The Collapse of Low-Skill Male Earnings in the 1980s: Skill Mismatch or Shifting Wage Norms?

by

David R. Howell*

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*Graduate School of Management and Urban Policy, The New School for Social Research

ABSTRACT

The rapid growth in wage inequality and the rising incidence of low earnings in the 1980's can be traced in large part to the sharp decline in the real hourly wages of low-skill men. This paper examines alternative explanations for this wage collapse. A widely accepted story is that this collapse reflected declining demand (job opportunities) for low-skill jobs, a consequence of biased technological change. The result was skill mismatch: too few low-skill jobs for the low-skill workforce. The evidence described in this paper offers little support for this hypothesis; while substantial shifts in the skill mix of employment took place between 1973 and 1983, there was 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 by firms in all sectors of the economy. An alternative "shifting wage norms" explanation is proposed. A survey of the evidence suggests that many employers began to adopt low-wage human resource strategies in the late 1970's. These employment practices undermined traditional wage-setting institutions (collective bargaining, internal labor market norms) that had protected low-skilled workers from the full force of labor market competition. In addition, these practices, together with unprecedented increases in the supply of low-skill foreign workers, resulted in a massive increase in the *effective* supply of labor competing for low-skill jobs. These developments led to a collapse of wages at the bottom of the wage distribution, a collapse facilitated by a 25 percent decline in the real value of the legal minimum wage in the 1980's.

After rising for almost three decades, the average real weekly earnings of production and nonsupervisory workers fell by 7.5 percent between 1973 and 1979 and by another 12.6 percent between 1979 and 1990. In 1982 dollars, the weekly wage was $327 in 1973, $303 in 1979, $277 in 1982, and just $265 in 1990.[1] This considerable drop in the value of the average production worker paycheck has coincided with a spectacular increase in earnings inequality (Levy and Murnane, 1992; Juhn, Murphy and Pierce, 1993). Indeed, the most highly publicized characteristic of recent earnings trends has been been the widening gap between highly educated and poorly educated workers.

Table 1 summarizes real earnings trends since 1973 by gender and educational attainment for full-time year-round workers from the March Current Population Survey files. The Table shows that the wage restructuring of the last two decades consisted of two fundamental developments. First, the real earnings of college educated female workers in the 1980's grew rapidly (14 percent) in the 1980's. The second and even more dramatic trend was the massive decline in the earnings of poorly educated men - down 25 percent for those with less than a high school and down 16 percent for men with just a high school degree since 1973. As the table shows, while real earnings for these workers fell in the 1970's, the percentage declines were 3 to 4 times larger in the 1980's, a decade in which the average earnings of college educated workers increased modestly. The increase at the top appears to be due exclusively to the increased earnings of those with post-graduate schooling. Average earnings for individuals with just a college degree actually fell by 2.3 percent.[2]

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[1]Average weekly earnings (Economic Report of the President,1991, Table B-44) were deflated by the CPI-U index (Table B-58).

[2]This last figure is for the 1979-91 period (Mishel and Bernstein, Economic Policy Institute, cited in the New York Times, December 13, 1993, p. D1).

Table 1
Changes in Real Earnings By Demographic Group, 1973-89
(Full-Time Year-Round Workers)

Gender/Years of Schooling			
Men	**1973-79**	**1979-89**	**1973-89**
0-11	-5.1	-19.6	-24.7
12	-4.1	-11.3	-15.5
13-15	-4.4	-2.8	-7.1
16+	-7.3	4.9	-2.4
Women			
0-11	4.1	-5.9	-1.8
12	2.8	1.5	4.2
13-15	.5	7.1	7.6
16+	-1.9	14.1	12.2

Source: Maury Gittleman, "Changes in the Structure of Earnings in the 1980's: An Occupational Perspective," unpublished (Bureau of Labor Statistics), 1993.

These data indicate that it was the sharp drop in the earnings of low-skilled men that was primarily responsible for the growth in male earnings inequality across education groups in the 1980's. This downward wage restructuring also meant that fewer low-skilled workers could rely on wage earnings to keep a family out of poverty. Acs and Danziger (1993) report that the incidence of "low earnings," defined as the poverty line for a family of four, doubled between 1979 and 1989 for employed male high school graduates, rising from 8 to 15 percent; for men with only some high school, the share of the employed workforce with poverty-wage earnings increased from 13 to 30 percent. The problem of low-earnings was substantially worse for black and Hispanic men: 25 percent of all employed black men and 41 percent of all employed Hispanic men with less than a high school degree earned poverty-level incomes in 1989, far above their 1979 levels (Acs and Danziger, 1993:Table 3).

While supply-side changes appear to provide a reasonably good account for

the modest wage growth observed for well-educated men in the 1980's,[3] there is no consensus on the reasons for the collapse at the bottom. Perhaps the single most widely accepted explanation is skill mismatch - that there was a fundamental shift in the mix of skills required in the workplace which caused a substantial decline in demand for low-skill workers. The growing mismatch between the skills demanded by firms and those supplied by the workforce reduced wages and increased joblessness among the low-skilled. Chinchui Juhn (1992:99), for example, infers from declining real wage and labor force participation trends that "job market opportunities have ... deteriorated significantly for less-skilled workers." Similarly, Juhn, Murphy and Pierce (1993:437) write that the "fall in wages for the least skilled is symptomatic of a fall in demand for low-wage workers" and conclude that "There are simply too few low-wage jobs...."[4] The current Secretary of Labor, Robert Reich, citing evidence of rising shares of poverty-wage workers and growing wage inequality, has written that there is a "mismatch between the skill Americans have and the skills the economy requires.... The long-term crisis in advanced industrial nations reflects in part a shift in relative labor demand against less-educated workers and those doing routine tasks and toward workers with problem-solving skills" (1993).

A widely accepted explanation for this shift in the demand for skills is technological change in the workplace. In an influential paper, Bound and Johnson (1992:371) assert that the "major cause (of relative wage changes in the 1980's) was a shift in the skill structure of labor demand brought about by biased techno-

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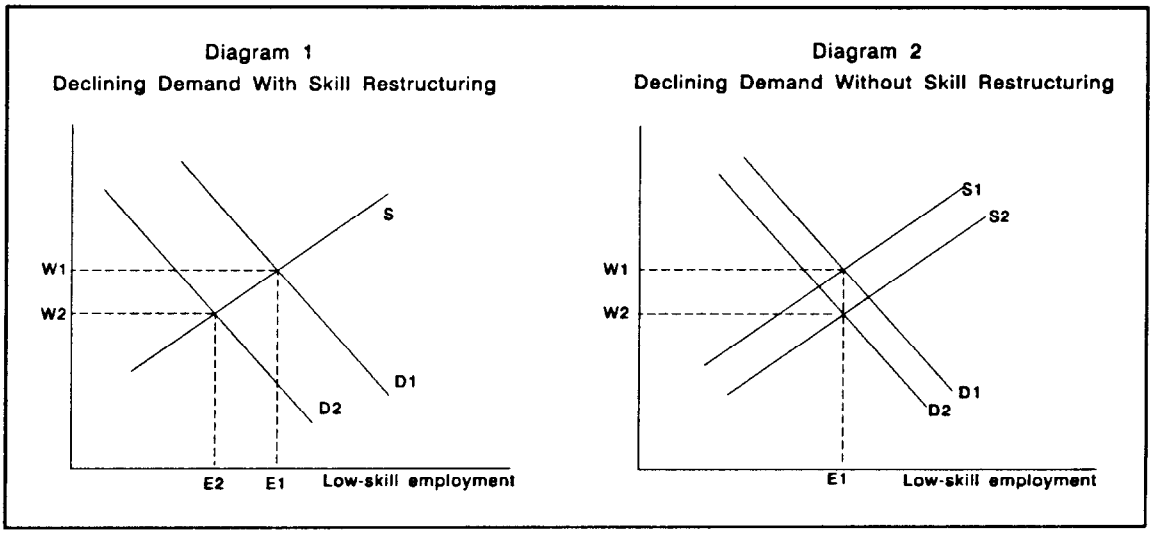
[3]Citing the work of Blackburn, Bloom and Freeman (1990) and Kosters (1992), Burtless (1992) states that "The supply of highly skilled workers more than kept pace with demand through the 1970's, when the wage premium for schooling shrank slightly. But the anemic growth of a highly skilled labor supply in the 1980's led to a sharp rise in the premium for education and skill."

[4] As the last quotation suggests, "low-wage" workers are frequently viewed as synonymous with "low-skill" workers in the recent empirical literature (see the introduction to Section 1).

logical change." Similarly, Acs and Danziger (1993:632) conclude that since most of the decline in earnings is found within industries for workers with the same education and experience levels and cannot be accounted for by the standard measures used in earnings studies, "changes in technology, whether autonomous or in response to foreign competition, provide the most plausible explanation for the fall in mean earnings." Neither of these studies attempted to directly test this proposition, but recent papers by Allen (1993) and Berman, Bound and Griliches (1993) have done so, finding that technological change helps to explain recent wage trends (Allen) and skill upgrading (Berman, Bound and Griliches) in manufacturing industries.

The beauty of the technology-induced skill mismatch explanation is its simplicity - it is a straightforward application of a simple demand and supply model in which relative wages reflect relative skills. It is also consistent with a wealth of anecdotal evidence on the skill upgrading effects of computer-based workplace technologies (although there is also counter evidence - see below). As Diagram 1 shows, a decline in demand for low-skilled workers caused by the introduction of new technologies can be expected to lead to lower wages and declining employment for low-skill (low-wage) workers. With no change in the supply schedule, declining job opportunities imply rising joblessness.



There is, however, another literature that has attempted to explain the growth in male wage inequality with little or no reference to skill restructuring. This body of research has focused on the statistical relationship between a variety of potentially relevant factors and relative wage trends. These factors range from underlying determinants (trade), to proximate causes (union strength), to developments that have merely facilitated the downward wage trends (the value of the minimum wage). For example, Borgas, Freeman and Katz (1992) find that low-skill immigration and trade are together responsible for 30-50 percent the growth in wage inequality. Borgas and Ramey (1993) conclude that the effects of foreign trade on high-wage workers in concentrated durable goods industries is the primary driving force behind the rise in wage inequality throughout the economy, although the mechanism through which this took place is left unclear. According to other studies, declining union strength and the drop in the real value of the minimum wage together explain some (Blackburn, Bloom and Freeman, 1990) or almost all (DiNardo, Fortin, and Lemieux, 1993) of the shift in relative wages. The empirical results have often been impressive - as a group, these studies explain considerably more than 100 percent of the change in wage inequality - but the reader is left without a coherent story.

After evaluating the evidence for the technology-induced skill mismatch hypothesis, this paper attempts to fashion this non-skill-related body of research into a "shifting wage norms" explanation - one that can be contrasted to the skill restructuring story. Briefly, while the upgrading of skill requirements in the 1980's does not appear to have risen above its long-term (upward) trend, two major developments differentiated the labor market of the 1980's from earlier decades. First, as a result of increasing competitive pressures (globalization and deregulation) and a shift towards a much more conservative, pro-market ideological climate, management pursued human resource strategies that severely undermined traditional wage-setting institutions (collective bargaining, internal labor market norms) that had protected low-skilled workers from the full force of labor market competition. Second, the closing of employment opportunities in the *middle* of the earnings distribution

(high-wage blue-collar jobs and moderately skilled white-collar jobs), the increasing availability of contingent workers, unprecedented increases in low-skill foreign workers, and the increasing ability (due to legal and technological changes) to relocate to low-wage locations, resulted in a massive increase in the *effective* supply of labor competing for low-skill jobs. These developments led to a collapse of wages at the bottom of the wage distribution, facilitated by a 25 percent decline in the real value of the legal minimum wage in the 1980's. This alternative story - lower wages without substantial skill restructuring - is depicted in Diagram 2.

The first four sections of this paper are concerned with the evidence for the technology-induced skill mismatch explanation for the 1980's wage collapse. Section 1 considers the implications of recent wage and joblessness trends for skill restructuring. Section 2 surveys the evidence on the impacts of new production technologies on skill requirements in U.S. workplaces. It also considers whether changes in standard industry and occupation employment shares suggests major skill restructuring in the 1980's. The third section then presents an alternative labor market segmentation perspective on employment restructuring in the 1980's.

