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ABSTRACT

The roles played by occupational education in the U.S. economy are changing. Because of the growing demand for and shrinking supply of skilled workers, economic success--of the nation and of individual members of the work force--is increasingly tied to educational and occupational attainments. Unless the nation increases its investment in educating and training noncollege-bound students, it faces two grave risks: overall economic growth will slow and unskilled workers will suffer diminishing economic prospects. The nation's economic success in the coming decades will depend on how well it meets, with investments in human capital in the classroom or on the job, the following imperatives that are raising the demand for skilled workers: (1) the technological imperative; (2) the trade expansion imperative; and (3) the entrepreneurial imperative. Occupational education is a way to get a job, leads to on-the-job training, leads to careers, fosters entrepreneurship, is an avenue to opportunity for the economically disadvantaged, and increases the flexibility of the economy by retooling the work force when existing skills and industries become obsolete. Annual U.S. investments in human capital already equal its investments in plants and equipment and exceed any other nation's. Education and training institutions--not Wall Street bankers--will be responsible for making most of the nation's productive investments. (CML)

NEW LIMITS TO GROWTH

ECONOMIC TRANSFORMATION AND OCCUPATIONAL EDUCATION

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Preface and Acknowledgments

This paper examines the changing economic roles played by occupational education in the national economy. It has grown out of two sets of concerns. First, the imminent reauthorization of the Perkins Act and the final reports of the National Assessment of Vocational Education led many experts to look carefully at the role of occupational education in the national economy.

Second, a broader concern with human capital and economic development has led more and more people concerned with economic development to examine our investments in human capital in greater detail. Almost unnoticed during the 1980s, investments in human capital had overtaken investments in physical capital and were estimated to generate more than one-half our annual growth in real income.

Several people have contributed to the paper. Madeleine Hemmings, executive director of the National Association of State Directors of Vocational Education, and Gloria Whitman, with the UNISYS Corporation, conceived the project. Professor Charles Benson, director of the National Center for Research in Vocational Education, was instrumental in providing funding for the project. Madeleine Hemmings has shared ideas and comments at several stages. Charles Benson and two reviewers for the National Center for Research in Vocational Education helped shape the final paper. Gloria Whitman has reviewed successive drafts and contributed many insights. Jack Brizius and Susan Foster, economic consultants, have undertaken research and contributed to the present draft.

Despite this invaluable assistance, the usual caveats apply, and the author retains full responsibility for sins of omission and commission.

Summary

Investments in people—made in the classroom and on the job—are the driving force of economic growth in the United States. Occupational education already plays a vital part in these investments. Its importance is growing rapidly because new technologies demand workers with greater occupational skills; international trade is exporting unskilled jobs, and the growing number of new businesses must hire trained workers rather than train them on the job. At the same time, because of the slowing rate of workforce growth and the poor preparation of many new entrants, employers cannot find enough qualified employees.

Because of the growing demand and shrinking supply of skilled workers, economic success—of the nation as a whole and of individual members of the workforce—is tied, increasingly, to educational and occupational attainments.

Unless the nation increases its investments in educating and training non-college-bound students, it faces two grave risks. First, overall economic growth will slow—starved of the occupational skills needed to sustain economic development. Second, unskilled people will suffer diminishing economic prospects—unable to find work or trapped in low-paying jobs, unqualified for the growing number of well-paid jobs.

The Importance of Occupational Education Is Growing

Already, annual increases in knowledge and in the skills of the workforce account for two-thirds of the annual growth in real per capita income. Six dollars out of every seven of national income are the earnings of labor or the returns to human capital (including our skills as entrepreneurs), and only one dollar out of seven are the returns to investments in land and physical capital.

Demand for Education and Occupational Skills Is Growing Quickly...

Our economic success in the coming decades will depend on how well we can meet three imperatives that are raising the demand for skilled workers:

The technological imperative. Technological change does not eliminate jobs, it redistributes them to industries demanding stronger basic skills. Neither does it "deskill"

jobs, it requires greater skills. And adopting and using new technologies require workers to have skills that employers cannot provide.

The trade imperative. The expansion of trade has increased the demand for skilled labor relative to the demand for unskilled labor. Expanded occupational education will be needed to allow the flexibility that international trade demands.

The entrepreneurial imperative. Most new jobs are created by new businesses, few of which offer their own training programs, and most of which need employees who can perform several roles. Success in creating and expanding a new business demands special skills that a growing number of occupational education programs are offering.

Our annual investments in human capital already equal our investments in plant and equipment and must continue to grow. Education and training institutions—not Wall Street bankers—will be responsible for making most of the nation's productive investments.

The U.S. rate of investment in its people exceeds that in any other nation and serves a much broader share of the workforce than in any other nation. For example, of American workers who have entered the workforce in the past five years, over 30 percent have received some postsecondary training or education. In no other nation had more than 20 percent been educated past high school. As a result, the American workforce is still the most productive in the world—the value of output per hour worked in the United States is 30 percent higher than in any European country and 40 percent higher than in Japan. But if we are to maintain our position and rescue the growing numbers of people whose real incomes have been falling, we will need to increase our rate of investment in human capital.

Despite these investments and attainments, the United States faces a growing shortage of trained employees and a growing surplus of untrained or poorly trained ones. In part, our problems stem from our success. New technologies—many developed from scientific discoveries made in the United States—are raising the level of skills needed to perform many tasks. At the same time, these technologies have made it possible for developing countries to industrialize rapidly. As a result, the United States is specializing, increasingly, in the production of goods and services that demand highly skilled employees and importing goods and services produced by unskilled and semiskilled people.

...While the Supply Is Shrinking

To meet these growing demands, the nation must overcome two barriers. First, workforce growth is slowing, and, second, many of those entering the workforce are poorly educated and lacking skills.

Fewer people are entering the labor force. A growing share of new entrants are minorities and immigrants. Employers cannot train these workers to fill the skill gap. But occupational education is preparing all types of new entrants, preparing disadvantaged people for mainstream opportunities, and recycling displaced workers.

Occupational education programs offer many successful examples of how the workforce can be provided with the capabilities needed by employers quickly, flexibly, at low cost, and to all types of people. But these models must become standard practice in all communities. Because we need to train more people and to train them in greater depth to meet the growing demands by employers, the nation will need to draw upon the full potential of its occupational education system.

Occupational Education Is Needed to Train People to Sustain Economic Growth and to Bring More People into the Economic Mainstream

Only about one-quarter of the workforce's occupational and career skills will be acquired through degree programs in universities. The rest must be acquired through classroom and on-the-job training. On-the-job training is provided mostly to those workers who have acquired some postsecondary education or training. Therefore, we must rely, increasingly, on occupational education to prepare the workforce for work.

- *Occupational education is a way to get a job;* high school graduates with vocational training are less likely to be unemployed than those without.

- *It leads to on-the-job training;* employers are more likely to train employees who have vocational training than those who do not. Occupational education graduates have skills that can be adapted in the workplace.

- *It is the opening of a career;* 65 percent of skilled jobs can be learned through occupational education. Less than one-third need college degrees.

- *It fosters entrepreneurship;* many graduates of occupational education courses begin their own businesses and many occupational programs offer business assistance.

- *It is an avenue to opportunity* for the economically disadvantaged. Occupational education offers mainstream skills without the stigma of participating in special programs.

- *It increases the flexibility of the economy;* when existing skills and industries become obsolete, the occupational education system retools the workforce.

Our rapidly changing environment poses severe challenges—and no sector will be more challenged during the coming years than education. We must invest to keep the skills of the workforce growing in pace with the expanding demands of employers and to extend those investments to the whole workforce in order to allow many more people to escape from poverty by qualifying for well-paid work.

1. INTRODUCTION: THE NEW LIMITS TO GROWTH

> There is much anxiety about food, energy, space, and other physical properties of the earth. Such anxiety is not new... I reject them, because a valid assessment must reckon the abilities of man to deal with changes in the physical properties of the earth. Increases in the acquired abilities of people throughout the world and advances in useful knowledge hold the key to future economic productivity and to human well-being.
>
> Nobel laureate economist Theodore Schultz, 1960

In 1972, a group of economists and sociologists calling themselves the Club of Rome published a widely read report predicting that burgeoning population and resource mismanagement would soon exhaust the world's supplies of food, fuel, and minerals. They predicted that economic development and social progress throughout the world would be arrested. When OPEC tripled oil prices the next year, their prophecies seemed fulfilled.

But the Club of Rome was wrong. Instead of scarcity, resource prices have fallen (in real terms) and world population growth has slowed. Ingenuity in response to market pressures has led to the development of new ways to conserve and manage our resources. This has severed the link between economic growth and resource consumption on which the Club of Rome's dire predictions were based.

Today, however, the United States and most developed countries are encountering a new limit to growth: the supply of skilled labor is failing to keep pace with growing demands, and there are too few jobs for unskilled labor.

This growth in demand is fueled by three forces: (1) new technologies displace unskilled jobs and demand greater occupational skills; (2) as international trade penetrates all corners of our economy, the United States must specialize in skill-intensive goods and services; and (3) the growing number of new businesses demand more versatile and already trained employees than larger enterprises have traditionally hired. These three factors are analyzed in the following three chapters.

At the same time, the nation's workforce is growing only one-third as fast as it was fifteen years ago, and many new workforce entrants lack basic and occupational skills. The shrinking supply and the deteriorating skills of new entrants are discussed in chapter 5.

Unmet Demands for Human Capital Will Slow Growth and Raise Unemployment

> Extreme division of labor—characteristic 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 shared responsibilities, possibly giving rise to composite or autonomous work groups with little or no internal supervision.
>
> Daniel Bell, *The Coming Post Industrial Society*, 1963

U.S. economic success today, individually and collectively, depends on human capital—the knowledge, skills, experience, education, and judgment of the workforce. In the past, U.S. growth depended on investments in its enormous industrial infrastructure—the plant and equipment that made its workers the most productive in the world. But today growth depends on skills, and this change has created new problems. How much we earn and the ease with which we can find work depends on the skills we offer potential employers. Untrained or poorly educated people are earning less and can find fewer jobs, while the incomes and the prospects of educationally qualified people are rising.[1]

The economy is more volatile. As production technologies change and as innovations render products obsolete, skills become outmoded and careers are shortened. People working today can expect to change occupations three times more frequently than their parents.[2] One recent study estimates that human capital depreciates at about 20 percent a year—so the "half life" of the average job skill may be no more than three years.[3] Training, therefore, is not a step taken when we first enter the workforce; it must be repeated throughout our working lives.

The workplace is changing as the skills of the workforce grow. The tendency toward increased specialization on many jobs is reversing. Employees are being called on to perform a greater variety of tasks as they make use of the information-gathering powers of the microprocessor. In addition, employees on some jobs are beginning to participate in managerial decisions—a responsibility that demands broader skills than those traditionally learned on the job. Employees who are best informed about the production processes or

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1. Chapter 5 discusses the rapid increase in earnings of better-educated and better-trained people in greater detail.

2. Pat Choate and June Linger, *The High Flex Economy*, New York, Simon and Schuster, 1986.

3. Lee Lillard and Hong Tan, *Employer Training: Who Gets It and What Are Its Effects*, Santa Monica, CA, The RAND Corporation, 1986, chapter 2.

closest to customers are being called upon to assume greater management responsibilities. This demands a combination of technical, problem-solving, and communications skills—a combination not taught within traditional academic curricula.

The economy is less centralized. Whereas most people worked for a branch of a *Fortune 1000* company in 1970, only about one-third do so today, and almost all new jobs today are created by people starting businesses.[4] Growing competition—national and international—coupled with new technology has allowed much economic activity to take place in new, smaller businesses and in regions of the country that were not formerly part of the economic mainstream. Businesses must adapt quickly to changes in consumers' tastes or to shifts in competitors' behavior. When economic growth depended on investments in physical capital, a small number of people controlled a large share of total investment. But investments in human capital are made by all members of the labor force. The nation's portfolio of human capital is widely held—we are all shareholders and enjoy its returns.

Because our economy is different, the policies we employ to promote economic growth must be different. In the future, economic development strategies must embrace occupational education and other strategies to raise the level and the effectiveness of human capital investments.

We Already Invest Heavily in Human Capital...

> The corporation that is not in the business of human development may not be in any business. At least, not for long.
>
> William Vaughn, Chairman, Eastman Kodak, 1978

Gross Investments in Human Capital Are Nearly Equal to Gross Investments in Plant and Equipment

Annual gross investments in human capital in 1985 were about $548 billion—about 14 percent of GNP. This compares with *gross* investment in plant and equipment (public and private) of $605 billion and *net* investments of $205 billion. The level of investments in the four major categories of education and training and the numbers of people served were:

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4. See chapter 4, below.

- Primary and secondary education: $157 billion—$143 billion by government and $14 billion by households—to serve 47 million students each year.

- Employer training: $210 billion to serve one-half of the workforce—about 60 million people.[5] This included direct spending on training programs and the wages and output forgone.

- Postsecondary education: $65 billion in direct spending—$16 billion by governments and $49 billion by households—(and at least as much again in forgone income by students) to serve 23 million students.

- Government programs to educate and train its workforce (including training by the Department of Defense) totaled $23 billion to serve over 2 million people. Indirect costs may equal these direct investments.

Investments in Skills and Knowledge Account for Two-thirds of the Annual Growth in Real Per Capita Income

> Wages, salaries, and other labor income constitute 86 percent of total national income. Contrary to popular belief, inequality in the distribution of income in the United States today arises primarily from unequal abilities to supply valuable human services. Human capital has to be included in our definition of wealth, because most income is earned in the United States by supplying the services of human resources.
>
> Paul Heyne, 1985

Investments in education and job skills—made in classrooms, job-training sites, and in universities--are responsible for almost two-thirds of the annual growth in per capita income. This is more than double the contribution of plant and equipment (table 1).

Human capital investments determine the overall rate of growth, and who participates in that growth. Differences in education and training are the most important single determinant of differences in people's earnings.[6]

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5. There are many estimates. The most systematic attempt to measure full costs is in Jacob Mincer, *Labor Market Effects of Human Capital and of Its Adjustment to Technological Change*, Paper prepared for the Conference on Employer-Sponsored Training, Alexandria, VA, 1988. See also Office of Technology Assessment, *Technology and the American Economic Transition*, Washington, April 1988.

