Learning to Compete: Feedback Effects of the Non-linear Economy

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There are three key forces that make a period of sustained prosperity likely during the 1990s. First, actions that reduce the cost of producing goods and services in the United States. Second, a new awareness of personal responsibility for the quality of American goods. Finally, a rapid growth in research and development investments.
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Feedback Effects of the Non-Linear Economy

by Murray Weidenbaum with Richard Burr and Richard Cook

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Introduction

After a period of rapid expansion in 1983 and 1984, the American economy is visibly slowing. Pessimists talk about the coming recession in late 1986 or early 1987, while the optimists see economic growth during the next several years at a rate that is only one-half of the 1984 pace. Simultaneously, fears of debt crises—farm and urban, domestic and foreign—are increasingly expressed. Moreover, concerns about import penetration and the resultant job losses are rising even more rapidly than the flows of goods and services from overseas. All this creates an uninspiring if not dismal economic outlook in the minds of many.

On reflection, the discouraging talk relies on the oldest and simplest method of forecasting: extrapolating the most current experience. As Patrick Henry so eloquently said, there was only one lamp by which his feet were guided, the lamp of experience. But he was not limiting himself to the last two yards that he had walked! In the broader perspective of American economic history, there is little support for the simpleminded approach to predicting economic trends. Rates of expansion vary greatly, and periods of growth and decline alternate.

A common pitfall awaits people who apply the experience to which Patrick Henry referred to in too limited and too simple a fashion. For example, the forecasts in Figures 1A and 1B rely on that fundamentally accurate but often misleading postulate of geometry: Two points determine a straight line. Thus, merely extending the most recent experience in 1982—a sharp decline from 1981—would have resulted in expectations of an accelerating recession in 1983 and 1984 (see Figure 1A). That would have missed entirely the strong recovery that occurred during that period. In only slight exaggeration, it may be said that this approach was widely followed; it typified the pessimism of those who, in 1981 and 1982, were writing about the fundamental weakness of the American industrial economy and advocating ambitious industrial policy approaches to deal with that situation.

An example of such thinking was provided by Ira Magaziner and Robert Reich in 1982. They wrote in *Minding America's Business*, "The U.S. economy is in crisis...In the absence of new strategic directions, the crisis can only deepen."

Similarly, extrapolating the sharp growth of 1983 and 1984 in the same simpleminded linear fashion would have yielded a misleading "up, up and away" forecast for the present (see Figure 1B). In essence, this was the spirit of the more optimistic supply-sideers who expected unbroken prosperity to result from the 1981 tax cuts.

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There is great danger that the latest two points in economic experience will continue not only to determine a straight line for the short run, but to influence excessively expectations for the long run. Thus, during this current period of short-term economic slowdown, many analysts are decreasing their long-term projections—their expectations of the growth of the American economy—for the entire decade ahead.

Sectors of the American economy most heavily affected by imports are responding far more dramatically. Here the often-prevalent voices of doom and gloom contend that the recent penetration of U.S. domestic markets by foreign producers will not only continue but likely will accelerate. A similar cry echoes from other sectors of manufacturing, where observers see only a decisive shift to services in the future.

John Naisbitt's 1982 book, *Megatrends,* helped to set this mood with statements such as, "It's becoming clear that yesterday is over, and as the Third World prepares to take over the major industrial tasks, the developed countries must move on to the new enterprises." More recently the chief executive of a major chemical corporation embellished this negative sentiment when he described the competitive environment as "a zero-sum global economy." In his view, this means that "if individual companies expect to grow they will increasingly have to do it at someone else's expense."

U.S. economic history clearly shows that Americans do not live in a linear world. During "hard times," steps are often taken that provide the basis for future expansion.

In each of these cases, the implicit forecasting approach used is to extrapolate naively the most recent experience. Yet U.S. economic history clearly shows that Americans do not live in a linear world. For one thing, important feedback effects occur. During periods of extremely rapid growth, marginal resources are brought into production, lowering productivity while raising costs. This contributes to inflationary pressures, which lead to changes in economic policy—nearly a move to restraint—that halt the expansion.

Thus, rapid growth in the first half of the 1950s (with an average annual increase in real GNP of 4.7 percent) was followed by a slower pace in the second half of the decade (3.2 percent yearly). Similarly, a strong growth pace in the 1960s—when real GNP increased at the average rate of 4.2 percent a year—was followed by the slower 3.3 percent rate of the 1970s.

