys.

Figure 4 Low-Wage and Low-Skill Shares of Total Employment, 1976–90



Note: Low Wage: <1.5 times poverty wage; Low Skill: 12 years of education or less.

Source: March CPS; includes ages 16–39.

### SKILL-MISMATCH AND JOBLESSNESS

The smil-mismatch model also predicts an increase in joblessness as the demand for low-skill workers declines. As new computer-based production technologies have became more widespread and more effectively utilized over time, joblessness among the least skilled should have steadily grown over the 1980s. Indeed, high unemployment and nonparticipation ra's have been frequently cited as evidence of a declir ag demand for low-skill workers. Just as the standard labor market model implies that skill-restructuring is the source of wage restructuring, it also suggests that, if rising joblessness occurs as wages (skills) decline, there must be a declining demand for lowskill labor (declining job opportunities). But if we "unbundle" the skill and wage distributions, increasing joblessness might be seen as the result of workers opting out of the legitimate labor market as the quality (wages and benefits) of jobs decline. Declining job quality may, in turn, reflect management practices, government policies, or supply-side developments, and not declining skill-levels of workers.

The data show a clear secular increase in unemployment and nonparticipation rates for low-wage men only through the recession years of 1980–82. While nonparticipation rates rose from 1983 through 1989 for low-wage men, unemployment rates fell even faster. The offsetting nature of these two series after 1982 are consistent with a very different story for the 1980s. There were increasing opportunities for jobs that were declining in quality. As a result, for those who chose to remain in the labor market, unemployment rates fell. But declining job quality also led to

greater discouragement and, therefore, led to higher nonparticipation rates.

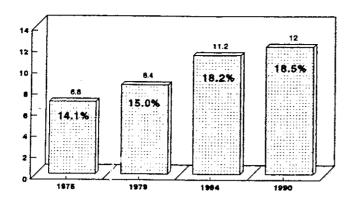
Does other evidence support a sharp contraction in job opportunities for low-skill workers? For young (20-24) black males—a demographic group as likely as any to be negatively affected by a declining demand for low-skill workers—the employed share of the population fell sharply from 72.6 percent in 1973 to 65.5 percent in 1979, and again to 53.9 percent in 1982. But it has risen steadily since, reaching 63.9 percent in 1988. Thus, the employment rate for young black men at the end of the 1980s was about what it was in 1979. The data for other male groups show similar trends. The unemployment rate for 25-34-yearolds was 5.2 percent in both 1979 and 1989. Among the unemployed, almost the same share were job losers in 1989 as in 1979 (45.7 and 42.9 percent). Unemployment rates for high school graduates were about the same in these two years. But the rates for teenagers and black workers were both lower in 1989 than in 1979.

In light of these data, one must ask: If the problem is skill-mismatch due to the increasing skill-requirements of new workplace technologies, why did joblessness and unemployment increase sharply in the 1970s, while it showed little or no increase between 1979 and 1989? The correct answer provided by the 1994 Economic Report of the President is straightforward: "Little evidence can be found that skill-mismatches have contributed much to recent increases in unemployment. . . ."

## LOW-SKILL AND LOW-WAGE TRENDS

Measured by the occupation mix of employment, there has been little shift in the demand for skills within industries since 1983. Unemployment and joblessness trends offer little support for skill-mismatch explanations. But, perhaps cognitive skill-requirements have grown within occupations and skillupgrading by workers hasn't kept pace. The mismatch story assumes a simple text-book labor market in which the wage structure reflects the skill structure. In this case, if skill requirements within occupations increase, the share of workers with relatively high skills and high wages should increase. It might be instructive, therefore, to look at recent trends in lowwage and low-education shares of employment. I define the former as the share of workers with earnings less than 1.5 times the hourly wage necessary for

Figure 5 The Number and Share of Young Low-Wage Workers With More Than a High School Degree, 1975-90



Note: includes ages 16-39 with work experience; low wages are those less than 1.5 times poverty wage. Source: March CPS.

a full-time full-year worker to keep a family of three above the poverty line. Low education is defined as being no more than a high school education (12 years of schooling). To focus on recent developments in the labor market, I have restricted the sample to 16-39year-old workers.