6. This was demonstrated by Lester Thurow in *Generating Inequality*, New York, Basic Books, 1976.

Table 1

Contribution of Human Capital to Real Per Capita Income Growth, 1929–1982

Contribution of human capital to growth in per capita income	
Improvements in education per worker	21 percent
Advances in knowledge	41 percent
Other factors	
Increases in the stock of capital	28 percent
Improved resource allocation	12 percent
The advantages of larger markets and higher levels of production	13 percent
[Other factors, such as increased regulation, reduced per capita growth by 13 percent]	

Source: Edward Denison, *Sources of Income Growth in the United States: 1929-1982*, Washington, Brookings Institution, 1985. Denison measures the contribution of factors to overall growth and estimates that 32 percent was attributable to population growth. In this table, his estimates are adjusted to show contribution to per capita income growth.

...But the Number of Skilled Workers Entering the Workforce Is Falling

Population Growth Is Slowing and a Growing Share of New Entrants Are Poorly Prepared

> Youth who do not go to college find it increasingly difficult to match changing market demands. Unless we act today, this shrinking labor pool will include a growing proportion of young people who are poor and at increased risk of failing at school and suffering related problems.... Moreover, the increasing complexity of today's world makes it more essential than in the past that we have an educated citizenry.
>
> Commission on Work, Family, and Citizenship, 1988

Since 1975, the number of people entering the workforce for the first time has fallen from about 2 million to 700,000. Tests measuring what these people know show falling scores. Employers today, therefore, must fill increasingly complex jobs from a smaller pool of prospective workers. As a result, the United States must upgrade its existing workforce– by ensuring that all new entrants are well prepared for work, by training those people who have not been part of the mainstream economy, and by retraining those whose skills have become obsolete.

Despite Its Importance, Many States and Communities Still Overlook Occupational Education in Their Economic Development Strategies

Despite the growing attention accorded to education and despite the huge sums they spend on it, most states have yet to manage their education and training programs as economic investments. When the National Governors' Association surveyed all fifty states

in 1986, only nine identified education and training as the major economic development issue they faced, and only twenty indicated that they were using human capital initiatives to support economic growth.[7] In the same year, the Council of Chief State School Officers surveyed the fifty states and found that only nine departments of education have any economic development strategies, and few are involved in the state's overall development activities.

In part, this reflects the failure of many elected leaders to appreciate the vital role that education and training play. It also reflects the excessively abstract way in which academic courses treat economic issues in many states. Few states, for example, include practical courses and programs relevant to the changing economic environment in high school curricula (table 2).

Table 2

Few State Education Programs Provide Students with Insight into Their Economic Environment

	Number of States Where: Courses Must Be...	
Course	*Offered*	*Taken*
The economy	39	24
Productivity	29	11
International education	25	7
Work ethic	24	8
Entrepreneurship	31	8
Career exploration	41	15

Source: National Conference of State Legislatures, *Education and Economic Growth*, Denver, 1988.

Occupational education can improve students' understanding of their economic environment. Skills, increasingly, are taught in a context that ensures that graduates are aware of alternative avenues of economic opportunity—how to seek and keep well-paid jobs or create their own businesses.

The U.S. Economy Is Becoming an Educational Meritocracy

As a result of the growing demand and shrinking supply of skilled people, the wages and salaries of trained and educated people are rising sharply, while earnings and job prospects for unskilled and semiskilled people are falling precipitously. The only avenue to economic success is through the acquisition of education and training.

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7. Marianne Clark, *Revitalizing State Economies*, Washington, National Governors' Association, 1986.

If the United States fails to invest more and more effectively in occupational skills, its rate of growth will slow. And if it fails to expand the share of the workforce with formal skills training, a growing number of people will be trapped in poverty.

In the future, there will be fewer and fewer well-paid jobs for people without skills. The widening divisions between the trained and untrained will create growing social tensions and rising social costs.

Occupational education—with its track record of serving many different types of students, from potential dropouts to displaced workers—is growing in importance as part of our national development strategy.

Implications: Federal and State Economic Strategies Must Recognize the Growing Importance of Occupational Education

> The substitution of knowledge for manual effort as the productive resource in work is the greatest change in the history of work, which is, of course, a process as old as man himself....Education has moved from having been an ornament, if not a luxury, to becoming the central economic resource of technological society.
>
> Peter Drucker, 1977

Most of our occupational skills are acquired at school or from employers (who often enroll their employees in local occupational programs). Only a small part are acquired through university degree programs.

Occupational Education Is Already an Important Part of High School and Postsecondary Education

Ninety-seven percent of the 1982 high school graduating class enrolled in at least one vocational course.[8] Vocational enrollments accounted for 20 percent of the total coursework taken by graduates of the class of '82. Students in the top half of measured ability take about 45 percent of vocational credits.[9] Students intending to continue academic studies after graduation account for almost one-half of all vocational course enrollments.

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8. U.S. Department of Education, *First Interim Report from the National Assessment of Vocational Education*, Washington, January 1988, pp. 1–5ff.

9. Ibid., pp. 1–9.

Increasing numbers of postsecondary students are enrolling in occupational education. A growing number of students graduating from high school are enrolling in postsecondary vocational courses—15 percent in 1972 and 19 percent in 1980.[10] Of this entering class, 11 percent enrolled in community colleges (where the greatest increase in vocational students has occurred), 3.6 percent in public technical institutes, and 2.4 percent in private vocational schools. Even students graduating from community colleges with academic degrees averaged 15 out of 70 credits in occupational subjects.

Occupational education helps high school students to graduate and to find work. The one-half of vocational students who take intensive occupational education programs graduate with more total credits than other students. Students receiving intensive vocational education in high school are more likely to enter the labor force, work more weeks in the year, and experience lower unemployment rates than others in their cohort without vocational training.[11]

Occupational education prepares students for further training by employers. Employers train their best-educated employees:[12] only 45 percent of those who failed to complete high school but 71 percent of high school completers receive training from their employers.[13] Employees who are trained in one job are also more likely than other new employees to be trained in subsequent jobs.[14] Since occupational education encourages students to stay in school, it increases students' chances of receiving employer-sponsored training.

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10. U.S. Department of Education, *Second Interim Report from the National Assessment of Vocational Education*, Washington, March 1989.

11. Paul B. Cambell et al., *Employment Experience of Students with Varying Participation in Secondary Vocational Education*, National Center for Research on Vocational Education, Ohio State University, 1981, and John A. Gardner et al., *Influences of High School Curriculum on Determinants of Labor Market Experience*, National Center for Research on Vocational Education, Ohio State University, 1982.

12. Mincer, *Labor Market Effects;* Lillard and Tan, Private Sector Training, chap. 2; Hong Tan, *Employer Training in the United States*, Paper prepared for the Conference on Employer-Sponsored Training, Alexandria, VA, December 1988.

13. Tan, *Employer Training*, table 2.8.

14. Mincer, *Labor Market Effects*, p. 7.

More Than Three-Quarters of the Skilled Workforce Are Trained in Noncollege Programs

Employees without college degrees earned three-quarters of all wages and salaries in 1984—or $28 billion of the nation's weekly payroll of $35 billion.[15] Most of these employees had gained skills that raised their earnings above the minimum paid for unskilled labor (with the exception of some, but certainly not all, of the 7.8 million people classified as laborers and in private household service). They gained those skills either on-the-job (from employers), or by enrolling in formal occupational education programs.

Four out of five workers in 1984 and three out of four by the year 2000 will not have college degrees. *Professional specialty*, accounting for 12 percent of the workforce, is the only occupational category that relies on college degrees to prepare employees (including scientists, lawyers, and doctors) (table 3). More than seven out of ten technicians—such as medical technicians, computer programmers, air traffic controllers, and paralegals—have not graduated from college. Four out of five sales workers—a category that includes cashiers, insurance agents, real estate agents, travel agents, and many other marketing occupations—do not have college degrees. Nineteen out of twenty precision craft workers—including machinists, tool and dye workers, construction trades, and mechanics—learn their skills through nondegree courses or on the job.

Occupational training in the classroom is important both to get jobs and to move ahead in careers for professional and technical occupations (table 4). Its importance is likely to grow as employers—who now direct about one-third of their expenditures for employee training to education institutions—increase the level of workforce training.[16] As the demands for more skilled workers increases and as the skills demanded become more complex, employer reliance on occupational education programs is likely to grow.

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15. Calculated from the last line in table 3. Total weekly wages and salaries were $35 billion. The share earned by people without college degrees was about $28 billion.

16. See Anthony Carnevale, *Employee Training: Its Changing Role and an Analysis of New Data*, Washington, American Society for Training and Development, 1984.

Table 3

In 1984, Most Employees in Most Occupations Were Not College Educated

Occupation	*Percent Noncollege*	*Median Weekly Wage*	*Total Number of Jobs*
Executive, Administrative	55.0%	$483	11.3million
Professional Specialty	25.5	455	12.8
Technicians	71.4	379	3.6
Sales	79.0	319	[illegible]
Administrative Support	89.0	275	
Private Household Services	98.4	134	[illegible]
Protective Services	94.3	232	
Precision Craft	94.6	384	12.5
Machine Operators	97.2	277	8.2
Transportation Workers	96.9	344	4.7
Handlers, Laborers	97.4	251	4.2
Farm, Fishing, Forestry	92.1	203	3.6
Average	**77.9**	**326**	**106.8**

Source: Office of Technology Assessment, *Technology and the American Economic Transition*, Washington, Table 10.3.

Table 4

Percentage of Employees Receiving Company and School Training to Get Job and Upgrade Skills (by One-Digit Occupation)*

	Training to Get Job		*Training to Upgrade Skills*	
Occupation	*School*	*Company*	*School*	*Company*
Men				
Admin/managerial	44.7	14.1	17.9	19.4
Prof/tech	76.0	11.5	30.5	17.3
Sales	16.7	15.0	8.8	19.4
Clerical	14.4	10.6	7.1	13.8
Services	8.3	10.7	8.0	10.9
Craft	11.0	17.0	8.1	16.2
Machine operative	6.7	8.4	5.2	5.4
Transport	1.3	6.2	1.6	5.3
Women				
Admin/managerial	36.7	10.6	17.6	17.9
Prof/tech	74.3	9.3	35.4	16.3
Sales	7.2	8.6	4.9	10.4
Clerical	32.2	6.0	10.8	9.5
Services	7.3	7.7	5.1	5.9
Craft	7.3	9.8	5.6	8.4
Machine operative	1.3	.1	.4	2.5
Transport	0.9	17.9	5.1	18.2

Source: Tan, *Employer Training*, table 2.3, from CPS data for 1983.
* For simplicity, this table omits company OJT and "other" categories.

The Shortage of Human Capital Will Not Be Easily Overcome

We can overcome the growing scarcity of skills that threatens our economic future only if we reconsider how we promote economic development. We cannot produce substitutes for human skills as easily as we did for physical resources. Human skills require large and lengthy investments—investments in people must begin at birth, or even before, and they require the time and energy of parents, schools, communities, and employers and continual updating and extension.

The mismatch between rising skill requirements and falling skill attainments is dividing the labor market into two parts: the market for skilled and educated employees, where the shortage will drive up incomes and multiply career opportunities; and the market for those without skills, where job opportunities will decline and wages will fall. Occupational education will, increasingly, be the only avenue through which non-college-bound youth will be able to move into the market for good jobs.

Most skills are not and will not be acquired through university degree programs. Even if the share of people enrolling in universities increases dramatically, they will still provide a much smaller share of the nation's new human capital than occupational education investments made by individuals and by employers. Occupational education is the catalyst that makes the growing volume of human capital investments productive in the workplace.

Secondary and postsecondary occupational education programs are already playing vital roles in overcoming limits to growth and must play even larger roles in the future. There are many examples of successful occupational education programs described in the following chapters that bring credit to the imagination and innovation of state and local administrators and policymakers. The nation will need to draw upon the full potential of the system by helping to make these innovations the standard practice of all communities.

2. THE TECHNOLOGICAL IMPERATIVE

> We are all in the process of buying and selling knowledge from one another, because we are each so profoundly ignorant of what it takes to complete the entire process of which we are a small part.
>
> Thomas Sowell, *Knowledge and Decisions*, 1982

Only 100 years ago, most people knew how to grow and prepare food, make their own clothing, and even build their own shelter. These skills were acquired informally—from family and friends. Today, the advance of technology has demanded much more specialized knowledge and skills that we must acquire through formal training in classrooms or at work. The continued advance of workplace technology will expand the importance of occupational education compared with training that can be acquired on the job. The skills employers expect the people to have mastered before they enter the labor market will grow. "When someone comes to work here," said Jack Bowsher, retired director of external training at IBM, "we double the cost because we have to pay salaries too. More and more industry is asking: 'How do we get people trained before we hire them?' Vocational schools do this."[1]

How technology affects our economy is complex. Many people feared that adopting new technologies would lead to widespread unemployment and replace craft jobs with less-skilled work. Experts forecast that the computer would demote human employees to janitors and electronics repairmen,[2] and that experienced steelworkers would be reduced to flipping hamburgers.[3] "If skills can be progressively built into machines," said William Abernathy, Kim Clark, and Alan Kantrow, "then workers need not be especially skilled themselves."[4]

These fears, for the most part, have proved unfounded. For educated and trained people, new technologies have created new career opportunities and rising real incomes. But for those without marketable skills, well-paid jobs are disappearing. Employers cannot

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1. Nancy Perry, "The New Improved Vocational School," *Fortune*, June 19, 1989.

2. For example, Jaques Ellul, *The Technological Society*, New York, Bantam, 1967.

3. Barry Bluestone and Bennett Harrison, *The Deindustrialization of America*, New York, Basic Books, 1982.

4. William Abernathy, Kim Clark, and Alan Kantrow, *Industrial Renaissance*, New York, Basic Books, 1983.

remedy the skills that these people lack. Although they invest heavily in their workforces, the deepening need for occupational skills prevents them from delivering remedial training.

Occupational education can help employers meet their growing skill demands. Programs must emphasize, increasingly, science and mathematics, technical training. The twists and turns through which technologies evolve prevent us from predicting how demands for skills will change. Therefore we need an occupational education system that responds quickly to new demands and provides workers with the theoretical and technical skills they need to continue to learn on the job.