The evidence surveyed in these three sections indicates that while the expansion of "problem-solving" jobs is real, the upgrading of the skill distribution in the 1980's was not radically different from trends in previous decades. Indeed, there is some evidence that the rate of increased slowed in this last decade. The uniqueness of the 1980's appears to have been less an unusually strong shift in demand away from *low-skill jobs*, reducing job opportunities and lowering wages, than a dramatic growth in the share of *low-wage jobs:* the demand by employers for low cost labor escalated dramatically at all skill levels. The main restructuring among nonsupervisory male workers in the 1980's was, therefore, not towards higher skill jobs but away from higher wage jobs. Indeed, the share of low-skill jobs was remarkably stable from 1983 into the 1990's.

Section 4 surveys the evidence in support of a shifting wage norms explanation for the wage collapse. Facing increasingly competitive product markets, abundant supplies of workers willing to accept low and declining real wages, favorable

government policies and a comfortable ideological climate, employers took a "low-road" human resource strategy, one aimed above all at reducing current labor costs. Indeed, in direct contrast to the technology-induced skill mismatch story, the fundamental problem in the 1980's in this alternative account was that most employers did not follow a high-tech, high-skills path.

Section 5 concludes the paper with a discussion of the policy implications of these two explanations. If the earnings problems of low-skilled workers is mainly the result of a shift in the demand for skills that stems from the increasing use of computers in the production process, public policy must address the need to substantially upgrade the cognitive skills of large portions of the current and future workforce - although it is unlikely that the effects of improvements in education and training would affect the wage distribution significantly for at least a decade. On the other hand, if the real mismatch in the 1980's was between skills provided and wages paid, improvements in education and training programs are unlikely to have much effect on the earnings problems of most nonsupervisory workers even in the long run, and public policies should aim to help reverse the downward shifts in wage norms without undermining the competitiveness of U.S. firms.

1. Relative Wage and Joblessness Trends as Evidence of Skill Mismatch

The simple labor market model assumes a close, if not perfect, correspondence between the skill and wage distributions: workers are paid their marginal product and the skills supplied by workers determine their relative productivity. This assumption is made explicit in many empirical studies. Describing his methodology for examining the incidence of unemployment across skill groups, Topel (1993:110) writes that "I will define relative marketable 'skills' in terms of a person's position in the overall distribution of wages." Similarly, Berman, Bound and Griliches (1993:5) assert that "Changes in the wage bill share will reflect changes in relative skill levels." Indeed, throughout the earnings literature, skills are used synonymously with wages. Interpreting a figure showing real wage changes by wage percentile, Juhn, Murphy and Pierce (1993:417) write that "the divergence in wages across

percentiles is pervasive and is not limited to a specific part of the wage distribution. Skill differentials have increased at all points in the skill distribution."

Within a framework in which the wage and skill distributions are interchangeable and with no shifts in supply, declining relative wages necessarily reflect declining "marketable skills." Indeed, if standard measures of skills cannot account for wage differentials or their change over time, it has become standard to refer to the residual as a measure of "unobserved skills." While measurement error is usually present, the danger of this approach is that, by definition, it rules out alternative, non-price theoretic explanations. As Diagram 1 showed, this model predicts falling wage levels fall as well as falling low-skill (low-wage) employment ("job opportunities"). The remainder of this section considers several questions that bear directly on the adequacy of this explanation for the 1980's wage collapse.

Can we rely on the simple marginal productivity model to understand relative wage trends in the 1980's? It hardly seems controversial to suggest that relative wages are determined by a variety of non-skill related factors ("wage setting institutions"). While more education tends to be associated with higher earnings, many other factors are equally or even more important for wage determination, including gender, race, union coverage, firm size and industry of employment (Groshen, 1991). One only has to ask, for example, why most nonsupervisory jobs dominated by women pay substantially less than those dominated by men despite far higher average educational attainment required in the "female jobs." And if, for instance, these "female jobs" happen to be increasingly located in small firms in competitive industries, they will tend to pay even less over time, even if their relative skill levels have risen. In addition, wage-setting may be affected by less measurable factors like employer and employee militance, changes in collective bargaining laws, and changes in the enforcement of government regulations affecting earnings and conditions of work (Mitchell, 1985, 1989; Wachter and Carter, 1989).

Recent evidence on interindustry skill distributions indicates that after controlling for all the standard characteristics, workers in detailed occupations are paid substantially different wages in different industries (Katz and Summers, 1989).

Using data from the Dictionary of Occupational Titles, Howell and Wolff (1991a) found that the wage distribution was not a good proxy for the skill distribution at the occupation or industry level, whether skills are measured by cognitive skills, motor skills or interactive ("people") skills. The link was particularly weak for nonsupervisory occupations.

Additional evidence on the skills-wage link can be found in the earnings inequality literature. Attempts to account for the unprecedented increase in male earnings inequality throughout the 1980's have naturally turned to measures of skill. If the wage distribution mirrors the skill distribution, growing earnings inequality within industries should be associated with widening skill differentials. But the data show little support for this expectation. Confirming earlier research by Karoly (1992), Wieler (1993) found that changes in the variance of educational attainment and potential work experience on the job do a poor job of accounting for the steady increase in earnings inequality within industries observed in the 1980's. Wieler went one step further and examined the effect of changes in the variance of cognitive, interactive and motor skill measures from the Dictionary of Occupational Titles on earnings inequality. Changes in these "direct" measures of skills reflect changes in the detailed occupation mix of industry employment. Examining 33 industries between 1973 and 1990, she found no statistical effect at the industry level in either decade: Unlike the substantial widening of the wage distribution in the 1980's, the dispersion of skill requirements was unchanged in the 1980's, even among technologically advanced manufacturing industries (see below).

If fewer and fewer jobs require low skills and this decline became more rapid in the 1980's, and the wage distribution reflects the skill distribution, there should be fewer jobs paying low wages - changes in the share of low-wage workers should roughly correspond to changes in the share of low-skill workers.[5] To examine this

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[5] The presence of too many low-skilled workers should not affect the wages for higher skilled jobs since the low-skilled are not, presumably, easily substitutable for higher skilled workers.

proposition, I calculated the share of workers earning low wages and the share with low educational attainment for 1975 (the earliest year for which hourly earnings can be calculated from the Current Population Survey), 1979, 1984 and 1990.[6] Low wages are defined as 1.5 times the poverty level for an urban family of three. Assuming 1750 hours of work (50 weeks, 35 hours), this "low-wage" threshold was an hourly wage of $8.09 in 1988. Low skills was defined as educational attainment that does not go beyond high school. While this is by no means an adequate measure of the skills required in the workplace (see Howell and Wolff, 1991a), it does offer a convenient and familiar measure of cognitive skills. Since the purpose was to provide insight into current labor market conditions and to reduce the effect that older, less-educated workers might have on the results, only those in the first half of their careers (ages 16-39) were included in the analysis.

Figure 1 shows that employed workers with low educational attainment declined throughout the 15 year period, from 62.8% in 1975 to 55.5% in 1990. Although the technological change explanation would suggest that the greatest rate of decline should have taken place in the second half of the 1980's 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 1980's. This Figure also shows that low wage workers increased from 50.6% to 55.8% of the workforce from 1975 to 1990, with the largest jump again occurring in the early 1980's.

Figure 2 reports another notable effect of 1980's restructuring: the growth of that part of the workforce with relatively high educational attainment but earning very low wages. Workers paid less than 1.5 times the poverty-level wage with more than a high school education grew from 6.8 to 12 million workers between 1975 and 1990. This amounted to an increase in the low-wage/high-skill share of employment from 14.1 to 18.5 percent. Again, the increase took place throughout

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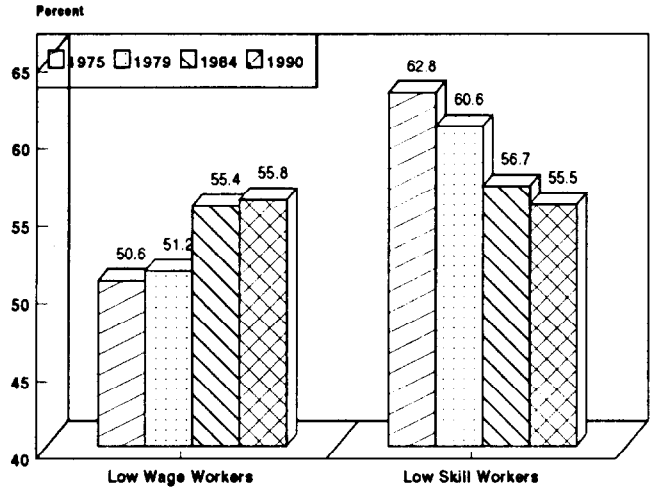
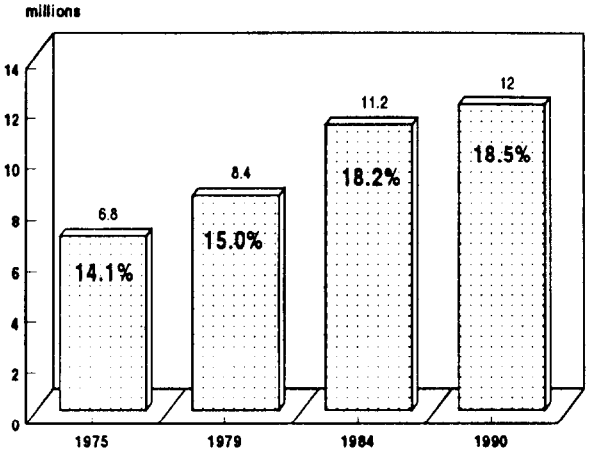
[6]Two of these years, 1975 and 1990, are recession years. Replacing these with 1976 and 1989 has no effect on the trends presented below.

Figure 1: Low Wage and Low Skill Shares of Total Employment, 1975-90



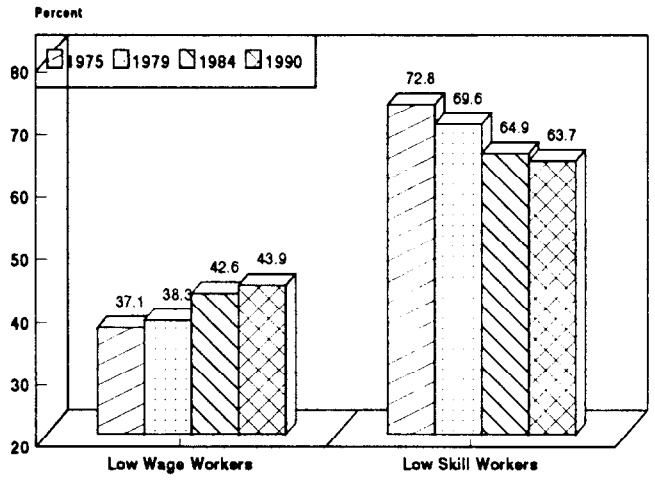
Source: March CPS. Includes ages 16-39.
Low Wage: <1.5 * poverty wage.
Low Skill: 12 years of Educ'n or less.

Figure 2: The Number and Share of Young Low-Wage Workers With More Than a High School Degree, 1975-90



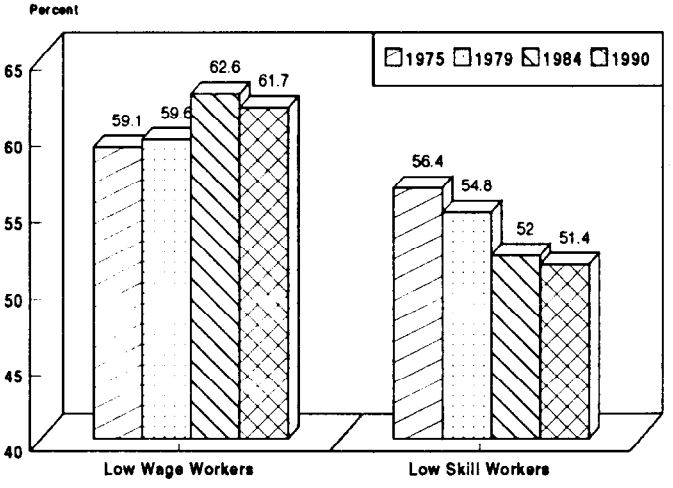
Source: March CPS. Includes ages 16-39 with work experience. Low wages are those less than 1.5 * poverty wage.

