

Chapter 11

Matching People to Jobs

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Matching People to Jobs

Few jobs will remain unaffected as structural change in the U.S. economy reshapes demand for skills, and as changes in demographics and education reshape supplies of skills and experience. Managers, physicians, laborers, clerks, sales people, and many others will find their jobs redefined. They will face changes in their power to command wages, in the stability of their positions, in the safety and the stress of their work, and in the texture of their daily working life. There will be new opportunities for pride and enjoyment in the workplace, and new opportunities for frustration and alienation.

Two things must happen to increase the fraction of people holding jobs that pay well and are rewarding in other ways: first, people looking for work must have the education and experience needed to take such positions; and second, production networks must change in ways that generate large numbers of such positions. Both are necessary for constructive change, but neither is sufficient. Increased supplies of well qualified people do not guarantee that the economy will generate good jobs. Technology capable of generating interesting employment opportunities can also be used to exaggerate the differences between rewarding and unrewarding jobs.

Previous chapters demonstrated that increasing demand for flexibility is a critical part of structural change in a period when trade and deregulation have heightened competitive challenges. This flexibility can only be achieved if management strategies are redefined to exploit the opportunities created by innovation. The point at issue is the way business networks will achieve the needed flexibility. Will flexibility be gained through production systems designed under the assumption that most employees will have few skills and little personal interest in the product or service delivered? Or will flexibility be achieved instead by building the capacity to adapt quickly and effectively with individuals and teams—creating value-added from the skill and commitment of all individuals involved?

It is simply too early to prove which of these strategies is more efficient with statistically convincing data. There is every reason to believe, however, that a production system based on skilled employees tak-

ing interest and pride in what they do is more likely to prosper in a period of transformation and heavy competition than one built on the presumption that good ideas come only from an elite. The second alternative also carries high social costs. It is reasonable to ask whether a democratic society can or will tolerate sharply growing disparity between elite and less privileged workers. The evidence presented throughout this discussion suggests that there is nothing inevitable about growing inequality in wages or job quality. Nor is there any guarantee that technology will be used to decrease inequality.

Flexibility, of course, is important for employees as well as for businesses. Working parents need flexibility to combine child raising with employment. Students and the elderly often prefer flexible schedules. Ambitious employees may want the flexibility to combine work with training and the freedom to move within and among companies. The critical question is whether strategies to achieve flexibility can work to serve both employer and employee interests.

One obvious effect of new production systems is their ability to affect the bargaining power of different groups. The pay commanded by different occupations is determined by a baffling mix of market forces and social values. Changes in both factors seem likely to reshape the links between pay and skill during the next two decades. Paying the average employee in the "Security and Commodity Broker" industry 3.8 times more than the average employee in education may well be a rational allocation of national economic assets. It is also possible that the rules that led to this and other large inequalities in pay are based in part on factors that could change as the economy is reshaped.

The factors shaping demand for work of different kinds are complicated by the fact that work can be an end in itself as well as a means to an end. Most people do not simply work until the "marginal unpleasantness is not worth the marginal wage,"¹ nor

¹ Tibor Scitovsky, *The Joyless Economy* (London, England: Oxford University Press, 1976), p. 90.

do most see work as merely receiving payment for an unenjoyable task. Pay cannot substitute for the triumph an inventor senses when an idea clicks, the delight a teacher takes on opening a mind to a new world, the pride a craftsman takes in a well built house, or the satisfaction a nurse or physician can find in delivering a baby or saving a life. The extent to which society expects such experiences or responsibilities to substitute for pay, of course, can change. For example, women are less likely to accept non-cash rewards in lieu of wages for traditionally "female" tasks, such as nursing and elementary school teaching, now that other opportunities are opening for their skills.

Many of the forces driving inequality will weaken over the next several decades, but they could well be replaced by others. The gap separating male and female wages, for example, has declined; this results in part from the growing number of women needing incomes and a rapid decline of high-paid, traditionally male jobs.

It is likely that incomes will depend increasingly on education and other formal credentials. This could be true because formal training has practical value in adding to a person's productivity and because education serves as a kind of hazing process, allowing those that emerge first priority in getting good jobs. Credentials provide a manager with an easy tool for selection when the characteristics needed are difficult to define with precision. As a result, credentials may gain in value as more jobs fall into non-traditional categories.

Inequality in educational levels may lead increasingly to inequality in incomes. Most of the people

entering the work force during the next two decades will be minorities and other groups that have often been poorly served by the Nation's educational system. Older workers displaced by new technology may lack the basic literacy and mathematical skills demanded by employers with expanding job opportunities.

The relative bargaining power of workers and management can be affected by changes in production systems. When a premium is placed on adaptability, the premium paid for seniority in a narrow task or for specialized skills must weaken. But people well adapted to the needs of a rapidly changing economic environment have found it difficult to translate their contribution to high wages because they lack a monopoly on any particular skill. If nothing else, the task of rewarding individual contributions to a business becomes much less mechanical.

This chapter enters these issues in the following order. It first addresses changes in U.S. labor supplies, examining both the number and kind of workers entering the work force. It then explores four aspects of the quality of the jobs being produced:

1. changes the demand for skills,
2. changes in wages and non-wage benefits,
3. changes in the flexibility and security of jobs, and
4. changes in job quality (measured in terms of both safety and the extent to which jobs match an individual's expectation of work as an act of self-fulfillment).

LABOR SUPPLY: THE SIZE AND COMPOSITION OF THE U.S. WORK FORCE

During the next two decades, the U.S. labor force is likely to grow much more slowly than it has in the recent past. The average worker will be older, more likely to be female, and less likely to be a non-hispanic white.

The labor force grew 3 percent per year during the early 1970s as the baby boom generation entered the work force and as women acquired jobs in increasing numbers. Growth rates declined sharply as the last of the baby boomers came of age. While the number of workers aged 45-55 is expected

to double during the next two decades, the number of new entrants will decline rapidly. The proportion of workers under the age of 24 could fall from approximately 30 percent in 1985 to 16 or 17 percent by 2005. Overall annual growth in the work force is expected to reach about 1 percent by the early 1990s;² growth could approach zero by 2020, depending on future rates of immigration.

²Janet L. Norwood (Commissioner of Labor Statistics, U.S. Department of Labor), "The Future of Employment," address to the Institute of Industrial Relations, University of California at Los Angeles, Oct. 18, 1986.

Women now constitute nearly two-thirds of all labor force growth, a share that is expected to continue through the end of the century.³ Younger women today are participating in the work force at a rate approaching that of their male counterparts. Between 1976 and 1986, women identifying themselves as "housekeepers" fell from 41 to 32 percent (see table 11-1). More women are looking for full- and part-time work, although a growing fraction of part-time work is involuntary.

In a sharp break from tradition, women are remaining in the work force even when they have children. Women born before 1945 tended to leave their jobs to raise children (see figure 11-1). In 1984, over two-thirds of women with children aged 6 to 17 were in the labor force—more than double the rate of 1950.⁴

³Ronald E. Kutscher, "Projections 2000—Overview and Implications of the Projections to 2000," *Monthly Labor Review*, vol. 110, No. 9, September 1987, p. 4.

⁴U.S. Department of Labor, Bureau of Labor Statistics, *Handbook of Labor Statistics 1983*, Bulletin 2175, Washington, DC, 1983; and *Employment and Earnings*, vol. 33, No. 11, November 1986.

While the number of working women is increasing, the percentage of men at work is actually below 1966 levels (again see table 11-1). In 1960, men between the ages of 55 and 64 were about as likely to be in the work force as their younger colleagues, but their participation rate has fallen steadily and is now below 70 percent (see figure 11-2). If this 20-year trend continues, only half of the men aged 55 to 64 will be working by the turn of the century. Participation for men over the age of 65 has fallen even more sharply, from 45 percent in 1950 to about 15 percent in 1985.

Declining participation rates among older men can be attributed to two main factors. First, some men are leaving the work force because early retirement maximizes returns on a pension.⁵ Second, many older men work in "declining" occupations and industries, and face a choice of retiring early, remaining employed by accepting a low-skill, low-wage po-

⁵U.S. Department of Labor, Bureau of Labor Statistics, cited in "Demographic Forecasts," *American Demographics*, vol. 8, No. 3, March 1986, p. 58.

Table 11-1.—Employment Status of Noninstitutionalized Adults Age 16 and Over (in percent)

Category	1986	1976	1981	1986
Men:				
Employed	81.5%	75.1%	72.8%	73.6%
Full time	77.2	69.4	67.0	66.9
Voluntary part time	2.9	3.6	3.6	3.9
Involuntary part time ^a	1.3	2.1	2.2	2.8
Looking for work (unemployed)	2.1	4.7	4.9	4.4
Looking for full time	1.9	4.4	4.6	4.0
Looking for part time	0.2	0.4	0.3	0.4
Not in labor force	16.5	20.2	22.3	22.0
Housekeeping ^b	N.A.	0.3	0.4	0.6
Education ^b	N.A.	1.8	1.5	1.9
Other	N.A.	18.1	20.4	19.5
Total	100.0	100.0	100.0	100.0
Women:				
Employed	38.6	36.8	49.1	53.0
Full time	30.0	27.5	36.8	39.5
Voluntary part time	7.6	7.9	10.0	10.5
Involuntary part time ^a	1.1	1.4	2.4	3.1
Looking for work (unemployed)	1.5	3.5	4.3	3.5
Looking for full time	1.2	2.8	3.7	2.7
Looking for part time	0.3	0.7	0.6	0.7
Not in labor force	59.9	59.7	46.6	43.5
Housekeeping ^b	N.A.	41.2	34.5	31.8
Education ^b	N.A.	1.8	1.7	1.8
Other	N.A.	16.7	10.4	9.9
Total	100.0	100.0	100.0	100.0

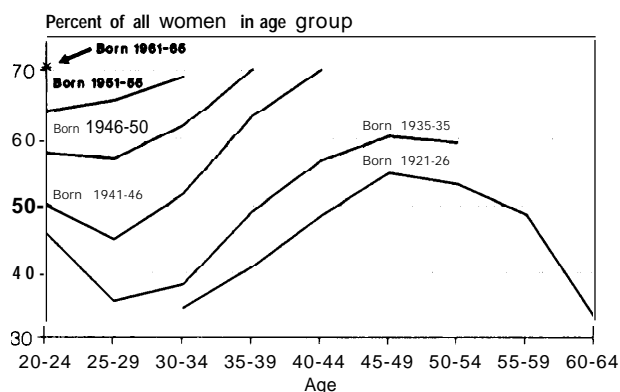
NA = Not available.

^aAssumes that involuntary part time for age 18-24 divided by age in same proportion in years 1966 to 1981 as in 1986.

^bFor years 1966 and 1976, assumes that persons in education and housekeeping aged 16-20 are same proportion as total.

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics, *Handbook of Labor Statistics 1983*, Bulletin 2175; *Employment and Earnings*, vol. 33, No. 11, Review, November 1986.

Figure 11-1.-Work Force Participation of Women Born in Different Years

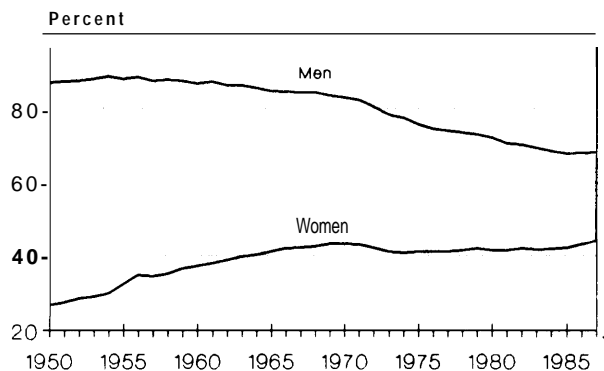


How To Read This Figure: 46% of women born between 1931 and 1935 were working when they were between the ages of 20 and 24. By the time they reached age 25-29, however, only 36% were working (many were now at home with young children). This same group of women, however, returned to the work force by the time they were 45-49 years of age, when over 60% were working.

People are defined to be participating in the work force if: (1) they did any paid work, (2) they made specific efforts to find employment sometime during the prior four weeks, (3) they were waiting to be recalled to a job from which they had been laid off, or (4) they were waiting to report to a new job within 30 days.

SOURCE: Ray Marshall and Beth Paulin, "Employment and Earnings of Women: A Historical Perspective," *Working Women: Past, Present, and Future*, Industrial Relations Research Series (Washington, DC: Bureau of National Affairs, 1987).

Figure n-2.-Participation Rates for Workers Aged 55-64 (percent employed or actively looking for work)



How To Read This Figure: The percentage of men aged 55-64 participating in the work force declined from about 90% in 1950 to about 50% in 1987 (see figure 11-1 for definition of "participation").

● November 1987.

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics, *Employment and Earnings*, various issues.

sition, or receiving extensive and often costly vocational training in order to keep a job of the same stature.⁶

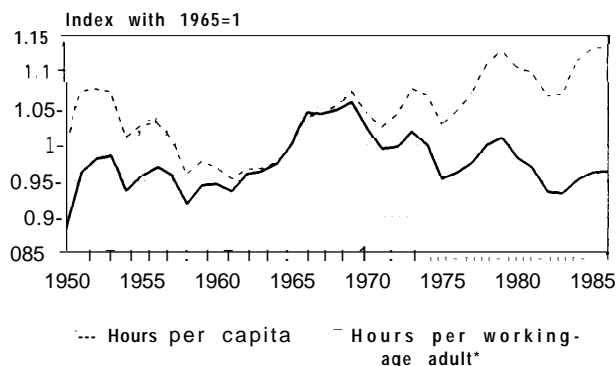
The increase in early retirements, however, may be a temporary phenomenon—an artifact of structural change and not a long-term trend. In the future, workers may not have retirement benefits that allow or encourage early retirement. Baby boomers may not want to retire if they are healthier and if their jobs are more rewarding and a more integral part of their social lives.⁷

The effects of earlier retirement and lower numbers of working hours per adult appears to have more than offset the increase in the number of working women. Figure 11-3 indicates that the number of hours worked per working age adult has actually declined during the past few years. On the other hand, the number of hours worked per American

⁶See U.S. Congress, Office of Technology Assessment, *Technology and Aging in America*, OTA-BA-264 (Washington, DC: U.S. Government Printing Office, June 1985), pp. 27-29.

⁷Terry Stephenson-Supple, "The Coming Labor Shortage," *American Demographics*, vol. 8, No. 9, September 1986, p. 35.

Figure n-3.-Recent Declines in Hours Worked Per Working-Age Adult* and Increases in Hours Worked Per Capita



How To Read This Figure: The number of hours worked per capita in 1986 was 14% higher than in 1965 (i.e., the index went from 1.00 to 1.14 during the period). The number of hours worked per working age adult (defined to be all people between the ages of 16 and 65 that are not in jails, nursing homes, or other institutions), however, declined by about 4% (the index fell from 1.00 to 0.96).