During "hard times," steps are often taken that provide the basis for future expansion. These include those cost-cutting, product and process innovations and other productivity-raising moves that help to turn the tide. The United States is experiencing such a period right now. There are three key forces that make a period of sustained prosperity in the decade of the 1990s more likely:

1. A variety of actions that reduce the cost of producing goods and services in the United States.
3. More rapid growth in investments in research and development, the basic fuel for innovation and technical progress.

Let us examine the growing importance of each of these key forces.
Reducing the Cost of Production

For a variety of sensible reasons—most notably to keep up with foreign competition—many American business firms have taken actions during the past several years that reduce the domestic cost of production. These actions range from simple changes in production methods to a basic restructuring of the business firm. Since compensation of employees constitutes about two-thirds of the cost of producing the nation’s output, labor costs are a natural starting point for cost cutting.

Reducing Labor Costs

The measurable changes that are occurring in the labor market are dramatic. For example, the 54 strikes involving 1,000 or more workers in the United States during 1985 were the fewest since 1947, when the Labor Department first began compiling such statistics. In addition, the 324,000 workers involved in the strikes was the lowest number of strikers on record. Figure 2 shows vividly the nonlinear nature of the history of labor-management disputes in the United States since the end of World War II. In any event, the American economy is enjoying a sustained period of domestic labor peace.

More fundamentally, competitiveness has been enhanced by the substantial slowing of the rise in nominal wage costs. In 1980, the average worker in the private sector in this country received a 9.0 percent wage increase. By 1984, the average annual increase was down to 4.1 percent (see Table 1).

Perhaps surprising to the proverbial man on the street, the change also turns out to be beneficial from the workers' viewpoint. In real terms (after boiling out the effects of inflation), the average worker in 1980 suffered a 0.2 percent decline in real wage rates. In contrast, 1984 witnessed a real increase of 0.3 percent—a modest change but in the desired direction. The downward trend in nominal wage costs was similar in both manufacturing and non-manufacturing sectors.

Moreover, the pace of negotiated wage increases in union agreements has slowed visibly. During the past four years, some groups of workers have actually experienced wage cuts (see Table 2). For example, in 1980, 71 percent of the workers covered in major collective bargaining settlements received an annual wage increase of 8 percent or more. By 1985, only 4 percent of the workers were in that category—and 26 percent received no increase or actually suffered a decrease. Looking ahead, the Conference Board’s Labor Outlook Panel is forecasting a modest 3.6 percent overall increase in average hourly earnings in 1986.

Some analysts see a further shift in the relative bargaining power of management and labor resulting from greater use of “contingent” employees. For example, companies that are trying to respond to rapid market changes, especially due to foreign competition, are increasingly using temporary and employee-leasing arrangements. Contingent employees also serve as a buffer to protect the security of regular employees.
Table 1
THE DECELERATION OF EMPLOYMENT COSTS
Annual Percent Change in the Labor Cost Index, 1980-1984

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Private Non-Farm</td>
<td>9.0%</td>
<td>8.8%</td>
<td>6.3%</td>
<td>5.0%</td>
<td>4.1%</td>
</tr>
<tr>
<td>By Industry</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manufacturing</td>
<td>9.4%</td>
<td>8.7%</td>
<td>5.6%</td>
<td>4.3%</td>
<td>4.4%</td>
</tr>
<tr>
<td>Durables</td>
<td>9.9%</td>
<td>9.2%</td>
<td>5.6%</td>
<td>4.1%</td>
<td>4.1%</td>
</tr>
<tr>
<td>Non-durables</td>
<td>8.6%</td>
<td>7.7%</td>
<td>5.8%</td>
<td>5.6%</td>
<td>4.9%</td>
</tr>
<tr>
<td>Non-manufacturing</td>
<td>8.8%</td>
<td>9.0%</td>
<td>6.5%</td>
<td>5.5%</td>
<td>4.0%</td>
</tr>
<tr>
<td>Construction</td>
<td>8.7%</td>
<td>8.8%</td>
<td>5.2%</td>
<td>4.5%</td>
<td>1.3%</td>
</tr>
<tr>
<td>Transportation and Public</td>
<td>11.2%</td>
<td>8.4%</td>
<td>7.2%</td>
<td>7.3%</td>
<td>3.3%</td>
</tr>
<tr>
<td>Utilities</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retail Trade</td>
<td>7.0%</td>
<td>7.5%</td>
<td>4.1%</td>
<td>4.7%</td>
<td>5.1%</td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>10.0%</td>
<td>7.8%</td>
<td>6.2%</td>
<td>4.8%</td>
<td>5.5%</td>
</tr>
<tr>
<td>Finance, Insurance, and Real</td>
<td>7.4%</td>
<td>9.9%</td>
<td>6.5%</td>
<td>8.5%</td>
<td>4.9%</td>
</tr>
<tr>
<td>Estate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Services</td>
<td>8.8%</td>
<td>10.6%</td>
<td>8.0%</td>
<td>6.0%</td>
<td>6.2%</td>
</tr>
</tbody>
</table>