Figure 3: Low Wage and Low Skill Shares of Goods Sector Employment, 1975-90



Source: March CPS. Includes ages 16-39.
Low Wage: <1.5 * poverty wage
Low Skill: 12 years of educ'n or less.

Figure 4: Low Wage and Low Skill Shares of Service Sector Employment, 1975-90



Source: March CPS. Includes ages 16-39.
Low wage: <1.5 * poverty wage.
Low skill: 12 years of Educ'n or less.

the period, but most (three-quarters) of the change was accounted for by the 1979-84 period.

Figures 3 and 4 distinguish the skill and wage trends shown in Figure 1 separately for the goods and service industries. These report that a declining share of low-skill workers and a rising share of low-wage workers characterize both industry groups. But there are two interesting differences. First, the pace of the restructuring - the percentage change from 1975-90 - was much more rapid in the goods than the service sector, both with respect to skills and earnings. Second, compared to the service industries, employment in the goods industries is characterized by far lower shares of low-wage workers in each of the four years (37-44% vs. 59-62%) and much higher shares of low-skill workers (7364% vs. 5651%).

At the industry level, the growth in low wage employment was the most pronounced in the goods industries. Of the 10 industries with greater than 20% increases from 1975 to 1990 in the low-wage share of total employment, 9 were goods producing. Among industries with substantial declines in the low-skill share of employment, many had large increases in low-wage shares. For example, between 1975 and 1990 restructuring in the Stone, Clay, Glass and Primary Metals industry (which includes steel) resulted in a 9% decline in the share of low-skill employment (from 77% to 70%) but a 76% increase in the low-wage share (from 23% to 40%). The communications industry saw its low-skill share decline by 33% (from 58% to 39%) and its low-wage share increase by 33% (from 22 to 29%). Even more dramatically, the automobile industry's low-skill employment share declined by 6% (from 76% to 71%) but its low wage share grew by 142% (from 17% to 40%).[7] Goods industries with high-wage, low-skill workforces appear to have restructured in the 1980's by radically lowering wages and gradually raising skill requirements - in short, by moving in the direction of the typical service sector

[7]These results are conservative since temporary workers, whose share of employment greatly expanded in the 1980's, are defined as service sector workers and are not included in the data.

workplace.

The elimination of living-wage, low-cognitive skill jobs (see Section 3) 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 low-skill shares of employment was insignificant in 1979 (.057) but rose to .255 in 1984 and .337 in 1990. As will be seen in the next section, a key avenue through which this convergence was achieved was by reducing the share of low-skill workers with relatively high earnings.

The skill 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 1980's. Indeed, high unemployment and nonparticipation rates have been frequently cited as evidence of a declining demand for low-skill workers (see Juhn, 1992; Topel, 1993). Just as the standard labor market model implies that skill restructuring is the source of wage restructuring, the model suggests that if rising joblessness occurs as wages (skills) decline, it is declining demand for low-skill labor (declining job opportunities) that accounts for rising joblessness. But if we "unbundle" the skill and wage distributions, increasing joblessness might be seen as the result of falling wage levels (which may reflect management practices, government policies, or supply side developments) with no necessary role for changes in job opportunities.

It should be noted that low-skilled male workers have always shown greater unemployment and nonparticipation rates than higher skilled workers, for an obvious reason: the jobs available to lower skill workers are not as good and there is less incentive to maintain a stable employment record. The worsening of these rates may occur independently of the effects of skill restructuring on job opportunities for low-skill workers - either through increases in competition from new sources

of labor supply (increases in female participation, demographic shifts that increase the numbers of young workers in the labor market, displacement of higher wage workers, or rising numbers of low-skilled foreign workers) or as a result of a decline in job quality (e.g., falling earnings and benefits or rising job insecurity), or both. Thus, an alternative explanation for rising joblessness in the 1980's is that the quality of jobs fell sharply due to employer wage and employment policies (see Mitchell, 1985 and 1989; Wachter and Carter, 1989) and the crowding of workers into the secondary labor market (Borjas, 1993) intensified, generating higher turnover (as workers search for better jobs) and rising numbers of discouraged workers.

A recent paper by Topel (1993) provides a good example of the importance of the lense through which the data are examined. Topel (1993) argues that since the secular rise in jobless time has occurred only among those earning the lowest wages, the most likely explanation is a decline in demand for low-skilled workers. But his data show a clear secular trend 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 series suggests little change in overall joblessness after 1983. These divergent trends are also consistent with a very different story for the 1980's: there were increasing opportunities for jobs that were declining in quality and as a result, for those who chose to remain in the labor market, unemployment rates fell. But declining job quality also led to greater discouragment, leading to higher nonparticipation rates.

Does other evidence support increasing joblessness in the 1980's? Juhn's (1992:Figure 3) data show that participation rates for both white and black male high school dropouts and high school graduates rose steadily from 1982 through 1987. 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% in 1973 to 65.5% in 1979 and again to 53.9% in 1982, but has risen steadily since, reaching 63.9% in 1988 (U.S. Department of Labor, 1989, Table 16). Thus, the employment rate for this group at

the end of the 1980's was about what it was in 1979. The data for other male groups show similar trends. One might ask at this point why, if the problem is skill mismatch due to the increasing skill requirements of new workplace technologies, did most of the increase in joblessness take place in the 1970's and not in the mid and late 1980's?

2. New Production Technologies and Skill Restructuring

A strong case for skill mismatch as the explanation for the earnings problems of low skilled workers in the 1980's requires more than evidence of declining relative wages and low employment rates. Undoubtedly, the attractiveness of the story is its consistency with both the observed declines in the relative wages of low skilled workers in the 1980's and the popular vision of the effects of computer-based mechanization in the workplace. With the rapid diffusion of computer-based production technologies and an increasingly competitive environment, it is widely recognized that the old regime of large, integrated, capital-intensive plants relying on low-skill manual labor is being transformed into a new production system of small, flexible, technologically advanced firms that depend upon an elite cadre of highly educated workers. Unlike the traditional "Taylorist" model, in the new "high performance" workplace workers must possess the cognitive and diagnostic skills necessary to perform a broad range of frequently changing tasks. So the upshot is that computers and related technologies require higher skills and workers with obsolete or insufficient skills inevitably get paid less and ultimately lose their jobs, leaving behind a more skilled workforce. This transformation is undoubtedly underway. But does it explain the wage collapse?

Most studies of skill change using aggregate data have employed indirect measures of technological change (productivity growth or the residual from wage equations) and skills (educational attainment, potential experience or relative wages). In an attempt to study the determinants of the levels and change in skill requirements using *direct* measures, Howell and Wolff (1992) measured the use of new technology by the value of computer purchases per dollar of output, the share of new

investment in total capital stock, and the share of engineers in the total workforce. Skills were measured by indices of cognitive, interactive and motor skill job requirements derived from the Dictionary of Occupational Titles as well as by the shares of five large occupation groups in total employment. Their results indicated that new production technologies have indeed tended to increase the cognitive skill levels of the workforce since 1970, with the strongest and most reliable effects occurring in the goods industries. The use of occupation shares as measures of skill levels produced mixed results: the deployment of new technology clearly raised the demand for professional and technical workers (high cognitive skill) while reducing the demand for managers (moderate-high skill), clerical workers (low-moderate skill), and operatives and laborers (low skill). These results suggest that while the effects of new production technology on skills varies by sector and occupation group, it is fair to say that, overall, it tends to raise the demand for high cognitive skill workers and reduce the demand for low cognitive skill workers.

There is also some evidence that both educational attainment and the return to education are higher in industries that are more technology-intensive, usually measured by R&D spending (or employment) and total factor productivity growth (Bartel Lichtenberg, 1987; Mincer, 1989, Allen, 1993). But to explain the earnings collapse for low-skill workers, there should have been a speed-up in the effective use of new technology in all sectors in the 1980's. Does recent research indicate that the impact of technological change on the mix of skills required in the workplace was substantially greater in the 1980's than in earlier decades? Was the impact of this skill restructuring on earnings sufficient to account for a large portion of the collapse of low-wage male earnings *throughout* the economy?

Few studies have directly addressed these questions. Allen (1993) does, however, present evidence that the rate of technological change, as measured by the share of R&D scientists and engineers in total employment, was greater in the 1980's than in the 1970's and concludes that some of the wage restructuring during this decade can be attributed to this increase. His measure of technological change accounts for 48 percent of the increase in returns to schooling in the

1980's for workers in manufacturing, but only 7 percent for the entire workforce. These results imply that trends in manufacturing cannot be generalized to the entire economy. 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 low-skill male workers in the 1980's. 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. This implies that the correlation between R&D and returns to schooling...reflects greater wage growth for college graduates in R&D-intensive industries, rather than a negative demand shock for high school graduates employed in those industries" (1993:22).

In a study of changing employment shares in manufacturing, Berman, Bound and Griliches (1993:2) point out that there was a large increase in the nonproduction share of manufacturing employment in the 1980's: "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 non-production 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 technological change is an important part of the explanation" (1993:33).

Since the diffusion and effective use of computer-based technologies is almost certainly taking place at an increasing rate, a technological change explanation for skill restructuring implies that the decline in demand for low-skill jobs should have become progressively greater throughout the decade. Indeed, Berman, Bound and Griliches (1993:Table 13) report a rapid increase 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 7.49 percent in 1987. Table 2 shows the investment in Office, Computing and Accounting (OCA) Machinery in four (arbitrarily

chosen) "high-tech" industries from 1977-1986 in constant dollars. After the mid-1970's, almost all OCA machinery investment consisted of computers. These data confirm that the investment in computers took place at a rapidly increasing rate over this period. The last row shows that in 1982 dollars, the real investment in computers in 1985-86 ranged from 2.7 to 6.7 times greater than the investment in 1977-78.

Table 2
Investment in Office, Accounting and Computing Machinery
For Selected Industries, 1977-86
(Millions of 1982 Dollars)

	Chemicals	Machinery	Elec./Electronic Machinery	Motor Vehicles
1977	114	854	228	98
1978	107	1,178	333	150
1979	122	1,526	479	167
1980	155	2,307	682	241
1981	195	2,859	828	501
1982	199	2,591	860	175
1983	213	2,529	1,155	115
1984	268	3,695	1,955	314
1985	309	4,339	2,383	467
1986	365	4,521	2,592	559
Total	2,047	26,399	11,495	2,787
1984-86/ 1977-79	2.75	3.53	6.66	3.23

It is immediately apparent from the employment trends presented by Berman, Bound and Griliches that virtually all of the "skill upgrading" they observe took

place in just 3 years - 1980, 1981 and 1982.[8] Indeed, their data indicate that the nonproduction share of employment in 1983 was identical to the share six years later. Figure 5 plots the nonproduction employment shares for durable, nondurable and total manufacturing for 1970-92. The graph 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 1980-82. 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 and 34.1 percent over the next 10 years. Although Berman, Bound and Griliches note that employers use recessions to restructure, there is no evidence that there was a substantial shift in skill mix in the 1990-91 downturn. 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, as Table 2 shows, was characterized by a far higher rate of investment in computer-based equipment?

Table 3 provides additional evidence on the stability of the skill mix in manufacturing after the recessions of 1980-82. Between 1983 and 1988, the ratios of craft to semi-skilled workers, technicians to clerical workers, and professionals to managers remained virtually unchanged. But as the first column shows, the ratio of craft workers to laborers declined steadily from about 4 in 1983 to to 3.4 in 1987 (it then rose slightly to 3.5 in 1988). These figures do not suggest a technological transformation of production, nor the kind of skill restructuring that could explain the enormous earnings declines suffered by low-skill workers or the considerable widening of the earnings gap between low- and high-skilled workers observed in the last decade.