● Noninstitutional population aged 18 to 85.

SOURCES: U.S. Department of Labor, Bureau of Labor Statistics, *Monthly Labor Review*, various issues; and U.S. Department of Commerce, Bureau of Economic Analysis, "National Income and Product Accounts," historical diskettes, table 6.11.

(counting the entire population) has increased as the baby boom has entered the work force. Higher gross national product (GNP) per capita has therefore been achieved in part by simply adding more people to the work force.

The racial mix of American workers is also changing rapidly. A majority of the people entering the U.S. labor force during the next few decades will be black, Hispanic, or Asian (see table 11-2). Blacks represented 9.2 percent of the work force in 1970, but are expected to account for 11.8 percent in the year 2000. The U.S. Bureau of Labor Statistics (BLS) projects that by the early 1990s more than 17 percent of all new entrants to the labor force will be black. Growth rates for Asian and Hispanic workers are more difficult to anticipate, since the rate depends on the extent to which illegal immigration from Asia and Central and South America is contained. Hispanics are expected to grow from 7 per-

cent of the work force in 1986 to at least 10 percent in 2000.⁸

Table 11-3 summarizes three sets of assumptions about participation rates for the year 2005:

1. The first case assumes simply that 1986 participation rates remain unchanged.
2. The second case assumes that participation rates for women are at least 90 percent of the rate of men in each age group (a trend established by women born in 1962/63); it also assumes that participation rates of older workers decline, following 20-year trends.
- 3 In the third case, it is assumed that men over the age of 55 will have approximately the same participation rate as they did in 1975, while older women participate at 90 percent of male rates.

⁸R. E. Kutscher, op. cit., footnote 3, P. 4

Table n-2.-Racial Composition of the U.S. Work Force 1986-2000

	Percent of the work force in 1986	Percent of the work force in 2000	Percent of growth in work force between 1986 and 2000
Black	10.8	11.8	17.4
Asian ^a	2.8	4.1	11.4
Hispanic ^b	6.9	10.2	28.7
White	86.4	84.1	71.2

NOTE: Totals exceed 100 percent because hispanics are also counted in other races.

^aIncludes native Americans, Alaskan natives, Pacific islanders.

^b Persons of Hispanic origin may be of any race.

SOURCE: Ronald E. Kutscher, "Projections 2000-Overview and Implications of the Projections to 2000," *Monthly Labor Review*, vol. 110, No. 9, September 1987, p. 4.

Table n-3.-Work Force Participation Rates

	Age range:							
	16-17	18-19	20-24	25-34	& 4 4	45-54	55-64	65+
Men:								
Case #1: 1986 Levels	0.41	0.66	0.85	0.94	0.95	0.91	0.68	0.16
Case #2: 2005 Trend	0.41	0.66	0.85	0.94	0.95	0.91	0.50	0.03
Case #3: 2005 Alternative	0.41	0.60	0.80	0.94	0.95	0.91	0.75	0.20
Women:								
Case #1: 1986 Levels	0.42	0.60	0.73	0.73	0.75	0.67	0.43	0.08
Case #2: 2005 Trend	0.41	0.80	0.77	0.85	0.86	0.82	0.42	0.05
Case #3: 2005 Alternative	0.41	0.60	0.77	0.85	0.86	0.82	0.68	0.18

SOURCE: Office of Technology Assessment, 1988 (see text details).

CHANGES IN THE QUALITY OF JOBS PRODUCED

An analysis of the match between jobs desired and jobs available must confront the vexing problem of defining a "good" job. Clearly, the answer to this question is as varied as the U.S. labor force itself.

The following discussion will examine four aspects of the issue:

1. How do the changes in production networks translate into changes in demand for different

kinds of skill?

2. How well are different skills paid? How can these differences be explained?
3. How much flexibility does a job offer to those that desire it?
4. How well does a job match an individual's expectation of work as an act of self-fulfillment? Is the job dangerous?

Technology and Skill

The problem of estimating the impact of new production recipes on skills and work life is not new. Hesiod worried about the effects of structural change on Greek workers in 800 B.C.⁹ Literature since the industrial revolution documents concern about the dehumanizing effects of automation, the alienation of worker from employer, and the increasingly vague connection between what a worker does during the day and a product of real social value (see box 1 I-A).

One question remains at the core of these discussions: precisely what do humans do better than machines? The question is presented in different ways as each new wave of innovation sweeps old patterns of production aside. Information technology has given it an entirely new twist. Machines are not only able to beat the fabled John Henry at steel driving, and weave more skillfully than Ned Ludd, they are now capable of seeing, touching, remembering billions of facts, and even undertaking elementary forms of reasoning.

In a period of transformation, basic questions need to be asked about where people can fit in as machines substitute for labor and skill. There is always one easy answer: people will be used instead of machines when they are less expensive. Anyone holding a job on this basis is obviously vulnerable. There are better answers.

Technology can enhance the human elements of work by automating tasks that have forced men and women to mimic machines. As chronicled in this volume (particularly in chs. 6 and 12), the technology now entering the U.S. economy has the potential to reduce the mechanical aspects of most work, allowing greater use of human imagination and greater opportunity for personal communication. In-

formation technology can remove barriers between conception and execution in ways that expand the time devoted to developing and testing the products of imagination. The ratios of authors to typesetters, architects to draftsmen, clothing designers to textile and apparel workers, and even of individual tutoring to repetitive recitation of lectures, can all increase. Medical personnel can spend more time talking with patients, and less time struggling with routine forms or counting cells through microscopes. Technology can allow sales personnel to spend more time with customers and clients so that they can more fully understand a customer's idiosyncratic tastes and desires. Innovation also makes it possible to tailor products and services to fit—benefiting both the customer and the producer while creating a more satisfying link between work and the final product.

It is obviously possible that the new technology can be used to make jobs more and not less mechanical. Information equipment could be used to create rigidly authoritarian management styles that force employees into narrowly defined tasks with little room for individual expression. In general, however, attempts to organize production in this way have not met with success.

Some jobs seem virtually unaffected by changes sweeping the rest of the economy. The jobs of farm workers, house cleaners, and nursing assistants require menial tasks that are difficult to replace with technology. Many such jobs involve sub-standard working conditions. Most are held by minorities and women.

The New Production Networks

The old debates over the links connecting technology and skill plainly need redefinition. The impact of complex production networks on jobs during the past few decades defies convenient characterization. It is not enough to ask whether technology degrades or upgrades a specific task (such as machining or typing). Rather, it is necessary to measure the effect of change on the entire network of employment that combines to deliver an amenity. These networks now combine a baffling collection of jobs. Jobs lost on the factory floor may be replaced by information-handling positions in other business sectors in other States.

⁹Hesiod, *Works and Days*.

What is the net effect of a shift from an economy dominated by machinists and farmers to one dominated by middle managers, para-professionals, sales clerks, and information processors (as outlined in

ch. 10)? It is likely, for example, that wages for “managerial” occupations will be reduced as growing numbers of people take jobs classified as management. However hard the Bureau of Labor Statis-

Box 1 1-A.—The Debate on Technology and Skills: Selected Views

Adam Smith, who provided the first clear example of the advantages of labor specialization, expressed clear reservations about the effects of such a development taken to the extreme:

The man whose whole life is spent in performing a few simple operations, of which the effects are perhaps always the same, or very nearly the same, has no occasion to exert his understanding or to exercise his invention in finding out expedients for removing difficulties which never occur. He naturally loses, therefore, the habit of such exertion, and generally becomes as stupid and ignorant as it is possible for a human creature to become.¹

The management specialist Fredrick Taylor attempted to apply the principles of good engineering design in machinery to the design of jobs. The central idea was to disconnect conception from execution, dividing tasks into discreet, highly specialized functions. Management would specify the correct way for an employee to move and act in the performance of these functions much as it would design specifications for a piece of equipment. The employee would be evaluated entirely in terms of the effectiveness of such actions, and would not be expected to understand the integrated operation of the production process.

Daniel Bell, and others writing in the 1960s and early 1970s, argued that the share of unskilled workers was diminishing throughout the economy, being replaced by substantial numbers of knowledge-based employment opportunities.² Several empirical studies seemed to confirm this.³ One 1963 analysis of automation in coal mining concluded that:

... extreme division of labor characteristics of previous stages of industrial development would be replaced by situations with fewer and less specialized work roles. The jobs of the future would require multi-skilling and share responsibility, possibly giving rise to composite or autonomous work groups with little or no internal supervision.⁴

Concern about alienation of the labor force has taken a somewhat different turn with each new wave of automation. In 1958, Charles Bright looked at technologies then entering the factory, and concluded that “automation had reduced the skill requirements of the operating work force and occasionally of the entire factory force, including the maintenance organization.”⁵ P.B. Doeringer and Michael Piore described the emergence of a “dual labor force”—one split between routine, low skilled jobs and an elite set of jobs—with reduced opportunities for moving from one area to the other.⁶ David Noble reviewed the history of machine tools to prove a similar point.⁷ While many of these works take a starkly ideological perspective, aspects of the thesis do find broad support. Abernathy, Clark, and Kantrow, writing about the “single, dominant paradigm for production” in the United States, find:

If skills can be progressively built into machines, then workers need not be especially skilled themselves . . .
... [G]ear up for long production runs, buffer yourself with enough inventory to keep the lines moving, inspect for defects—if at all—at the end of those lines, treat workers primarily as a reservoir of costs that can be bled out under pressure as the need arises, and you will boost your market share, your profits, your stockholder’s good disposition, your bond ratings, your own compensation, and the Nation’s industrial health.⁸

¹*The Wealth of Nations*, 1776 (London: Every man’s Library, J.M. Dent & Sons Ltd., 1947), vol. II, p. 278.

²Daniel Bell, *The Coming of Post-Industrial Society* (New York: Basic Books, 1973); C. Kerr, J.T. Dunlop, F.H. Garbison, and C.A. Myers, *Industrialism and Industrial Man* (Cambridge, MA: Harvard University Press, 1960).

³R. Blauner, *Alienation and Freedom* (Chicago, IL: University of Chicago Press, 1964); C.R. Walker, *Toward the Automatic Factory* (Westport, CT: Greenwood Press, 1957); J. Woodward, *Industrial Organization: Theory and Practice* (London, England: Oxford University Press, 1965).

⁴E.L. Trist and K.W. Bamforth, “Some Social and Psychological Consequences of the Longwall Method of Coal Getting: An Examination of the Psychological Situation and Defenses of a Work Group in Relation to the Social Structure and Technological Content of the Work System,” *Human Relations*, vol. 4, No. 1, 1951, pp. 3-38.

⁵J.R. Bright, “Does Automation Raise Skill Requirements?” *Harvard Business Review*, vol. 36, No. 4, July/August 1958, p. 86.

⁶P.B. Doeringer and M.J. Piore, *Internal Labor Markets and Manpower Analysis* (Lexington, MA: Heath-Lexington Books, 1971).

⁷David F. Noble, *Forces of Production: A Social History of Industrial Automation* (New York, NY: A.A. Knopf, 1984); *America By Design: Science Technology, and the Rise of Corporate Capitalism* (New York, NY: A.A. Knopf, 1977).

⁸W. Abernathy, K. Clark, and A. Kantrow, *Industrial Renaissance: Producing a Competitive Future for America* (New York, NY: Basic Books, 1983).

tics works to ensure consistency of definitions, statistics give an imperfect view of the changes taking place. Many changes can only be understood by examining patterns of job change in individual sectors, as undertaken in chapter 12.

Perhaps the most striking change is that occupations now held by people with college degrees are growing comparatively quickly. College graduates held 13.2 percent of all jobs in 1967 but 25.3 percent of all jobs in 1987 (see table 11-4). About half of all new jobs were filled by college graduates during these two decades.

The way jobs are created, and the pay that can be commanded by these jobs, depends heavily on management discretion. Two factors appear to have a major impact on the way production strategies translate into demand for skills, and into the bargaining power of employees offering different skills: the extent to which businesses, or networks of businesses, are managed as authoritarian hierarchies; and the extent to which workers can be easily substituted for each other.

The Rise and Fall of Hierarchies.—Will new business networks provide more or less freedom than the ones they replace? Will they provide workers with more independence and therefore more opportunities for taking pride in what they accomplish at work, or will they result in rigidly hierarchical management structures in which individual employees find themselves meticulously monitored in the way they undertake ever more specialized assignments?¹⁰ The studies of business networks in chap-

¹⁰ See Barbara Baran and Carol Parsons, "Technology and Skill," Berkeley Roundtable on International Economics, University of California, Berkeley, CA, January 1986.

Table 11-4.-Education Levels of the U.S. Work Force, 1967-87 (in percent, age 25-64)

Education level	Labor force share in:		
	1967	1979	1987
Less than 4 years of high school	41.1	21.9	14.9
4 years of high school	35.2	39.6	40.2
1 to 3 years of college	10.6	17.3	19.7
4 years of college or more	13.2	21.3	25.3
Total (ages 25-64)	100.0	100.0	100.0

NOTE: Percentages calculated for March of years indicated.

SOURCE: Wayne J. Howe, "Education and Demographics: How Do They Affect Unemployment Rates?" *Monthly Labor Review*, vol. 111, No. 1, January 1988, p. 4.

ters 6 and 12 provide no clear guidance. There appears to be no necessary link between production technology and the kinds of jobs created. Both manufacturing and office work can be upgraded or sharply downgraded as the result of new equipment. Clerical office workers can be upgraded to take on new responsibilities—becoming "parapublishers," "paralibrarians," and "paramanagers"—or their jobs can be reduced to mindless data entry.¹¹ Production workers can be made a part of teams expected to move quickly from a design to a new product, or they can be reduced to machine tenders.

It is difficult to demonstrate which management strategy will prove most effective in different circumstances. On the other hand, there is a growing body of anecdotal evidence supporting the view that the new generation of automation works well in office and manufacturing environments only when people expected to work with the equipment have a role in modifying the system.¹² It now appears that more of the next generation's job opportunities will be built around ambiguous situations, as opposed to those that are routine. Insurance underwriters will see more complex and unusual cases. Manufacturing operatives may need to intervene in the production process only when something breaks, or when a control program needs to be redesigned around a new part. It may be possible to build such a system using unskilled personnel with narrow task assignments operating under rigid hierarchical control. However, it is difficult to conceive that this kind of arrangement—or one that prevents the organization of a team of people who expect to work together for some time—could work well under dynamic conditions.

Company interest in employee roles is frequently credited for the success of the GM/Toyota plant in Fremont, CA.¹³ Xerox, Kodak, Hewlett Packard, and several other firms have shifted production to teams including engineering marketing, design, and production. There is a growing belief that large plants

¹¹ Larry Hirschorn, "Office Automation and the Entry Level Job. A Concept Paper," Management and Behavioral Science Center, Wharton School of Business, University of Pennsylvania, Philadelphia, PA, no date; and R. Howard, *Brave New Workplace* (New York, NY: Viking Press, 1985).