Technological Change Redistributes Jobs and Raises the Skills Needed to Perform Them

> U.S. manufacturing is in the throes of a fundamental changeover in its production systems. Under pressure of rapid globalization of its own markets, fierce competition from technologically capable trading partners, and an aging industrial base, the United States is moving from labor-intensive mass-production factory of the past to the information-intensive, custom quantity factory of the future.
>
> Dennis A. Swyt, U.S. Bureau of Standards, 1987

Quantum reductions in the cost of collecting, processing, and communicating information are transforming work in all industries. New information technologies link producers more closely with suppliers and customers. Technology has accelerated engineering design and production planning so that products can be tailored more precisely to customers' demands and can be quickly improved. They allow tighter inventory control, closer monitoring of shop-floor production, quicker delivery of goods and services, faster reduction of costs and waste, and product diversification.[5] But these benefits can be enjoyed only if employees and employers are flexible and innovative.

Technological Change Has Shifted Jobs from Manufacturing to Other Sectors

The technological revolution has transformed manufacturing more rapidly than other sectors. Because workers today are using three times as much capital equipment as they used only a decade ago, the share of total employment in manufacturing has fallen sharply (from 40 percent in 1950 to 20 percent today),[6] while the share of national income

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5. Dennis A. Swyt, *U.S. Manufacturing Systems: Factories Past Present and Future*, U.S. Bureau of Standards, 1987.

6. The Hudson Institute, *Workforce 2000*, Indianapolis, IN, 1987.

generated in manufacturing has remained constant at about 31 percent.[7] Manufacturing still employs over 20 million people, and each of those employees has become much more important in the economy.

New ways of making things have eliminated unskilled and semiskilled jobs while creating new technical jobs. In automobile production today, for example, new production techniques have halved the number of production jobs, but, more important, they have also cut in half the share of those jobs that were filled by semiskilled labor—from 75 percent to 34 percent.[8]

The image of increasingly high-tech production in manufacturing is that of highly automated activity in which advanced equipment and few people are employed to produce sophisticated products. But this is misleading. High-tech industries are human-capital-intensive (table 5). They employ scientists and technicians designing new products and improving production techniques. Employees in high-tech industries work with an average of only $12,200 of plant and equipment (in 1972 dollars). Employees in traditional industries work with capital worth $17,700.

Table 5
Characteristics of High-Tech and Traditional Industries, 1980

	High-Tech	*Traditional*
Employment	2 million	20 million
Capital/labor ratio ($/worker)	$12,200	$17,700
Age of equipment (years)	5.8	6.9
Output	$73.2 billion	$833.5 billion

Source: Ann P. Bartel and Frank P. Lichtenberg, "The Skill Distribution and Comparative Trade Advantage of High Technolgy Industries," *Advances in Industrial and Labor Relations* 4 (1987), p. 167.

For several decades, high-tech industries have experienced quite different patterns of growth than traditional industries—with output per worker, the capital stock, as well as output growing much faster (table 6). Despite their small overall share of employment, high-tech industries account for a disproportionately large share of the growth in employment opportunities.

New technologies, however, have not reduced the overall number of jobs. In fact, by expanding how much each of us can produce, by broadening the range of goods and

7. Swyt, *U.S. Manufacturing Systems*, p. 9

8. *Economist*, May 21, 1988, p. 80.

Table 6
Annual Growth Rates of High Tech and Traditional Industries, 1960-80

	High-Tech	*Traditional*
Employment	0.89%	0.15%
Capital stock	3.30	0.92
Real output	3.58	0.84
Output/worker	1.43	0.60
Capital/labor ratio	1.27	0.67

Source: Bartel and Lichtenberg, "Skill Distribution."

services that can be offered, and by making it possible for more people to work (by reducing the importance of physical strength, for example, automation has opened many new jobs to women), technological advance has increased employment. After a century of unprecedented technological progress, a larger share of the population is employed today and is earning more than at any time in our past. Since 1950, the share of the adult population in the labor force has risen from 60 percent to 66 percent.[9]

New Technologies Demand More Skilled Workers

> An insurance company took advantage of the capabilities of desk-top computers to restructure. It created small teams to work directly with field agents and carry out all 167 tasks once performed by three separate departments. Five jobs—messenger, file clerk, customer assistance clerk, claims adjuster, and policy writer—have been combined into one job—that of claims adjuster.
>
> Sue Berryman, 1988

New technologies are creating opportunities mostly for people with advanced technical skills and with sound basic skills, but they are eliminating jobs that can be performed by people with low skill levels. This is not new. Since 1900, the nation's workforce has changed radically. Instead of being employed as farmers and laborers, people today have become technologists, craftspeople, clerical workers, and managers (table 7).

The demand for skilled workers has been growing relative to the demand for unskilled workers for many decades. The share of people employed in production and service jobs as compared with technical and managerial jobs has declined. Dennis Swyt of the U.S. Bureau of Standards has plotted the changing structure of occupations (see figure 1). The horizontal axis measures the distribution of the workforce between *service* workers and *managerial and administrative* workers (including proprietors, managers,

9. *U.S. Statistical Abstract*, Washington, U.S. Government Printing Office, various years.

Table 7
Skilled Occupations Have Grown Rapidly as a Share of the Workforce

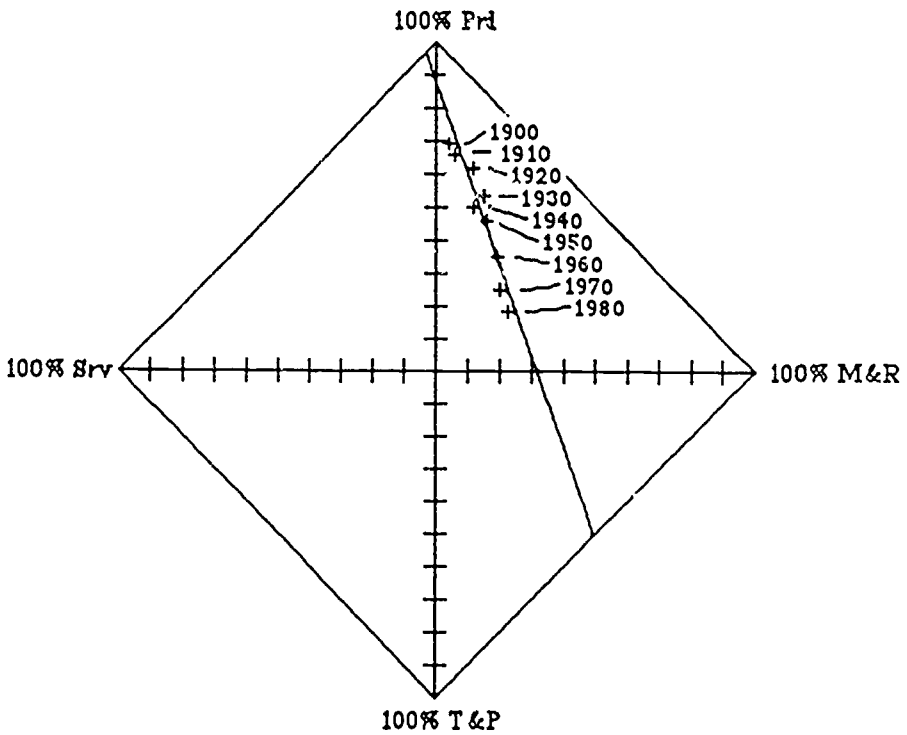
	Share of Experienced Workforce	
Occupation	*1900*	*1985*
Farmers/farm managers	20%	2%
Laborers	30	6
Craftsmen/operatives	22	28
Clerical/sales	7	27
Managers/proprietors	6	11
Professional/technical	4	17

Source: *U.S. Historical Statistical Abstracts*, various years.

administrators, clerical, and sales). The vertical axis measures their distribution between *production* workers (including laborers, operatives, precision production, and craft workers) and *technical/professional* workers (including professional, technical, and related occupations).

By plotting the occupational distribution of the workforce at several points in time, Swyt shows the growing importance of *professional/technical* and *managerial and*

Figure 1
The Shifting Occupational Structure of the U.S. Workforce



Source: Dennis A. Swyt, *The Technologies of the Third Era*, Washington, U.S. Bureau of Standards, 1988, p. 62.

administrative occupations, and the shrinking relative numbers of service and production workers. The extrapolation of the time trend predicts that in 2010 the number of *professional/technical* workers will exceed the number of production workers.

Since 1900, production workers have fallen steadily from 80 to 35 percent of the workforce, while managerial workers have risen from 15 percent to 40 percent, technical workers have risen from 5 to 15 percent, and service workers have risen from 5 to 12 percent.[10] The growing occupations are more likely to demand occupational education (rather than college degrees—see previous chapter) than declining occupations.

One-half of the growth in employment since 1979 has been in managerial and in professional and technical occupations. The very rapid increase in incomes of people with postsecondary training or education during the 1980s, despite the fact that the "supply" of human capital has increased, suggests that technology is increasing, not reducing, demands for educated and skilled workers.[11]

Employers Must Hire Better-Prepared People to Work with New Technologies

> Rapid technological change in an industry increases the probability of getting managerial training and training from in-house sources...especially for the most educated, but decreases the probability of getting professional, technical, and semi-skilled manual training, or training from external sources such as business, technical, and traditional schools...possibly because skills specific to new technologies are not readily available outside the firm.
>
> Lillard and Tan, *Employer Training*

Employers cannot provide their workers with all the skills they need to employ new technologies. They need to start with employees who can not only read and write, but who can solve problems, who are familiar with basic technologies, and who understand what is required in the world of work. Employers invest in those people who have invested in themselves and who can demonstrate practical skills. The nation's long-term economic success, therefore, requires employees to have formal occupational education so that employers can invest in job-specific skills later.

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10. Swyt, *U.S. Manufacturing Systems*, p. 12.

11. Jacob Mincer, *Labor Market Effects of Human Capital and of its Adjustment to Technological Change*, Paper prepared for the Conference on Employer-Sponsored Training, Alexandria, VA, 1988; and Kevin Murphy and Finis Welch, *Wage Differentials in the 1980s: The Role of International Trade*, Paper presented at Mont Pelerin Society General Meeting, September 1988.

Unskilled people have fewer and fewer chances of rectifying their deficiencies on the job. Economist Thomas Bailey reports the manager of a large U.S. apparel plant complaining: "These workers can't do anything they haven't done before, and my equipment is changing too fast to allow me to show them how to do everything."

Studies of firms' hiring patterns show that, as the rate of technological change accelerates, employers first hire people with more formal training—people who can adapt to a rapidly changing work environment. Only when technologies mature can employers develop their own in-house training programs.[12]

Employees who have received occupational training are more adaptable and can be retrained more readily when new technologies require new skills.[13] As a result, firms that hire skilled workers and invest in training enjoy lower turnover rates than those that do not.[14] This flexibility is not costless. Employees experience lower earnings while they are being trained or retrained.[15] But their earnings grow faster once they have completed training, they are less likely to be laid off, and, if they quit, they find other work more easily.[16] In 1983, people with occupational training experienced an average of 9.0 weeks unemployment; those without averaged 10.2 weeks.

Mass production divided production into simple repetitive steps such as the productive "pin factory" that inspired Adam Smith, two hundred years ago, to argue that "the greatest improvement in the productive powers of labour...seems to have been the effects of the division of labour."[17] Today, however, numerically controlled equipment is reversing the benefits from specialization and requiring a broader range of skills among employees. Columbia University economist Thomas Bailey illustrates its advantages:

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12. Mincer, *Labor Market Eff...* Bartel and Lichtenberg find that the age of the capital stock in an industry is inversely related to ... average years of education of its workforce ("The Comparative Advantage of Educated Workers in Implementing New Technology" *Review of Economics and Statistics*, February 1987). Lillard and Tan (*Employer Training*) find less training in "high tech" industries (p. 30).

13. Mincer, *Labor Market Effects*.

14. Ibid.

15. Ibid.

16. Ibid., p.14.

17. Adam Smith, *The Wealth of Nations*. New York, New York Library Edition, 1937, p. 3.

A shirt manufacturer reorganized from one large assembly line into many small departments each producing entire shirts. Because orders are filled each day, products flow more efficiently to the customer. Direct labor costs were cut 5 percent, throughput time fell from 3 days to 3 hours, and the share of second-quality shirts fell from 2 percent to 0.2 percent. The company now produces a much wider product range.[18]

New technologies require employees to learn high-level diagnostic and problem-solving activities that require the ability to conceptualize.[19] When New Jersey Bell Telephone switched from electromechanical to microelectronic switching systems, its engineers could not handle the problems: If something went wrong with the old technology "you could see it and hear it," according to its director of corporate training. With the new system, "you have to envision it."[20] Such conceptual skills may best be learned in the classroom rather than on the job.[21]

The National Academy of Sciences concluded in 1986 that: "training requirements remain skills-oriented, but the skills are defined more broadly to include the ability to think about the process, as well as interpersonal and team skills."[22] These skills are traditionally offered to voc-ed students but now are demanded of almost all employees.

Implications: Occupational Education Equips the Workforce for New Technologies

The pace of technological development now is so great that life cycles for electronics products and processes already have collapsed to three to five years, and rarely will exceed five to ten years in most other industries. As a result, any set of skills also can be obsolescent in five to ten years. Continuous re-skilling must be a top national priority.

U.S. Department of Commerce, 1988

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18. Thomas Bailey, *Changes in the Nature and Structure of Work*, Paper prepared for the Conference on Employer-Sponsored Training, Alexandria, VA, 1988.

19. Olivier Bertrand and Thierry Noyelle, *Human Resources and Corporate Strategy*, Paris, OECD Press, 1988.

20. *Business Week*, October 19, 1987, p. 114.

21. The evidence is reviewed in Sue Berryman, *Economy and Education: Many Miles to Go*, Paper prepared for the Seminar on the Federal Role in Education, Aspen Institute, Aspen, CO, July 31–August 10, 1988.

22. National Academy of Sciences, Committee on Effective Implementation of Advanced Manufacturing Technology, *Human Resource Practices for Implementing Advanced Manufacturing Technology*, Washington, National Academy Press, 1986.