By Occupation

| White Collar | 8.7% | 9.1% | 6.4% | 5.9% | 4.4% |
| Blue Collar  | 9.5% | 8.6% | 5.6% | 5.0% | 3.6% |
| Service Workers | 8.1% | 8.5% | 8.5% | 5.2% | 6.2% |


Increasing Productive Efficiency

While management negotiations with unions are stabilizing labor costs, import penetration has sparked a war on other costs. In addition to holding down the cost of labor, firms are attempting to get more for the labor dollars they do spend by improving productivity. More flexible work rules and improved worker attitudes are two of the more important methods being used.

Loosened work rules can generate important savings in the production process. The traditional way was to have narrow job classifications, with each employee performing one task. With new agreements to perform a number of different tasks, however, fewer workers are required or the same number of workers can produce more. Also, there is less down time due to waiting for a worker with the right classification. This illustrates one among many efficiencies—large and small—which, in the aggregate, can result in substantial increases in productivity and hence competitiveness.

For example, a Chrysler plant in Indiana has reduced labor costs 30 percent or $2.8 million a year by getting workers to agree to perform tasks outside their crafts. Goodyear has signed a pact that allows the 429 craftsmen at its Alabama plant to work outside their trade as much as 25 percent of the time if necessary. General Motors successfully negotiated with its Manville, Ohio, union to eliminate jobs such as machinists' "tool chasers." Having machinists get their own tools and other changes raised productivity in one stamping plant by 26 percent.

Work-rule changes also have saved money in the petroleum industry, where refiners report that output per worker increased by more than 10 percent in recent years. One oil company, American Petrofina, merged six classifications into two at one refinery, cutting the workforce by 25 percent. The move saved $4 million a year.

Table 2
WAGE RATE CHANGES FOR MAJOR COLLECTIVE BARGAINING AGREEMENTS
Percent of Workers by Category of Wage Change, 1980-1984

<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Decrease</td>
<td>0%</td>
<td>3%</td>
<td>2%</td>
<td>15%</td>
<td>5%</td>
<td>4%</td>
</tr>
<tr>
<td>No change</td>
<td>0%</td>
<td>3%</td>
<td>42%</td>
<td>22%</td>
<td>18%</td>
<td>22%</td>
</tr>
<tr>
<td>Increase</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-4 percent</td>
<td>4%</td>
<td>3%</td>
<td>9%</td>
<td>14%</td>
<td>44%</td>
<td>38%</td>
</tr>
<tr>
<td>4-8 percent</td>
<td>25%</td>
<td>9%</td>
<td>23%</td>
<td>39%</td>
<td>30%</td>
<td>33%</td>
</tr>
<tr>
<td>8 percent and over</td>
<td>71%</td>
<td>81%</td>
<td>24%</td>
<td>10%</td>
<td>2%</td>
<td>4%</td>
</tr>
</tbody>
</table>

Average Percent Change    | 9.5% | 9.8% | 3.8% | 2.6% | 2.4% | 2.8%              |

Some companies have attempted to improve worker attitudes on the
reasonable assumption that more motivated workers do better quality work.
At Jones & Laughlin, a major steel maker, a labor-management participation
team analyzes production problems and suggests ways of improving efficiency.
The company saved $75 million in 1982 largely because of employee suggestions
and work force cutbacks that resulted in the remaining workers being assigned
more duties.

The Harley-Davidson Motor Company is also making great strides. Although
the motorcycle maker has been protected by high tariffs, those tariff rates will
decline automatically to 4 percent in 1988 from the 24 percent level levied in 1985.
The prospect of dwindling protection has caused the company to adopt
Japanese management techniques that are partially responsible for making it
profitable again.

Indeed, Harley-Davidson has attracted executives from other companies to its
monthly seminars on efficient management. The firm has sharply decreased
absenteeism by maintaining an open-door policy with workers and discussing
employee complaints. Costs of fixing motorcycles on warranty have plummeted
as a result of a new commitment to quality, the company says. This experience
is not now unique in American industry.