Figure 4 shows that employed workers with low educational attainment declined throughout the 15year period—from 62.8 percent in 1975 to 55.5 percent in 1990. Although the technology-change explanation suggests ' at the greatest rate of decline should have taken place in the second half of the 1980s, when the demand for skills presumably accelerated and those without adequate skills dropped out of the labor market, the data indicate that the most rapid decline actually took place in the early 1980s. It also shows that low wage workers increased from 50.6 percent to 55.8 percent of the workforce from 1975 to 1990, with the largest jump again occurring in the early 1980s.

Figure 5 reports another notable effect of the 1980s restructuring: the growth of that part of the workforce with relatively high educational attainment but with very low wages. Workers with more than a high school education who were paid less than 1.5 times the poverty-level wage grew from 6.8 to 12 million workers between 1975 and 1990. This represented an increase in the low-wage/high-skill share of employment from 14.1 to 18.5 percent. Again, the increase took place throughout the period, but most (three-quarters) of the change occurred in the 1979-84 period.

At the industry level, the growth in low-wage employment was the most pronounced in the goods

industries. Of the ten industries with greater than 20percent increases from 1975 to 1990 in the low-wage share of total employment, nine were goods-producing. Among industries with substantial skill-upgrading, many had increases in low-wage employment shares. For example, between 1975 and 1990, restructuring in the stone, clay, glass, and primary metals (including steel) industries resulted in a 9 percent decline in the share of low-skill employment (from 77 to 70 percent). But these industries experienced a 76percent increase in the low-wage share (from 23 to 40 percent). The communications industry saw its lowskill share decline by 33 percent (from 58 to 39 percent). But its low-wage share increased by 33 percent (from 22 to 29 percent). Even more dramatically, the automobile industry's low-skill employment share declined by 6 percent (from 76 to 71 percent). But its low-wage share grew by 142 percent (from 17 to 40 percent). The results for the chemicals, machinery. and electrical machinery industries were similar. Industries with high-wage, low-skill workforces appear to have restructured (mainly in the early 1980s) by radically lowering wages and gradually

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raising skill-requirements. In short, they moved in the direction of the typical service-sector workplace.

The elimination of living-wage, low-cognitive-skill jobs has produced an extraordinarily rapid convergence of low-wage and low-skill employment shares among industries since 1979. Interestingly, in this respect the recent restructuring has made the labor market more like that described in the textbook model. The correlation between low-wage and lowskill shares of employment was insignificant in 1979 (0.057). But it rose to 0.255 in 1984 and to 0.337 in 1990. Consistent with this finding, my work with Maury Gittleman (see Gittleman and Howell in For Further Reading) indicates that the most striking feature of the employment restructuring among male workers since 1973 has been less a shift away from low-skill jobs than the disappearance of high-wage low-skill jobs.

The central policy recommendation that follows from the skill-mismatch story is that we must attack low earnings and massive inequality by investing in education and training. That the success of a supply-side approach is not guaranteed is strongly suggested by the recent evidence that growing shares of near-poverty-level jobs have coincided with substantial declines in low educational attainment.

#### **ALTERNATIVE STORIES**

An enormous amount of empirical research has been undertaken in the last few years on the collapse of real wages at the bottom of the wage distribution and the sharp rise in earnings inequality in the United States since the late 1970s. Among academic economists and Clinton Administration policymakers, a widely accepted scenario is that the decline in wages for low-skill men reflects declining demand (job opportunities), caused primarily by skill-biased technological change in the workplace (namely, computerization). This explanation has the great advantage of being both simple and consistent with the most elementary labor

Making workers smarter should be a top priority, but even massive investment in education and training will not, by itself, have much impact on the distribution of earnings—certainly not in the next decade.

market model. To wit: If competitive pressures in the labor market ensure that the wage distribution reflects the skill-distribution, a decline in job opportunities for low-skill workers will lower their wages, if their supply doesn't decline as well. There are simply too many low-skill workers.