States are upgrading occupational education programs to embody new technologies and to use occupational courses to deepen the technological skills of nonvocational students:

> Athena Junior High School in Greece, **New York**, has required all students to take industrial arts courses since it opened seventeen years ago. Its success inspired New York to use it as a model for their 1984 vocational education reforms that have replaced all industrial arts terminology with technological language, embedded keyboarding into elementary language arts, and established tests for computer literacy at third and sixth grade. In high school, the reforms establish core courses in communications, production, transportation, electronics, energy, and drawing for all occupational education courses.[23]

> To strengthen students' grasp of "generic" technical skills, states from **New York** and **North Carolina** to **Oregon** are changing from job-specific occupational programs to broadly defined "cluster-related" programs.[24] For example, Bowling Green Technical School in **Kentucky** has created an industrial technology program combining subjects previously taught in separate programs, including computer numerical control, programmable controlling, robotics, pneumatics, hydraulics, and electronics.[25]

> Tektronix, an **Oregon**-based manufacturer of electronic equipment, tried to shift its traditional assembly line workforce to a flexible manufacturing system four years ago. The company discovered that 20 percent of its production workers lacked rudimentary skills needed for the transition. Tektronix is solving the problem by contracting with the nearby Portland Community College to run a remedial on-site program in basic math and English for its many non-English-speaking assemblers. Tektronix has

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23. James E. Good, "New York State Curriculum Plans," *Technology Teacher*, February 1986, pp. 72–78.

24. Gulf South Research Institute, *Vocational Education in Louisiana*, Baton Rouge, LA, 1987, appendix A.

25. Ibid., pp. A1–A13.

added to the program courses to enhance such skills as team building, negotiating, and effective time management.[26]

Technology—taught as a fusion of science with occupational skills—is proving an effective way to blend vocational and academic streams. The International Technology Education Association has counted 1,200 schools in forty-seven states offering Principles of Technology courses as part of their occupational education curricula.[27] The course teaches basic physics concepts such as force and energy through hands-on experiments. One of the developers of the course, Dan Hull, explains: "Only 12 percent of high school students study physics. Yet physics is the foundation of most new technologies. So we said: 'Let's take physics and put it in work clothes.'" Students improve their understanding of physics more extensively through the principles course than through regular academic physics courses.[28]

States occupational education programs are preparing students to work in the new technological environments even in rural areas. For example, the University of North Dakota Industrial Technology Department developed five independent, self-contained, transportable laboratories with supporting curriculum materials on Laser/Fiber Optics, Photovoltaics, Computer Assisted Drafting and Machining, and Robotics. Teachers from twelve local schools and 726 students were taught during 1988.

Occupational Education Produces Scientists as Well as Technicians

The shortage of skilled people is widespread. It is particularly severe in technical subjects—areas that often build upon interests developed in high school occupational education programs. Occupational education trains technologists, but it often lays the foundation for scientific education as well by broadening the appeal of scientific and engineering subjects to high school students. The small numbers of high school students majoring in the sciences and their poor overall performance in math and science subjects is a major concern to the National Science Foundation, which estimates that the nation faces a shortage of 27,000 science PhDs by the end of the century. If more students enroll in occupational education today, the number of science Ph.Ds in the future will grow.

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26. *Fortune* , April 11, 1988.

27. "Reading, 'Riting, 'Rithmetic, and Now Tech Ed," *BusinessWeek*, October 19, 1987, p. 114.

28. Perry, "New Improved Vocational School."

> Sandy Union High School, Oregon, has developed a model environmental science course using a multi-use trail on 40 acres of woodland owned by the school. Students are team taught everything from zoology and physics to forestry and photography by both vocational and science teachers.[29]

Technological Change Made Occupational Education More Important

Occupational education is not a substitute for reading, writing, and the ability to reason. But occuaptional programs can teach abstract subjects such as physics, chemistry, and biology through a hands-on learning environment. In addition, occupational education allows students to understand the workplace, to become familiar with technologies, and to acquire applied skills. Education that combines job-specific skills with basic skills raises productivity and employability more effectively than education that provides only strong basic skills.[30] Our experience shows, not surprisingly, that "occupational skills have a larger direct impact on productivity than basic skills," but that "basic skills and occupational skills are both essential."[31]

In summary, technological progress increases the value of occupational education and reinforces the importance of strong conceptual skills.[32] Employees must be able to learn, to participate in decision making, to work in teams, and to solve problems. Employers need people who are familiar with basic technologies so that they can be trained in the specific skills needed on the job and retrained when those capacities become obsolete.

As the State Directors of Vocational Education recently argued:

> During the next two decades, technological advances and increasing international competition together with demographic shifts may change our nation and our way of life more dramatically than at any other time in our history...How can we prepare ourselves...for individual and national success? Through expanding our national commitment to education.

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29. *A Step-by-Step Guide to Integrating Science Concepts and Vocational Skills in the High School Classroom*, Sandy, OR, Sandy Union High School District 2.

30. J. E. Hunter and R. F. Hunter, "The Validity and Utility of Alternative Predictors of Job Performance," *Psychology Bulletin* 96, no.1 (1984), pp. 72–98.

31. John Bishop, *Occupational Training in High School: When Does it Pay Off?* Working Paper no. 88-09, Ithaca, NY, Cornell University, 1987.

32. Tan, *Private Sector Training*.

3. THE INTERNATIONAL TRADE IMPERATIVE

> The American economy has died and been replaced by a World economy. There is no such thing as a national economy in the way we used to talk about it 20 or 30 years ago, because it is becoming fully integrated with the rest of the world.
>
> Lester Thurow, 1986

As international trade grows in importance, the demand for skilled labor in the United States accelerates relative to the demand for unskilled and semiskilled labor. The United States, increasingly, is specializing in exporting human-capital-intensive goods and services and importing goods and services requiring less skilled workforces.[1]

For decades after World War II, trade was of little overall importance to the U.S. economy. In 1950, exports totaled about 5 percent of GNP and imports 4 percent.[2] But since 1970, international trade has expanded, and the pace has accelerated since 1980. It has brought U.S. residents a growing variety of consumer goods—from economy cars and televisions to clothes and shoes. It has opened markets for alert domestic producers able to judge the demands of foreign markets. Trade has also opened a flood of foreign goods that compete with domestic firms.

The United States, as a whole, benefits from trade—the value of the new goods and services it is able to import is greater than the exports that it ships overseas to pay for them. But although trade has created new opportunities in export industries, it has reduced jobs in those industries where imports have risen. In the United States export industries tend to be those employing skilled workers. Import industries tend to employ less-skilled workers. While most benefit from trade as consumers, and some benefit as employees, some people lose from it. Occupational education provides our export industries with a skilled workforce and helps those who lose to build alternative careers.[3]

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1. Ann P. Bartel and Frank R. Lichtenberg, "The Skill Distribution and Competitive Trade Advantage of High Technology Industries," *Advances in Industrial and Labor Relations* 4 (1987), pp. 161–176.

2. Ibid., p. 283.

3. Office of Technology Assessment, *Technology and the American Economic Transition*, Washington, U.S. Congress, May 1988.

The Expansion of Trade Has Increased the Demand for Skilled Employees While Shifting Unskilled Jobs Overseas

> The only direct advantage of foreign commerce consists in the imports.
>
> John Stuart Mill, 1854

Trade occurs because nations differ in the goods and services that they are *relatively* good at producing, not because they are absolutely more efficient than other nations. As the level of international trade expands, *all* nations necessarily produce *more* of those goods and services in which they enjoy a comparative advantage and relatively less of other goods and services in which their trading partners enjoy a comparative advantage. Trade is, after all, the exchange of goods among nations in which all participants gain.

The U.S. Balance of Trade—Exports minus Imports—Has Deteriorated during the 1980s

The trade deficit has become a major national concern. As more nations have reached a level of development that allows them to participate in trade, the market share of U.S. manufacturers in world exports has, inevitably, declined—from 13 percent in 1973 to 10 percent today—even though the level of U.S. exports has risen. From approximate balance in 1980, the U.S. current account trade deficit—the difference between the value of U.S. goods and services sold to foreign buyers and the value of goods and services made overseas purchased by U.S. buyers—has reached record levels; the May 1989 trade figures projected an annual deficit of over $135 billion. About 80 percent of this deficit has been attributed to increased imports since 1979 of manufactured durable goods—electronics, automobiles, steel, and apparel—a development that has caused concern about the ability of the United States to compete in foreign markets.

The rapidity with which trade has expanded has led to painful shifts in the U.S. economy. Traditional industries have shrunk—shoes in Maine, steel in Ohio, and copper in Arizona. But shrinking of traditional industries does not reflect the failure of U.S. firms to compete as much as the exploitation of our comparative advantage: shrinking industries are those in which the United States no longer enjoys a comparative advantage.

Most of the jobs lost when imports climbed over the past two decades, therefore, have been semiskilled and unskilled jobs in manufacturing. And most of the jobs gained

through the growth of exports require relatively high levels of human capital.[4] For example, a major study by the Office of Technology Assessment of U.S. trade patterns in 1984 found that job losses were concentrated in low- and medium-wage manufacturing while gains were concentrated in high-wage manufacturing, transportation, and transactional activities, which include finance (see table 8).

Table 8

The Impact of 1984 Trade on U.S. Domestic Employment

	Percent of Jobs in Sector		*Jobs as % of*
Sector	*Lost to Imports*	*Gained from Exports*	*of Total Jobs in U.S*
Natural resources	8.2%	8.1%	3.5%
Construction	3.9	2.9	4.5
Low wage manufacturing	16.9	5.6	4.6
Medium wage manufacturing	25.9	23.7	9.6
High wage manufacturing	1.6	15.8	5.9
Transportation & trade	15.2	27.6	26.3
Transactions	8.7	12.9	13.0
Personal services	1.5	2.1	5.5
Social services	1.0	1.3	27.2

Source: Office of Technology Assessment, *Technology and the American Economic Transition*, p. 291.

Two researchers who recently reviewed the relationship between human capital and earnings for two decades concluded that the rapid growth of the trade deficit since 1979 has been the primary force in driving up the demand for educated labor. At the same time, expanded trade has reversed the narrowing of black/white wage differentials because "import" industries were those that had traditionally offered well-paid jobs to minority and unskilled employees.[5]

Continued loss of world market share by the United States is inevitable. But this does not imply that U.S. exports are shrinking or that its industries are weakening, only that there are more nations trading and that nations are enjoying the benefits from greater specialization. In 1973, the United States shipped 13 percent of world exports of manufactures. Last year, it shipped about 10 percent.

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4. Kevin Murphy and Finis Welch, *Wage Differentials in the 1980s: The Role of International Trade*, Paper presented at Mont Pelerin Society General Meeting, September 1988.

5. Ibid., pp. 2–5.

The U.S. Comparative Advantage, Increasingly, Is in Goods and Services Requiring Highly Skilled Employees

> The world is growing smaller. Fiber optic networks span the continents. Billions of dollars move in seconds from Milan to Tokyo to New York. Goods move around the world in a single day. An individual product may contain parts manufactured in five different countries and be assembled in a sixth. New markets and opportunities emerge almost over night. In this competitive and rapidly changing environment, success belongs to those who can anticipate, adapt, and respond quickly.
>
> Virginia Governor Gerald Baliles, 1988

Aggregate trade data hide important sources of strength. The United States has enjoyed a positive balance of trade in high-tech industries while experiencing a growing deficit in traditional industries. In 1984, exports of high-tech goods of $29.1 exceeded imports of $26.3. Traditional industries experienced a deficit of $39 billion (on imports totalling $77.5 billion).[6] Although high-tech industries accounted for 9 percent of manufacturing employment in the United States in 1980, they accounted for 44 percent of manufacturing exports. Less than 5 percent of the output of traditional industries was exported, while 40 percent of high-tech output was sold overseas. High-tech industries, as we saw in the preceding chapter, employ workers with greater skills than those in traditional industries.

New technologies and the evolution of worldwide capital markets means that many less-developed countries are able to produce "capital-intensive" goods such as steel and automobiles whose production technologies are relatively mature—demanding large investments in plant and equipment and using a relatively unskilled workforce. The United States, on the other hand, is specializing in the production of goods and services whose technology is rapidly changing and where it can profitably deploy its well-educated workforce.

In 1980, the United States had by far the most educated labor force among developed countries. One in nine members of the civilian labor force had reached what UNESCO calls the third level of education, defined as "the successful completion of education at the secondary level—including high school, teachers' training school, vocational, or technical school." The nations with the next highest percentages of third-

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6. See Ann P Bartel and Frank R. Lichtenberg, "The Comparative Advantage of Educated Workers in Implementing New Technology," *Review of Economics and Statistics* 64, no.1 (February 1987), pp. 62–76.

level education include the Netherlands (5.3 percent), Sweden (4.7 percent), Japan (4.5 percent), and the United Kingdom (2.0 percent).

In fact, contrary to conventional wisdom, American workers remain far more productive than workers in any other nation. In a year, the average American worker produces goods and services worth 20 percent more than those in Germany. 40 percent more than those in Britain, and 50 percent more than those in Japan.[7] For each hour worked, American employees are about twice as productive as employees in Japan. The United States enjoys a comparative advantage in exporting the products of its high technology industries (and of other activities that rely on U.S. "thoughtware" rather than its hardware).

The United States has created this comparative advantage over many years of investing in education. While Western Europe was rebuilding its physical plant after World War II, the United States created the G.I. Bill that extended participation in postsecondary education. States have rapidly increased spending on postsecondary education and training institutions. Yet federal and state development strategies still concentrate on supporting traditional industries—through tax benefits, import tariffs and quotas (voluntary and involuntary), capital subsidies, customized training programs, and other means.[8] If these measures are successful, they will delay the movement of resources—human and physical capital, and management—into more productive uses in emerging high-tech industries.

The growth in trade is a response to many factors, including reductions in trade barriers (tariffs, quotas, and regulations), the creation of global capital markets, falling transportation costs, and new technologies that make many activities "portable," allowing less-developed countries to industrialize and for companies to operate globally. Almost all the goods and services we use today are international, that is, they embody products, know-how, finance, and resources of many countries.

Comparative advantages change as nations develop their capacities to produce and new nations enter the trading arena. These shifts are impossible to predict and occur quickly since trade multiplies the number of firms developing and marketing new products.

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7. Treasury of the United Kingdom, *Economic Progress Report, 1989*, described in *Economist*, May 29, 1989, p. 61.

8. See Marianne Clark, *State Development Strategies*, Washington, National Governors Association, 1986; and Richard Mackenzie, *The Great American Job Machine*, Washington, Cato Institute Press, 1988.