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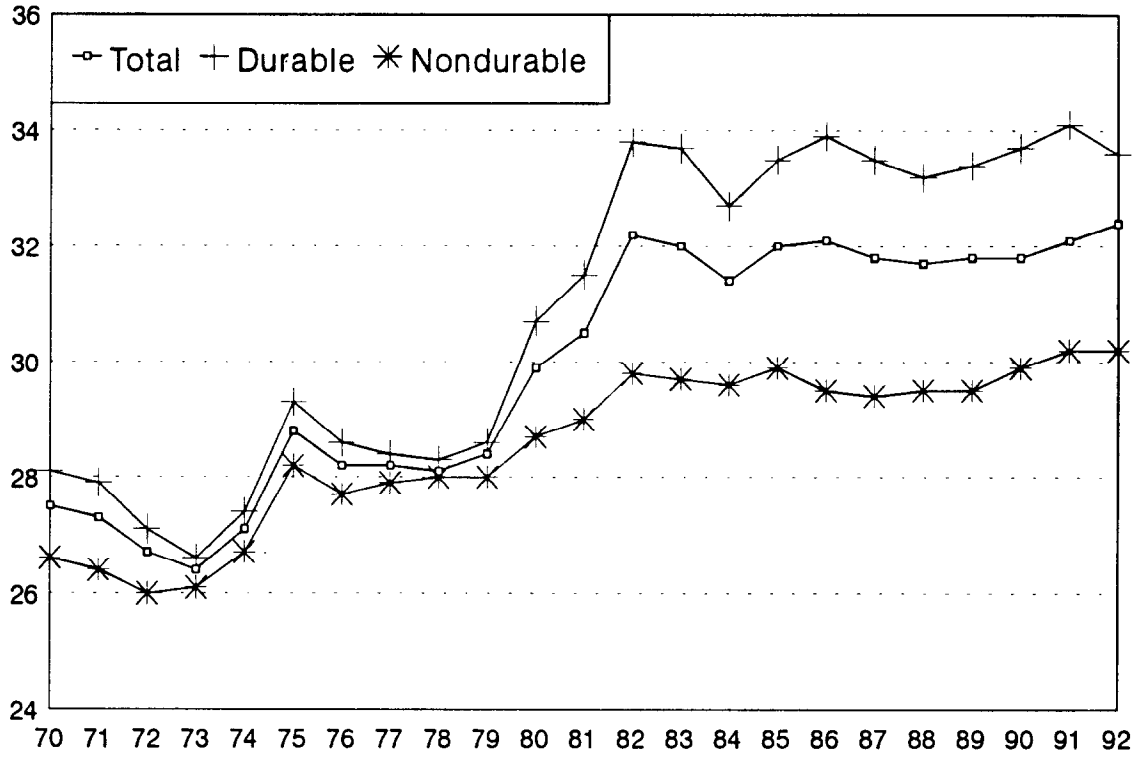
[8]Although they don't seem to think that the timing of the restructuring matters for their story, the authors do recognize that the employment shifts were concentrated in the 1980-82 period: "roughly 70 percent of the within-industry and over 80 percent of the between-industry shifts ... that occurred between 1979 and 1987 did so between 1979 and 1982" (Berman, Bound and Griliches, 1993:10).

Figure 5: The Nonproduction Share of Manufacturing Employment, 1970-88*



*Source: 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.

Table 3:
Occupational Employment Shares In Manufacturing, 1983-88

	Craft/ Laborer	Craft/ Semi-Skill	Technical/ Clerical	Prof/Mgr
1983	3.97	.59	.29	.76
1984	3.75	.60	.29	.71
1985	3.82	.61	.30	.72
1986	3.64	.61	.31	.74
1987	3.38	.60	.28	.73
1988	3.54	.60	.29	.72

Source: Handbook of Labor Statistics, Table 20, (U.S. Department of Labor, 1989).

The timing of these employment and investment trends is also relevant to the interpretation of the regression results presented in the Berman, Bound and Griliches study. They regress the 1979-87 change in the nonproduction share of employment across industries on the level and change in the share of computers in total investment. The coefficients are positive, and they conclude that this measure of technological change accounts for "one-quarter to one-half of the within-industry move away from production labor that occurred over the 1980's" (p. 27). Even if these one and two variable regressions are adequately specified,[9] and the direction of causation is right (the authors point out that it may be that industries with high nonproduction shares tend to invest more in computers - more office workers require more desktops), is it plausible that investments in computers, which took place mainly after 1982, can explain up to half of the shift away from production labor, which occurred entirely before 1983? Interestingly, they note that their 1977-

[9]There are surely other factors than computers that account for changes in the nonproduction share. Gordon (1993) interprets the same measure as an indicator, not of skill mix, but of "bureaucratic burden" reflecting the need of employers in a confrontational labor relations setting to intensively supervise and monitor workers. He has shown that this share varies dramatically across highly developed nations - all presumably with roughly similar investments in computer-based technologies.

87 computer variables as well as their 1974 measure of R&D are also powerful predictors of nonproduction employment trends for 1959-73, a period with virtually no computer investment.

It seems quite reasonable to agree that "skill upgrading has been occurring in 'high-tech' manufacturing industries" (Berman, Bound and Griliches, 1993:30), but the important - and controversial - questions are whether shifts in skill compostion were substantially greater in the 1980's than in earlier decades, whether these shifts were due entirely or largely to the use of computer-based technologies, and whether any shift in the demand for skills that did occur can explain a large portion of the wage collapse for low-skill men in the 1980's. A compelling technological change explanation for the expansion of male earnings inequality and the growing share of male workers with low earnings throughout this decade needs to account for the failure of the skill mix to not only upgrade after 1983, but upgrade at an increasing rate.[10]

Another perspective on skill and wage restructuring is provided by trends in skill and wage inequality. If skill restructuring is the source of declining wages, trends in skill inequality should map closely to movements in wage inequality. Does the evidence support this? As mentioned above, Wieler (1993) developed measures of cognitive, interactive, and motor skills from the Dictionary of Occupational Titles and added these to Karoly's (1992) model. These measures reflect direct ratings of skill requirements of detailed occupations by U.S. Department of Labor specialists; changes in the skill measures reflect changes in employment mix among some 500-odd occupations.

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[10] It is worth noting that Borjas and Ramey (1993) reject the technological change story on timing grounds: "There is no commonly agreed upon measure of skill-biased technological change. In fact, much of the work that argues for skill-biased tecnological change as an important factor in relative wages uses residuals from regressions... The residuals graphed above, however, do not look like technological change, because they have no correlation over time. Therefore our results lead us to doubt the importance of technological change (aside from its effects on the trade flows) on relative wages" (Borjas and Ramey, 1993:9,12).

Wieler found that changes in the variance of these "direct" measures of skill had no reliable statistical effect on changes in earnings inequality. Particularly striking were the results at the industry level. She presents figures that report the variance of hourly earnings, educational attainment, and three measures of skill requirements from the Dictionary of Occupational Titles for each year from 1975 through 1990 for each of 33 industries. While earnings inequality increased in almost every industry, the skill measures showed little change. For example, the variance of hourly earnings in the Auto industry increased from .190 to .298 over this period, almost all of which took place after 1979. Yet, the skill measures all show remarkable stability - the data show no evidence of a growing dispersion of skill levels. The same pattern can be seen for other durable goods industries, such as Electrical Equipment, Machinery, as well as many service industries.

From the vantage point of the entire economy, there is no doubt that there has been a gradual increase in the demand for highly skilled workers. As Fritz Machlup pointed out back in the early 1960's, the increase in the demand for information workers - those with relatively high cognitive skills - dates to at least the turn of the century. While this was caused in large part by the shift away from agriculture in the early decades of the century, the same trend can be found in the goods industries since the 1940's. Indeed, the share of semi-skilled and low-skilled manual workers in total employment declined substantially in each decade from 1950 to 1980 (Howell and Wolff, 1991b). Several recent studies using economy-wide data on occupation and industry employment trends and direct measures of skill requirements have found declining rates of skill growth with each decade since the 1960's (Howell and Wolff, 1991a; Mishel and Teixera, 1991).

Using different data and methods, Murphy and Welch (AER, May 1993) concluded that "we do not find that the demand for skill grew particularly rapidly during the 1970's and 1980's, a period when wage inequality expanded in comparison to the three earlier decades...." Similarly, Katz (1991:105) notes that "Estimates of within- and between-industry demand shifts indicate little or no acceleration in the 1980's" and suggests that "the differences in the 1970's and the 1980's depend

substantially on differences in relative supply shifts."

Interestingly, the same Skill Commission whose theme was the necessity of choosing between high skills or low wages conducted a survey of employers and found that only 5 percent of the firms were actually concerned about a skill shortage. This is consistent with the key finding of a new study on international competitiveness by a prominant commission, assembled by the McKinsey consulting firm and headed by Professor Robert Solow of MIT, that it was not primarily skills or technology that distinguished productivity rates among nations, but rather management and labor relations policies (cite).

Any discussion of the role played by technological change in distinguishing the earnings trends of the 1980's from previous decades should consider industry and occupation case studies. Curiously, it is rare in the earnings literature to find such references. Although it seems safe to say that, as a rule, studies showing significant effects are more likely to be submitted and accepted for publication than those that show negligible effects, a number of recent case studies appear to raise doubts about the extent of skill upgrading due to technological change in the workplace.

In his study of machine shops in the U.S., Jeffrey Keefe (1991:515-16) found that "the diffusion of NC (numerical controls) has had no significant impact on overall machine shop skill levels." Using data from a large compensation consulting firm, Peter Cappelli (1993:528) reports significant skill upgrading for most production occupations between 1978 and 1986, but consistent with Keefe's finding, the cause did not appear to be technological change: "Changes in production jobs seem much more driven by developments in traditional employee relations arenas. Particularly influential have been new management views concerning how jobs should be redesigned." According to Milkman and Pullman (1991), the technological upgrading of GM's Linden New Jersey plant in the mid 1980's tended to raise skill requirements of skilled jobs and deskill the semi- and lower-skill jobs. Similarly, among clerical jobs, Cappelli (p.524) finds that half "experienced significant upskilling, and the other half had significant deskilling" and concludes that new

office technologies appear to be the cause of the deskilling. Tilly (1992) also refers to the deskilling of cashiers by new electronic scanning systems. It should be noted that deskilling should have the effect of *increasing* job opportunities for those with the least educational attainment.

The available evidence indicates that there is considerable flexibility in the way U.S. firms have reorganized production as new computer-based technologies were introduced in the late 1970's and 1980's, ranging from sharp skill upgrading to little change or even deskilling (Shaiken, 1985). In a careful study of plants using identical flexible manufacturing systems producing similar products in Japan and the U.S., Jaikumar (1986) found startling differences in performance and employment patterns. Japanese plants were more flexible and productive and relied heavily on skilled workers, particularly engineers (over 40 percent of the workforce). U.S. plants, on the other hand, employed far greater shares of low-skilled workers (8 percent were engineers).

But there is also evidence that high tech plants can be operated efficiently with relatively low-skilled workers. Shaiken (1993) describes a new, technologically advanced Ford assembly and stamping plant in Mexico. This plant had higher quality ratings on the cars it produced than five of the eight Japanese-owned factories in the United States. According to the skill mismatch perspective, a high-tech, high-performance manufacturing plant such as this should rely primarily on highly skilled workers - there should be relatively few job opportunities for low-skilled workers. But according to Shaiken (p. 60) "the average age of the initial workers hired was in the early twenties. All lacked auto industry experience. Thirty percent had a junior high school education and 63 percent had completed high school or a technical education." Evidently, high-tech, high-performance manufacturing is consistent with an extremely low-skill and inexperienced workforce.

In a recent case study of changes in occupational employment in the commercial banking industry, Kuster (1993:24-25) concluded that despite substantial restructuring as a result of deregulation and the introduction of computer-based technologies, "commercial banks tended to retain their traditional occupational

staffing patterns." In fact, despite the rapidly growing use of automated teller machines (ATM's), tellers actually increased in both number and share of total industry employment. Again, there is little evidence from this industry that technological change dramatically reduced job opportunities for low-skill workers in the 1980's. The effects of new technologies on job opportunities and skill levels appears to vary widely by company, industry and occupation, and the aggregate upgrading that took place in this decade probably reflects a continuation of long-run trends.