But tough negotiations with labor can cause backlashes. United Airlines
pilots, angry because they believe the company tried to break the Air Line Pilots
Association during a 29-day strike in 1985, are reportedly wasting fuel. A veteran
United pilot told a reporter that an "awful lot of pilots are burning more gas.
We're not interested in saving money for the company any more."

Changes in Production Approaches

Several American companies have adopted the Japanese just-in-time inven-
tory system in which components are provided as needed instead of having large
batches made in advance and stored. Harley-Davidson, for example, reports that
the system freed $22 million previously tied up in inventory at a York, Penn-
sylvania, plant alone and dramatically reduced reorder lead times.

A Chrysler plant in Fenton, Missouri, also is using the just-in-time approach.
The system cut its inventory to $20 million from $29 million, resulting in about
$1 million a year savings in interest costs. Reduced inventory also has meant less
damage to parts from overcrowded storage conditions.

One of the most ambitious production improvement efforts to date is the
General Motors Flint Assembly project, which is converting a 60-year-old com-
plex of unrelated component manufacturing and auto assembly plants into a
500-acre integrated production facility.

The Flint Assembly Complex builds, virtually under one roof, most of the
major components needed for the front-wheel drive vehicles that replace the
Buick LeSabre and the Olds Delta 88. The work performed includes engines,
transmission components and complete bodies. In effect, steel blanks for body
construction enter at one end of the plant and finished cars leave at the other.
Previously, partially completed automobile bodies were built at a body plant
on the other side of town and shipped to the final assembly location.

A key element at Flint is the just-in-time system of inventory management.
The complex operates without the usual "safety net" in a conscious effort to
force discipline into a manufacturing system that formerly operated with con-
venient, but expensive, fallback positions. If a quality problem now arises in
any part of the system, it must be corrected immediately. Otherwise, the entire
production operation may grind to a halt.

Proponents of pursuing joint ventures with Japanese and South Korean
companies defend it as a way of saving some American jobs; opponents
view such out-sourcing as "exporting" of jobs.

As might be expected, considerable investment is required, especially in the
company's workforce. Between 4,000 and 5,000 employees are receiving training
in new technical skills in three Flint-area educational institutions. Building
on the ongoing Quality of Work Life program, union officials participated in
the planning of Flint Assembly throughout its development.

Out-Sourcing. Each of the major auto producers is pursuing joint ventures
with Japanese and South Korean companies as a long-term way of cutting costs
on small cars. Proponents of this approach defend it as a way of saving some
American jobs, while opponents view such out-sourcing as "exporting" of jobs.
In any event, General Motors has at least four separate agreements with
Japanese and South Korean affiliates to supply up to 500,000 cars a year to its
U.S. dealers. Ford has contracts pending with Japan's Mazda Motor Corpora-
tion and Korea's Kia Industrial Company. Chrysler has signed ventures with
Mitsubishi Motors and Samsung Corporation.

The American steel industry is seeing the benefits in a similar arrangement.
National Steel Corporation, which is half-owned by Nippon Kokan, has
enhanced its productivity. In the first year of Japanese involvement, National
increased the amount of prime finished product made from molten steel by
3 percent. National Steel President Robert McBride estimates that a 1 percent
increase in product yield adds $20 million to the company's profitability.

Caterpillar Tractor Company, the world's largest manufacturer of heavy con-
struction equipment, also has learned this lesson. The company reached its goal
of slashing costs by more than 20 percent by the end of 1985, a year ahead of
schedule. It has reduced its workforce by one-third and increased the number
of parts it acquires from outside. Caterpillar's efforts seem to be paying off. The
company reported a fourth-quarter 1985 pre-tax profit of $87 million, compared
with a loss of $251 million for the same period in 1984.

Targeting Capital Spending. Simultaneously, the composition of new capital
spending by American industrial firms has shifted away in large measure from
additions to productive capacity and toward replacement of existing machinery
and facilities with more efficient equipment. For example, the outlays for new
plant and equipment devoted to computers and instruments rose from $28
billion in 1970 to $142 billion in 1983. Such changes curb the unit cost of production rather than expand the total amount of product.

In some cases, the use of new technology can result in products manufactured more efficiently than at modern foreign plants. One ton of steel production at Chaparral Steel is estimated to use 1.8 man-hours, whereas the Japanese on average require 2.3 man-hours. Another steelmaker, Timken Company, invested $300 million in an advanced mill in the midst of the last recession. The new facility makes better quality steel for its tapered roller bearings, the anti-friction devices Timken invented.