¹² M.A. Maidique and R.M. Hayes, "The Art of High-Technology Management," *Sloan Management Review*, vol. 25, winter 1984, pp. 17-21.

¹³ See Richard Corrigan, "GM-Toyota-Deal Symbolizes the Trend Toward an international Car Market," *National Journal*, vol. 15, No. 23, June 4, 1983, pp. 1156-1161.

may suffer diseconomies because of the distance between different kinds of workers inherent in a large scale. A senior vice president of General Electric's aircraft engines division was recently quoted as saying that management can be closer to workers if plants are limited to between 600 and 1,500 people.¹⁴ Nearly two-thirds of the 830-person work force in a Westinghouse Furniture Systems plant in Grand Rapids, MI is involved in both product design and business strategy. The teamwork seems to have paid off: plant productivity—measured by constant dollar sales per employee—rose 74 percent between 1983 and 1986.¹⁵ Unfortunately, the integration of job design with equipment design is probably an exception and not the rule. Interviews with 196 organizations found little planning in reorganization of offices around new technology.¹⁶

Efforts to introduce mass production models in clerical activities have met with mixed success. It was once thought that large "typing pools" and segregated "back office" activities would represent the future of clerical work. While no national statistics are available, anecdotal evidence suggests that instead of being isolated in "electronic sweatshops," clerical staffs are being more closely integrated into the substantive work of businesses in ways that make these employees less and not more mechanical. The insurance industry, discussed in greater detail in chapter 12, provides examples of businesses which have reintegrated clerical and professional tasks in both function and office location. Surveys conducted by Honeywell, Minolta Corp., and Professional Secretaries International have shown that 70 to 90 percent of secretaries believe automation makes their tasks go faster, and frees time for more interesting and challenging work.¹⁷ A survey by the National Association of Working Women (9-to-5) found that work with new office technology was both more in-

teresting and enjoyable (68 percent) and less stressful and pressured (54 percent).¹⁸

The integration of management with other workers is a necessity in comparatively small establishments whether or not they are a part of larger firms. Travelers Corp., a Hartford, CT insurance firm, is finding that after their organization had responded to new technology-based sales and underwriting systems, their middle managers were not managing in traditional ways but were participating more substantively in the work of the firm.¹⁹

There is legitimate concern that electronic surveillance can monitor every keystroke and track every moment of a typist's life. Telephone company supervisors can measure the precise length of time an information operator spends handling each call, know precisely when the operator takes a break, and listen in on all calls.²⁰ Between 20 and 35 percent of all clerical workers (4 to 6 million people) may be monitored by electronic equipment.²¹

Obviously, data gathering is needed for purposes other than monitoring individuals; data collected electronically from individual work stations is apparently used to evaluate individuals in only about half the cases.²² While electronic surveillance is chilling, it is not obvious that this represents greater intrusion than more traditional systems in which supervisors personally monitored performance. Automated surveillance monitors only the most routine activities, and many of the characteristics of "electronic sweatshops" seem applicable only to the most mechanical tasks. Most jobs requiring judgement, and most jobs "with new applications," are not susceptible to electronic supervision.²³

¹⁴C.H. Deutsch, "U.S. Industry's Unfinished Struggle," *The New York Times*, Feb. 21, 1988, p. 7.

¹⁵John Hoerr, "Getting Man and Machine to Live Happily Ever After," *Business Week*, No. 2995, Apr. 20, 1987, p. 61.

¹⁶B. Johnson and R.E. Rice, "Policy Implications Implementing Office Systems Technology," paper presented at the 11th Annual Telecommunications Research and Policy Conference, Annapolis, MD, April 1983.

¹⁷H. Hartmann, R.E. Kraut, and L.A. Tiny, ed., *Computer Chips and Paper Clips: Technology and Women's Employment*, National Research Council (Washington, DC: National Academy Press, 1986).

¹⁸9-to-5, "The 9-to-5 National Survey on Women and Stress," National Association of Working Women, Cleveland, OH, 1984.

¹⁹Peter Nulty, "How Managers Will Manage," *Fortune*, vol. 115, No. 23, Feb. 2, 1987, p. 50.

²⁰See R. Howard, op. cit., footnote 11; R. Rice et al., "The Survival of the Fittest: Organizational Design and the Structuring of Word Processing," paper presented at the meeting of the Academy of Management, Dallas, TX, August 1983; and U.S. Congress, Office of Technology Assessment, *The Electronic Supervisor: New Technology, New Tensions*, OTA-CIT-333 (Washington, DC: U.S. Government Printing Office, September 1987).

²¹*The Electronic Supervisor*, op. cit., footnote 20, p. 32.

²²See H. Hartmann et al., cd., op. cit., footnote 17; and "The 9-to-5 National Survey on Women and Stress," op. cit., footnote 18.

²³Alan Westin et al., "Privacy and Quality of Work Life Issues in Employee Monitoring," contract report prepared for the Office of Technology Assessment, 1986, cited in *The Electronic Supervisor*, op. cit., footnote 20.

Ironically, while factory and "back office" production is moving away from hierarchical management, many occupations not traditionally tied to any formal bureaucratic management—such as physicians, teachers, residential construction managers, and farm managers—may find themselves increasingly enmeshed in bureaucracies. Physicians are often now employees of health maintenance organizations. Professionals with training in business as well as agriculture are now managing large farms. Teachers may find themselves in structures more familiar in other information industries if technology leads to greater specialization in teaching functions.²⁴ It maybe technically possible to introduce rigid, hierarchical management into such systems by greatly reducing the autonomy of these professions. It is more likely that these systems will move toward a new form of management strategy—being neither hierarchical nor a network of independent individuals.

The collapse of traditional hierarchies in many networks has led to new roles for managers. Chapter 10 documented a rapid growth of people identified as "managers" that is not matched by growth in traditional management support personnel. These statistics alone suggest that the daily tasks of managers are more closely integrated with work done by other staff members. The integration ranges from managers who do their own typing and data analysis because word processing and data manipulation has been vastly simplified by automation, to store managers who double as sales staff because routine management has been simplified by centrally controlled software.

General v. Specific Skills.—Even if average skill levels increase, wages could go down if employers treat workers as relatively interchangeable commodities. Skills could become more homogeneous while tasks grow more specialized. This change has advantages, in that it allows people with solid basic training to help their firms adjust rapidly to new requirements. Convergence of skills can give workers greater mobility, affording them a certain degree of immunity to problems in a particular firm or industry. Generalized skills can, however, also make workers more of a mass commodity, and can greatly

weaken the ability of the worker to bargain with employers.²⁵

Rapid growth in temporary help businesses seems to argue that there is strong demand for skills not linked to the special interests of individual firms. This growth has been aided, of course, by an increasing tendency on the part of many U.S. firms to reduce long-term commitments, so as to adjust staffing according to short-term need; until recently, temporary workers were thought of as little more than replacements for absences, or "fill-ins" during peak workloads. Today's temporary employees are often those with skills so transferable that they need no specific training to work in an unfamiliar firm. Temporary employment agencies contributed nearly 3 percent of total job growth between 1982 and 1985—the average number of workers employed by these firms at any given time doubled during this period, reaching 735,000 at the end of 1985 and 786,000 by 1986. Nearly one-third of this total was employed by the Federal Government.²⁶ While many of these temporary individuals specialize in office work, a growing number are also industrial workers (typically low-paid helpers, laborers, or material movers), nurses, nursing aids and orderlies, and even people needed for defense work in engineering job shops.²⁷

Income and Compensation

The changes in the mix of skills required by the U.S. economy are of more than theoretical interest. They can translate directly into changes in the distribution of wages. The value attached to different skills changes in complex ways, depending on both the supply of workers offering different training, experience, and talents and the demand for labor.

Both supplies and demands are changing. When the baby boom generation was entering the job market, entry level workers typically had more education and less experience than the ones they replaced. Accordingly, the older workers of tomorrow are likely

²⁵ Harry Braverman, *Labor and Monopoly Capital: The Degradation of Work in the Twentieth Century* (New York: Monthly Review Press, 1974).

²⁶ Eileen Applebaum, "Alternative Work Schedules Of Women," Paper presented to the Economics Department of Temple University, Philadelphia, PA, July 1985.

²⁷ M.L. Carey and K.L. Hazelbaker, "Employment Growth in the Temporary Help Industry," *Monthly Labor Review*, vol. 109, No. 4, April 1986, pp. 37-44.

²⁴For a review of these studies see H. Hartmann et al., ed., *op. cit.*, footnote 17.

to have increased expectations based on both education and experience. The economy will need to expand at least 2.5 percent per year for the next two decades simply to pay the baby boom work force wages equivalent to those paid today for experienced workers with equivalent educations.²⁸ Wages are also under pressure because Americans find themselves in direct competition with foreign producers (see ch. 7).

In theory, workers can increase the "quality" of the services offered by investing in education and by virtue of job experience. In fact, markets depend on a variety of factors that cannot easily be quantified.²⁹ Wages can depend on the relative cost of capital and workers. Real wages have fallen while real capital costs have, if anything, increased during the past few years. Compensation (wages, salaries, and benefits) has not grown as fast as labor productivity, and the fraction of national income paid as compensation has declined.

Discrimination on the basis of sex, race, and other factors still plays a role in setting wages. There are also deep cultural factors that determine how much a person should be paid to work in dangerous or unpleasant occupations or in occupations that are attractive or rewarding. The logic of these factors hinges on values that are difficult to forecast.

International competition may force managers to rethink basic strategies for rewarding pay. The ratio of pay between U.S. managers and U.S. blue-collar workers within manufacturing is at least twice the equivalent ratio in Japan.³⁰ Are American managers prepared to argue that the U.S. scheme is based only on a concern about maximizing the performance of their firms?

It is apparent that major changes are underway. The following discussion will trace some of the factors that connect changes in the structure of the economy with changes in links connecting skills and income. It begins by examining overall trends in compensation paid, attempting to explain how real

GNP per capita could be increasing while real wages are declining. It then addresses some of the factors that lead to changes in the way the funds available for compensation are allocated on the basis of occupation, race, sex, and other factors.

Shares of National Income

Patterns of growth in income and wages appear to have changed sharply in the early 1970s. Averaging out the effects of recessions, real per capita GNP has increased steadily for a generation but real weekly earnings received by private workers in 1985 were nearly 14 percent below their 1973 peak. The real hourly wages of non-supervisory workers in private businesses declined by 10 percent during the same period.³¹ Younger workers fared particularly poorly.³² While gains in compensation roughly followed gains in productivity during the 1970s, they diverged in 1980 (see figure 1-20 of ch. 1). Productivity grew sharply between 1982 and 1986, but compensation barely recovered from the 1982 recession.

These paradoxes are explained by four factors (box 11-B provides a guide to the accounting vocabulary used in the next few paragraphs):

1. Compensation grew more rapidly than GNP between 1950 and 1970, but has grown slightly more slowly than GNP since 1970.
2. The fraction of compensation received as wages and salaries is declining, as a growing share of compensation is paid as benefits.
3. The fraction of personal income received as wages and salaries is declining, as transfer payments (particularly payments made to retirees) and unearned income capture a growing fraction of all personal income.
4. The fraction of the population working has increased.

One of the most basic changes is that the fraction of GNP paid as depreciation increased steadily during the 1970s. This reduced the amount that

²⁸See W.H. Esselman and O.S. Yu, "Economic Growth to Meet Income Expectations," *Journal of Policy Analysis and Management*, vol. 2, No. 1, fall 1982, pp. 111-118.

²⁹G.S. Becker, *Human Capital* (Chicago, IL: University of Chicago press, 1975).

³⁰J. Hattori, "Product Diversification," in *Effective Management: A Japanese View*, TBS-Britannica, Tokyo, 1983 (Cambridge, MA: The MIT Press, 1984).

³¹U.S. Department of Labor, Bureau of Labor Statistics, *Handbook of Labor Statistics*, 1982; and *Employment and Earnings*, vol. 33, No. 11, November 1986.

³²The William T. Grant Foundation Commission on Work, Family, and Citizenship, "Youth and America's Future," Washington, DC, p. 21, based on analysis of March 1974 and March 1987 Current Population Survey Public Use Tapes, calculations by Center for Labor Market Studies, Northeastern University, Boston, MA.

could be paid to individuals in the form of compensation or investment income. An increase in depreciation would be expected from an economy going through a major transformation, since a significant amount of capital stock would become obsolete.

Compensation's share of GNP has fallen slightly since the early 1970s, while the share of GNP paid as wages and salaries has dropped at a faster rate (see figure 11-4). Expanding imports, heightened domestic competition, and a variety of other factors obviously created considerable pressure for wage restraint; workers are seeing a smaller fraction of their compensation in the form of wages and salaries. Wages have come under particularly intense pressure in the heavily unionized High Wage Manufacturing industries (see ch. 10). Since 1981, each year has seen record low or near-record low wage adjustments as measured by the Bureau of Labor Statistics.³³

The personal income (as distinct from GNP—see box 1 I-B) that did not go into wages, salaries, and benefits went to transfer payments and returns to

capital. Private and public pensions and other benefits grew quickly during the past two decades. Aid to families with dependent children and other types of transfers grew sharply during the late 1960s, but have not since grown in percentage terms (see figure 11-5). Employer contributions for social insurance have tripled since 1950 (as a fraction of all personal income), while employer contributions for health insurance have grown eightfold. Many unions have solicited increases in benefits in lieu of taxable wage benefits; indeed, employer benefits are often greater in sectors characterized by high levels of unionization (see table 11-5).

After falling steadily for 25 years, "unearned" income (money collected from proprietary income and rent, dividends, and interest payments) has been increasing as a fraction of all personal income since the mid 1970s (its GNP share has been constant since 1970).³⁴ Figure 11-6 suggests that the increase is due almost entirely to interest income, which has grown far more rapidly since 1976 than during the two previous decades—possibly due to the comparatively high real interest rates of the past decade.

³³This BLS series dates back 18 years, and covers private industry agreements covering 1,000 workers or more. See Joan Borum and James Conley, "Wage Restraints Continue in 1985 Major Contracts," *Monthly Labor Review*, vol. 109, No. 4, April 1986, pp. 22-28.

³⁴This form of income has, however, not captured a growing share of GNP, suggesting that the portion of "property type income" paid as personal income is shrinking while depreciation, retained earnings, and other categories are gaining share.