3. Changes in the Job Quality Structure: An Alternative Perspective on Employment Restructuring

The simple demand and supply framework shown in Diagram 1 predicts that declining demand for low-skill workers will generate fewer low-skill/low-wage jobs. The evidence, however, suggests that the skill and wage distributions are not identical, and Figures 1-4 indicate *growing* shares of low-wage workers. If there are substantial numbers of low-skill, moderate-wage jobs, as well as many moderate-skill, low-wage jobs, it might be useful to have a classification scheme that groups jobs by taking into account both wage and skill levels. This, in turn, requires that jobs are defined by both industry and detailed occupation (Costrell, 1990). That is because, first, there are vast differences in the quality of jobs in each industry, no matter how detailed its definition, and second, because occupation groups include very different kinds of jobs depending upon the industry of employment. Compare, for example, the earnings of a legal secretary with a secretary employed in, say, a private university. Or compare the pay of a truck driver for a local furniture store with a driver for the U.S. Postal Service.

One could, therefore, define jobs by both occupation and industry, and then group these occupation-industry cells into a small number of categories based on a number of accepted indicators of job quality. This would offer the advantages of both simplicity (a small number of job groups) and usefulness (job groups that are relatively similar in terms of quality). Using cluster analysis, Maury Gittleman and I

have done this (Gittleman and Howell, 1993). We grouped 621 jobs (94% of the nonagricultural workforce) on the basis of 17 measures of job quality[11] and found that the structure of jobs could be characterized in three tiers, or "segments," each with two component "contours." Each of these job contours employed between 11 and 21 percent of total employment in 1979.

The **Independent Primary** segment consists of two subsets of jobs distinguished primarily by whether the employer is the public sector. The *Private Independent Primary (I-P)* contour is characterized by high earnings, high shares of workers with health and pension benefits, high cognitive skill levels, and full-time private sector jobs. These are almost exclusively professional, managerial, and high-wage sales jobs. Jobs in the *Public I-P* contour were similar in most respects, but workers in these jobs were employed almost exclusively in the public sector. Examples are teachers, police, firefighters, postal workers, and public sector managers and administrators.

The **Subordinate Primary** segment also consists of two contours, the *Routine White-Collar* and the *High-Wage Blue-Collar.* The white-collar job group pays moderate wages, requires moderate cognitive skill levels but demands very low strength and other physical demands. Most of the workforce is female. Examples of these jobs are nurses, health technicians, and full-time clerical workers. The *High-Wage Blue-Collar* contour is made up moderate/high wage, low cognitive skill jobs in which high shares of workers have health and pension benefits, are unionized, and do tasks requiring substantial strength and other physical demands (e.g., truck drivers, assemblers, and machine operatives in high-wage industries).

The **Secondary** segment includes the *Low-Wage Blue-Collar* and *Contingent* contours. Compared to the *High-Wage Blue Collar* contour, workers in *Low-Wage Blue-Collar* jobs earn much less, are less likely to be union members or to have employer paid health and pension benefits, require lower cognitive skills, and work

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[11]Demographic characteristics like gender, race, age, and marital status were not employed in the cluster analysis.

at tasks requiring higher strength and other physical demands. Typical of these jobs are machine operatives and laborers in various low-wage industries, carpenters and painters in construction, and cooks and miscellaneous food occupations in retail trade. The *Contingent* contour consists of jobs that pay poverty-level wages, are the least likely to provide health and pension benefits, and have the highest shares of workers employed part-time and part-year. At the same time, average educational levels are substantially higher than in the two blue-collar contours. Examples are cashiers and sales occupations in retail trade, child care workers and household workers.

These six contours were defined using data for 1979 (primarily from the 1980 Census). Earnings ranged from $17,400 in the *Private I-P* contour, where 86 percent worked full-time, to $4,700 in the *Contingent* contour, where only 37 percent were full-time. Despite educational attainment that was almost a year and a half greater (12.8 compared to 11.4), the average hourly wage in the *Routine White-Collar* contour was just 70 percent of the *High-Wage Blue-Collar* wage ($5.24, compared to $7.44). Not surprisingly, 75% of *Routine White-Collar* job holders were female, compared to just 15% of *High-Wage Blue-Collar* employees. Both unionization and health insurance coverage were also highest in the *High-Wage Blue-Collar* contour.

Using this classification scheme, we find a dramatic restructuring of employment since 1973, with most of the change concentrated in the 1979-83 period. Figure 6 shows that the subordinate primary segment declined by 4 percentage points between 1979 and 1990 (most of which was accounted for by the *High-Wage Blue-Collar* contour), while the independent primary segment has grown rapidly since 1973, rising from about 25 to 32 percent of the workforce (accounted for almost entirely by the *Private I-P* contour). In contrast employment in the secondary segment has remained virtually unchanged between 1979 and 1990. In fact, unlike the 1979-83 period, there was virtually no change in employment shares between 1987 and 1990. Since the transformation to "high performance" workplaces was presumably more prevalent in the later period, the timing of these changes lends little support to the skill mismatch

thesis that technological advances have led to a drop in low-skill, low-wage job opportunities on a scale large enough to cause a major restructuring of the wage distribution.

Since the wage collapse was concentrated among low-skill men, and because the skill mismatch story focuses on declining job opportunities for these workers, a more revealing indicator of employment restructuring might be male employment by segment presented as a share of the total male population. This measure is reported for the three job segments for 1973-90 in Figure 7. The trends are quite similar to those reported in Figure 6. The Figure shows substantial shifts in job/population ratios between 1973 and 1983 and remarkable stability between 1983 and 1990. Whereas job opportunities for men were about the same in each of the three segments in 1979, by 1983 there were far fewer jobs per capita in the middle (the subordinate primary segment) than at the top (independent primary) or bottom (secondary). The post-1982 period has been characterized by a very gradual continuation of this "declining middle" as both independent primary and secondary jobs held by men per capita expanded at the expense of the subordinate primary segment. In sum, Figures 6 and 7 show that the major shifts in employment among the three job segments between 1979 and 1983 did not characterize the 1983-90 period. Indeed, the magnitude of employment shifts among the segments clearly decline with each 3-4 year period between 1979 and 1990.

Did the relative stability in the quantity of employment in the 1980's shown in Figures 6 and 7 (and Figure 5 and Table 3 in Section 2) also characterize the quality of jobs in the low-skill contours? Figure 8 reports that average real wages in all four low-skill contours declined substantially between 1979 and 1990. In the two secondary contours most of the drop took place between 1979 and 1983. Only the *High-Wage Blue-Collar* contour shows large and persistent declines after 1983. Whereas Contingent jobs decline by about 2 percent and Routine White Collar and Low-Wage Blue-Collar jobs fall by roughly 4 percent, the average real wage in the High-Wage Blue-Collar contour was 8 percent smaller in 1990 than in 1983. The wage restructuring of low-skill jobs in the 1980's appears to have had its greatest negative effect on workers

Figure 6: The Distribution of Employment By Job Segment: 1973-90*

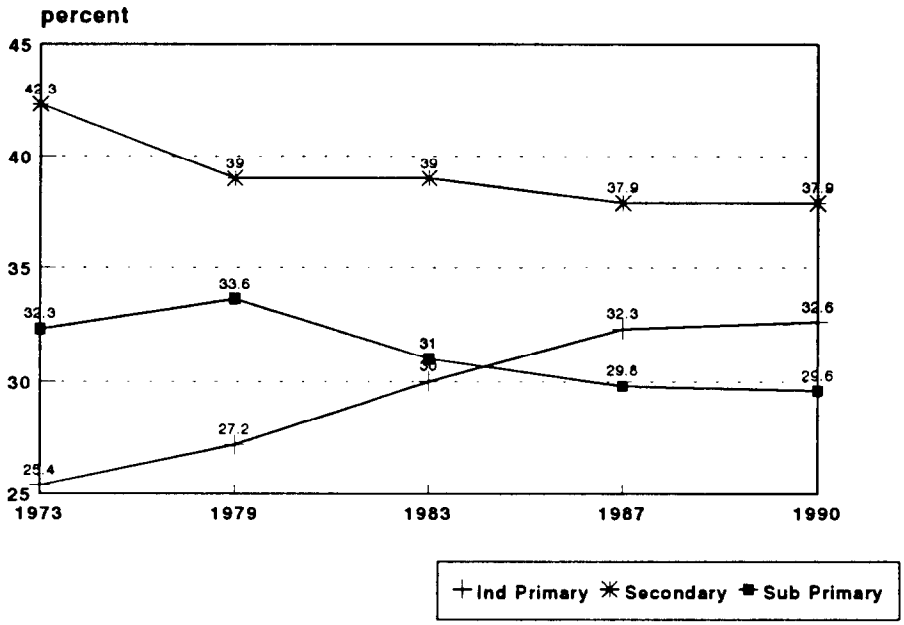
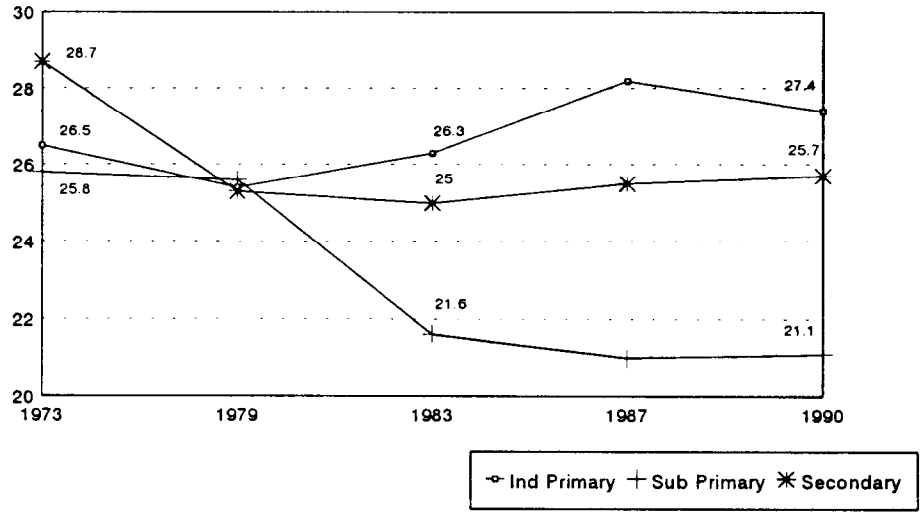
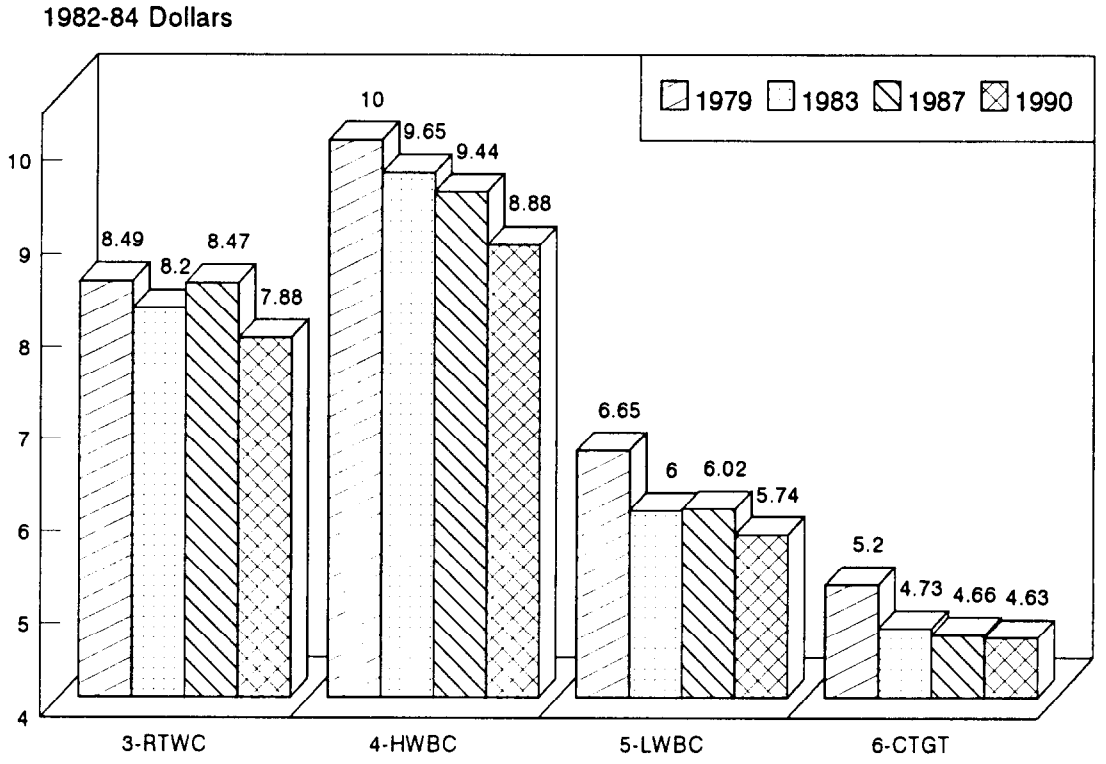


Figure 7
Male Employment Population Ratios By Segment*



* Male workers in each segment per 100 men ages 16-65 and not in school
Source: March CPS Files

Figure 8: Male Real Hourly Earnings For Subordinate Primary and Secondary Contours: 1979-90



Source: March CPS files
Median hourly earnings were deflated by the CPI-U-X1.

in relatively high-wage jobs.