Other Strategies. Price reductions forcing cost containment have emerged as the dominant way that American firms respond to import pressures. But it is clear that they rely on other approaches simultaneously. In addition, there are many variations on the price or economizing approach to meeting foreign competition.

For example, in the auto manufacturing industry for many years operations had been based on achieving economies of scale via high-volume, long-running production with fairly rigid product specifications. Because economies of scale emphasized large factories and standard product design, changes in the product could become expensive. Today, as a result of a shift to computer-based manufacturing, production can be based on economies of scope. This newer approach allows for low-cost, flexible production of a variety of products on the same automated equipment.

An extension of this economizing strategy is leading to important structural changes in a great many of the larger American corporations. The horizontally integrated firm, producing virtually every product in the markets in which it operates, is becoming less prevalent. Many companies are preferring to specialize, focusing on specific product niches that are secure against foreign competition.

On reflection, this is to be expected as U.S. firms find themselves competing more fully in a global economy. Surely far fewer of our domestic markets can be properly thought of as part of a closed economy.

In an ambitious restructuring effort, General Electric raised about $5 billion since 1981 by selling off 155 divisions. Among them were GE’s small-appliance operation, which manufactures toasters and irons, and Utah International, a natural-resource subsidiary.

The company’s new strategy is to move gradually away from traditional manufacturing and to focus instead on growth industries such as electronics and financial services. The $5 billion proceeds from its restructuring activities helped to finance its acquisition of RCA, a move strengthening GE’s position in electronics and services.

The Union Carbide Corporation, a firm under severe pressure for many reasons in addition to foreign competition, also has undergone extensive restructuring. It has divested $500 million in what it now views as “non-strategic” assets and businesses, including its commodity-metals business and its European bulk-chemical, plastics and polyethylene businesses. Carbide also wrote down other assets totalling $865 million, including petrochemicals, metals and carbons segments. At the same time, the company built an industrial gases plant in Spain, acquired a consumer products business in France and entered an industrial gases joint venture in Italy.

Companies also are combatting imports with financing innovations. Major U.S. car manufacturers have increased sales by providing low-interest-rate financing on new cars. In effect, this means squeezing profit margins in an effort to remain competitive.

In addition, a rapid rate of product innovation has been emphasized. American shoe firms such as Timberland Company, Reebok International and Rockport Company have responded with stylish footwear to ward off foreign competition. Even apparel manufacturing, one of the most import-affected industries, is using style to compete with low-cost foreign products. Companies such as RJMJ Inc. continue to make a profit selling women’s pants and shorts through improved timing and greater flexibility of production. Whereas foreign apparel makers need at least six months’ lead time to coordinate manufacturing with retail sales, RJMJ’s president says his company “can turn on a dime. We can get piece goods to [our plants] in a day or two and produce products for the shelves in three to four weeks. That enables us to catch a trend.”

The Influence of Government

Meanwhile, government actions to reduce the value of the dollar in world currency markets are helping American firms to compete more effectively both at home and abroad. Despite some softening in the dollar in 1985, the average value of the dollar in relation to other major currencies (the “trade-weighted” dollar) remains almost 40 percent higher than the level in 1980. This is the equivalent of a special 40 percent tax levied on American producers, exacerbating other cost differences with their foreign competitors.

A significant weakening of the dollar would enhance the effectiveness of the various private-sector strategies to restore the competitiveness of American firms.

There are many reasons for the strong dollar. Some of these are inherently favorable, such as the worldwide view that the American economy is a major "safe haven" for investors. There is little concern here about expropriation or the other arbitrary governmental actions that have occurred so frequently overseas and have increased the relative risk of investing in many other countries.

But some of the reasons for the strong dollar are not so benign, such as the massive budget deficits whose financing has forced real interest rates up so high. That, in turn, has increased the foreign demand for dollars and in the process raised the “price” (or exchange rate) of dollars.
Recent governmental policies and actions have attempted to restore the U.S. dollar to its earlier exchange rate relationships. The passage of the Gramm-Rudman-Hollings bill represents a congressional and presidential commitment to eliminate the federal budget deficit by 1991. The specific budget cuts needed to achieve that goal, however, have not yet been designated by the Congress or the White House.