Actions by governments also change comparative advantages—often inadvertently. By pursuing a cleaner environment, for example, the United States has exported some relatively "dirty" jobs in steel and mining. *Trade, therefore, creates an imperative: adapt quickly or fall behind.*

Implications: Occupational Education Promotes Faster Adaptation to a Competitive Global Economy

> The nations of the earth are now engaged in a race for commercial supremacy, and in that race today Germany is taking the lead...This is in large measure, owing to the fact that she is more progressive in the matter of industrial education than any other nation in the world.
>
> *Congressional Record*, 1912

Because the United States has the best-educated workforce of any nation, the rapid expansion of international trade is leading it to specialize in the production of goods that require highly educated employees. The corollary of this growing specialization in knowledge-intensive activities is that the United States is also importing a growing volume of goods that require heavier capital investments and relatively larger numbers of unskilled or semiskilled employees. The United States is, in effect, "exporting" jobs for people without much education. The Office of Technology Assessment recently concluded:

> Keen international competition has made a capacity for making and marketing products from new technologies critical for survival. Success often hinges on an ability to react quickly, to provide consistent quality, or to tailor products to highly specific applications...the composition of a nation's trade is increasingly a function of the skills and education of its workforce.[9]

The problems of workers displaced by trade, which some observers have attributed to the "failure" of the United States to compete in foreign markets, are due in part to the fact that the United States has established leadership in producing goods that demand well-educated employees and in part to the corollary—a comparative disadvantage in producing goods that demand greater investments in physical capital. Economic development policies that subsidize ailing, capital-intensive, traditional industries—through import quotas, for example—may impede the United States from exploiting its comparative advantage. Instead, our economic policy must concentrate on raising the occupational qualifications of those workers displaced by the growing trade.

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9. Office of Technology Assessment, *Technology and the American Economic Transition*, p. 285.

The production of goods that are both knowledge-intensive and characterized by rapid advances in technology relies heavily on highly educated employees and uses little physical capital relative to labor. Therefore, incentives offered by state and local development agencies that attempt to attract high-tech firms by subsidizing physical capital—through tax abatements, low-interest-rate loans, and direct grants—may not prove as effective as measures to increase the quality of the local workforce. Capital subsidies will be more attractive to traditional industries where technologies are mature, workers can be trained on the job, and capital costs are relatively larger.

Occupational Education Helps Displaced Workers Change Careers

> One of my most vivid early recollections is the great trouble that came to the silk weavers when machinery was invented to replace their skill and take away their jobs. No thought was given to these men whose trade was gone.
>
> Samuel Gompers, 1922

To produce more skilled workers, the nation must "recycle" the two million people displaced each year when their companies shrink or close. Occupational education helps people move from declining to expanding occupations and sectors by providing a commmitment to lifelong learning and training:

> The Francis Tuttle Center in Oklahoma City, **Oklahoma**, enrolls students who range in age from 16 to 60, in classes that run from 7:30 am to 10 pm, six days a week, with multiple entry and exit points (based on aptitude tests).

> **Oregon** has developed a new approach to occupational education that recognizes that, although only about 25 percent of new jobs require a university degree, the skills required by the other "nonuniversity" careers are growing. They have created a "vocational education" continuum, serving part-time employees and mature students and providing multiple entry and exit points.

Occupational education programs can retool workforces and preserve local businesses:

In Lewiston, **Idaho**, the Potlatch Corporation closed an antiquated logging mill, laying off four hundred people. Funds from the state voc-ed program, the corporation, the union, and Lewis-Clark State College were used to upgrade the workers' skills, enabling the plant to renovate and reopen.

In **Nebraska** last year, a biotechnology training program in a community technical college retrained fifty-nine displaced farmers.

Michigan has combined the resources of its JTPA system with those of its postsecondary voc-ed system to create the *Quik Start* program. Employers who need to upgrade or retrain their workforces can use customized training programs offered through local community colleges and vocational schools.

California created the Employment Training Panel in 1982, funded by a state surcharge on the unemployment insurance tax. A panel of business representatives uses the $50 million annual proceeds to fund training contracts for the company workforces that need retraining. Local vocational programs have been heavily used.

Occupational Education Can Train People in the Skills Businesses Need to Participate in World Markets

Penetrating international markets is by no means an easy task—it requires businesses to master the intricacies of contracts, tariffs, finance, and marketing to societies with different tastes. Occupational education can provide the foundation for learning these techniques, starting in high schools:

At Mount Edgecumbe High School in **Alaska**, one-third of the 160 students—most of whom are native Americans—are engaged in an intensive Pacific Rim program. Students learn of foreign cultures, foreign languages, and apply what they have learned preparing smoked salmon and marketing it in Asia.

Waukesha County Technical College in **Wisconsin** received the Governor's export achievement award in 1987 for a program that offers dozens of detailed technical seminars on videotape that help businesses

create export programs. The seminars cover topics from the "do's and taboos of gift giving and gestures when dealing with overseas customers" to "how to ship ocean freight."

Occupational Education Is Also Vital to Maintaining the United States Comparative Advantage

We no longer face the option of shutting our frontiers to trade. Singapore Prime Minister Lee Yuan Yew argued that economic development policy today must recognize, not fight, the links that trade has forged: "The crux of the problem is whether leaders in both industrial and developing countries have adjusted intellectually and emotionally to this being one interdependent world."

Success of our trade competitors has not depended on low wages and the exploitation of unskilled labor. It has depended on heavy investments in human capital; therefore, U.S. competitiveness will depend, also, on investments in occupational education. In 1970, only 40 percent of young South Koreans enrolled in school. Today, 85 percent enroll.[10]

Recognizing our growing interdependence means recognizing the growing importance of investing in human capital and also recognizing that we must find ways to deal with the consequences of displacement more effectively than we now do. Despite these disruptions, "the greatest meliorator in the world," Ralph Waldo Emerson observed, "is selfish huckstering trade." Occupational education is among the most cost-effective ways to make the investment in human capital necessary to maintain our competitive position in the world economy and take advantage of these benefits while dealing with its adverse consequences.

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10. Ibid. For a discussion of the importance of the quality of Asian education see Harold M. Stevenson, "Mathematics Achievement of Chinese, Japanese, and American Students," *Science*, February 14, 1986.

4. THE ENTREPRENEURIAL IMPERATIVE

> But what most astonishes me in the United States, is not so much the marvelous grandeur of some undertakings, as the innumerable multitude of small ones.
>
> Alexis de Tocqueville, 1835

For nearly three decades after World War II, economic activity was relatively concentrated. In 1970, the Fortune 1000 employed nearly two-thirds of the workforce and created a comparable share of the new jobs. Today, the Fortune 1000 employ little more than one-third of the workforce and create—at least directly—an even smaller share of new jobs.

Most new jobs in the United States are created as the result of the birth of new businesses or the expansion of businesses less than five years old. Therefore entrepreneurial skills are an important part of the nation's stock of human capital. At the same time, these new businesses demand employees who can perform many different tasks and who can grow with the business, but new businesses are less able to train their employees in-house than are large businesses. Occupational education is an important resource in supporting the entrepreneurial economy.

Policymakers have only recently realized the importance of entrepreneurs. In part, this is the result of the absence, until recently, of any reliable data on jobs created by new business. Therefore, national and local development policy has focused on providing incentives—tax abatements and direct grants—to influence the location and investment decisions of large established firms.[1] But during the 1970s, the extraordinarily rapid growth of Silicon Valley businesses—largely without the benefit of these incentives—drew attention on the importance of enterprising and risk-taking people When public policy discovered the entrepreneur, it also uncovered a new role for occupational education.[2]

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1. The relationship between entrepreneurship and economic development policy is examined in greater detail in Roger Vaughan, *Mixing Metaphors: Education and Economic Development*, Institute for Education and the Economy, Columbia University, 1989. See also Roger Vaughan, Robert Pollard, and Barbara Dyer, *The Wealth of States*, Washington, Council of State Policy and Planning Agencies, 1986.

2. The term was coined in the seventeenth century by French economist Jean Baptiste Say. He defined an entrepreneur as anyone actively seeking new and more productive ways to use resources--by introducing new products or services, by developing more efficient ways to make things, or by opening up new markets. The concept was developed in the 1920s by Austrian economist Joseph Schumpeter

Most New Jobs Are Created by New Businesses

> The entrepreneurial spirit, the potential for discovery, is always waiting to be released. Human ingenuity is irrepressible and perennial; and to release it requires an environment free from special privilege or blockages against new members.
>
> Israel Kirzner, 1984

In 1978, MIT professor David Birch published the first statistics showing how many jobs were created by new businesses. His study based on business incorporations has become the most widely cited and, possibly, the most influential study in economic development literature.[3] Initial attention was drawn to his finding, later disputed, that between 1969 and 1976 businesses with fewer than twenty employees generated 80 percent of the new jobs, while the share of total employment in large enterprises was shrinking.[4] The less-noticed fact—and one that has proved statistically more robust—was that half of all new jobs were generated in businesses during their first three years, even after allowing for the somewhat higher death rate of young companies.[5] Because his data are limited to incorporations and exclude other forms of business, they probably understate the overall importance of entrepreneurship.

Each year, it appears, total employment grows by about 2 million, about 600,000 new incorporations occur, about 1 million new businesses are created, and half a million people enter self-employment.[6] Nearly one-sixth of the workforce heads a business (many in addition to regular work). There are 18 million businesses in the United States today, and the Small Business Administration estimates that by the year 2000 there will be 25 million businesses. As the number of businesses increases, the average size of firms is shrinking. Between 1977 and 1985, while total output of goods and services in the United

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in *Theory of Economic Development*, University of Chicago Press, 1926. Since the late 1970s there has been a spate of books and research on the issue.

3. The original 1978 study was not formally published, but it circulated rapidly, aided by the author's strenuous speaking schedule. In 1981, a version entitled "Who Creates Jobs?" was published in *Public Interest*, Autumn 1981.

4. Catherine Armington and Marjorie Odle, then of the Brookings Institution, arrived at much lower figures. The different estimates are reviewed in Robert Friedman and William Schweke, "The Debate over Who Creates Jobs," *Entrepreneurial Economy*, August 1983, pp. 4–8.

5. Catherine Armington and Marjorie Odle, *Sources of Employment Growth, 1978–80*, Paper prepared for the Second Annual Small Business Conference, Bentley College, MA, 1982.

6. *Economist*, January 21, 1989, p. 67.

States grew by 34 percent, the average output per firm fell by 20 percent in services, 31 percent in construction, 7 percent in manufacturing, and 58 percent in mining.[7]

Although there are no nationwide data on new jobs in new firms, recent research in a few states has uncovered consistent evidence of the dominant role that new entrepreneurship plays in creating new opportunities:

> In **Maine**, a state that has experienced rapid growth over the past five years, 18 percent of all jobs at the end of 1987 were in businesses that had been created since 1981, a period when total employment had grown by less than 14 percent.[8]
>
> In **Iowa**, a state that had experienced severe economic problems over the past five years, 13 percent of the jobs at the end of 1987 were in firms that had not existed five years earlier. Total employment grew by less than 5 percent during those five years.[9]
>
> Jobs created by new firms accounted for more than half of the new jobs created in **Minnesota** between 1978 and 1986.[10]
>
> In **North Dakota**—which has a very low rate of business incorporations—20 percent of people working at the end of 1988 were employed in businesses less than five years old while total employment had grown by only 11 percent.
>
> Between 1975 and 1985, the share of the workforce that is self-employed grew from 5.4 percent to 7.9 percent.

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7. Ibid.

8. Mark Popovich and Terry F. Buss, *Rural Enterprise Development: A Maine Case Study*, Washington, Council of State Policy and Planning Agencies, 1989.

9. Terry F. Buss and Mark Popovich, *Rural Enterprise Development: An Iowa Case Study*, Washington, Council of State Policy and Planning Agencies, 1987.

10. Paul Reynolds and Brenda Miller, *1987 Minnesota New Firms Study: An Exploration of New Firms and Their Economic Contribution*, Center for Urban and Regional Affairs, University of Minnesota, 1988.

Although different studies use different data for different time periods and therefore cannot be directly compared, all demonstrate the primary role of the birth of new businesses in creating new opportunities—regardless of prevailing economic conditions, region, or local economy. The rising importance of new forms is not limited to the United States. During the 1960s, small firms created less than half the new jobs in Japanese manufacturing. Today, they create all of them.[11]

It is through the birth of new enterprises that economies diversify and draw upon the diverse talents of their populations.[12] In Iowa, for example, less than 15 percent of the new firms in rural communities were linked to the ailing farming sector. Entrepreneurs were creating jobs that were less tied to the boom-bust farm cycle.

Who Are Entrepreneurs?

If Silicon Valley drew attention to the importance of new businesses, it also created a stereotype: entrepreneurs must have advanced engineering degrees, a patent for a piece of arcane computer hardware, and plan on going public before their twenty-first birthday. In fact, the true picture of entrepreneurship is very different:

> *Creating new businesses is not limited to highly trained engineers and high-income households.* Eight percent of the 2.8 million dislocated workers who were reemployed between 1979 and 1984 did so by self-employment.[13]

> *Many of the poor already earn some income through entrepreneurial efforts.* Six percent of AFDC single parents and 27 percent of Food Stamp recipients in **Minnesota** reported self-employment income in 1984.[14]

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11. David S. Birch, "Yankee Doodle Dandy," *INC Magazine*, July 1987.

12. Vaughan, Pollard, and Dyer, *Wealth of States*.

13. Paul Flaim and Ellen Sehgal, "Displaced Workers of 1979-1983: How They Fared," *Monthly Labor Review*, June 1985, p. 15.

14. Internal document of the Minnesota State Planning Agency, Human Services Division, December 1985, pp. 1–2. Much higher numbers were interested: one-third of AFDC single parents responding to the survey said they were interested in starting a business and could name the specific business they wanted to start. In addition, 25 percent of General Assistance recipients, 30 percent of AFDC-UP recipients, and 36 percent of Food Stamp recipients expressed interest in starting businesses. See Robert Friedman, *Safety Net as La' 'r*, Washington, Council of State Policy and Planning Agencies, 1988.

Occupational training can provide a good basis for starting a business. One-sixth of new business owners surveyed in Ohio have taken occupational courses.

More educated people are more likely to become entrepreneurs, but the effect is not strong. A recent analysis of self-employed people found that the only characteristic distinguishing them from people working for others was that they were more likely to have a father who had been self-employed.[15] Example, it appears, is a powerful influence.

The recent rapid increase in business formation rates is an indirect consequence of technological change that is allowing the decentralization of economic activity. New businesses can enter markets more easily and large corporations are able to contract out for more specialized products and services.