Box 11-B.—U.S. Gross National Product and Personal Income in 1986 (trillions of dollars)

Gross national product	\$4.2	Personal income	\$3.5
Compensation	2.5		
Wages and salaries	2.1	Wages and salaries	2.1
Supplements to wages and salaries.	0.4	Other labor income (supplements less employer contributions to social insurance)	0.2
Proprietors' income and rental income adjusted for depreciation (a).	0.3	Proprietors' income and rental income adjusted for depreciation (a).	0.3
Net interest	0.3	Personal interest income (b)	0.5
Corporate profits adjusted for depreciation (a,c)	0.3	Personal dividend income	0.1
Depreciation(d)	0.5		
Indirect business taxes & other (e) ... ,	0.3	Transfer payments	0.5
		less personal contributions for social insurance	—0.2

(a) More precisely, these "property-type" incomes reflect inventory valuation and capital consumption adjustments.

(b) Personal interest is net interest, plus interest paid by government, plus interest paid by consumers to business, less interest received by government.

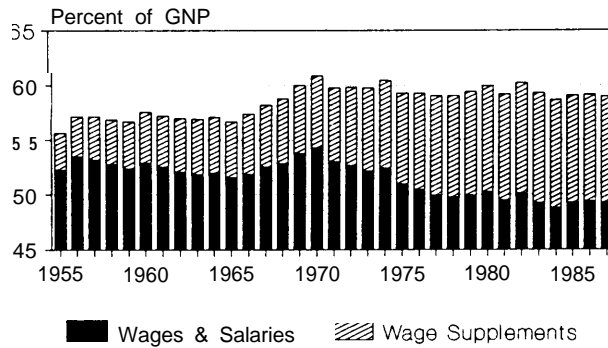
(c) Corporate profits include dividends, undistributed profits, profits tax liability, inventory valuation, and capital consumption adjustment.

(d) Capital consumption allowance with capital consumption adjustment.

(e) Business transfer payments, less subsidies, less current surplus of government enterprises (together, these are less than \$0.02 trillion)

SOURCE: U.S. Department of Commerce, Bureau of Economic Analysis, "National Income and Product Accounts, Survey of Current Business, July 1987, Table A.

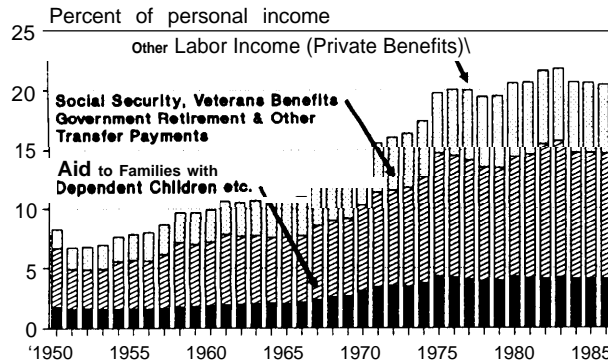
Figure 11-4.-Compensation and Wages & Salaries as a Percent of GNP (current dollars)



How To Read This Figure: Wages and salaries paid to employees were about 54% of GNP in 1970 but fell to 49% of GNP in 1986. Compensation paid to employees—defined as wages and salaries, employer contributions for social insurance, and “other labor income” (a category including employer contributions to pensions, profit sharing, group insurance, workers’ compensation, supplemental unemployment, and directors’ fees)—was slightly more than 60% of GNP in 1970 and is now slightly below 60%.

SOURCE: U.S. Department of Commerce, Bureau of Economic Analysis, “National Income and Product Accounts,” historical diskettes, table 2.1.

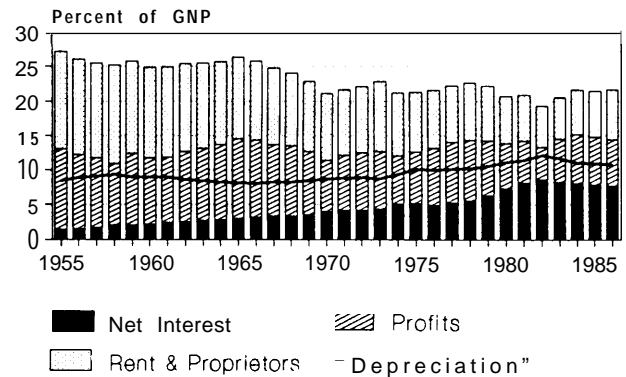
Figure n-5.-Transfers and Benefits (as a percent of personal income in current dollars)



How To Read This Figure: Transfer payments (which include old-age, survivors, disability, and health insurance benefits; government unemployment insurance benefits; veterans benefits; government employees retirement benefits; and aid to families with dependent children) rose from about 5% of personal income in 1950 to 15% in 1981. Transfer payments plus “other labor income” (see definition in figure 11-4) totaled 20% of personal income in 1986. In addition to these two components, personal income includes: wages and salaries, proprietors’ income, rental income, personal dividend income, and personal interest income (less personal contributions for social insurance).

SOURCE: U.S. Department of Commerce, Bureau of Economic Analysis, “National Income and Product Accounts,” historical diskettes, table 2.1.

Figure n-6.-Property-Type Income as a Percent of GNP (current dollars)



How To Read This Figure: Property-type income (the sum of rental income, proprietors’ income, corporate profits, and depreciation) was about 25% of GNP in 1960, is now about 21% of GNP. Net interest increased from 2% of GNP in 1980 to 7% in 1986. Profits (defined as corporate profits adjusted for inventory valuation and depreciation) fell from 12% of GNP in 1950 to 5.6% in 1986.

● Capital consumption allowances with capital consumption adjustment.

SOURCE: U.S. Department of Commerce, Bureau of Economic Analysis, “National Income and Product Accounts,” historical diskettes, tables 1.1, 1.9, and 1.14.

Trends in the Dispersion of Compensation

As the total fraction of GNP paid as wages and salaries is declining, it is not surprising that there has been concern about how available funds are allocated. This proves to be a vexing subject because existing data makes it difficult to determine whether inequality is growing or shrinking.³⁵

It is clear that inequality in the way both wages and capital earnings are allocated by family has increased (see figure 2-8 of ch. 2). Only the highest income families enjoyed real increases in labor income, with families in the the top 1 percent and top 5 percent enjoying particularly large growth. Growth in unearned income has been allocated more evenly,

³⁵ In addition to the discussion in ch. 2 (see especially footnote 33 of that chapter), see Lucy Stetson Gorham, *U.S. Industry Employment Trends from 1969 to 1995 and the Implications for Economic Inequality*, Massachusetts Institute of Technology, Department of Urban Studies and Planning, Cambridge, MA, 1984; Barry Bluestone and Bennett Harrison, “The Great American Job Machine,” Study Prepared for the Joint Economic Committee of the U.S. Congress, Dec. 9, 1986; Janet L. Norwood (Commissioner, U.S. Bureau of Labor Statistics), “The Job Machine Has Not Broken Down,” *The New York Times*, section 3, p. 3, Feb. 22, 1987; Richard M. Cyert and David C. Mowery, eds., *Technology and Employment: Innovation and Growth in the U.S. Economy* (Washington, DC: National Academy Press, 1987).

Table n-5.-Other Labor Income by Industry (as percent of compensation)

	1950	1960	1970	1980	1985
Agriculture, forestry, fishery	0.3	2.0	2.8	5.4	5.2
Mining	4.7	7.5	8.8	12.0	11.3
Construction	2.6	2.4	3.5	8.8	10.5
Manufacturing	3.0	6.2	7.9	12.3	12.7
Durable	2.7	6.3	8.5	12.8	13.0
Nondurable	3.4	6.1	7.1	11.6	12.3
Transportation	2.0	3.8	4.8	9.3	10.1
Communications	6.4	7.3	12.7	16.6	18.3
Electric & gas utilities	6.0	9.0	9.8	15.4	15.9
Wholesale trade	1.2	2.8	4.3	6.7	7.2
Retail trade.....	1.3	2.3	3.6	5.5	6.2
Flea	4.0	6.0	7.3	10.9	10.4
Other services	0.9	2.0	3.0	6.1	6.8
Government	0.1	0.2	1.1	3.2	4.5

^aFinance, insurance, and real estate.

NOTE: For definition of "other labor income," see figure 11-4.

SOURCE: U.S. Department of Commerce, Bureau of Economic Analysis, "National Income and Product Accounts," historical diskettes, Table 6.13.

with the top 40 percent of all families enjoying some growth in capital income.

Taking all sources of income together, it appears that the real income of most American families has declined in recent years and that the gap separating the wealthiest and poorest families has increased. The discussion of chapter 2 suggested, however, that many of these changes have resulted from demographic factors (e.g. smaller family sizes, growth of households headed by women) and from correlations between the earnings of husbands and wives. Adjusting for family size and numbers of earners, and using what may be a more appropriate adjustment for inflation, it appears that most family types enjoyed real growth in total income between 1970 and 1986. Families headed by elderly people did comparatively well (their incomes grew 50 percent between 1970 and 1986), while the incomes of both young families and families consisting of single mothers with children experienced no significant gains. Even making these adjustments, however, family incomes were less equally distributed in 1986 than in 1970.³⁶

The changes underway in the economy are likely to affect most of the factors that determine wages. It appears, for example, that discrimination on the basis of gender is shrinking while inequality growing out of differences in educational attainment is

growing. Income transfers have the effect of eliminating some of the differences between Americans who are employed and those who are retired or otherwise without income. New patterns of investment in emerging industries can alter the mix of returns paid to labor and capital. Capital investment is increasing in networks that once contributed value-added primarily through labor, such as health, education, and insurance processing.

Table 11-6 shows the compensation paid in the industries where jobs were being added most rapidly and most slowly between 1983 and 1986. On average, the jobs created paid better than the average job, but the patterns of relative change are difficult to explain. There is little correlation between wage growth by industry and productivity growth, and little correspondence between high wages and high rates of job growth.³⁷ Some of the industries that added the most full-time-equivalent jobs after the recession paid low wages while others paid well.

Wages and salaries paid to men have become more unequal over the last 20 years (see figure 11-7). There was a sharp rise in inequality during the recession of 1982 that was not reversed during the subsequent recovery; employers appear to have made major wage adjustments during the period. Wages paid to women, on the other hand, appear to have become more equal during the same period, although inequality has grown slightly since 1981.

³⁶U.S. Congress, Congressional Budget Office, "Trends in Family Income: 1970-1986," (Washington, DC: U.S. Government Printing Office, February, 1988).

³⁷A regression examining the connection between wages and job growth shows an R^2 below 0.1.

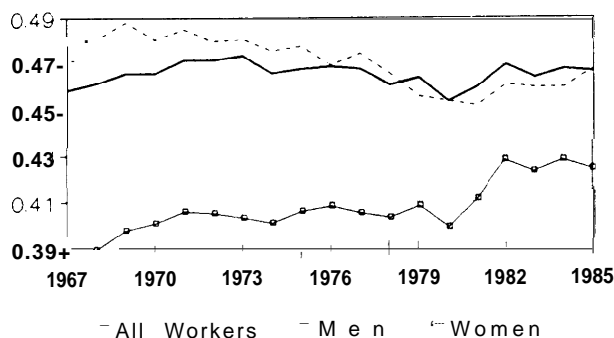
Table 11-6.—The 12 Industries with the Highest and Lowest Growth in Full-Time Equivalent Employees Between 1983 and 1986

	Compensation per full-time equivalent job (\$1986)	Percent above or below 1986 compensation average	Job Growth 1983-1986 (000s)
Highest growth industries:			
Retail trade	\$16,183	-38.5	2,094
Business services	\$23,105	-12.2	1,180
Construction	\$28,499	8.4	888
Health services	\$25,271	-3.9	524
Wholesale trade	\$30,129	14.6	460
Other services	\$26,885	2.2	301
Education	\$28,159	7.1	231
Miscellaneous professional services	\$33,175	26.1	222
Social services and membership organizations	\$15,679	-40.4	221
Hotels and other lodging places	\$16,603	-36.9	197
Credit agencies other than banks	\$26,360	0.2	187
Trucking and warehousing	\$27,577	4.9	171
Lowest growth industries:			
Oil and gas extraction	\$40,727	54.9	-142
Farms	\$11,344	-56.9	-110
Telephone and telegraph	\$43,968	67.2	-77
Primary metal industries	\$38,092	44.8	-75
Leather and leather products	\$17,694	-32.7	-52
Railroad transportation	\$48,379	83.9	-51
Apparel and other textile products	\$16,212	-38.4	-51
Textile mill products	\$20,565	-21.8	-34
Chemicals and allied products	\$40,074	52.4	-27
Petroleum and coal products	\$56,600	115.2	-26
Coal mining	\$45,029	71.2	-18
Metal mining	\$41,122	56.4	-15

NOTE: compensation includes employer contributions for social insurance, as well as "other labor income," pensions, group insurance, etc.

SOURCE: U.S. Department of Commerce, Bureau of Economic Analysis. "National Income and Product Accounts," Survey of Current Business, vol. 66, No. 7 July 1986, various tables

Figure n-7.—Measures of Inequality in Earnings (using the gini coefficient --see text for definition)



How To Read This Figure: The Gini coefficient measures inequality. A coefficient of 0 means complete equality (i.e., all workers would have precisely the same earnings), a coefficient of 1 means complete inequality (i.e., one worker would receive all earnings). The figure shows that for all workers, inequality in wage and salary earnings in 1970 was approximately the same as it was in 1985.

SOURCE: McKinley L. Blackburn and David E. Bloom, "The Effects of Technological Change on Earnings and Income Inequality in the United States," National Bureau of Economic Research, working paper No. 2337, Cambridge, MA, August 1987.

When both men and women are considered there appears to have been no significant change in inequality in wages.³⁸ This happens because the gap separating men and women is shrinking even while the distribution of wages among men is increasing.

The data used to make these statements have two major limitations. First, the data do not contain information about benefits paid by employers. The increase in part-time and temporary work has aggravated the difference between permanent full-time jobs paying benefits and temporary positions with few benefits. Benefits range from 18 percent of compensation in the highly unionized communication industries and 13 percent in durable goods manufacturing to 6 percent for service employees (again see table 11-5). Many women are not paid benefits.

³⁸ McKinley L. Blackburn and David E. Bloom, "The Effects of Technological Change on Earnings and Income Inequality in the United States," Working Paper No. 2337, National Bureau of Economic Research, Cambridge, MA, August 1987.

Second, the data are unable to examine the distribution of earnings above a certain threshold (or "top-code") established by the U.S. Bureau of the Census for each year. Since much income growth has apparently occurred in the highest income groups, this can be a major limitation. Changes in the "top-code" can further confuse the results.³⁹

A comparison of compensation paid to individuals working in different industries avoids both of these problems but creates another. It is unable to reflect changes in compensation occurring within individual business sectors. An examination of distribution indicates that there has been some increase in inequality when average compensation is ranked by industry. Figure 11-8 shows that the fraction of all compensation paid by industries with high and low rates of compensation is growing. The share of all compensation paid by industries that pay less than 75 percent of the national average doubled between 1956 and 1986. Looking at the other end of the spectrum, the figure shows that in 1956, only 1 percent of all compensation was paid by industries whose

average compensation was 40 percent or more above the national average; in 1986, however, 7.5 percent of compensation was paid by such industries.