Simultaneously, Secretary of the Treasury James Baker has embarked on an international cooperative effort to encourage the downward movement of the dollar in foreign exchange markets. A significant weakening of the dollar would enhance the effectiveness of the various private-sector strategies to restore the competitiveness of American firms and of the goods and services that they produce and sell. But lasting changes in exchange rates require more substantive actions than merely financial intervention by governments in international currency markets. Sustained improvements in monetary and fiscal policies are required.

Improving the Quality of U.S. Products

An important lesson that American companies have learned in recent years is that "Made in Japan" (or South Korea or Taiwan) is no longer synonymous with shoddy quality. In fact, the inroads of foreign competition into U.S. domestic markets have frequently been caused by the superior quality of the import rather than just lower cost. As a result, unprecedented pressure has been generated for improving the quality of products that American businesses manufacture.

A 1985 poll on product quality showed mixed results. In many product categories, American-made items were rated as being of higher quality than the corresponding import (see Table 3). Important examples of perceived U.S. superiority in quality included furniture, clothing, personal computers, appliances and—by a smaller margin—automobiles. However, the survey also showed that 45 percent of the respondents viewed imported consumer electronics goods (televisions, radios and VCRs) as being of higher quality, while only 40 percent thought the same goods made in the United States were of higher quality. Many recent actions by U.S. companies to deal with the quality challenge demonstrate the feedback effects of our non-linear economy.

Meeting Domestic Quality Requirements

Many U.S. firms are responding positively to the consumer preference for quality. For example, Steinway & Sons, the well-known piano manufacturer, facing rising competition from Yamaha and Kawai, has improved the quality of its pianos, which remain popular with concert pianists. The company proudly recalls that 35 of the 37 Asian contestants performed on Steinway grands at a recent international competition.

Despite increased imports, Steinway & Sons is forecasting increased sales. Steinway President Lloyd Meyer contends that American manufacturers generally have rested too long on their laurels and allowed importers to equal them in quality. “I blame management for losing the quality edge,” Steinway Company’s president maintains.

Indeed, ignoring or de-emphasizing quality can be costly, as a Harvard Business School study of the air conditioning industry demonstrated. Professor David Garvin found that the failure rates of room air conditioners from the lowest-quality producers were between 500 and 1,000 times greater than those from the highest-quality producers.

Garvin analyzed Japanese and American firms in an industry where practically the same assembly-line processes and manufacturing equipment are used

<table>
<thead>
<tr>
<th>Item</th>
<th>Percent Viewing U.S. Goods as Higher Quality</th>
<th>Percent Viewing Foreign Goods as Higher Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Furniture</td>
<td>84%</td>
<td>4%</td>
</tr>
<tr>
<td>Major appliances</td>
<td>78%</td>
<td>6%</td>
</tr>
<tr>
<td>Clothing</td>
<td>70%</td>
<td>13%</td>
</tr>
<tr>
<td>Small appliances</td>
<td>58%</td>
<td>19%</td>
</tr>
<tr>
<td>Automobiles</td>
<td>46%</td>
<td>38%</td>
</tr>
<tr>
<td>Personal computers</td>
<td>41%</td>
<td>22%</td>
</tr>
<tr>
<td>TVs, radios, VCRs, etc.</td>
<td>40%</td>
<td>45%</td>
</tr>
<tr>
<td>Weighted Average</td>
<td>53%</td>
<td>14%</td>
</tr>
</tbody>
</table>

Source: American Society for Quality Control.
to make an essentially standardized product. Therefore, the staggering differences in performance between Japanese and American firms could not be attributed to differences in technology or capital.

Japanese companies were reported to be far superior to their U.S. counterparts in many measurable ways. The average U.S. assembly-line defect rate was almost 70 times that of the Japanese and their average first-year service call rate nearly 17 times the Japanese service call rate. Products made by the worst Japanese company had an average failure rate less than half that of the best U.S. manufacturer.

The key payoff of higher quality comes from the savings realized from avoiding the costs of reworking defective products or replacing defective parts. Garvin noted that “failures are much more expensive to fix after a unit has been assembled than before.” In addition, customer complaints about products— even when they are subsequently replaced—often result in the long-term erosion of a company’s customer base.

Westinghouse Electric is an example of a corporation that can show benefits from emphasizing quality. It has established 2,000 quality circles involving 20,000 employees and a Quality College to foster participative management and quality training. The result has been that Westinghouse has averaged real productivity gains of 7 percent a year for three years in a row, 1982 through 1984. Thomas Murrin, president of Westinghouse’s energy and advanced technology group, says such a result “means that every 10 years you double your output without adding any resources.”