Implications: Occupational Education Promotes Entrepreneurship

> [teaching entrepreneurship by helping people create their own businesses] makes the course immediately and personally relevant; and it gives each person a concrete project as a goal. Psychologically, it is the litmus test for determining how committed a person is to the training and to getting into business. Intellectually, it is a very demanding task that forces a person to think in a logical manner through the steps that he or she will have to take in order to launch a successful venture. In the process, it also helps the fledgling entrepreneur make as many mistakes as possible but to do so on paper and not when it is too late.
>
> George Kanahele, founder of HETADI, 1981

The economic potential of policies to promote entrepreneurship is often overlooked because of the attention commanded by large businesses in the media. The press rarely describes the birth and growth of a new business. This conveys the view that opportunities are created by attracting firms from other localities and denying entrepreneurial role models. Nevertheless, because the number of relocating plants is declining, many states report that they have created or are in the process of creating programs to encourage the starting and expansion of new businesses (table 9).

Occupational education can promote entrepreneurship by teaching not only technical skills, but the skills that are needed to improve the chances of success of a new business venture. It is an often-repeated myth that entrepreneurs are born, not made: people can be

15. Richard Bingham, Cleveland State University, unpublished research.

Table 9
Number of States with Entrepreneurial Legislative Initiatives

Programs	*Prior to 1981*	*1981-87*	*1988*	*1989*
Technical assistance	5	23	7	6
Entrepreneurial training				
Welfare recipients	0	7	4	7
Unemployed	0	7	4	4
Other target groups	0	2	3	2
Seed capital	3	23	8	0

Source: Dan Pilcher and Barbara Puls, *1988 State Economic Development Survey Results*, National Conference of State Legislatures, February 1989.

taught many skills that will increase their chances of becoming entrepreneurs and of succeeding when they do start up their own businesses.

Because interest in entrepreneurship is relatively recent and because the process of starting a new business is complex, we do not know all the ways in which occupational education can encourage entrepreneurs. The Center on Education and Training for Employment in Columbus, Ohio, has created a model of entrepreneurial development that illustrates potential roles for occupational education programs.[16] The model reflects the view that occupational education is a lifelong commitment, begun in the lowest grades and continued through the unpredictable evolution of individual careers.

Teaching Entrepreneurial Awareness

People are more likely to consider self-employment or starting a business later in their career if they understand that new businesses are a major source of new opportunities and if they understand some of the issues involved in starting a business.

Yet traditional economics courses in high school have done a poor job in explaining what is involved in starting a business—often devoting more time to the learning of abstract concepts than in practical skills. Applied Economics, sponsored by Junior Achievement and pioneered in occupational education courses, is proving an effective way to help people understand more clearly how jobs are created. Occupational education programs provide an ideal forum for making students aware of how they could apply their occupational skills to the creation of a business.

16. These are summarized in *Entrepreneurship Education: Lifelong Learning for Small Business Success*, Center on Education and Training for Employment, Ohio State University, no date.

Business concepts can also be used to strengthen the teaching of basic skills: cash flow projections, for example, can teach simple arithmetic, and sales can be used to demonstrate the importance of the ability to communicate clearly. The importance of occupational education in laying this entrepreneurial foundation is demonstrated by the survey results in Ohio that found that one-sixth of all those owning businesses had majored in occupational education in high school.

In some high schools, students actually create their own businesses. In Rabun Gap, **Georgia**, for example, the Foxfire Fund, Inc., set up enterprises in the local high school producing books, records, tapes, and furniture. Munising High School in **Michigan**'s Upper Peninsula started a business making wooden pallets to give students real business experience as part of a course in practical business economics.[17] In **North Carolina**, the Rural Education and Action Learning program has encouraged several high schools to start entrepreneurial efforts that range from a boat rental business to a New York–style deli.

Training Potential Entrepreneurs

> You cannot tell who is going to make it and who is not. Everyone who wants to try deserves a chance.
>
> Patricia Montoya, Women's Employment Network

Between graduating from high school and actually starting businesses, there is a break in the learning model. Two thirds of new businesses are started by people between the ages of 30 and 49—usually after learning a particular trade or learning about local markets.[18] But several programs have demonstrated the importance of further education and training when people reach this stage in their entrepreneurial evolution.

The *Women's Economic Development Corporation* (WEDCO) is a Minneapolis-based not-for-profit corporation that helps women—mostly low-income women—develop business plans and secure financing for new businesses.[19] Founded by four women entrepreneurs, WEDCO is supported partly by a local bank so that clients have access to private credit and partly by foundations and fees. Since its inception, WEDCO has helped

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17. Vocational teachers were trained by Northern Michigan University's Department of Education which disseminates material and works with local chambers of commerce. Without local chamber sponsorship, local high schools cannot offer the course.

18. Terry Buss, David Gemmel,and Roger Vaughan, *New Businesses in the Upper Peninsula of Michigan*, Northern Michigan University, 1989, reviews comparable studies in Maine, Iowa, North Dakota, and Michigan's Upper Peninsula.

19. Roger Vaughan, "Eat More Salsa," *Washington Monthly*, May 1988; Friedman, *Safety Net*.

launch six hundred new businesses and expand three hundred existing ones, generating over one thousand jobs. The average capitalization required for these ventures was only $4,300. One-third of those helped were living in poverty—although there were no income qualifications to participate.[20]

Another example, the *Hawaii Entrepreneurship Training and Development Institute* (HETADI), proves that a pedagogical approach easily adapted to occupational education programs can assist entrepreneurs effectively. HETADI was set up in 1977 with U.S. Department of Labor funds to train low-income people to set up businesses.[21] It has since assisted over three thousand people in the United States, Africa, and Asia. During the first class, participants describe their proposed ventures. About 50 percent drop out because their ideas are impractical or because they lack the commitment. Those remaining meet weekly for three months preparing business plans for their enterprises. One-half of those completing the course set up their own businesses and have enjoyed a higher survival rate than comparable very small businesses set up by the population at large.[22]

Further occupational training can help people who are thinking about starting their own business. While no amount of advice and training guarantees success, most businesses fail not because basic ideas are unsound but because of the entrepreneurs' "incompetence, lack of managerial experience, and unbalanced experience."[23] Most loan applications are rejected because the applicant is unable to demonstrate that (1) they have viable projects, and (2) they have the skills needed to manage them. The model of occupational education can be applied to entrepreneurship.

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20. An illustrative case is that of two sisters, both working in low-paying jobs they disliked, who had a salsa recipe popular with friends. They needed credit to go into business which had been refused by local banks. With help from WEDCO, which included staff role playing bankers as the sisters applied for a loan, they put together a business plan which allowed them to secure a $18,825 loan from First Bank Minneapolis. In the first six months, they sold over $300,000 of salsa and other foods, working long hours but finding the effort rewarding.

21. Richard Kennedy, "HETADI: Serving the Poor Throughout the World," *Entrepreneurial Economy* 4, no.9 (June 1986), p. 8.

22. Arthur Young Inc., *Evaluation Business Starts among Graduates and Rejected Applicants in the HETADI Training Project Sponsored by the CETA Program of the City and County of Honolulu*,Unpublished Report, July 27, 1982.

23. For example, see National Federation of Independent Businesses, *Report on Small Business*, Washington, 1981, and Michael Kieschnick and Belden Daniels, *Innovations in Development Finance*, Washington, Council of State Policy and Planning Agencies, 1981.

Good advice can help people to evaluate risks and to master the mechanics of setting up and managing a business. It can also teach some people that they are not cut out to be entrepreneurs.[24]

These and other effective programs prove that entrepreneurial assistance can be an important part of occupational education. They are staffed by people who have started their own businesses. They are backed by local financial institutions. They help people develop their own business plans rather than providing general information. They offer personal as well as technical support. Some programs charge fees for services to participants. JTPA Title II and AFDC Work Incentive (WIN) program funds are used to pay for disadvantaged people who cannot afford fees—although, because the process of creating a business is slow, this type of training yields low placement rates and therefore is not widely used.[25]

Problems do not end when a business survives its first few months. Expansion brings new problems: there is a workforce to be hired, trained, and managed; expansion requires new financial techniques; and products must be marketed to an ever-growing number of customers. Small Business Development Centers, universities, community colleges, and vocational institutions have all demonstrated the potential value of providing further training opportunities to entrepreneurs as their business grows. For example, the Northern Economic Initiatives Center at Northern Michigan University has widened markets for craft businesses by sending entrepreneurs to trade shows.

Training Employees for New Businesses

Training programs are helping teach entrepreneurial skills, but also providing these new ventures with their workforces. Sixty percent of over nine thousand business surveyed in Ohio hired vocational graduates and stated that these employees were better prepared than those with no vocational training.[26]

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24. Meriwether Jones, "Lessons from Entrepreneurial Training Programs," *Entrepreneurial Economy* 4, no.9 (1986), pp. 2–10.

25. St. Paul's (MN) Women's Economic Development Corporation operates a Create Your Own Business program with JTPA funds. Hawaii's Entrepreneurship Training and Development Institute uses JTPA extensively. And Indiana offers a program for displaced farmers using JTPA funds to pay a private contractor. See Paul Roitman Bardack, "Economic Development Resources Inc., Contracting to Train the Local Entrepreneur," *Entrepreneurial Economy* 4, no.9 (June 1986), p. 12.

26. John Bebris and M. Catherine Ashmore, *Summary of Ohio Entrepreneurs Survey Results*, Columbus, OH, Center on Education and Training for Employment, Fall 1988.

Three-quarters of the people entering the labor force today find their first job in a company hiring less than one hundred people.[27] They will be called upon to perform a variety of tasks—someone who would serve only as a secretary in a large corporation would, when working for a small business, also deal directly with customers, purchase supplies, control inventory, and keep accounts.

Yet small entrepreneurial companies are less likely than large businesses to train employees on the job, and many state customized training programs are geared to meet the needs of large business.[28] The wave of new business start-ups must draw on local occupational education programs or fail to expand because they lack skilled labor.

A growing number of the graduates of occupational education courses will be creating their own businesses—some upon graduation, more after several years work experience. Successful entrepreneurship certainly requires more than the technical expertise offered in occupational education programs—the willingness to take risks, the imagination to spot market niches, and the ability to learn from mistakes. While these characteristics may not be easily taught, other necessary skills can be learned.[29] Since 1981, programs to teach the skills needed to start a business have assumed a modest but important place in the occupational education and economic development strategies of most states.[30]

The other side of the entrepreneurial economy is the fast pace with which jobs are lost when businesses shrink or disappear. The United States not only enjoys the highest birth rate of new businesses among developed countries, it also has the highest failure rate. New businesses are more volatile than larger businesses—they are more likely to expand,

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27. There are many different and often conflicting estimates of the importance of new businesses in the process of creating jobs; Birch, "Yankee Doodle Dandy," is the most cited source. But Birch uses Dun and Bradstreet data on incorporations which are unreliable. Not every incorporation is a new business, for example. Recent studies have been conducted in rural areas using unemployment insurance files which capture all new businesses in which at least one employee is covered by unemployment insurance--see Buss and Popovich, *Iowa Case Study*. These studies have found that jobs created in new business accounted for almost all job growth in most counties.

28. Anthony Carnevale, *Employer Investments in Training* , Washington, American Society of Training and Development Institutions, 1984.

29. Albert Shapero, "Entrepreneurship: The Key to Self-Renewing Economies," *Commentary*, April 1981.

30. *Entrepreneurial Economy* 4, no.9 (June 1986), for a summary of state initiatives and J. Norman Reid, *Entrepreneurship as a Community Development Strategy for the Rural South*, Washington, U.S. Department of Agriculture, Economic Research Service, August 1987.

contract, or close. Their employes, therefore, are more likely to change their occupation or even lose their jobs.

5. THE SHRINKING SUPPLY OF SKILLED LABOR

> The nation's ability to compete is threatened by our inadequate investment in our most important resource: people. Put simply, too many workers lack the skills to perform more demanding jobs.
>
> *Business Week*, September 19, 1988

Traditionally, the U.S. economy has met its growing demands for human capital by replacing each retiring generation of workers with new generations that are both more numerous and better trained. But today, fewer people are entering the workforce and many new entrants lack basic and occupational skills.

In 1975 there were 2 million Americans entering the workforce. In 1988, barely 700,000 Americans entered the workforce for the first time. Tests measuring the average educational attainment of high school students have fallen since the 1960s. Employers today, therefore, must fill increasingly complex jobs from a smaller and less well educated pool of prospective workers.

As the numbers of new entrants declines, the United States must make better use of its existing workforce—by ensuring that all new entrants are well prepared for work, by training those people who have not been part of the mainstream economy, and by retraining those whose skills have become obsolete. Occupational education programs help make better use of increasingly scarce labor supply.

The shortage of skilled labor is driving up earnings rapidly. Until recently, policymakers were more concerned with too much rather than too little human capital. During the 1970s, the well-educated baby boomers entered the workforce and drove down relative earnings of people with postsecondary education or training. The earnings of people with four years of postsecondary education relative to the earnings of those with only a high school diploma fell from 150 percent in 1965 to 130 percent in 1979. This shrinking premium prompted one economist to title an influential 1976 study *The Over-educated American.*[1]

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1. Richard Freeman, *The Overeducated American*, New York, Academic Press, 1976.

But since 1980, returns to education have risen sharply as a result of the growing demands of employers and the falling supplies of new workers.[2] By 1986 the earnings of those with postsecondary qualifications had leapt to 180 percent—a startling symptom of the sudden emergence of a human capital shortage.[3]

Fewer People Are Entering the Labor Force...

Human labor is not an end but a means.

Frederic Bastiat, 1843

The Number of People Entering the Workforce Has Fallen

Until the 1970s, most economists believed that "the most decisive mark of the prosperity of any country is the increase of the number of inhabitants."[4] But as many middle-class women were drawn into the workforce, driving up the "opportunity cost" of child raising, the U.S. birth rate fell sharply after the baby boom, despite the predictions of demographers. The number of women of childbearing age who give birth has fallen from 125 out of every thousand in 1960 to 60 today. At the same time, the rate of increase in labor force participation by women, which has been one of the major sources of labor force growth, is slowing.