The statistics cited above apply to industries and not to occupations. Chapter 10 demonstrated that there has been a significant change in the distribution of occupations within individual businesses. Between 1973 and 1982, more jobs appear to have been lost in occupations from the lowest wage group than from middle income groups (constant 1982 dollars); measured in current dollars, the middle group actually increased its share of the total.⁴⁰ The dangers of assuming that new jobs added in an occupation classification are the same as the average existing job have already been discussed.

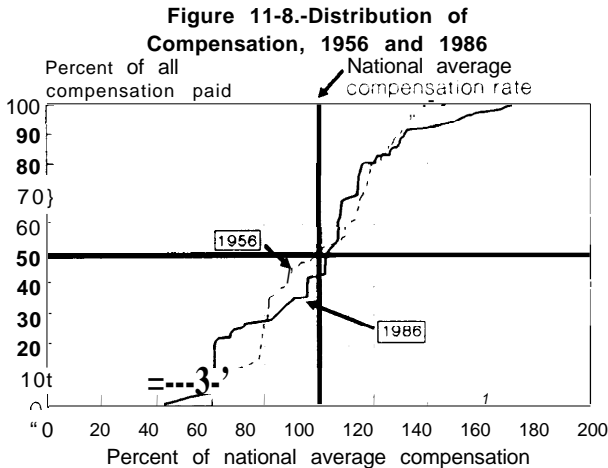
Accounting for Differences in Wages and Compensation

Some of the changing patterns of income just discussed result from changes in the education, sex, and race of the individuals entering the work force. These connections can be powerful but are difficult to trace.

The Effects of Education and Experience.—There has been considerable discussion about whether recent declines in rates of national productivity growth can be traced to changes in the quality of the U.S. work force. There are conflicting possibilities. On one hand, the entry of relatively large numbers of inexperienced workers—the baby boom generation and women without significant work experience—seems likely to have decreased overall levels of productivity. On the other hand, the new job entrants were better educated, at least as measured in terms of average numbers of years in school, than their predecessors.

The increasing levels of educational attainment shown in table 11-4 do not all result from the fact that younger workers are better educated than older ones. Figure 11-9 indicates that the major difference between young workers and older workers is a

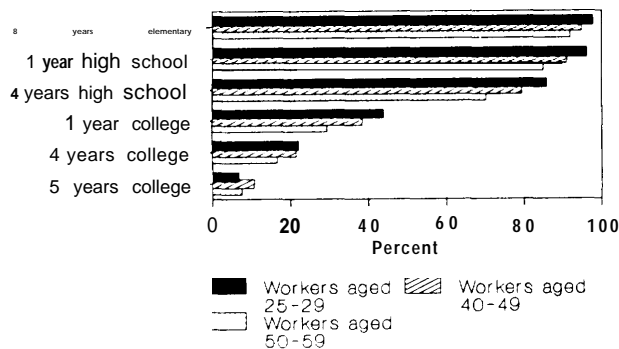
³⁹See U.S. Congressional Budget Office, "The Changing Distribution of Federal Taxes: 1975-1990," (Washington, DC: U.S. Government Printing Office, November 1987); and the discussion of this subject in ch. 2.



SOURCE: U.S. Department of Commerce, Bureau of Economic Analysis, "National Income and Product Accounts," historical diskettes, tables 6.4 and 6.7.

⁴⁰ Neal Rosenthal, "The Shrinking Middle Class: Myth or Reality?" *Monthly Labor Review*, vol. 108, No. 3, March 1985, p. 4. Later work by the Bureau of Labor Statistics shows that within each occupation, there was a downward shift in average earnings between 1973 and 1982; see Patrick J. McMahon and John H. Tschetter, "The Declining Middle Class: A Further Analysis," *Monthly Labor Review*, vol. 109, No. 9, September 1986, pp. 22-27.

Figure n-9.-Education Levels of Workers in 1985 (percent of workers with education above indicated levels)



How To Read This Figure: In 1985, 97.8% of workers aged 25-29 had at least eight years of education while 91.8% of workers aged 50-59 had at least eight years of education.

SOURCE U.S. Department of Education, Center for Education Statistics, *Digest of Education Statistics 1987* (Washington, DC: U.S. Government Printing Office, May 1987), table 9

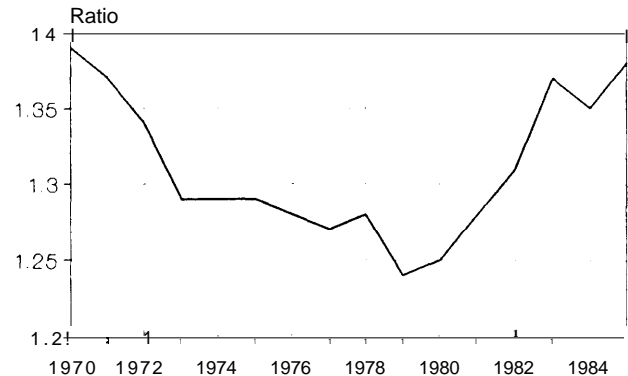
higher rate of completion of high school. Workers aged 40-49 are actually more likely to have advanced degrees than their younger colleagues, presumably because many returned to get degrees. Unfortunately, these statistics say nothing about the *quality* of the education produced; chapter 3 provided some evidence suggesting a decline in educational quality.

Returns to investments in education appeared to be falling during the early 1970s, in part because of the large number of baby boomers entering the work force. Many were better educated than the people they were replacing. The declining wages paid for education led in part to speculation that Americans were "over educated."⁴¹ Figure 11-10 makes it clear, however, that education has been paying increasing returns in the 1980s. An analysis of 1980 census data for white male workers seems to reveal a much stronger return to investments in education than to work experience after age 30.⁴²

⁴¹ R.B. Freeman, *The Over-Educated American* (New York, NY: Academic Press, 1976).

⁴² A regression on the wages of white men, using the following variables [statistically significant coefficients in brackets]: average years of education [0.63], percent not in labor force in 1975, average hours [0.008], percent under 20 [-2.38], percent aged 20-29 [-1.43], percent aged 30-39, percent aged 40-49, percent aged 50-64, percent over 65 [-4.96], percent in south [0.227]; R^2 0.851. See B.T. Thornton Dill, L.W. Cannon, and R. Vanneman, "Race and Gender in Occupational Segregation," in *Pay Equity: An Issue of Race, Ethnicity and Sex* (Washington, DC: National Committee on Pay Equity, February 1987).

Figure 11-10.-Does It Pay To Graduate From College? (ratio of income of college graduates to income of high school graduates)



How To Read This Figure: In 1979, the average worker with 4 years of college had earned income **24% higher than the average worker with only 4 years of high school** (an income ratio of 1.24). By 1985, college graduates earned an average of 38% more than high school graduates (a ratio of 1.38).

SOURCE: U.S. Department of Education, Center for Education Statistics, *The Condition of Education* (Washington, DC: U.S. Government Printing Office, 1988), table 2:3.

The value of education was particularly pronounced for younger workers entering an increasingly competitive labor market. The real mean hourly earnings (1985 dollars) for civilian males aged 20-24 fell 26 percent between 1973 and 1986, but the earnings of high school drop-outs fell 42 percent while earnings for college graduates fell only 6 percent.⁴³

Without attempting to adjust for the quality of education, which standardized test score trends indicate may be declining, some estimates indicate that the increased overall level of education in the work force added 0.47 percentage points to GNP growth rates between 1973 and 1982.⁴⁴

Retraining can, however, reinforce rather than lessen inequality. The Education section of chapter 6 suggested that an important function of modern education was to prepare people to continue to learn throughout their career. This seems to be the case. People with good educations and high incomes represent the majority of all those engaged in adult edu-

⁴³ The William T. Grant Foundation, op. cit., footnote 32.

⁴⁴ Martin Neil Bailey, "What Has Happened to Productivity Growth?" *Science*, vol. 234, No. 4774, Oct. 24, 1986, p. 445.

cation and training.⁴⁵ One-third of all people with more than 5 years of college participated in adult education in 1984, as opposed to only 2 percent of people with less than nine years of schooling. And while only 28 percent of all families in the United States had incomes over \$35,000 in 1984, over 37 percent of people enrolled in adult education came from these families.⁴⁶

The Effects of Race and Sex.—The rapid increase of women in the work force, and the continued, though diminishing, disparity between male and female wages, has contributed to the growing inequality in wages, as more women have entered the labor force during this period. Table 11-7, for example, indicates that while male and female wages have become somewhat more equal since 1973—the worst year for women—the ratio between female and male earnings is still far from even.⁴⁷

Salaries of younger women more closely approach those of men (again see table 11-7). In 1979, women 20 to 24 years old earned 77 percent of the weekly earnings of their male counterparts—a fraction that grew to nearly 86 percent by 1985. The ratio for women 25 to 34 years of age increased from 0.68

⁴⁵ See U.S. Congress, Office of Technology Assessment, *Technology and Structural Unemployment: Reemploying Displaced Adults*, OTA-ITE-250 (Washington, DC: U.S. Government Printing Office, February 1986), p. 275.

⁴⁶ U.S. Department of Education, Center for Education Statistics, *The Condition of Education* (Washington, DC: U.S. Government Printing Office, 1986), based on "Current Population Survey," Washington DC, May 1984.

⁴⁷ The ratio between male and female wages seems to have considerable durability, as evidenced by this passage from Leviticus 27.1-4:

The Lord spoke to Moses and said, "When a man makes a special vow to the Lord which requires your valuation of living persons, a male between twenty and sixty years old shall be valued at fifty silver shekels. If it is a female, she shall be valued at thirty shekels."

Table 11-7.-Changes in Ratio of Female to Male Wages

	Female/male wage ratio:*				
	1970	1973	1980	1985	1986
1960	0.59	0.57	0.60	0.64	0.70
	Recent years, by age cohort:**				
	20-24	25-34	35-44	45-54	
1979	76.7	67.5	58.2	57.0	
1985	85.7	75.1	63.2	59.6	

SOURCES: *David E. Bloom, "Women and Work," *American Demographics*, September 1986, p. 25. 1986 data provided by the Bureau of the Census, U.S. Department of Commerce, September 1987.

**Council of Economic Advisors, *Economic Report of the President*, 1987, p. 221.

to **0.75** during the same period. However, women between 45 and 54 years of age earned less than 60 percent as much as males in 1985—a fraction that did not change significantly after 1979.⁴⁸

Between 35 and 40 percent of the pay gap separating men and women results from the occupations women choose or have forced upon them. Some of the remaining gap in pay results from the fact that women have not invested as heavily in their own education as men, or have elected to choose college majors that lead to low paying occupations. Half of the earnings difference separating male and female college graduates may be explained by choice of major.⁴⁹ This, of course, leads to a question of causality. Are women underinvesting in themselves or choosing low paying majors because they do not feel that they can obtain well paying jobs, or are their choices based on other factors (interests in nursing rather than engineering) that lead to lower wages?⁵¹

Most professional women are teachers, but there are growing numbers in other fields (see table 11-8). Occupational segregation has declined primarily because women have entered male professions, and not the reverse. Women have done most poorly in business management; only 36 percent of administrators are women, and only 5 to 10 percent of top executives. Only one Fortune 500 company is headed by a woman—Katharine Graham of *The Washington Post*.

Table 11-9 indicates the extent to which women and minority wages are lower than white male wages because of differences in education and work experience. Much of the disparity between male and female wages, and between the wages of whites and blacks, results from segregation by occupation, rather than inequality in pay for identical work.⁵² Half of all women, for example, work in occupations where two-thirds of all workers are female.⁵³

⁴⁸Council of Economic Advisors, *Economic Report of the President*, January 1987, Washington, DC, p. 221.

⁴⁹D.J. Treiman and H.I. Hartmann, cd., *Women, Work, and Wages: Equal Pay for Jobs of Equal Value* (Washington, DC: National Academy Press, 1981).

⁵⁰Ibid.

⁵¹Kenneth Arrow, "Economic Dimensions of Occupational Segregation: Comment I," in *Signs: Journal of Women in Culture and Society* 1, pt. 2 (Spring, 1976), pp. 233-237.

⁵²W.T. Bielby and J.N. Baron, "Men and Women at Work: Sex, Segregation and Statistical Discrimination," *American Journal of Sociology*, vol. 91, pp. 759-799.

⁵³B.T. Thornton Dill et al., op. cit., footnote 42.

Table 11-8.—Percent Female in Selected Occupations

	1970	1986
Architects	4	8
Bus drivers	28	50
College & university teachers	29	37
Computer scientists	14	28
Doctors	10	18
Lawyers	5	20
Technicians	34	47
1st year medical students	9 ^a	34

^aRepresents 1969 ratio.

SOURCES: David E Bloom, "Women and Work," *American Demographics*, vol. 8, No. 9, September 1988, p. 25. Council of Economic Advisors, *Economic Report of the President*, 1987, p. 219.

The disadvantages faced by blacks in the American workplace have been painfully difficult to change. Black unemployment is at least twice that of whites in all age groups except women over 55, while black male teenagers with work experience dropped from 67 to 47 percent between the mid-1960s and the mid-1970s; current unemployment among black teenagers is close to 50 percent. Differences in levels of educational attainment are creating growing inequality among blacks. The earnings of young black male high school drop-outs fell 61 percent between 1973 and 1986 while the earnings of black college graduates increased 6.5 percent.⁵⁴

The heavy hand of history continues to limit black mobility. Blacks are comparatively immobile because of their concentration in inner cities, while many attractive jobs are opening in suburban and exurban areas poorly served by public transportation (see

⁵⁴ The William T. Grant Foundation, op. cit., footnote 32.

the last section of ch. 5). Poor neighborhoods and other factors contribute to comparatively weak educational experiences. A history of unemployment and underemployment further limits opportunity; a large fraction of young blacks has already been scarred by chronic unemployment. Many reach their prime working age without any successful work experience.⁵⁵

One of the greatest barriers facing minorities is the way they have been served by the educational system. While there are not major racial differences in "median years of school completed," there appears to be a significant disparity in the quality of the education obtained (see figure 11-11).

Flexibility and Job Security

Americans have always been willing to tolerate frequent job changes. Unlike workers in most other developed countries, Americans frequently change jobs and even move to different parts of the country to find them. This mobility has been a source of strength for the U.S. economy, allowing it to shift with comparative ease into new production systems.⁵⁶

But an economy that achieves flexibility largely through the use of "disposable" workers, who accumulate little experience and have little loyalty to

⁵⁵J. Norwood, "The Future of Employment," op. cit., footnote 2.