Unfortunately, there is also a great disadvantage in the skill-mismatch story. As I have argued, the empirical evidence does not provide much support for it. The source of the earnings problem of U.S. workers appears to be just the reverse of that proposed by the technology-induced skill-mismatch hypothesis. In the face of mounting competition, employers have reduced unit labor costs and have increased flexibility in the production process by following the "low road" (lower wages, little training, and fewer permanent employees). Wage concessions, the outsourcing of parts, relocation of operations to low-wage sites, the substitution

of contingent for permanent workers, and other employer policies aimed at reducing labor costs all have had substantial effects on relative wage trends in the 1980s. But they did not have major consequences for the skill-mix. The recognition of the key role played by these employment practices (reflecting a major shift in wage norms by employers) requires that the labor market be viewed through a lens that does not automatically equate wage and skill levels. As former Labor Secretary Ray Marshall has put it: "Since the early 1970s, U.S. companies have been competing mainly through reducing domestic wages and by shifting productive facilities to low wage countries."

#### **POLICY IMPLICATIONS**

The skill-mismatch and shifting wage norms explanations imply diametrically opposed government employment policies for reversing the wage collapse. If the rising incidence of low wages and the growth of earnings inequality over the last two decades can be attributed to declining job opportunities for low-skill workers due to technological change, the solution is straightforward. We must increase the number and quality of applicants for the growing pool of high-skill jobs. The answer, in short, is a supply-side remedy of more and better education and training. Indeed, the implication of the mismatch story is that we are twenty years too late. A choice to invest more heavily in skills back in the 1970s could have alleviated the skill-mismatch and fundamentally altered the course of future earnings trends. Given the nature and pace of technological advances, the United States effectively "chose" a low-wage path by failing to invest the resources necessary to increase the literacy of a large segment of the working-age population.

In contrast, if the main source of the wage restructuring was a fundamental shift, not in skill-requirements, but in wage norms, raising the level of skills that workers bring to the workplace will do little to reverse the recent collapse of low-skill male earnings. The shift away from low-skill labor can be observed throughout the post-World War II period. There is no direct evidence that technological change in the workplace dramatically altered the pace of this process in the 1980s. Indeed, the period since 1983 shows remarkable stability in skill-composition.

Rather, the distinctiveness of the period since 1979 has been the wholesale adoption of employment practices designed to reduce short-run labor costs. Private-sector human-resource policies have undergone a sea-

change which cannot be understood simply in terms of demand and supply pressures. Richard Freeman and his colleagues have underlined the significance of differences across developed countries "in the efficacy of alternative ways of organizing workplaces and structuring labor markets." (See Richard B. Freeman in For Further Reading.) At the decentralized end of the international spectrum, the late 1970s and the early 1980s saw a radical shift by U.S. employers toward the textbook model (and away from the European model), in which the decentralized marketplace, unregulated by government or social norms, is charged with the sole responsibility for wage and employment outcomes.

Wage-setting institutions that had been designed to protect low-skilled workers from the full impact of wage competition were dismantled. This was a reflection of increasing competitive pressure (deregulation and globalization), a shift in ideological climate, and a variety of accompanying government policies such as deregulation, sharp reductions in the staffing of agencies that monitor adherence to labor laws, and a 40percent decline in the real value of the legal minimum wage. As the costs of health benefits exploded, the continued reliance on employers for health insurance may also have contributed to the increase in the demands made by firms for wage concessions, the

preference of employers for part-time and temporary workers instead of permanent employees, and the decisions of many firms to relocate operations to lowwage anti-union locations.

A shifting wage-norms explanation suggests that reversing the declining real (and relative) wages of low-skill workers requires public policies that address, not just worker characteristics, but the way wage-setting institutions work-both inside and outside the

Making workers smarter should be a top priority, but even massive investment in education and training will not, by itself, have much impact on the distribution of earnings—certainly not in the next decade. Besides, most jobs will continue to require less than a college degree. A labor market that increasingly offers poverty-wage jobs to these workers provides them with little incentive to invest in education and training-no matter how well we design and implement the programs. Equally important, low-wage employment strategies and high levels of job insecurity are an unlikely recipe for developing a competitive economy of high-performance workplaces.

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