With fewer new, young workers, the average age of the workforce is increasing. The number of sixteen- to nineteen-year-olds in the workforce is declining absolutely, and the share of the workforce aged twenty to thirty-four is falling. In the future, therefore, retraining existing workers will be a growing source of new labor skills. Not surprisingly, retraining will be limited to experienced and trained workers. Those without classroom credentials are much less likely to be retrained.[5]

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2. Kevin Murphy and Finis Welch, *Wage Differentials in the 1980s*, paper prepared for the Annual Meeting of the Mount Pelerin Society, September 1989.

3. Kevin Murphy and Finis Welch, *The Structure of Wages*, Los Angeles, Unicorn Research Corporation, 1988. After about six years in the workforce, differences between employees with twelve to fifteen years of schooling and those with more than sixteen years are small.

4. Adam Smith, *Wealth of Nations*, vol. 1, bk. 1, chap. 7, p. 72.

5. Jacob Mincer, *Labor Market Effects of Human Capital and of Its Adjustment to Technological Change*, Paper prepared for the Conference on Employer-Sponsored Training, Alexandria, VA, 1988.

And the Characteristics of New Entrants Are Changing

In 1986, nearly 45 percent of the workforce were white men, 35 percent were white women, 21 percent were minorities, and about one-sixth were immigrants.[6] White men will be only 10 percent of the growth in the workforce during the next decade, white women will make up 34 percent of the increase, minorities will be 56 percent of the new workers, and immigrants will provide nearly one-quarter of the new workers. A declining share of immigrants are working-age men—many are entering the United States as dependents and relatives of people already working in the United States.[7] Many, therefore, will need to enroll in occupational education programs before they can join the workforce.

Labor shortages are not new—but in the past, the United States could import skilled workers. In fact, until the depression in the 1930s, the rapid growth of the American economy often outpaced its skilled labor supply. In 1902, a contracting company in New York City was forced to import 4,900 skilled mechanics from Europe at fifty cents per day, about 20 percent above the union rate.[8] To retain competitiveness in the world economy, the National Association of Manufacturers argued: "As every manufacturing establishment must have first-class mechanical equipment and management, so also it must have in its workmen skill equal to that of its competitors."[9] Today, however, our skill requirements are much higher and the skill levels of many immigrants are relatively lower.

... And Many New Workers Are Poorly Prepared

> And as the economy comes to depend more and more on women and minorities, we face a massive job of education and training—starting before kindergarten. Can we afford it? We have no choice.
>
> *Business Week*, September 19, 1988

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6. Hudson Institute, *Workforce 2000, Indianapolis, IN, 1987.*

7. Anthony Pascal, *Immigration Issues for the 1990s*, RAND Corporation working paper, Santa Monica, CA, 1988.

8. Norton Grubb and Marvin Lazerson, *American Education and Vocationalism: A Documentary History,1870–1970*, New York, Teachers College Press, 1974.

9. Ibid., p. 96, cited in Stuart Rosenfeld, *Vocational Education and Economic Growth*, 20th Anniversary Seminar Series, National Center for Research in Vocational Education Ohio State University, October 1, 1985.

Many New Workforce Entrants Lack Basic and Occupational Skills...

For twenty years, the average educational attainment of students graduating from high school has been falling.[10] One high school student in four will fail to graduate, and scores on tests of academic achievement are declining.[11] Despite a little improvement since 1985, scores remain disappointingly low.[12]

A majority of high school graduates are unable to use bus timetables, locate the Pacific, identify the century in which the Civil War was fought, or understand the arguments in a newspaper article.[13] One-third cannot locate France on a map of Europe, one-third did not know that the Declaration of Independence signified the break with England by American colonists, and one-half were not aware that F. Scott Fitzgerald wrote *The Great Gatsby*.

The *National Assessment of Educational Progress* reports that although there has been some increase in math scores, only 6 percent of seventeen-year-olds could perform adequately on math questions requiring algebra or multistep problem solving. Most alarming, American students consistently rate at or near the bottom in international comparisons in math and science—the best American math students fall below the average score for Japanese students. Advanced American science students place ninth out of thirteen countries in physics, eleventh in chemistry, and last in biology.[14]

The poor relative performance of the United States in sciences must be seen in the context of the growing critical shortage of scientists in the United States. Only about 4 percent of college degrees are in the sciences or engineering, and the National Science Foundation estimates that the nation will face a shortage of twenty-seven thousand science PhDs by the end of the century. Occupational education in high schools is playing an

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10. William Bennett, *Education in America: Making it Work*, Washington, U.S. Department of Education, 1988.

11. Commission on Excellence in Education, *Nation at Risk*, Washington, U.S. Department of Education, 1983.

12. Bennett, Education in America.

13. Chester Finn and Diane Ravitch, *What Do Our Children Know*, New York, Columbia University Press, 1987.

14. International Association for the Evaluation of Education Achievement, *Science Achievements in Seventeen Countries*, Oxford, Pergamon Press, 1988.

increasingly important role in arousing student interest in scientific and technical subjects (see chapter 2).

...And the Problem Is Getting Worse

The Hudson Institute estimates that three-quarters of those entering the workforce between 1985 and 2000 will be qualified only for what the U.S. Department of Labor classifies as Level 1 and Level 2 jobs, those that require limited verbal and writing skills. But they will compete for only 40 percent of the new jobs—leaving many unemployed and, perhaps, unemployable. Only 25 percent of the new entrants will be qualified for three-quarters of the new jobs. In 1988 New York Telephone Company had to test sixty thousand applicants to fill three thousand entry-level vacancies.[15]

Unemployment rates do not reflect the full picture. Since 1980, the rate of discouraged workers—people no longer counted as unemployed because they are not actively looking for work—has been climbing despite falling welfare benefits.[16] Between 1979 and 1986, the number of discouraged workers nationwide rose from one million to early two million.

Six years ago, *A Nation at Risk* warned:

> The people of the United States need to know that individuals who do not possess the levels of skill, literacy, and training essential to this new era, will be effectively disfranchised, not merely from the material rewards that accompany competent performance, but also from the chance to participate fully in our national life.

This warning is even more urgent today. As the demand for educated employees grows, we are less and less able to afford the economic cost of lost productivity, the fiscal cost of their dependence on public support, and the social costs that accompany poverty.

Employers Cannot Fill the Skills Gap...

> It is no exaggeration to say that the struggle in which we are engaged may well be won or lost in the classroom.
>
> Michigan Governor James Blanchard, 1984

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15. *Business Week*, September 19, 1988, p. 105.

16. James A. Kadamus, *Worker Retraining*, New York State Department of Education, June 11, 1985.

Although a growing number of jobs require training on the job, employers concentrate on training those employees who have basic skills. They cannot remedy the failure to acquire workplace skills before entering the workplace. In 1986, over one-half of all employees reported receiving some form of postsecondary occupational training—about one-half of these at their own initiative and about one-half from their employers.[17] Two out of five men and one out of three women report that they needed occupational training (formal or on-the-job) to qualify for their present jobs,[18] and 26.7 percent of men and 28.2 women reported that they needed further training to upgrade skills on their current jobs.

Those with little education or training have little chance of being trained by employers: employers train only 45 percent of the high school dropouts they hire, but they train 70 percent of high school completers and 80 percent of those with some postsecondary education.[19] While many employers do operate special programs for disadvantaged workers, in general they are not well-equipped to undertake what Xerox chairman David Kearns calls "product recall work for the public school system."[20] After all, the employees taught basic skills by their employers can capitalize on their new skills by moving to other jobs. Those who are trained in skills *specific* to a job do not gain as much from moving. Therefore, less than 1 percent of corporate training budgets is devoted to basic skills development.[21] Small and new businesses, it appears, are even less able to deal with poorly prepared employees than large employers.

Employers do not train minorities and women as readily as white men, even if they have comparable educational attainment—perhaps because employers have had less experience with such employees in many skilled occupations and are less able to assess their abilities. One-half of white employees who had not completed high school were

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17. Lee Lillard and Hong Tan, *Employer Training: Who Gets It and What Are Its Effects*, Santa Monica, CA, The RAND Corporation, 1986, table 2.3.

18. Hong Tan, *Private Sector Training in the United States*, Paper prepared for the Conference on Employer-Sponsored Training, Alexandria, VA, 1988.

19. Tan, *Private Sector Training*, table 2.8.

20. David T. Kearns and Denis P. Doyle, *Winning the Brain Race*, San Francisco, Institute for Contemporary Studies Press, 1988.

21. Personal communication from Anthony Carnevale to Sue E. Berryman cited in Berryman's *Economy and Education: Many Miles To Go*, a paper prepared for the Seminar on the Federal Role in Education, Aspen Institute, Colorado, July 31–August 10, 1988. For a list of company programs teaching employees basic skills, see Jorie Lester Mark, *Let ABE Do It: Basic Education in the Workplace*, Washington, American Association of Adult and Continuing Education, Fall 1987. This report estimates employer investments in teaching basic skills at $2 billion annually.

trained by their employers, but only 40 percent of nonwhites were.[22] Female employees are less likely to be trained by their employers than similarly educated male employees.[23] For some occupations—despite public programs to prevent discrimination on the basis of sex and race—minorities and women need to use occupational education as the first step on a career ladder.

... Neither Can Special Programs to Train and Place the Disadvantaged

> A man who qualifies himself well for his calling, never fails of employment.
>
> Thomas Jefferson, 1811

Despite more than two decades of experimentation and many billions of dollars of spending, special programs to train and place the disadvantaged have not worked well. In large part, they have failed because they do not provide participants with adequate occupational skills or because they stigmatize participants in the eyes of potential employers. Mainstream occupational education programs, on the other hand, allow disadvantaged people to acquire marketable skills without stigma.

Emphasis on Placement Rather Than Training Has Meant That Special Programs Have Not Helped Many Disadvantaged People

Special training programs for the disadvantaged have served only a small fraction of that population. In 1980, for example, Robert Taggart estimated that the 700,000 who participated in Comprehensive Employment and Training Act programs during the year, and less than one-tenth of those in the labor force whose earnings (combined with those of other family members) fell below the poverty level.[24] Only about one-half of those participating were enrolled in classroom training—for an average of between 3 and 6 months. Under the Job Training Partnership Act, annual participation exceeds one million (one-half of whom were youth), but a much smaller share of participants (34 percent) receive classroom training, and many were in the classroom for only one or two weeks.[25]

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22. Tan, *Private Sector Training*

23. Lillard and Tan, *Employer Training*, p. 29.

24. Robert Taggart, *A Fisherman's Guide*, Kalamazoo, MI, W. E. Upjohn Institute, 1981.

25. Sar A. Levitan and Frank Gallo, *A Second Chance: Training for Jobs*, Kalamazoo, MI, W. E. Upjohn Institute, 1988.

By comparison, over 400,000 people were enrolled in postsecondary vocational education programs in 1980 for an average of over 1000 hours each.[26]

JTPA concentrates much more heavily than did CETA on developing job-finding skills for participants (34 percent of all participants compared with 11 percent). The average program lasts no more than two weeks and therefore can provide no skill development.[27] Under CETA, most people experienced little or no increase in wages as a result of passing through the program.[28] Most increases in earnings were the result of working more weeks. Those who received formal classroom training, however, enjoyed small increases in wages.[29]

Displaced workers have also not been well served by the creation of special programs.[30] Only about 15 percent of all displaced workers enroll in training programs, and only a small fraction of these find jobs that use their new skills.[31] While most displaced workers find alternative employment, the U.S. Department of Labor estimates that one out of three displaced workers lack marketable skills or recent occupational education and they cannot easily find other work.[32] Many of the steel workers left jobless in the Midwest during the past decade were highly skilled—but their skills were not easily transferred to other occupations. For those without sound, general occupational skills, displacement has led to despair.[33]

Economically disadvantaged people are also unlikely to be enrolled in state customized training used to recruit industry,[34] although a few community economic development agencies have signed first-source agreements with local Private Industry

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26. National Center for Education Statistics, *Digest of Educational Statistics: 1983–84*, Washington, 1985.

27. Levitan and Gallo, *Second Chance.*

28. Taggart, *Fisherman's Guide.*

29. Ibid.

30. Ibid.

31. Terry F. Buss and Roger J. Vaughan, *On the Rebound*, Washington, Council of State Policy and Planning Agencies, 1989.

32. M. Podgursky, *Job Displacement and Labor Market Adjustment: Evidence from the Displaced Worker Survey*, paper prepared for the Panel on Technology and Employment, OTA, 1987, and P. O. Flaim and E. Sehgal, "Displaced Workers of 1979–83," *Monthly Labor Review*, no.108, 1985.

33. The literature is reviewed in Buss and Vaughan, *On the Rebound.*

34. David Stevens, *State Industy-Specific Training Programs*, Department of Economics, University of Missouri, 1986.

Councils; industries receiving development assistance (loans, tax abatements, etc.) agree to try to hire graduates of local JTPA programs.[35]

Many states enrolled displaced workers in programs originally designed for the economically disadvantaged. Yet few displaced workers needed coaching in basic work habits. They need marketable credentials. Mainstream occupational education programs recycle workers far more effectively (see chapter 3).

Subsidies to Private Employers for Hiring the Disadvantaged Stigmatize Participants

As an alternative to training in special public programs, the federal government has tried using subsidies to induce private employers to hire and train the disadvantaged. Proponents hoped that the promise of "real" jobs as rewards for successfully completing training would motivate participants more effectively than attending traditional classroom training.[36]

Welfare grants have been employed for fifteen years as wage subsidies.[37] In the 1970s, MDRC diverted welfare grants to employers for several months as an experiment to encourage the hiring of their clients. The programs proved so cumbersome that MDRC's William Grinker concluded, "The effort expended certainly does not appear to justify short-term results."[38] Following the 1984 Deficit Reduction Act, states were allowed to divert welfare grants (without having to apply to HHS for a waiver), but the program met with little more success.

The Targeted Jobs Tax Credit provided employers a tax credit for hiring economically disadvantaged youth. Employers have showed little willingness to use it.[39]

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35. See COSMOS Corporation, *Best Practices in Training and Economic Development Linkages*, Washington, forthcoming.

36. Masanori Hashimoto, "Minimum Wage Effects on Training on the Job," *American Economic Review*, 72, no.5 (December 1982), pp. 1070–87.

37. Under waivers from the U.S. Department of Health and Human Services under section 1115 of the Social Security Act.

38. Harvey D. Shapiro, *Setting Up Shop: A Report on the Role of Revenue Generating Projects in the National Supported Work Demonstration*, New York, MDRC, 1983.