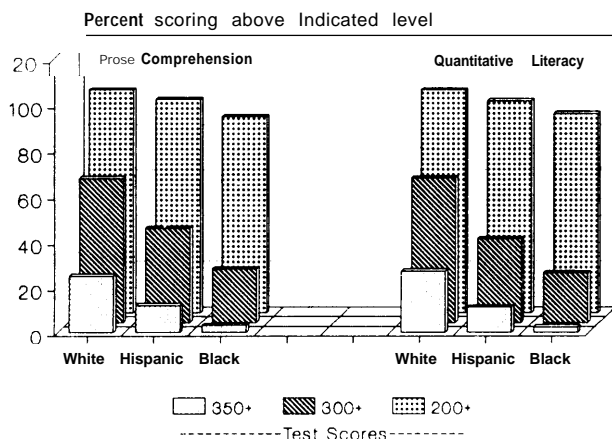
⁵⁶*Technology and Structural Unemployment*, op. cit., footnote 45, p. 144.

Table 11.9.—The Effects of Education, Experience, Sex, and Age on Income

	Male occupations (<34.1% F)	Female occupations (>34.1% F)	Effect on expected female earnings
Average education	13.2	13.5	+ 1.9 percent
Average hours	44.2	43.0	– 1.0 percent
Percent under 30	27.5	30.8	–5.3 percent
Percent new workers	10.0	12.7	– 1.1 percent
	White occupations (<34.1% Min.)	Minority occupations (>34.1% Min.)	Effect on expected minority earnings
Average education	14.2	12.1	– 11.7 percent
Average hours	44.4	42.9	– 1.3 percent
Percent under 30	24.4	34.5	– 15.0 percent
Percent new workers	9.2	13.3	– 1.6 percent

How To Read This Table: Individuals in occupations that were predominantly male had an average education of 13.2 years, while individuals in predominantly female occupations had an average of 13.5 years of education. This factor would cause the female occupations to pay 1.9 percent more than the male occupations.

SOURCE: B.T. Thornton Dill, L W Cannon, and R. Vanneman, "Race and Gender in Occupational Segregation," *Pay Equity: An Issue of Race, Ethnicity Sex*, National Committee on Pay Equity, February 1987. Work based on 5 percent sample of 1980 census data from U.S. Department of Commerce, Bureau of the Census.

Figure 11-11.-Literacy Skills by Race

How To Read This Figure: Americans aged 21 to 25 were given a series of tests in 1985 to determine literacy levels (some of the results of this test are also reported in table 3-27 of ch. 3). In the prose comprehension portion of the test, 25% of the whites but only 3.1% of the blacks who took the test received scores of 350 or more; 98% of whites and 86% of blacks received a score higher than 200.

SOURCE: U.S. Department of Education, Center for Education Statistics, *Digest of Education Statistics 1987* (Washington, DC: U.S. Government Printing Office, May 1987), table 11.

an individual employer, pays a considerable price. Some of the cost appears in productivity lost because of continual personnel changes. There are high social costs as well. Often the people most heavily affected are those with the fewest resources.

While employers are demanding and receiving greater flexibility from their workers, there has also been increased demand in the work force for non-standard work hours. Mothers of small children, students, the elderly, and others wanting to combine paid jobs with outside activities seek options other than full-time employment from 9:00 AM to 5:00 PM. Many would prefer to adjust their working hours as needs change from week to week.

It appears that the new production and service networks being built around many different markets can provide greater options for both employees and employers. Technology can help by lowering the transaction costs associated with monitoring uneven work schedules, by improving the tools used to train and retrain people needing to move to new jobs, and even by creating options to work at home.

In the past, it was common to attribute a lack of flexibility to union work rules or other contractual

rigidities. While these complaints are still heard, they have greatly diminished. Many contracts now contain provisions to help employees adjust to new technologies, and unions have generally recognized the need for productivity growth and technical change in an increasingly competitive world.⁵⁷

The Employer's Perspective

Firms have reacted to demands for greater flexibility and adaptability in a variety of ways. Flexibility is inherent in sectors where small businesses are continually formed and disbanded. Small businesses are often bound by few inhibitions in hiring and firing. Many larger firms have tried to achieve flexibility by minimizing commitments to employees and by hiring large numbers of "contingent" workers (see below).

There are also many cases where firms have made a conscious effort to gain flexibility by investing in their employees. Chapter 3 documented the enormous investment being made in education and training at the corporate level. Other firms have found ways to use profit sharing to spread the pain of economic hard times among many workers, rather than letting a few bear the burden when they are laid off. Some have allowed greater choice in work schedules—permitting employees to adjust their work to home needs.

There is no clear indication of which strategy is prevailing, or which is most likely to succeed under the rules now governing the U.S. economy.

Traditional Strategies for Flexibility. -U.S. businesses have always achieved flexibility through plant closings and layoffs, coupled with new hiring in areas where growth is occurring. There is no sign that this strategy is changing. Between January 1981 and January 1986, 10.8 million jobs were lost due to plant closings, abolition of positions, or slack work.⁵⁸

New techniques for achieving flexibility are now coming into wider use. Businesses unwilling to undertake the cost of hiring permanent workers during periods of long-range uncertainty have turned increasingly to part-time and temporary workers.

⁵⁷See Cyert and Mowery, *op. cit.*, footnote 35, for a review of this subject.

⁵⁸Francis W. Horvath, "The Pulse of Economic Change: Displaced Workers of 1981-1985," *Monthly Labor Review*, vol. 110, No. 6, June 1987, pp. 3-12.

Over the past decade, there has been significant growth in the number of contingent workers—individuals employed temporarily, subcontracted from an intermediary firm, part-time workers, and self-employed individuals. Taken as a whole, this group increased 25 percent between 1975 and 1985 (compared to total employment growth of 22 percent). There are now 30 million employees in these categories—27 percent of the labor force.⁵⁹ The growth of a contingent work force may also mean that a significant number of people will find themselves without work during recessionary periods, as firms seek to streamline costs by cutting back on employment of subcontractors or temporaries. This could be particularly true among service sector businesses, many of which are now considered to be relatively insulated from the impact of recessions.

The comparative decline of employment in manufacturing has also reduced the proportion of traditional, 40-hour per week “full time” jobs. Not only do most service businesses have lower average numbers of working hours, the hours per job in these businesses have been declining (see figure 11-12). Hours fell sharply in the fast-growing retail businesses. Time devoted to finance, insurance, and real estate activities declined until the early 1980s, but the trend was reversed when this sector rebounded from the 1982 recession.

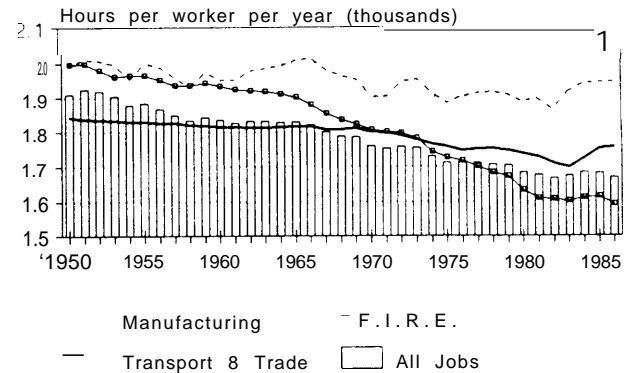
It is obvious that a lack of commitment to employees can carry a high price. Constant turnover can prevent the development of effective working teams that seem critical to productivity.⁶⁰ Most new production systems and delivery networks involve a considerable amount of informal, on-the-job learning. The costs of this learning are high, but are seldom recorded (see notes to table 3-26 of ch. 3). Attempts to avoid training can prove costly. A survey of firms attempting to introduce new automation during the past few years found that the training needs associated with new equipment were “vastly underestimated” in most of the cases examined.⁶¹

⁵⁹S. Christopherson, “Peak Time, Slack Time: The Origins of Contingent Labor Demand,” Working Paper Series 117, Institute of Industrial Relations, University of California at Los Angeles, October 1986.

⁶⁰See John E. Ettlie, “Facing the Factory of the Future,” paper prepared for the National Science Foundation by the Center for Social and Economic Issues, Industrial Technology Institute, Ann Arbor, MI, August 1984.

⁶¹B. Johnson and R.E. Rice, *op cit.*, footnote 16.

Figure 11-12.-The Decline in Hours per Job in Different Businesses



How To Read This Figure: In 1950, the average worker in finance, insurance and real estate (F. I. R. E.) businesses worked approximately 1,840 hours per year. By 1986, employees in F.I.R.E. averaged 1,755 hours per year.

SOURCE: U.S. Department of Commerce, Bureau of Economic Analysis, “National Income and Product Accounts,” historical diskettes, tables 6.6 and 6.11.

Firms unable to command loyalty are vulnerable to raids on valuable workers. The problem is particularly acute in the rapidly growing “high technology” sectors of the U.S. economy, where many firms make a business of luring crucial employees from each other. Intel was co-founded by Robert Noyce, Andrew Grove, and Gordon Moore, who helped invent the integrated circuit before leaving Fairchild. Zilog was founded by seven Intel executives; LSI Logic was founded by former Fairchild executives; and MOS is the brainchild of ex-Motorola Employees. Lester Hogan abandoned General Electric with 18 engineers to work at Motorola, and then left Motorola for Fairchild. It is not uncommon for semiconductor executives, engineers, and programmers to have worked for half a dozen firms;⁶² similarly, turnover rates in the U.S. electronics industry are 20 to 30 percent per year.⁶³ Of course, these moves may be as much the result of opportunities in the recipient enterprises as of some substandard commitment to employees among firms losing key workers.

⁶²Charles H. Ferguson, “U.S. Microelectronics in Decline: Evidence, Analysis, and Alternatives,” Massachusetts Institute of Technology, VLSI Memo No. 85-284, Cambridge, MA, December 1985.

⁶³U.S. Electronics Association, 1980, cited in *Ibid.*

Alternative Strategies for Flexibility.—

Profit Sharing.—There is compelling theoretical evidence to suggest that firms may be collectively better off if they find a way to share the risks more equitably among their employees by adjusting compensation for all workers instead of placing most of the cost on the few who must be let go.⁶⁴

A variety of mechanisms are possible, but all involve making some portion of employee compensation vary with a firm's profitability. In addition to being a mechanism for keeping employment comparatively steady, profit sharing can be used as a management tool to provide employee incentives. A number of firms have reported successful experiments in profit sharing as a tool in motivating employees. An observer looking at a program in the Philips Company, where bonuses average 40 percent of an employee's pay, reports that motivation is so strong that "if a husband dies, the wake is at night so that no one misses work."⁶⁵ Firms that elect to manage their operations by giving individual managers considerable independence, such as managers of most franchised service stations, expect the managers to bear the risks and rewards of fluctuating profits.

Perhaps the Nation's premier example of profit sharing is Lincoln Electric, the world's largest manufacturer of arc-welding products. The company pays 6 percent of net income in common stock dividends. Of the rest, bonuses range from 20 to 120 percent on top of base salaries that are already competitive. Although national statistics are difficult to read, it appears that while few firms have gone as far as Lincoln, there has been significant growth in schemes to share profits and risks. A recent survey of a variety of data sources revealed the following:⁶⁶

- half a million companies have some form of profit sharing;
- at least 6 major airlines and 15 companies have employee ownership plans taken in response to deregulation and cost pressures that followed;
- overall, 11 million employees in 8,000 busi-

nesses now own at least 15 percent of the companies employing them;

- in 1983, 19 percent of all production employees, 27 percent of all technical and clerical employees, and 23 percent of all professional and administrative employees were covered by profit sharing agreements;
- the National Bureau of Economic Research found that "one-shot" bonus payments, replacing general pay increases, were called for in almost 20 percent of all 1985 union contracts, up from 6 percent in 1984;
- 20 percent of 564 companies surveyed by Hewitt Associates in 1986 gave one-time bonuses to white collar workers, up from 7 percent in 1985; and
- it is estimated that Ford will pay an average of \$3,000 per worker in profit sharing bonuses because of the company's strong 1987 performance.⁶⁷

In spite of the fact that the classic "Scanlon Plan" calls for 75 percent of profit sharing to go to employees, most profit-sharing schemes actually in place appear to apply primarily to professionals and managers. Top executives get most of the benefit. A study of 491 companies conducted by the Conference Board, a business research organization, showed that while 58 percent had top executive bonus plans, only 11 percent had profit sharing plans, 8 percent had all-employee bonuses, and 3 percent had group cost-control incentives. One leading bank pays bonuses of 30 percent for excellent branch managers but only 6 to 8 percent in bonuses to employees.⁶⁸

Training and Retraining. ⁶⁹—Another way to ensure that flexibility can be achieved without layoffs is to develop planning strategies that encourage workers to adapt themselves to new jobs created as production systems change.⁷⁰ Since firms have difficulty guaranteeing that investments in worker training will rebound to their advantage, rather than to that of an employee who can take his or her knowledge elsewhere, there is an understandable reluctance for firms to invest heavily in training.

⁶⁴M. L. Weitzman, *The Share Economy* (Cambridge, MA: Harvard University Press, 1984).

⁶⁵Theodore Cohn, reported in R.M. Kanter, "The Attack on pay," *Harvard Business Review*, vol. 64, No. 2, March-April 1987.

⁶⁶R.W. Kanter, op. cit., footnote 65.

⁶⁷John Holusha, "Ford Had Record Net of \$4.6 Billion for 1987," *The New York Times*, Jan. 28, 1988, pp. D1, D4.

⁶⁸R.W. Kanter, op. cit., footnote 65.

⁶⁹For a comprehensive examination of this subject, see Technology and Structural Unemployment, op. cit., footnote 45.

⁷⁰R.W. Cyert and D.C. Mowery, ed., op. cit., footnote 35.

Private corporations are often forced to remedy defects in training provided by the elementary and secondary school system. For example, 18 percent of firms responding to a 1985 *Training Magazine* survey of firms with 50 or more employees said that they offered a remedial education program of some sort.⁷¹ Nearly one-quarter of the firms surveyed in 1977 by the Conference Board reported that "some or much" of what they taught their employees in corporate training programs was "really the responsibility of the schools."⁷² Similarly, 11 percent of firms surveyed in 1975 provided remedial education,⁷³ either in-house or in the form of tuition reimbursement, for basic education after hours. The Department of Defense is also forced to make heavy investments in remedial training.⁷⁴ In the view of one expert:

It appears that one could cynically describe the U.S. educational philosophy as one of indifference for 18 years followed by insistence on intensive, enormously expensive retraining efforts. There seems to be insufficient time and money to do it right, but plenty of time and money to do it over again.⁷⁵

As the previous discussion suggests, it appears that most training serves to help people with good educations stay ahead. The opportunities and problems involved are discussed in greater length in the Education section of chapter 6.

Industry pays for most retraining in the United States. The social gains from investments in training, however, can exceed the private returns realized by individual firms, and private sector retraining programs are often beyond the means of the individuals most in need of such assistance—suggesting the need for public policy that can encourage greater investment in training.⁷⁶

⁷¹ Dale Feuer, "Where the Dollars Go?" Training: *The Magazine of Human Resources Development*, October 1985, p. 48.

⁷² Seymour Lusterman, *Education in Industry* (New York: The Conference Board, 1977).