Declines in quality can be seen in other indicators as well. For example, the share of workers with employer provided health insurance fell in all six contours, but the greatest declines were in the blue-collar and contingent contours: coverage in the *High-Wage Blue-Collar* contour fell from 83.6% to 72.8%, while coverage declined from 56% to 42% in the *Low-Wage Blue-Collar* contour and from 33% to 25% in the *Contingent* contour. For each of these contours, the decline in the share of workers covered by health insurance was greater between 1983 and 1988 than between 1979 and 1983 (Howell and Gittleman, 1993, Figure 8).

These results indicate that the employment restructuring that took place in the 1980's had two main features. First, as Bluestone and Harrison (1986) and others have argued, there was a sharp decline in the middle of the job structure for men, which took place largely between 1979 and 1983. There was little change in the share of both subordinate primary and secondary jobs after 1983, suggesting that opportunities for low-skill, low-wage jobs did not decline much during the 1980's, and certainly did not decline at an increasing rate. Second, the quality of subordinate primary and secondary jobs, as measured by earnings and health benefits, fell in both absolute and relative terms *throughout* this decade. These developments appear more consistent with an explanation of recent wage trends that emphasizes a concern throughout the 1980's with labor costs (shifting wage norms) than one that focuses primarily on shifts in skill requirements caused by computer-based technological progress.

4. Towards an Alternative Story: The 'Restructuring' of Wage Norms

An enormous research effort has been made to try to understand the severe deterioration in the earnings status of low-skilled workers in the 1980's. Surveying this literature, Levy and Murnane (1992) concluded that we do not yet have the data to provide an entirely satisfactory answer. But we do know that it was primarily changes in wage rates within industry and education groups that led to the rise in inequality and that the greatest declines in wages took place among those with the least educational attainment - although as noted above, it should be remembered that the

incidence of low earnings grew substantially among black and Hispanic male college graduates as well.

If the evidence does not provide much support for the technology-induced skill mismatch explanation, why did the wages of low-skill men collapse? The remainder of this sections sketches an alternative story - one that is multifaceted and in need of much more analysis, but one that also seems broadly consistent with the evidence. My point of departure is that it was less the production technology than the labor relations policies adopted by management that has undergone a radical change. Faced with increasingly competitive product markets, a growing supply of workers willing to accept very low-wage jobs, favorable government policies and a pro-market ideological climate, private sector firms revamped their employment and wage-setting practices, eroding the barriers to the full force of labor market competition that had protected low-skill workers. Although many firms may not have had a real choice - small subcontractors, for example (Harrison and Kelley, 1991) - most U.S. firms appear to have taken "low-road" (see Appelbaum, 1992).

This "shift in wage norms" story has two main parts: 1) *declining demand* - lower wage offers to the same or similar workers for the same or similar work through wage concessions, relocation, outsourcing and the use of contingent workers, all of which were facilitated by the eroding role of *protective wage-setting institutions* (labor laws, labor unions, and the minimum wage), and *2) increasing supply* - the crowding of secondary labor market due to displacement of higher-wage workers and the growth of low-skill immigrant labor supply.

4.1 Declining Demand: Lower Wages For Similar Work

The following passages portray the fundamental shift in management's approach to labor relations that began in the late 1970's. In the Brookings Papers, Daniel Mitchell (1985:589-90) describes the increasingly confrontational approach of employers:

> "the longevity of the (wage) concession movement and its spread to less-than-dire situations suggest that the initial concessions have encouraged other employers to try their luck in demanding similar settlements.... Management, cheered by what is perceived as a shift in the

> balance of power, has changed its bargaining goals.... The political and legal climate change has been reflected in a greater willingness of management to take actions in labor disputes that might not have been publicly or politically acceptable in the past... Even firms with a long history of unionization are using nonunion labor."

At the end of the decade, Michael Wachter and William Carter (1989:253-4), also in The Brookings Papers, refer to a fundamental shift in human resource policies within firms as well as the legal rules governing employment practices:

> "Until the late 1970's or 1980's, firms rarely made use of their rights under *Mackay Radio* to hire permanent replacements. Instead, firms used managers to replace striking workers temporarily. When replacement workers *were* hired, they were seldom offered permanent jobs. When strikes occur today, replacement workers are more likely to be offered permanent jobs.... The rules governing plant closings and relocation are based on newer decisions.... In simple terms, the rules mean that management decisions to implement partial plant closing, work relocation, asset sales, and even some types of subcontracting are not mandatory topics (for bargaining)."

At the end of the 1970's, firms begain to fundamentally reassess their employment and wage-setting practices. Large integrated (high wage) firms began to downsize and rely more heavily on low-wage suppliers. Advances in telecommunications and transportation facilitated the relocation of lower-skilled operations to low-wage sites, leaving behind a core of permanent, relatively skilled employees supplemented (often heavily) by part-time and temporary workers. Central to this part of the strategy has been an uncompromising attack on the "middle" - typically those blue-collar workers with relatively low cognitive skills taking home middle-class paychecks.

Consistent with this perspective, Borjas and Ramey (1993) have argued that much of the increase in earnings inequality in the 1980's can be traced to the erosion of "rents" earned by low-skilled workers in concentrated industries - an erosion they attribute to increased foreign competition in durable manufacturing. They show that trade competitiveness in this sector has closely mirrored trends in wage inequality since the 1970's. A recent study by Papadakis (1993) underscores the role of durable goods industries in the worsening of the trade balance in the early 1980's. She reports that the trade balance shifted from a $3.6 billion surplus in 1982 to a $67.8 billion

deficit just two years later. By 1987 the manufacturing trade deficit rose to $125 billion (1993:7). She attributes about 55 percent of the increase in the trade deficit to four durable goods industries: motor vehicles (24.5%), nonelectrical machinery (14.7%), electronic equipment (9.7%) and electrical machinery (5.5%) (1993:Table 2).[12]

In an innovative study, Galbraith and Calmon group manufacturing industries into six clusters based on wage growth from 1958 to 1988 and estimate the fit between average cluster wages and trade performance. He finds no association in 1960, a much closer fit in 1980, and by 1987 finds that "the alignment of trade and wages had become remarkably precise" (1993:28). He also presents evidence suggesting that wage trends in the service industries often move in tandem with selected manufacturing industries. "For example, we see that wages in garment-related service trades, such as men and women's clothing, department stores and shoe stores, and even laundries, appear to move with wages in textiles ... while wages in grocery stores move nearly alongside wages in bakeries and breweries" (1993:30-31).

The role of foreign trade as a determinant of skill restructuring, declining wages, and earnings inequality remains controversial. Berman, Bound and Griliches (1993:33) conclude their study by stating that "What our results do not suggest is that the bulk of skill upgrading that occurred within manufacturing can be attributed to trade." Krugman and Lawrence (1993) come to the same conclusion concerning earnings trends. Their argument is that the magnitude of the trade deficits are simply not sufficient to account for observed employment and earnings trends, even in manufacturing. These studies, however, focus exclusively on what is measurable - various indicators of import penetration and export shares. But it seems likely that much of the employment and earnings shifts by U.S. firms since the late 1970's were based on a perception of a growing competitive threat. For instance, with numerous quotes from executives, Louis Utchitelle (New York Times, 7/26/93:A1) has reported recently that many leading

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[12] Curiously, however, figure 5 above showed that all of the employment restructuring in the durable goods industries took place prior to 1983. This would be an important area for future research.

corporations have been downsizing by reducing both production and white-collar workers, not because of current weakness, but because it is widely understood to be necessary to remain competitive in the late 1990's.[13] By the time the trade data are published, the competitive battle - if not the war - has already been lost. Similarly, the passage of new trade agreements such as NAFTA can affect the bargaining power - and wages - of workers well before the trade statistics show any change.[14]

While the extent to which various measures of foreign trade can, or should be expected to, account for skill or wage restructuring will no doubt remain controversial, there appears to be widespread agreement that competitive pressures have increased throughout the economy, and that this has led to a heightened concern with labor costs. A great deal of evidence suggests that low labor cost strategies by employers, not declining demand due to the rapid diffusion of new technology, is the main source of the rising incidence of low earnings. Concession bargaining became widespread by the mid 1980's. Mitchell (1985:Table 1) shows that the proportion of workers under major private union settlements whose wages were frozen or cut ranged from 0 to 5 from 1964 through 1980, rose to 8 percent in 1981, jumped to 44 percent in 1982, and was 37 percent in 1983, 23 percent in 1984 and 26 percent in 1985. Just 2 percent of settlements had no first-year wage increase was in 1981, but this figure rose to 12 percent in 1982 and ranged from 25 to 37 percent between 1983 and 1988 (Mitchell, 1989:Table 14).

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[13] Uchitelle writes that "the recent announcement by Procter & Bamble that it, too, will shrink its work force called attention to a surprising aspect of America's jobs crisis: profitable companies with booming sales are also shedding jobs, insisting that to survive the 1990's, they must prepare for the worst."

[14] According to Shaiken (1993:63), a recent Wall Street Journal poll found that "one-quarter of almost 500 corporate executives polled admitted that they are either 'very likely' or 'somewhat likely' to use NAFTA as a bargaining chip to hold down wages. About 40 percent indicated that they might move at least some production to Mexico within the next several years." It seems likely that this response by employers had little to do with the widely heralded (by economists) rise in the demand for skill, but a lot to do with wage rates.

Downsizing often works in tandem with wage concessions. General Motors has recently agreed to sell most of its ownership in three parts plants employing some 2000 employees. These workers, currently covered by a UAW contract that guarantees them the same wage as assembly line workers, will have to negotiate a separate agreement with the new company at the end of the contract, virtually guaranteeing wage concessions in the near future (New York Times, Nov 24, 1993:D3).

The relocation of operations to low-wage sites has also had a downward effect on the relative earnings of many low-skill workers. The anecdotal evidence is overwhelming. For example, according to spokespersons of Pratt and Whitney, the firm's decision to relocate as many as 9,000 high paying production jobs from a high skill state (Connecticut) to lower skill states (Maine and Georgia) was expressly designed to reduce labor costs (New York Times, April 15, 1993: A1). There has been no mention of a role played by new workplace technologies in this relocation. Similarly, to reduce labor costs, Grumman's manufacturing operations are now being transferred from Long Island to Florida and Louisianna (NYT, 1/18/94:B6). Another recent New York Times report (July 18, 1993:A1) documents the substantial demand for extremely low-skilled labor in the 1980's in Saipan and other U.S. owned islands in the South Pacific where some 20,000 workers, recruited primarily from mainland China, typically put in six days a week for half the minimum wage making American brand-name clothes. As this demand for low-skilled workers willing to accept poverty-level wages expanded in these offshore U.S territories in the 1980s, low-skill but living-wage garment jobs decreased in the continental United States.