Emphasizing quality has also profited Harley-Davidson. Management places more responsibility on the individual worker, coaching employees to evaluate their own work and improve the quality of the components. All employees receive 40 hours of training in statistics so they better understand how to measure the quality of their output and improvements in it. The moves have caused a rise in defect-free motorcycles coming off the assembly line. Whereas 50 percent of the motorcycles were free of defects five years ago, 99 percent are now reported to be flawless.

High-technology industry also is concentrating on quality. In 1980, Hewlett-Packard tested semiconductors from three American companies and three Japanese firms, and found that the Japanese failure rate was one-sixth that of the U.S. producers. But the American firms virtually had closed the gap when the same test was made two years later.

America’s automakers, long regarded as the epitome of old-line industry, are also making substantial strides. On a crash program to close the “quality gap” with their foreign counterparts, particularly the Japanese, domestic automobile manufacturers have been pressuring American steel manufacturers to improve their performance. Three years ago, for example, Ford was rejecting and returning nearly 9 percent of the steel it purchased from suppliers because of surface defects or faulty chemistry. Now the rate has been reduced to less than 2 percent.

One way of improving quality is to iron out the bugs in the assembly process before shipping the product. GM took this step in its new Wentzville, Missouri, facility. The announcement was unusual apparently because the company’s—and the industry’s—previous practice was to iron out these problems while continuing production. Quality problems in the past were thus passed on to the dealers and customers to avoid the huge costs of halting production.

A somewhat similar experience occurred in the fall of 1985 in Ford’s automotive operations in Dearborn, Michigan. Production was delayed because the rear doors were not meeting the rear fenders correctly. Ford executive Lou Ross was quoted as saying, “Ten years ago, confronted with the same problem, we would have built on the appointed day. Today... we start when we meet the standard.”

The scene was repeated at a Detroit-area GM plant, where faulty Cadillacs and Chevrolet Caprices remained in the repair lots instead of being shipped to the dealers. “What really blows the minds of people today is that we won’t ship cars if we don’t have the quality right,” says GM spokesman Clifford Merriott. Unintentionally repeating Ford’s estimate, he adds, “There’s no doubt that 10 years ago we would have shipped those cars.”

“Ha! Ten years ago?” says M.L. Douglas, president of the United Auto Workers’ Local 22. “It’s more like two years ago... But people are beginning to realize that we just can’t do things like that anymore.” In retrospect, how could the average worker on the production floor have been expected to really care about quality when management appeared to be so indifferent?

Pushing faulty cars out the factory door also can be expensive. Chrysler learned that lesson when it tried to meet a deadline on the Plymouth Volare/Dodge Aspen models in the mid-1970s. “Not doing any galvanizing on the Aspen/Volare cost us $100 million because of rust,” Chrysler Chairman Lee Iacocca says. The rest of the industry seems to have learned the lesson. Ford now allows 36 months from car design to production instead of the former 28 months.

Auto companies also have improved quality through quick response to defects in parts. Chrysler’s Fenton, Missouri, plant now corrects problems with parts in two days. A decade ago, the turnaround time could have been as much as 20 days.

Catering to Foreign Customers

Quality is not only important to American consumers, but especially to foreign consumers, notably the Japanese. Ocean Foods of Astoria, Inc. in Oregon has capitalized on the Japanese consumers’ characteristic concern for higher-quality products, making Japan one of its principal markets. “They’ll pay top dollar for your product, but only if it’s of absolute top quality,” says Grant Larson, vice president of Ocean Foods. “They are unmovable when it comes to quality control.”

Ocean Foods pays special attention to detail in its food processing to ensure mandatory quality control for the finicky Japanese. In the words of one senior executive of the firm:

When we catch the fish, they are iced down and stacked in a precise way. Then
the fish are flash-frozen. If the salmon aren't arranged this way prior to freezing, some of them will freeze at uneven temperatures. The flesh can become slightly discolored, or part of a tail will stick to the salmon below or above it and break off. If there is the slightest discoloration of the fish, or if part of the tail is broken off, forget it. You just won't sell that salmon [to the Japanese].

Other U.S. companies are apparently realizing the appreciation that the Japanese have for quality—the average consumer in Japan spends about $600 a year on American-made goods (the average U.S. consumer spends only $290 a year on Japanese products). Although few people in Japan had heard of Cross pens a decade or so ago, they have become a status symbol and are considered a most desirable business gift. Comparable results have occurred for other overseas competitors in Japan. Bondhus Corporation hand tools command 80 percent of the Japanese market even though five Japanese firms have lower prices.