⁷³ *Ibid.*

⁷⁴ See U.S. General Accounting Office, Report to the Secretary of the Army, "Poor Design and Management Hamper Army's Basic Skills Education Program," GAO/FPCD-83-19, Washington, DC, June 20, 1983; and Thomas G. Sticht, *Basic Skills in Defense*, Office of the Assistant Secretary of Defense, Manpower, Reserve Affairs and Logistics, March 1982.

⁷⁵ See U.S. Congress, office of Technology Assessment, "Education," sector study, Washington, DC, 1987.

⁷⁶ For a recent review, R.M. Cyert and D.C. Mowery, ed., op. cit., footnote 35.

Flexibility and Business Size.—There is no clear relationship between the structure of a business sector, measured in terms of the size and scope of firms, and the strategies adopted for flexibility in that sector. Analysis is restricted to anecdotes, which demonstrate that both small and large firms can provide flexibility at a comparatively low human cost.

A business network can achieve flexibility by letting small businesses and self-employed individuals absorb most of the pain of adjustment. This is the primary source of flexibility for sectors dominated by small businesses, such as construction. During economic downturns, many small construction firms either go bankrupt or are effectively closed while their owners undertake maintenance or renovation jobs.⁷⁷

There are examples of areas where networks of small enterprises have been able to operate effectively in highly volatile situations while providing attractive work environments.⁷⁸ Small firms, however, are typically much more willing to achieve flexibility through rapid layoffs and new hires. They are far less likely to be covered by union contracts. In 1983, 18.8 percent of all U.S. employees worked under union contracts. Of this total, 4.7 percent of firms with fewer than 25 employees had such contracts, as opposed to 30 percent of all firms with more than 500 employees.⁷⁹

Smaller firms are also less likely to help their workers adjust to new job demands, or to find new work when they are laid off. One survey found that firms with 10,000 or more employees spend on average \$86 per worker for training, while firms with 500 to 1,000 employees spend \$27 per worker.⁸⁰

There is no ambiguity about the relative poverty of benefit packages offered to small business. While 67 percent of all U.S. employees are covered by an

⁷⁷ See U.S. Congress, office of Technology Assessment, *Technology and the Future of the U.S. Construction Industry* (Washington, DC: The AIA Press, 1986).

⁷⁸ This is a strategy that Charles Sable argues has worked effectively in Northern Italy and in parts of Western Europe. See Michael Piore and Charles Sable, *The Second Industrial Divide* (New York: Basic Books, 1984).

⁷⁹ U.S. Small Business Administration, *The State of Small Business* (Washington, DC: U.S. Government Printing Office, 1985), p. 253.

⁸⁰ Seymour Lusterman, op. cit., footnote 72; see also S. Lusterman *Trend; in Corporate Education and Training* (New York, NY: The Conference Board, 1985).

employer's health plan, for example, 85 percent of the workers in firms with more than 500 employees are covered, as compared to only 39 percent of workers in firms with fewer than 25 employees. Similarly, 56.4 percent of all workers are covered by an employer or union pension fund. Only 18.7 percent of employees in small firms are covered in such a manner, while 86 percent of employees in firms with more than 500 workers are covered.⁸¹

Small firms may also be more flexible in hiring scarce talent when a new business opportunity emerges. They have often been able to raid skilled employees from other businesses.⁸² Entrepreneurs have also been able to take advantage of the training employees have received in larger firms, though small, entrepreneurial firms are often bought by larger ones.

Willingness to hire and fire workers on short notice, and to pay high premiums for crucial tasks, can combine to create a large gap between the wages of skilled and unskilled workers in small firms. The gap separating the wages of a physician and a nurse in a private practice is typically far larger than in a corporate health maintenance organization.⁸³

Sectors operating with a few large and dominant firms can achieve flexibility if the larger firms successfully pass the burden of adjustment to smaller "satellite" suppliers. This strategy is widely practiced in Japan, and applies to some satellite systems operating in the United States—firms such as Eli Lilly, Hewlett-Packard, and Digital have no layoff policies similar to those offered in Japan. IBM faces business downturns by curtailing contracts with supplier firms, performing this work within IBM itself.

The Employee's Perspective

Employees as well as employers can desire flexibility. The key question is whether variations in work schedules are under the control of the worker or the employer. There should be reasonable ways to search for compromise.

⁸¹U.S. Small Business Administration, op. cit., footnote 79, PP. 259 and 274.

⁸²Presentation of Gordon Moore, Chairman & CEO of the Intel Corp., Symposium on Economics and Technology, National Academy of Engineering, Palo Alto, CA, Mar. 17-19, 1985.

⁸³U.S. Congress, Office of Technology Assessment, "Health," sector study, Washington, DC, 1987.

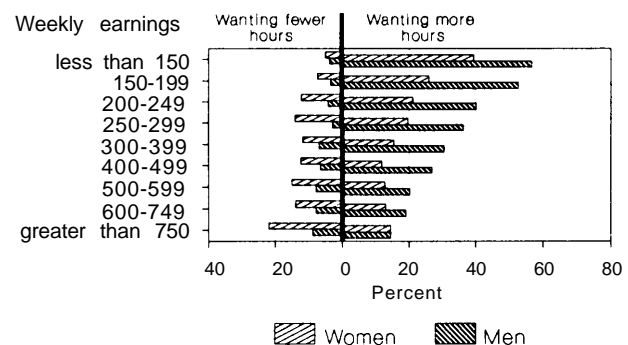
It is difficult to estimate the underlying demand for flexibility in work schedules, if only because relatively few people have the luxury of considering such choices. There is reason to believe that a real unmet need exists among employees for greater flexibility. Parents with young children, for example, would clearly benefit from adjustable work schedules, particularly given the shortage of adequate child care facilities; a survey of women with children under five found that one-quarter were forced to curtail their working hours due to the unavailability of day care.⁸⁴ Inability to change schedules among parents has also led to such social developments as "latch key children." Many elderly people, forced to choose between the shock of complete retirement and continued full-time employment, would opt for greater flexibility if it were available. The extent to which a person is interested in more or less work is heavily dependent on income (see figure 11-13). As income rises, people are more likely to choose unpaid time than pay. Women appear to trade free time and income in a different way, but both sexes follow a roughly similar pattern.⁸⁵

Figure 1-21 of chapter 1 makes it plain that the burden of adjustment to the emerging economy has been most painful for those with poor educations.

⁸⁴E. Applebaum, op. cit., footnote 26.

⁸⁵Susan E. Shank, "Preferred Hours of Work and Corresponding Earnings," *Monthly Labor Review*, vol. 109, No. 11, November 1986, p. 43.

Figure 11-13.-Desire for More or Fewer Hours of Work (percent of workers aged 25-54)



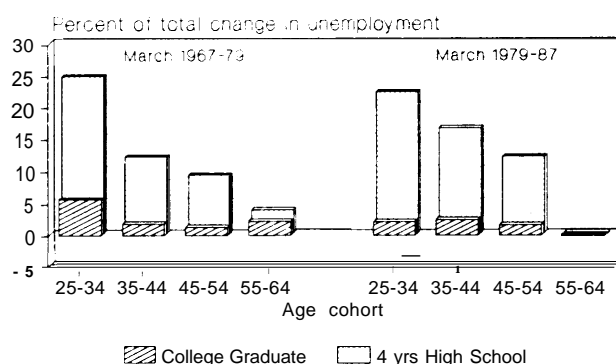
How To Read This Figure: In 1985, about 21 % of all women earning \$200-250 a week wanted to work more hours, while slightly more than 12% wanted fewer hours of work.

SOURCE: Susan E Shank, "Preferred Hours of Work and Corresponding Earnings," *Monthly Labor Review*, November 1986, p 43.

People with post-graduate degrees were scarcely affected by the recessions of the early 1980s, while one high school drop-out in four was unemployed at the peak of the downturn. The figure presented in chapter 1 also forces some reflection about “natural” or “frictional” unemployment; post-graduates seem perfectly capable of keeping “frictional” unemployment below 3 percent.

Figure 11-14 shows that overall growth in unemployment can be traced largely to growing unemployment of young, poorly educated workers. Unemployment grew even for young college graduates between 1967 and 1979 as the baby boom entered the job market. Older workers also suffered growing unemployment during this period. During the 1979-87 period, however, growth in unemployment

Figure 11-14. Contribution of Growth in Unemployment Rates by Age and Education to Increase in Total U.S. Unemployment



How To Read This Figure: Unemployment was 3.0%/0 in March 1967, 4.2%/0 in March 1979, and 5.7%/0 in March 1987. This figure shows the extent to which this increase can be explained by growth in the unemployment rates of workers with different levels of education (removing the growth in unemployment due to demographic effects—e.g., the entry of large numbers of young workers who tend to have higher rates of unemployment than middle aged workers).

The figure shows that nearly 25%/0 of the growth in the U.S. unemployment rate between March 1967 and March 1979 resulted from an increase in the unemployment rate of workers aged 25-34 who had only four years of high school; 5%/0 of the increase could be explained by growth in the unemployment rates of college graduates aged 25-34. Similarly, 22%/0 of the growth in the U.S. unemployment rate between March 1979 and March 1987 was attributable to a further increase in the unemployment rates of workers with high school educations aged 25-34.

SOURCE Wayne J. Howe, “Education and Demographics: How Do They Affect Unemployment Rates?” *Monthly Labor Review*, vol. 111, No. 1, January 1988, pp. 3-9

among college graduates was not responsible for any significant part of overall growth the national unemployment rate. But much of the overall increase could still be traced to rising unemployment among high school graduates—particularly younger ones.

While the average number of hours worked per week has not declined significantly for two generations, there has been an extraordinary amount of movement in work schedules. Figure 11-15 summarizes changes in working hours that occurred between 1979 and 1985. The 40-hour week is becoming less common, while there is considerable growth in both shorter and longer work weeks.⁸⁶

Surprisingly few adults hold stable, full-time jobs and receive pay for 40 hours a week, 50 weeks a year. This translates into significant variation in yearly incomes. The average year-to-year change in work hours during the 1970s was nearly 320 hours (see table 11-10); while change among white men matched this average, change ranged from 280 hours for white women to 350 hours for blacks. More than 20 percent of white men reported average changes of more than 500 hours per year over the 10 year period, and nearly 75 percent experienced at least 1 year of change of at least that magnitude.⁸⁷

With the exception of the 17 percent of the U.S. labor force working under union contracts, those working in firms having a long tradition of no lay-offs, and those working for the Federal government, which until recent budget cutbacks has tended to discourage firing except in rare circumstances, few Americans have much control over their job tenure. Nearly two-thirds of all U.S. workers aged 25 and older have worked for their current employers less than 9 years, while less than 1 of every 8 people (and only 1 in 15 women) have been with the same firm for 20 or more years (see table 11-11).⁸⁸

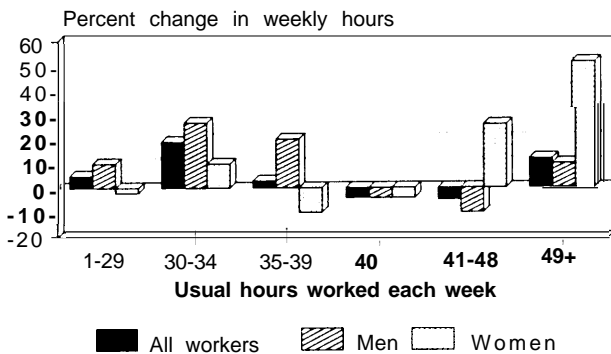
While strong circumstantial evidence suggests that these variations are involuntary, some variation in working hours is voluntary. Parents may elect to

⁸⁶Shirley J. Smith, “Growing Diversity of Work Schedules,” *Monthly Labor Review*, vol. 109, No. 11, November 1986, p. 8.

⁸⁷Greg J. Duncan, *Years of Poverty, Years of Plenty*, Survey Research Center, Institute for Social Research, University of Michigan, Ann Arbor, MI, 1984, p. 10.

⁸⁸Paul O. Flaim, “Work Schedules of Americans, An Overview of New Findings,” *Monthly Labor Review*, vol. 109, No. 11, November 1986, p. 5.

Figure 11-15.—Change in Average Weekly Hours Worked (May 1979–May 1985)



How To Read This Figure: The number of men and women working 40 hours per week declined about 4% between May 1979 and May 1985. The number of women working more than 49 hours per week increased nearly 50% during this period.

SOURCE: Shirley J. Smith, "Growing Diversity of Work Schedules," *Monthly Labor Review*, vol. 110, No. 11, November 1986, p. 10.

work fewer hours when their children are young. University professors take sabbatical leave once every 7 years.

Table 11-10.—Year-to-Year Changes in Annual Work Hours (1969-1978)

Average yearly change in work hours	319 hours
Percent of sample with average yearly change in annual work hours	
Less than 100 hours	19 percent
100 to 250 hours	27 percent
250 to 500 hours	34 percent
More than 500 hours	20 percent
Percentage for whom work hours changed by 500 hours or more	
In at least one year.	68 percent
More than half the time.	11 percent

NOTE: Data applies to "household heads and wives," and includes unmarried men and women who headed households and wives of men who headed households.

SOURCE: Greg J. Duncan, *Years of Poverty, Years of Plenty*, Survey Research Center, Institute for Social Research, University of Michigan, Ann Arbor, MI, 1984.

Table 11.11.—Continuous Employment with Current Employer (men and women age 25 and older)

	Years of continuous employment				
	Total	1 or less	2-9	10-19	20 or more
Men	100.0	18.0	42.2	23.2	16.7
Women	100.0	23.4	50.8	19.1	6.7
Total	100.0	20.3	45.9	21.4	12.3

SOURCE: Paul O. Flaim, "Work Schedules of Americans: An Overview of New Findings," *Monthly Labor Review*, vol. 109, No. 1, November 1986, p. 4.

Under current practices, workers often receive little notice of impending layoffs, which increases their sense of powerlessness. Blue-collar workers receive an average of 7 days notice of plant closing, and white-collar workers an average 15 days; unionized blue-collar workers receive an average of 2 weeks, while blue-collar workers in non-union establishments receive an average of only 2 days.⁸⁹ With such short notice, it is not unusual for workers to face extended periods of unemployment—which vary among different industries—before securing another job, during which time they may lose all unemployment and health benefits that were associated with their previous job. As a recent OTA study concluded, "Notice periods this brief do not allow time to prepare an effective program of adjustment assistance for the displaced workers."⁹⁰

On the whole, little of the growing variation in work schedules appears to be voluntary. For example, the percentage of women working involuntarily part-time increased 300 percent between 1967 and 1984.⁹¹ In October 1986, 23 percent of men and 17 percent of women working part-time reported that they would prefer full-time work—percentages that have grown sharply during the past 10 years.⁹²

Accepting part-time work can mean real economic hardship. Part-time workers earn an average of \$4.50 per hour compared to \$7.80 per hour for full-time workers, while receiving far fewer benefits. Moreover, more than 19 percent of women working involuntarily part-time lived in households below the poverty level in 1983, up from 13.4 percent in 1979.⁹³

The factors that have led to part-time work also create a situation where many people put in ex-

⁸⁹U.S. Congress, Office of Technology Assessment, *Plant Closing: Advance Notice and Rapid Response—Special Report*, OTA-ITE-321(Washington, DC: U.S. Government Printing Office, September 1986); U.S. General Accounting Office, "Plant Closings: Information on Advance Notice and Assistance to Dislocated Workers," Washington, DC, 1987.