Another way to reduce labor costs is to substitute part-time and temporary workers for permanent full-time workers. The temporary help industry grew eight times faster than employment in all nonagricutural industries between 1978 and 1985 and increased from 620,500 in 1984 to 1,031,500 in 1989 (Carre, 1992:45, Table 1). Based on Katherine Abraham's estimate from an employer survey that there were 1.5 million temporary help workers, short term hires, and on-call workers in 1986, Carre estimates that there were over 2 million of these "contingent" workers by 1989. Relying largely on the work of Osterman (1988) and Golden and Appelbaum (1990), Carre (1992:75)

concludes that it is "changes in firm demand for labor rather than changes in workers' preferences (that) have driven the rapid growth of contingent labor in the 1980's." She also points out that not only do contingent workers offer lower labor costs, but they add flexibility - managment gains greater control over work schedules and the way tasks are performed.[15]

The consequence of wage concessions, plant relocations, outsourcing and an increased reliance on contingent workers is, as Bennett Harrison (1993) has described it, a job structure that is being transformed from one with a diamond shape, with lots of good, relatively low-skilled jobs, to one with an hourglass shape, in which only the best and worst jobs are expanding. Levy and Murnane's survey confirms this conclusion. In their words, "the male earnings distribution has 'hollowed out,' leaving larger percentages of workers at the top and bottom of the distribution, and a smaller percentage in the middle" (1992:1371). This is also confirmed by Figures 6 and 7, in which independent primary jobs have expanded, subordinate primary jobs have declined, and secondary jobs have remained roughly constant since the late 1970's.

To fundamentally alter traditional employment and wage-setting practices within the firm, various institutional changes were necessary. Those most focused upon by the literature have been union power and the value of the minimum wage. Blackburn, Bloom and Freeman (1990) have shown that changes in union density and the value of the minimum wage can be shown to be statistically associated with the decline in the relative wages of low-skilled men. In a study that attempts to account only for changes in wage inequality in the U.S., DiNardo, Fortin and Lemieux (1993) present striking evidence on the central role played by the declining value of the minimum wage on the collapse of wages at the bottom of the wage distribution. They show that between 1979 and 1988 "the lower tail (of the wage distribution) grew significantly fatter over the period. Most of this fattening occurred in the area between the old

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[15] According to a recent Wall Street Journal report, "In 1992, temporary jobs accounted for about two-thirds of new private-sector jobs... When taken together, temporary, contract and part-time workers now make up about 25 percent of the workforce" (WSJ, 3/11/93:A1)

(higher) 1979 federal minimum wage and the lower 1988 minimum" (1993:9) and conclude that "labor market institutions are at least as important as supply and demand considerations in explaining changes in he U.S. distribution of wages from 1973 to 1992" (1993:31).

In another paper, DiNardo and Lemieux (undated) have compared wage inequality trends in Canada and the U.S. in the 1980's. Despite similar labor markets, wage inequality grew rapidly in the U.S. but not in Canada. Dinardo and Lemieux find that "during this period, union density fell precipitously in the United States but declined very little in Canada. Similarly, the real minimum wage declined by 23 percent in the United States but by only 12 percent in Canada... we find that unions and the minimum wage accounted for 80 percent of the difference in the growth of inequality in the two countries." Confirming Katz, Loveman and Blanchflower's (1993) conclusion that unions and the minimum wage helped explain the different experiences of France (low inequality growth) and Great Britain (increasing wage inequality) during this period, the authors conclude that their findings underline "the enormous, though neglected, role of labor market institutions in explaining the very different changes in wage inequality across countries."

The undermining of traditional wage-setting institutions may have also tended to increase within-group (gender-education-experience) wage inequality. While the conventional view is that technological change has increased the demand for skill, leading to an increased premium for "unobserved skills" within these demographic groups, it may be that the de-institutionalization of the labor market has had a greater effect. Wage norms appear to have broken down within firms (as internal labor markets are opened up to external competition), within industies (as increasing competition causes differences among firms to become a more critical factor in wage outcomes) and among communities (as transportation and telecommunications facilitate the relocation of some, but not all, firms to lower wage areas). In short, the "law of one price" may have been undermined, not promoted, by the recent wage restructuring. Take, for example, the airline industry: With deregulation "Employees at smaller carriers like Republic actually saw their pay go up when bigger airlines, like

Northwest, took them over and brought in higher wage scales. But many have felt the pain as the competition set off by deregulation put relentless pressures on costs..." (NYT, 12/12/93: F5).

Another important, but neglected, area of research, concerns the impact of government social policy on the undermining of traditional wage-setting norms in the private sector. The U.S. continues to rely heavily on employers to provide health insurance, pensions, child care, and other fundamental benefits - benefits that appear as labor costs to employers. These costs are assumed by the public sector in most other developed countries. As the costs of benefits rise, our "privatized" benefits system encourages employers to substitute part-time and temporary low-wage jobs, increasing both the share of low earners and wage inequality.

4.2 Increasing Supply: The Crowding of Secondary Labor Markets

Traditional measures of labor supply - the number of workers in a particular age-gender-education group - suggests that there was no significant increase in the low-skill labor supply in the 1980's (Katz and Murphy, 1993). However, part of the decline in bargaining power that contributed to the wage collapse may be traceable to "unmeasured" increases in the supply of workers willing (or required) to compete for low-wage jobs.

As the middle of the earnings structure narrowed, low-skill workers have crowded into a pool of "secondary" jobs that remained a fairly constant share of total jobs throughout the 1980's, tending to lower the wages of what were already the worst jobs in the labor market. According to a recent Department of Labor study (Herz, 1991), more than 4.3 million workers were displaced during the boom years of 1985-89.[16] Only 72 percent had been re-employed by January 1990 and of these, about 10 percent worked part-time. Among those re-employed full-time, about 40 percent earned less in current dollars than on their previous job. Not surprisingly, those least

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[16] The study defines displacement as "job loss due to plant closings or moves, slack work, or the abolishment of their positions or shifts."

successful in the labor market after displacement were high-wage blue-collar men. According to Herz (1991:7) "Six of every 10 displaced workers in this industry (transportation equipment) earned less on their new jobs than on their old one, and more than half of this group suffered declines of 20 percent or more."

The downward effect of displaced high-wage low-skill workers on the wages at the bottom of the earnings distribution can also be inferred from research by Robert Topel (1993:113). Between 1979 and 1988, he finds that "nearly one-third of the unemployed had predisplacement wages above the 60th percentile, and only 14 percent are from the bottom decile.... Among displaced workers with prior earnings from the upper four deciles, current wages are about half of their predisplacement level." Defining the unskilled as those with low wages, Topel (p. 110) interprets his results as showing that "Many of the 'unskilled' who are unemployed or out of the labor force appear to have been high-wage workers whose specialized skills have become obsolete."[17]

Despite the rising average premium for a college degree relative to a high school degree in the 1980's, a weak job market has forced many lower-level white-collar workers with college degrees to compete for relatively low-skilled jobs. This became particularly pronouncd at the end of decade, in the "white-collar recession" of 1990-91. Like the displacement of high-wage blue-collar workers earlier in the decade, this weakening in the middle of the earnings distribution added to the supply of workers competing in the low-skill job market.[18] There is abundant evidence that computer-

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[17] High-wage blue-collar workers were certainly hard hit by the 1980's, but there is no evidence that these were workers with specialized skills or that their skills became obsolete at a rate that was substantially greater than in earlier decades.

[18] This does not necessarily conflict with the evidence that the return to college education rose sharply in the 1980's. While growth in the "redundant" portion of the college educated labor supply will tend to reduce the absolute value of this return, increasing earnings by the unaffected (higher skill) part of the college educated pool could more than offset this effect. Furthermore, the increasing competition for lower skill jobs by the redundant college educated workforce will also tend to lower the wage of those with low educational attainment. A large part of the growth in the wage gap between college and high school degree holders was due to the decline in the earnings of the latter (see Table 1).

based technologies and corporate restructuring have made large numbers of middle-level managers redundant. As mentioned above, regression results suggest that the use of new technology had a downward effect on the share of both managers and clerical workers between 1970 and 1985 (Howell and Wolff, 1992). Consistent with this finding, Kuster's (1993) case study of the commercial banking industry found that between 1987 and 1990 there was a 13 percent decline (from 45,000 to 39,000) in general managers, a decline from 2.9 percent to 2.5 percent of total industry employment.

In support of this twist in the skill mismatch story, data from the Panel Study of Income Dynamics (PSID) show that in the late 1970's about 40 percent of the sample reported themselves to be "over-educated" for their jobs (Sicherman, 1989). According to recent reports by economists from the U.S. Labor Department, throughout the 1980's about 20% of college graduates were working at jobs that don't normally require a degree, and this is expected to increase to 30% at the end this decade (Hecker, 1992; Shelley, 1992). Declining opportunities in the middle of the job ladder might be expected expected to have the greatest negative impact on minority workers. In fact, the share of black and Hispanic college graduates with poverty-level wages rose dramatically in this decade, from about 9 percent to just under 15 percent. If the unemployed and those who had stopped looking for work are included, the incidence of low earnings among college graduates rose from 14.6 percent to 21.4% for black men and from 11 percent to 19.4% for Hispanic men (Acs and Danziger, 1993). It seems reasonable to assume that one consequence of declining opportunities for moderately skilled white-collar jobs has been to force those with training for white-collar jobs to compete for jobs with low cognitive skill requirements, contributing a downward pressure on their wages.

Immigration patterns compounded the downward effect that displaced high-wage workers had on the wage rates of low cognitive skill jobs. There was an unprecedented increase in the flow of low skill foreign workers into the U.S. in the 1980's, both legal and illegal. According to Borjas, Freeman and Katz (1992:214-15) the combination of rising imports and growing numbers of low-skilled foreign workers had substan-

tial negative effects on the relative earnings of native low-skilled workers. The authors concluded that "We estimate that between 30% and 50% of the ... decline in the relative weekly wage of high school dropouts from 1980 to 1988 can be attributed to trade and immigration flows." Case study evidence supports this finding. In his study of the Los Angeles restaurant and hotel industry, Waldinger (1992) concluded that "the story of black displacement in restaurants and hotels can be traced not to skill upgrading, but rather to competition with a rapidly growing immigrant population." Similarly, a General Accounting Office study cited by Jack Miles (Atlantic, October 1992) found that "Janitorial firms serving downtown Low Angeles have almost entirely replaced their unionized black workforce with non-unionized immigrants." Again, it appears to have been labor costs, not skill restructuring, that explains this result.

5. Concluding Remarks

An enormous amount of empirical research has been undertaken in the last few years to describe and explain the sharp rise in earnings inequality in the U.S. since the late 1970's. Most studies have focused on the growth in the education premium (e.g., the college to high school wage differential). A large part of the growth in this premium can be attributed to the collapse in the real wages of low-skill men. This paper examines alternative explanations for this wage collapse. Among academic economists, a widely accepted story is that the decline in wages for low-skill men reflects declining demand (job opportunities) caused primarily by biased technological change. This explanation has the great advantage of being both simple and consistent with the most elementary labor market model - 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.

Unfortunately, a great disadvantage of the skill mismatch story is that the empirical evidence does not provide much support for it. The evidence presented in Sections 1-3 suggests that the skill and wage distributions for nonsupervisory workers do not closely correspond. In the late 1970's over one-fifth of nonsupervisory workers held high-wage, low-skill, blue-collar jobs (Gittleman and Howell, 1993: Figure 1) and much

of the wage restructuring in the 1980's was at their expense. Wage concessions, the outsourcing of parts and relocation of operations to low-wage sites, the substitution of contingent for permanent workers, and other employer policies aimed at reducing labor costs all had substantial effects on relative wage trends in the 1980's but 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 lense that does not automatically equate wage and skill levels.