39. Only 27,000 credits were issued in 1985. Initially the credit was extremely popular, but many of the employers were using it retroactively--that is, they were determining, ex post, which of their new hires may be eligible and claiming a credit for them. Clearly, it was doing little to influence hiring decisions. See Levitan and Gallo, *Second Chance*.

Overall, being eligible appears to stigmatize recipients.[40] *The workplace does not appear to be the best place to remedy a lack of basic skills—even with subsidies.*

Implications: Occupational Education Prepares Disadvantaged Students, Raises the Skills of the Poor, and Brings Nontraditional Workers into the Workforce

Occupational Education Reduces High School Dropout Rates and Helps Dropouts Become Employable

Flexible occupational education programs are making productive employees out of dropouts, low-income students, and the unemployed. And they are succeeding where special employment and training programs have failed, by offering meaningful training in mainstream training programs that do not stigmatize participants.

> In Brooks County, **Georgia**, a poor, predominantly black community, high school students built and operate a day care facility so that poor mothers can work. The state has made this school-based enterprise the only secondary school in Georgia that graduates students certified as day-care workers. The school-based enterprise has also reduced dropout rates.[41]

> In blighted **West Philadelphia**, occupational education programs are being used to rebuild the neighborhood and to improve educational attainment. Classwork and skill-building projects are fully integrated: students learn geometry and carpentry by rehabilitating row houses; they learn math and business skills by operating school stores; they are learning music and mechanics by renovating a massive school organ; and they are learning biology by operating a greenhouse.[42] And far fewer students are dropping out.

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40. Reviewing a demonstration program in Dayton, Brookings fellow Gary Burtless concluded that "the amount of harm done by the voucher must have been considerable...employers appeared to interpret the voucher as implying 'damaged goods'" (Gary Burtless, "Are Targeted Wage Subsidies Harmful? Evidence from a Wage Voucher Experiment," *Industrial and Labor Relations Review* 39, no. 1 [October 1985]).

41. Stuart Rosenfeld, "Setting Goals for Vocational Education," Southern Growth Policies Board, Research Triangle Park, NC,1984.

42. William E. Nothdurft, "Parachute or Partnerships," *Entrepreneurial Economy Review* 5, no. 5 (January 1989).

The *Enterprise High* program, in **Michigan**, teaches students who are at risk of dropping out of high school by exploring the skills needed to start up new businesses. Participants spend one-half of each day "enterprising" and one half in the classroom. They are three times as likely to stay in school until graduation as similar students not participating, and 75 percent of graduates are fully employed.[43]

Occupational Education Brings Disadvantaged People into the Economic Mainstream

Occupational education programs can provide an effective path into the mainstream economy for many economically disadvantaged people. But to succeed, the programs must be marketed to disadvantaged people who may be unaware of opportunities or of how to take advantage of them. The programs must also remedy the lack of basic skills that hold back most disadvantaged people, and they must meet the special needs of the disadvantaged by providing placement assistance, day care, or help with transportation.

Assisting the disadvantaged has always been central to federal support of vocational education: the Perkins Act specifies that 20 percent of funds be spent on disadvantaged people and that 57 percent of funds be spent on meeting special needs. Most secondary and postsecondary occupational education already offers dropout prevention and recovery programs for disadvantaged students.

Arizona's "Model Minority Mentor" program recruited one hundred disadvantaged participants in 1988 and provided them with career development and vocational assessment services, helping most to find opportunities for well-paid careers.

Connecticut's "Business, Industry, and People" (BIP) program offered by Windsor Public Schools attempts to overcome the sex biases of seventh and eighth graders toward different occupations.

The most successful programs have targeted their resources at meeting the special needs of the disadvantaged so that they can acquire marketable human capital.

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43. Richard Benedict, "Enterprise High: Where Students Profit from Education," *Entrepreneurial Economy*, May 1988.

In **Ohio**, Adult Vocational Education Full Stop Service Centers provide a "one-stop" source of advice and special services for disadvantaged students, including ABE/GED, financial assistance, career services, and even child care.

In the **District of Columbia**, teen parents participate in a summer institute that prepares them for enrollment in full-time programs in which they are helped with transportation, child care, lab fees, and life-management skills.

The Single Parent/Homemaker project in **Oklahoma** offers education and training to single mothers; the program has more than doubled the earned income of participants.

Some states offer funding to low-income students so that they can continue occupational education after high school:

New York State has established a tuition assistance program for dislocated workers that provides up to $1,500 to approved training providers for each (JTPA Title III) eligible person enrolled in a program leading to employment.[44]

Michigan has created a tuition incentive program to pay community college course fees for disadvantaged people who graduate from high school. The state boasts that lack of money is no longer a reason why people end their education when they graduate from high school.

Other state programs concentrate on recruiting disadvantaged people for mainstream education and training opportunities by informing them of the enrollment requirements, sources of finance, and career prospects.

Maine has successfully enrolled disadvantaged people in a wide range of educational activities through the Work Employment, Education, and

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44. Kadamus, *Worker Retraining*, p. 12.

Training (WEET) program set up in 1981.[45] WEET provides employability assessment, counseling, referral to training and education, job search, OJT contracts, and assistance with related child care, transportation, and other costs. WEET enrolled 2,620 recipients in training and education courses, raised the number of AFDC recipients passing General Education Development (GED) exams annually from 72 to 171, enrolled 319 in postsecondary vocational technical institutes, and more than doubled the number attending the University of Maine from 269 to 648.

Maryland's School-Apprenticeship Linkage Program is a joint venture of the U.S. Department of Labor, the Maryland State Department of Economic and Employment Development, and the Maryland State Department of Labor. It allows students to complete their high school education while working part-time and to continue into apprenticeships when they graduate.

Occupational Education Programs Can Bring Nontraditional Workers into the Workforce

Occupational education programs can also bring nontraditional people such as immigrants and ex-offenders into the workforce. For example, immigrants with limited English often drop out of training programs.

At Portland (**Oregon**) Community College, fewer than one in ten students with limited English completed their programs. The completion rate rose to 80 percent when the college offered these students intensive, vocational-specific preparation classes prior to enrolling in mainstream programs.

The Chicago, **Illinois**, voc-ed system managed to reduce the failure rate among limited English students from 47 percent to 12 percent by providing bilingual tutors and paying peer tutors.

Oklahoma has created a program for nonviolent offenders including aptitude testing, occupational tryouts, and employability planning. The

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45. Linda Wilcox, "Jobs for Welfare Recipients: The Maine Experience," *Entrepreneurial Economy* 5, no. 3 (February 1987). From April 1982 to January 1985, WEET helped 3,287 AFDC recipients find jobs at an average entry wage that rose from $3.49 to $4.38 per hour.

recidivism rate is only 16 percent, compared with a statewide rate of 60 percent.

Hagerstown Junior College in **Maryland** works with three correctional institutions to counsel inmates, provide them with remedial training, and enroll them in mainstream programs. In 1988, nineteen graduates of the program received Associate of Arts degrees.

And, as the labor shortage becomes more acute, vocational programs are succeeding in placing more handicapped students in mainstream jobs.

South Carolina offers handicapped students an intensive vocational program, allowing students to choose by trying out different programs for several weeks. Graduates are offered special placement help which has led to an average placement rate of 73 percent over the past three years.

The occupational education system is, therefore, a vital bridge to the mainstream economy and to good jobs for millions of people, including the majority of high school graduates who are not bound for college, displaced workers, immigrants, and poor people. These people are not well served by the small number of places offered in special programs—many of which fail to enhance the long-term earnings of participants. These people are not likely to be trained by employers either, because employers cannot offer the remedial services and special help that many of these people need. Occupational education offers a proven, flexible, and cost-effective way of helping those who face fewer and fewer opportunities as our economy develops.

6. CONCLUSION: ECONOMIC TRANSFORMATION AND OCCUPATIONAL EDUCATION

> The business of education is not to make the young perfect in any one of the sciences, but so to open and dispose their minds, as may best make them capable of any, when they shall apply themselves to it.
>
> John Locke, 1691

In the past decade, the nation has become painfully aware that education and training are vital to its economic and social well-being. As employers search for people to operate new technologies, to provide new services, and to compete globally, they are facing a shrinking number of people entering the workforce, too many of whom are inadequately prepared.

The first wave of reaction to *Nation at Risk* and to the growing concern of parents and employers over the quality of education has been to concentrate on primary and secondary schools. For the most part, state and local governments have adopted simple solutions—raising teachers' salaries, reducing class sizes, and lengthening the school year.[1] A recent and exhaustive review of the results suggests that these measures have had little impact and are very expensive.[2]

Therefore, states are examining ways to raise educational performance by making education more accountable—to encourage better management and more effective use of resources. As they do so, occupational education programs are providing important lessons. Occupational programs have been accountable—reporting placement rates and, sometimes, the earnings of graduates—and responsive to the needs of local employers since their inception.

> A recent survey by the Office of Technology Assessment reports that thirty-seven states compile and publish placement rates for their vocational programs, seventeen use this data in regularly evaluating programs, and

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1. Summarized in William Bennett, *American Education: Making It Work*, Washington, U.S. Department of Education, 1988.

2. See Eric Hanusheck, *Education Reform:What Do We Know*, University of Rochester, 1989. See also John Chubb, "Why the Current Wave of School Reform Will Fail," *Public Interest*, no. 90 (Winter 1988); and Jack Brizius, "Education Reform: The Next Wave," *Entrepreneurial Review*, March 1989.

nine states mandate a minimum placement rate to retain eligibility for state funding.[3]

New Hampshire's Department of Postsecondary Vocational-Technical Education produces an annual re[illegible]rt that shows, for every occupation in each institution, employment experience, continuing education, salaries and unemployed, and, for each institution, percent employed in major field. The report also lists employers who hire voc-ed graduates. The state employs rigorous criteria for determining whether a program will continue: if enrollment is less than 80 percent capacity for two consecutive years or if less than 45 percent of freshmen graduate, the program is discontinued

In **Kansas**, the state matches the social security numbers of graduating students with employment security files to calculate the average placement rates and earnings for each program in all postsecondary institutions offering occupational courses.

In **Florida** the State Board of Community Colleges "flags" programs in institutions that perform poorly with respect to ten measures (including a 70 percent placement rate, graduation rate, enrollment) and works with them to improve performance. Those that fail to improve may lose accreditation and state funding.

In **Oklahoma** the State Board of Regents for Higher Education reviews all voc-ed programs offered by local institutions. External committees visit every five years, and detailed self-evaluation reports are required.

As a result, states are recognizing employers' growing need for occupational training. The National Conference of State Legislatures reports that twenty-seven states passed legislation creating or expanding training and retraining programs between 1981 and 1987 and eleven passed legislation in 1988.[4]

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3. Office of Technology Assessment, *Performance Standards for Secondary School Vocational Education*, U.S. Congress, April 1989.

4. Dan Pilcher and Barbara Puls, *1988 State Economic Development Survey Results*, Denver, National Conference of State Legislatures, 1989.

Postsecondary occupational education programs are embracing new technologies and are teaching the business skills needed by emerging occupations and industries. They are also exploiting their close relationships with employers to upgrade curricula and to teach entrepreneurial skills to the growing number of people starting their own businesses. This trend is the result of the flexibility to innovate that has been provided through federal funding and from state policies that have encouraged educators to listen closely to the needs of businesspeople as they design the curricula.

The importance of classroom training in learning occupational skills is growing. The increasing complexity of the skills demanded by employers is causing a growing number to replace their informal on-the-job training programs with formal classroom programs—many of which are offered by local occupational education institutions. Europe has traditionally relied on on-the-job apprenticeships, but employers' growing demands for more qualified employees has increased use of formal classroom training that resembles the postsecondary occupational education in the United States.

We cannot delegate skills training to employers because employers will rely increasingly on occupational education programs. Employers invest heavily in people with sound basic skills and little in remedial education because they are ill equipped to provide it. Employers cannot afford to invest in basic occupational training because trainees are free to move to other companies where they will receive higher wages for their new skills.

And it is also unrealistic and expensive to expect all new entrants to prepare for their careers through academic rather than occupational postsecondary training. For someone with a career in mind and little interest or aptitude for academic subjects, college is an inefficient way to learn about the world of work. College will always remain the choice of a small—although important—part of the workforce.

We Still Face Severe Challenges

> Education has in America's whole history been the major hope for improving the individual and society.
>
> Gunnar Myrdal, 1961

An economy passing through changes as fast and as far-reaching as those in the United States must constantly seek ways of helping those displaced abruptly and painfully. We must find ways to make our existing training and education systems serve employers

and employees more effectively. The occupational education system must play a vital and catalytic part in this process.

Policymakers and business leaders are beginning to link occupational education with economic development. But the link is not yet firmly rooted in the public's mind: policymakers must emphasize how investments in occupational education lead to increased incomes, more jobs, reduced dependence, and other visible outcomes.

Research has found that occupational education has lowered dropout rates, raised incomes of disadvantaged youth, and provided people with skills who would *not* otherwise obtain them.[5] It offers not simply technical skills, but an understanding of work that may help develop more positive attitudes. If education reform is to make a difference in the workplace—allowing the rapid adoption of new technologies, supporting U.S. firms in international market places, and promoting entrepreneurship—and extend the opportunity to participate as widely as possible, then the full potential of the occupational education system must be developed.

Just as the energy crisis spurred people into developing new ways of conserving and generating energy, the human capital shortage offers the chance to revitalize our education and training system. The nation's occupational education system must play an increasing role in directing and enhancing our human capital investments. Practices that are successful models today will have to become standard programs.

Occupational education is not a special program for special groups. It deserves serious attention as a way to meet *all* the new demands for employee skills and as a way to enhance the increasingly scarce supplies of skilled labor. And it deserves attention today, because delay crowds the workforce with more and more unemployed and unemployable people, raises the cost of scarce skilled labor, and renders employers less and less able to compete in world markets.

Occupational education, therefore, is central to the nation's human capital investments—an integral part of how all types of skill needs are met and supply barriers are overcome. As employers demand more and more competent employers, high school students—including the one-half who do not enroll in postsecondary education programs—must graduate with a broader understanding of the technologies they will be confronted with at work and with the skills they will be required to use. "Our goal," says Ernest

5. John Bishop, *The Economic Role of Vocational Education*, Cornell University, April 1989.

Boyer, president of the Carnegie Foundation, "should be a quality education that helps students understand that life is a blend of work and further education."