⁹⁰*Plant Closing: Advance Notice and Rapid Response—Special Report*, op. cit., footnote 89, p. 1.

⁹¹E. Applebaum, op. cit., footnote 26. While the ranks of all involuntary part-time workers have declined slightly since 1983, current levels are historically high (5.3 million in 1986 v. 4 million in 1980); the U.S. Bureau of Labor Statistics indicates that there is normally a much greater decline two to three years into a recovery. See Richard L. Worsnop, "Part Time Work," *Congressional Quarterly's Editorial Research Reports*, vol. 1, No. 22, June 12, 1987, p. 291.

⁹²U.S. Department of Labor, Bureau of Labor Statistics, *Employment and Earnings*, vol. 33, No. 11, November 1986, p. 17.

⁹³E. Applebaum, op. cit., footnote 26.

tremely long hours. Figure 11-15 demonstrated significant growth among people working more than 49 hours per week, and among women working from 41 to 48 hours. At the same time, moonlighting in a second job—or in several jobs—has reached record high levels. The moonlighting rate among women doubled between 1970 and 1985.⁹⁴

Flexible work hours (“flex-time”) have been encouraged by the Federal government,⁹⁵ while 4 of every 10 American employers have implemented programs that give workers the freedom to change the time at which they arrive and leave from work.⁹⁶ For example, Intel, a company of 21,500 employees located in California’s Silicon Valley, has created a “flexible work program,” in which temporary workers agree to adjust their hours according to the firm’s needs (anywhere between 0 and 40 hours per week, at an expected average of 20 to 25) in return for partial benefits.⁹⁷

Volatility of work schedules can translate into volatility in income. The ability to change jobs results in opportunities for growth and higher income as well as opportunities for failure. A study following 5,000 families during the 1970s found extremely high rates of both upward and downward movement in income. Dividing household incomes into five categories, 23.2 percent moved at least two categories during the decade, and 36.8 moved at least one. Only 40 percent remained in the same relative income position. While more than 71 percent of the white men working in relatively low-paying occupations (clerical and sales, unskilled labor, and non-union operatives in non-durable manufacturing) had moved into higher-paying occupations during the decade, only 40 percent of the black males had done so.⁹⁸

⁹⁴John F. Stinson, Jr., “Moonlighting by Women Jumped to Record Highs,” *Monthly Labor Review*, vol. 109, No. 11, November 1986, p. 23. See also John D. Owen, *Working Hours* (Lexington, MA: Lexington Press, 1979).

⁹⁵U.S. Congress, General Accounting Office, “Alternative Work Schedules for Federal Employees,” GAO/GGD-85-63, Washington, DC, July 19, 1985.

⁹⁶U.S. Department of Labor, Bureau of Labor Statistics, “BLS reports on Employer Child Care Practices,” news release No. 88-7, Jan. 15, 1988.

⁹⁷*Plant Closing: Advance Notice and Rapid Response—Special Report*, op. cit., footnote 89, p. 11.

⁹⁸Greg J. Duncan, op. cit., footnote 87, table 4.5; and University of Michigan, Institute for Social Research, “Five Thousand U.S. Families—Patterns of Economic Progress,” vol. 1, 1984.

Job Satisfaction and Alienation

Perhaps the most important gap between expectation and reality in the emerging U.S. economy may exist in an aspect of employment that is difficult even to describe, much less quantify. One of technology’s most important contributions to the work force is its ability to make work a source of interest and pleasure, rather than one of drudgery and exertion. The work place can be a part of a pleasurable society, and can provide a sense of worth and accomplishment.

Expectations in jobs areas varied as people themselves. Empirical analysis of this subject is limited, and necessarily somewhat vague. Most people would describe a “good” job as one that offers opportunities for learning, creativity, autonomy, and variety.⁹⁹ New production networks have the potential to improve many jobs measured on all of these factors. Of course, not everyone would find increased interest and challenge at work a mark of progress. Some people prefer impersonal, routine tasks that do not follow them home—tasks that may involve their hands but not their minds, freeing them for conversations at work.¹⁰⁰

People also want an opportunity to see and evaluate the results of their individual contributions. While most workers resent intrusive monitoring by supervisors, they may enjoy an opportunity to measure the quality of their own work.¹⁰¹

While statistics available from polls are ambiguous (see table 11-12), it appears that at least half of U.S. workers look on employment as both a source of money and a basic expression of self worth. Unfortunately, it is not possible to tell what percentage of the labor force would respond in this way if it were clear that technology could make jobs more interesting, or if increased flexibility in working hours could minimize conflicts between work and raising children; as table 11-12 shows, nearly one-third of the individuals responding to one poll did claim that they would consider a cut in pay in return for more interesting work. There was near-unanimous agree-

⁹⁹J.R. Hackman and G. Oldham, *Work Redesign* (Santa Monica, CA: Goodyear Publishing Co., 1980); and J.R. Hackman, J.L. Pearce, and J.C. Wolfe, “Effects of Change in Job Characteristics on Work Attitudes and Behaviors, A Naturally Occurring Quasi-Experiment,” *Organizational Behavior and Human Performance*, vol. 21, pp. 289-304.

¹⁰⁰Katzell, Yankelovich et al., *Work, Productivity, and Job Satisfaction*, The Psychological Corp., 1975.

¹⁰¹The Electronic Supervisor, op. cit., footnote 20, p. 56.

Table 11-12.—The Rewards of Working

Question:	Response
It is personally important to work?(a)	88 percent answered YES
"I have an inner need to do the very best I can, regardless of pay."	Answering YES 63 percent of college graduates 48 percent of high school graduates 52 percent average
Would you take a cut in salary for more meaningful and interesting work?	32 percent answered YES
Is your main interest in work earning money for other things?(a)	7 percent answered YES
"Most people get their real satisfaction from their home life and their leisure, not their work."	51 percent union leaders DISAGREE 62 percent management DISAGREE
"I find my work interesting but I wouldn't let it interfere with the rest of my life."(a)	21 percent answered YES
"The hue and cry about mounting job dissatisfaction is an invention of professors, journalists, and the 'left'." (b)	80 percent union leaders DISAGREE 71 percent management DISAGREE
Management's concern for the welfare of their employees improves productivity.	86 percent union leaders AGREE 82 percent management AGREE

SOURCES: (a) Harvey Lauer, *Jobs in the 1980s and 1990s: A Sourcebook for Policymakers*, Aspen Institute, Queenstown, MD, June 1983.
(b) Katzell, Yankelovich, et al., *Work, Productivity, and Job Satisfaction*, The Psychological Corp., 1975.

ment that the productivity of the workplace depended heavily on management's concern for their employees.

Occupational Health and Safety

An obvious measure of the quality of American jobs is the extent to which they provide an environment that minimizes the risk of injury and disease. While fatalities and injuries directly traceable to work are responsible for only a small fraction of deaths and sickness in the United States, there is much room for improvement. Over 10 million work-related injuries leading to restricted activity or requiring medical attention occur each year. Of these, approximately 3 million result in lost work time. In 1985 alone, 2 million people suffered disabling injuries on the job, and over 10,000 died.¹⁰²

¹⁰² U.S. Bureau of the Census, *Statistic/Abstract of the United States*: 1987 (107th edition.), Washington, DC, 1986, table 696.

For the most part, changes in economic structure have improved the safety of working conditions. While the correlation between safe jobs and areas of strong growth is not strong, jobs are increasing where the risks of accidents are comparatively low (see table 11-13). Automated equipment can be substituted for some of the most hazardous work: robots replace human paint sprayers, and automated weaving equipment reduces exposure to particles that cause "brown lung." This was done in part to comply with new occupational health and safety regulations. Taken together, such effects appear to have reduced injury rates more than 30 percent since 1972.¹⁰³

Tracing the impact of economic change on workplace safety is an uncertain business. Data collected on deaths and injuries resulting from work can be unreliable. Accident rates are affected by demographics (younger, less experienced workers tend to have more accidents), business cycles (injury rates increase when high employment rates bring inexperienced people into new jobs and lead to more overtime), changes in the way safety regulations are enforced, and a variety of other factors than can mask the effects of structural change in the economy.¹⁰⁴ Rapid changes in production technology increase the difficulty of ensuring safety conditions. Production processes may become obsolete before they can be shown to expose workers to hazards.¹⁰⁵

The emerging structure of the U.S. economy may add new kinds of risks. Stress resulting from working conditions has become a major health hazard,¹⁰⁶ resulting in stress-related absenteeism and medical expenses that may cost between \$50 and \$75 billion annually.¹⁰⁷ In addition, alcoholism and drug abuse may be related to job-induced stress. The National Institute on Drug Abuse has estimated that U.S. firms lose \$33 billion per year due to employee drug abuse.¹⁰⁸

¹⁰³ U.S. Congress, Office of Technology Assessment, *Preventing Illness and Injury in the Workplace*, OTA-H-256 (Washington, DC: U.S. Government Printing Office, April 1985), p. 35.

¹⁰⁴ See *Ibid.*

¹⁰⁵ See R. Howard, op. cit., footnote 11.

¹⁰⁶ R. Arndt and L. Chapman, "Potential Office Hazards and Control," contract report prepared for the Office of Technology Assessment, September 1984, in *Preventing Illness and Injury in the Workplace*, op. cit., footnote 103.

¹⁰⁷ U.S. Congress, Office of Technology Assessment, *Automation of America's Offices*, OTA-CIT-287 (Washington DC: U.S. Government Printing Office, 1985), pp. 300-304.

¹⁰⁸ David W. Hoyt et al., "Drug Testing in the Workplace—Are Methods Legally Defensible?," *Journal of the American Medical Association*, vol. 258, No. 4, July 24/31, 1987, p. 504.

Table 11-13.—The Safest and Most Dangerous industries
(lost workday cases per year per 100 full-time equivalent jobs (FTEs))

	Lost workday cases in 1984	Percent growth in lost workday cases 1975-84	Percent of all FTEs in 1984	Percent of all growth in FTEs between 1975 and 1984
Security, commodity brokers	0.3	-25%	0.4%	0.2%
Banking	0.7	17	2.1	0.5
Insurance carriers	0.8	33	1.7	0.3
Educational services	1.3	-7	1.7	0.3
Communication	1.4	-7	1.7	0.2
Personal services	1.5	15	1.2	0.2
Pipelines, except natural gas	1.7	6	0.0	0.0
Real estate	2.2	16	1.4	0.4
Business services	2.2	10	4.9	2.5
All private industries	3.7	12	100.0	100.0
Rubber and misc. plastics products . . .	6.4	-4	1.0	0.2
Stone, clay, and glass products	6.6	12	0.8	-0.0
Fabricated metal products	6.7	2	1.9	0.0
Construction	6.9	25	5.7	1.1
Water transportation	7.3	-11	0.2	-0.0
Air transportation	7.5	1	0.6	0.2
Food and kindred products	8.1	11	2.1	-0.1
Trucking and warehousing	9.1	21	1.7	0.3
Lumber and wood products	9.9	16	0.9	0.1

FTE = Full-time equivalent employee.

SOURCES: For injury rates, US Bureau of the Census, *Statistical Abstract of the United States: 1987* (107th edition), Washington, DC, 1986; for FTEs, U S Department of Commerce, Bureau of Economic Analysis, "National Income and Product Accounts," historical diskettes, table 6.7b. FTE

While uncertainty in the American economy have often been great, pressures can increase in periods of rapid change. Rapid changes in working environments and management practices can lead to stress. Many new office jobs result in increased responsibility without increased authority—a combination that easily leads to stress.¹⁰⁹ Increased use of electronic surveillance equipment may also contribute to stress.¹¹⁰

The first part of this chapter documented a dramatic increase in work force participation rates of women, many of whom must combine work with stressful family responsibilities; this, in turn, can increase stress on the job as well. For example, a recent survey of several firms found that roughly one-quarter of employees over age 40 provided care for elderly relatives, and that 80 percent of these providers were women;¹¹¹ this has translated into

symptoms of depression that are three times higher among the *providers* of eldercare than among the elderly themselves.¹¹²

Increased numbers of jobs are now found in offices. Until recently, little was known about illness related to an unhealthy indoor environment—now called the "sick building syndrome." Unlike toxic substances associated with industrial settings, Federal safety standards have not yet been applied to indoor pollution. Symptoms are typically vague, including dizziness, drowsiness, and headaches, but can also include such life-threatening diseases as cancer and pneumonia.¹¹³ The problems are often difficult or impossible to trace. Many appear to be tied to tobacco smoke, building fabrics, and copy-machine chemicals.¹¹⁴ The long term effects are still

¹⁰⁹ See the discussion of the insurance industry in the Personal Business and Communication section of chapter 12.

¹¹⁰ See 9-to-5, "The 9 to 5 National Survey on Women and Stress—Office Automation: Addendum," National Association of Working Women, Cleveland, OH, 1984, pp. 4-5; see also *The Electronic Supervisor*, op. cit., footnote 20.

¹¹¹ "Issues for an Aging America: Employees and Elder Care," University of Bridgeport, Center on Aging, Bridgeport, CT, 1987.

¹¹² University of Michigan, School of Nursing, cited in Fairlee Winfield, "Workplace Solutions for Women Under Eldercare Pressure," *Personnel*, vol. 64, July 1987, pp. 31-39.

¹¹³ Hal Levin, "Indoor Air Pollution and Its Applications in Office Building Development and Operation," in J. Thomas Black et al., ed., *The Changing Office Workplace*, The Urban Land Institute, Washington, DC, 1986.

¹¹⁴ Robert Steyer, "Sick-Building Syndrome." *Across the Board*, December 1986, p. 35.

largely speculative. They are likely to be at least as great as exposure to air pollution outdoors.¹¹⁵

Asbestos exposure in buildings also presents a serious problem in some areas. While the removal of **asbestos** from schools has been given much attention by the Federal government during the past dec-

ade, States have had to shoulder most of the burden of addressing the 733,000 public, commercial, and large residential buildings that are estimated to contain the substance.¹¹⁶

¹¹⁵ Hal Levin, *op. cit.*, footnote 113

¹¹⁶ U.S. Environmental Protection Agency, cited in Rochelle L. Stanfield, "Abating Asbestos," *National Journal*, vol. 19, No. 43, Oct. 24, 1987, p. 2704.