Equally important, while substantial shifts in the skill mix of employment took place between 1973 and 1983, the data suggest that little skill restructuring has occurred since 1983. Crucially, however, it was in this latter period that we observe the highest rates of investment in computer-based technologies by firms in all sectors of the economy. Indeed, the source of the problem 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 increased flexibility in the production process by following the "low road" - lower wages, little training, and fewer permanent employees. As former Labor Secretary Ray Marshall (1992:36) has put it, "Since the early 1970's, U.S. companies have been competing mainly through reducing domestic wages and by shifting productive facilities to low wage countries."

There is an important literature that does not attempt to explain the wage collapse by skill restructuring; it consists of studies that explore the statistical association between changes in wage inequality and a variety of possible determinants. Based in part on this literature, Section 4 outlined a "shifting wage norms" explanation in which declining demand and increasing supply account for the wage collapse. But in this alternative story, declining demand reflects the adoption of more confrontational, low-wage employment practices by firms rather than declines in low-skill job opportunities that stem from technological advances in the workplace.

The policy implications of these two explanations are quite different. 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 skilled 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 1970's could have alleviated the skill mismatch and fundamentally altered the course of future earnings trends. Given the nature and pace of technological advances, the nation 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, raising the level of skills that workers bring to the workplace is not likely to reverse the recent collapse of low-skill male earnings if the main source of the wage restructuring was a fundamental shift in wage norms - that is, if firms adopted low-wage employment practices as a result of increasing competitive pressure, a shift in the ideological climate, and a variety of government policies (e.g., the deregulation of trucking and airlines industries, the Federal Government's breaking of the Air Traffic Controllers Union, the character of the appointments made to the National Labor Relations Board, and the failure to pass legislation that would maintain the real value of the minimum wage). As the costs of health benefits exploded, the continued reliance on employers for health insurance may have also contributed to the increase in the demands made by firms for wage concessions, the increasing preference of employers for part-time and temporary workers instead of permanent employees, and the decisions of many firms to relocate operations to low-wage anti-union locations. A shifting wage norms explanation suggests that reversing the declining real (and relative) wages of low-skilled workers requires public policies that address, not just worker characteristics, but the way wage-setting institutions work, both inside and outside the firm.

Few will, or should, oppose the Labor Department's "get smart" policies for workers, but the reality is that changes in the ability of workers to provide the skills needed in technologically advanced workplaces had little to do with the startling growth in poverty-wage jobs, the drop in real earnings, and the growth of earnings

inequality in the 1980's. We need to improve our education and training system, but making workers smarter 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, and 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.

References

Acs, Gregory and Sheldon Danziger, "Educational Attainment, Industrial Structure, and Male Earnings Through the 1980's," The Journal of Human Resources, Vol 28, No. 3, 1993, pp. 618-648.

Allen, Steven G., "Technology and the Wage Structure," manuscript, October 1993.

Appelbaum, Eileen, "Structural Change and the Growth of Part-Time and Temporary Employment," in Virginia L. duRivage, ed. New Policies for the Part-Time and Contingent Workforce, Economic Policy Institute series, (Armonk:M. E. Sharpe), 1992.

Bartel, Ann P. and Frank R. Lichtenberg, "The Comparative Advantage of Educated Workers in Implementing New Technology," Review of Economics and Statistics, Vol. LXIX, No. 1, February 1987.

Berman, Eli, John Bound and Zvi Griliches, "Changes in the Demand For Skilled Labor Within U.S. Manufacturing Industries: Evidence From the Annual Survey of Manufacturing," NBER Working Paper #4255, January 1993.

Bound, John and George Johnson, "Changes in the Structure of Wages in the 1980's: An Evaluation of Alternative Explanations," American Economic Review, Vol. 82 No.3, June 1992, pp. 371-392.

Borjas, George J., Richard B. Freeman and Lawrence F. Katz, "On the Labor Market Effects of Immigration and Trade," in Borjas and Freeman, eds., Immigration and the Workforce, (Chicago: University of Chicago Press), 1992.

_____ and Valerie A. Ramey, "Foreign Competition, Market Power, and Wage Inequality: Theory and Evidence," manuscript, May 1993.

Cappelli, Peter, "Are Skill Requirements Rising? Evidence from Production and Clerical Jobs," Industrial and Labor Relations Review, April 1993, pp. 515-30.

Carre, Francoise J., "Temporary Employment in the Eighties," in Virginia L. duRivage, ed., New Policies for the Part-Time and Contingent Workforce (Armonk, New York: M.E. Sharpe), 1992.

Commission on the Skills of the American Workforce, "America's Choice: High Skills or Low Wages!," National Center on Education and the Economy, June 1990.

DiNardo, John and Thomas Lemieux, "Diverging Male Wage Inequality in the United States and Canada, 1981-1988: Do Unions Explain the Difference?" Undated manuscript.

_____, Nicole Fortin, and Thomas Lemieux, " Labor Market Institutions and the Distribution of Wages, 1973-1992: A Semi-parametric Approach," manuscript, December 31, 1993.

Economic Report of the President (Washington: U.S. Government Printing Office), 1991.

Galbraith, James K. and Paulo Du Pin Calmon, "Industries, Trade and Wages," forthcoming in Michael Bernstein and David Adler, eds., Understanding American Economic Decline (Cambridge: Cambridge University Press).

Gittleman, Maury and David R. Howell, "Job Quality and Labor Market Segmentation: A New Perspective on the Effects of Employment Restructuring by Race and Gender Since 1973," Industrial and Labor Relations Review, forthcoming.

Golden, Lonnie and Eileen Appelbaum, "What is Driving the Boom in Temporary Employment? An Economic Analysis of the Determinants of Temporary Employment," Report to the U.S. Department of Labor, Women's Bureau, February 1990.

Gordon, David M. "The 'Bureaucratic Burden' in the Advanced Economies: A Cross-National Perspective on Monitoring and Supervision," manuscript, December 1993.

Groshen, Erica L., "Five Reasons Why Wages Vary Among Employers," Industrial Relations, Vol. 30, no. 3, Fall 1991, pp. 350-380.

Harrison, Bennett, "Big Firms, Small Firms, Network Firms: Dualism and Development in the Age of 'Flexibility'," Working Paper 93-21, the Heinz School of Public Policy and Management, Carnegie Mellon University, April 1993.

Hecker, Daviel E., "Reconciling Conflicting Data On Jobs for College Graduates,"

Monthly Labor Review, July 1992, pp. 3-12.

Herz, Diane E., "Worker Displacement Still Common in the Late 1980's," Monthly Labor Review, May 1991, pp. 3-9.

Howell, David R. and Edward N. Wolff, "Trends in the Growth and Distribution of Skills in the U.S. Workplace, 1960-85," Industrial and Labor Relations Review, Vol. 44, No.3, April 1991(a), pp. 486-502.

_____, "Changes in the Information-Intensity of U.S. Employment Since 1950: Has Information Technology Made a Difference?," manuscript, July 1991(b).

_____, "Technical Change and the Demand for Skills by U.S. Industries," Cambridge Journal of Economics, Vol. 16, No. 2, June 1992, pp. 127-46.

Howell, David R., "Stages of Technical Advance, Industrial Segmentation and Employment: Computer-based Automation in Historical Perspective," in Economics as Worldly Philosophy, edited by Ron Blackwell, Jaspal Chatha and Edward J. Nell (New York: St. Martin's Press), 1993, pp. 75-103.

Jaikumar, Ramchandran, "Postindustrial Manufacturing," Harvard Business Review, November-December 1986, pp. 69-76.

Juhn, Chinhui, "Decline of Male Labor Market Participation: The Role of Declining Market Opportunities," Quarterly Journal of Economics, CVII, 1992, pp. 79-121.

_____, Kevin M. Murphy, and Brooks Pierce, "Wage Inequality and the Rise in Returns to Skill," Journal of Political Economy, vol. 101, no.3, 1993, pp.410-442.

Karoly, Lynn, "Changes in the Distribution of Individual Earnings in the United States: 1967-86," Review of Economics and Statistics, February 1992, 74(1), pp. 107-15.

Katz, Lawrence F., "A Reinterpretation of the Role of Relative Supply Shifts," in Marvin H. Kosters, ed., Workers and Their Wages: Changing Patterns in the United States," (Washington D.C.: The AEI Press), 1991.

_____ and Kevin Murphy, "Changes in Relative Wages, 1963-1987 - Supply and Demand Factors," Quarterly Journal of Economics, February 1992, 107 (1), pp. 35-78.

_____, Gary W. Loveman and David G. Blanchflower, "A Comparison of

Changes in the Structure of Wages in Four OECD Countries," NBER Working Paper No. 4297, March 1993.

Keefe, J., "Numerically Controlled Machine Tools and Worker Skills," Industrial and Labor Relations Review, vol.44, no.3, April 1991.

Krugman, Paul and Robert Lawrence, " "

Kuster, Jeffrey C., "Occupational Employment in Commercial Banking, 1987-90," Monthly Labor Review, April 1993, pp. 21-26.

Levy, Frank and Richard J. Murnane, "U.S. Earnings Levels and Earnings Inequality: A review of Recent Trends and Proposed Explanations," Journal of Economic Literature, Vol. XXX, September 1992, pp. 1333-1381.

Marshall, Ray, "The Future Role of Government in Industrial Relations," Industrial Relations, Vol. 31, No. 1 (Winter 1992), pp. 31-49.

Mincer, Jacob, "Human Capital, Technology and the Wage Structure: What do Time Series Show?," manuscript, August 1991.

Mitchell, Daniel J. B., "Shifting Norms in Wage Determination," Brookings Papers on Economic Activity, 2:1985, pp.575-599.

_____, "Wage Pressures and Labor Shortages: The 1960's and 1980's," Brookings Papers on Economic Activity, 2:1989, ;;.191-231.

Mishel, Lawrence and Ruy A. Teixeira, "The Myth of the Coming Labor Shortage: Jobs, Skills, and Incomes of America's Workforce 2000," manuscript, Economic Policy Institute, undated.

Murphy, Kevin M. and Finis Welch, "Inequality and Relative Wages," American Economic Review, Vol.83, no.2, May 1993(a), pp. 104-9.

_____, Occupational Change and the Demand for Skill, 1940-1990," American Economic Review, Vol 83, no.2, May 1993(b), pp. 122-8.

Osterman, Paul, Employment Futures, Reorganization, Dislocation, and Public Policy, (New York: Oxford University Press), 1988.

Papadakis, Maria, "Did (or Does) the United States Have a Competitiveness Crisis," Journal of Policy Analysis and Management," Vol 13, No. 1, Winter, 1994, pp. 1-20.

Reich, Robert, "Workers of the World, Get Smart," New York Times, OP ED page,

July 20, 1993.

Shaiken, Harley, "Going South: Mexican Wages and U.S. Jobs After NAFTA," The American Prospect, Fall 1993, pp. 58-64.

Shelley, Kristina J., "The Future of Jobs For College Graduates," Monthly Labor Review, July 1992, pp. 13-21.

Sicherman, Nachum, "'Over-Education' in the Labor Market," Technical Paper No. 3, National Center on Education and Employment, April 1989.

Tilly, Chris, "Dualism in Part-Time Employment," Industrial Relations, Vol.31, No. 2, Spring, 1992, pp. 330-347.

Topel, Robert, "What Have We Learned from Empirical Studies of Unemployment and Turnover?," American Economic Review, May 1993, pp. 110-115.

U.S. Department of Labor, Bureau of Labor Statistics, "Outlook 2000," Bulletin 2352, April 1990.

_____, "Handbook of Labor Statistics," Bulletin 2340, August 1989.

Wachter, Michael L. and William H. Carter, "Norm Shifts in Union Wages: Will 1989 Be a Replay of 1969?," Brookings Papers on Economic Activity, 2:1989, pp. 233-264.

Waldinger, Roger, "Who Makes the Beds? Who Washes the Dishes? Black/Immigrant Competition Reassessed," manuscript, Department of Sociology, UCLA, February 1992.

Wieler, Susan S., "Intra-Industry Inequality in the United States, 1972-90: Technological Innovation and the Role of a Changing Skill Mix," unpublished dissertation, New York University, July 1993.