Commitments to Quality

The enhanced concern with improving quality in American industry has not been primarily a matter of setting up new quality control departments or even expanding existing ones. After all, companies in the United States traditionally devoted far more resources to quality-control efforts than did their foreign counterparts.

But quality assurance is more than just a collection of expensive scientific and professional personnel checking, reviewing and improving production practices. Producing quality requires emphasizing this aspect of the production process throughout the firm.

The air-conditioner-industry study cited earlier confirms this point. Japanese companies pay more attention to quality than many of their American competitors by means of such innovations as creating internal consumer review boards to evaluate the products. Another way the Japanese foster quality is by having top management hold daily review meetings about quality. In contrast, American firms with the lowest assembly defect rates met 10 times a month; the worst-quality U.S. companies averaged four such meetings a month.

Management's message was reflected on the front lines of production. First-line supervisors at four of six Japanese air conditioner manufacturers surveyed said quality was most important to management; their counterparts at nine of 11 U.S. companies surveyed said meeting the production schedule was the highest priority.

Management can communicate its emphasis on quality by paying attention even to small details. For instance, National Steel now requires workers to clean their work stations instead of leaving the task for janitors. The Japanese co-owners, who suggested the policy, reasoned that if workers have enough pride to take care of their work stations, they might also care more for their product.

But there is more to improving quality than just providing an example. For instance, Chaparral Steel Company uses an unusual but no longer novel approach to employee relations to ensure that workers put into practice what the company preaches: It practices egalitarianism in many aspects of its activities in an effort to improve output and quality. "We consider everyone to be line, there are no staff positions per se," says Chaparral President Gordon Forward. The company has no customer service representatives, for example. Production managers answer customer complaints. Forward says, "You ought to see how motivated they are to fix the problem when they come back."

Thus, the most effective quality controls involve, in effect, a shift in the locus of responsibility—from the inspectors in the quality control department to the employees who actually do the work.

The most effective quality controls involve a shift in the locus of responsibility—from inspectors to the employees who actually do the work.

The Accelerating Growth of Research and Development

Even though many government officials occasionally wax eloquent about the science policy of the federal government, the United States lacks a comprehensive policy on the subject. Others can debate whether that is good or bad. What is relevant to this analysis is that the great bulk of research and development financed and sponsored by the federal government is not a result of deliberate actions to carry out a policy on "science." Rather, in most instances, it is more a matter of happenstance. Yet a shift in science funding has powerful effects on the competitiveness of American industry.

Thus, in the haphazard nature of science policy, the completion of the "man on the moon" project by NASA meant a reduction in that agency's budget. It just so happens that NASA devotes one of the highest percentages of expenditures to R & D among federal agencies. As shown in Table 4, NASA spent one-half of its budget on R & D in 1981, while the ratio for the federal government as a whole was less than 5 percent. Even a shift in emphasis on the federal budget away from space exploration was simultaneously a move to downgrade the importance of science in the federal government.

Similarly, and of greater consequence because of its overwhelming size, the post-Vietnam cutbacks in the military budget meant a major decline in the volume of federal R & D funding—but not as a deliberate policy. The shift in emphasis in the federal budget during the 1970s from, so to speak, warfare to welfare meant a shift of resources away from the most R & D-intensive sectors of the budget. Simultaneously, a rapid expansion occurred in federal spending...
Table 4
FEDERAL AGENCY R & D AND TOTAL OUTLAYS IN 1984

<table>
<thead>
<tr>
<th>Department or Agency</th>
<th>R &amp; D Outlays (in billions)</th>
<th>Total Outlays (in billions)</th>
<th>R &amp; D/Total (percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Above-average R &amp; D Ratios</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>National Science Foundation</td>
<td>$1.1</td>
<td>$1.2</td>
<td>91.7%</td>
</tr>
<tr>
<td>NASA</td>
<td>3.5</td>
<td>7.0</td>
<td>50.0</td>
</tr>
<tr>
<td>Energy Department</td>
<td>4.7</td>
<td>10.6</td>
<td>44.3</td>
</tr>
<tr>
<td>Nuclear Regulatory Commission</td>
<td>.2</td>
<td>.5</td>
<td>40.0</td>
</tr>
<tr>
<td>Commerce Department</td>
<td>.3</td>
<td>1.9</td>
<td>15.8</td>
</tr>
<tr>
<td>Defense Department</td>
<td>23.6</td>
<td>220.8</td>
<td>10.7</td>
</tr>
<tr>
<td>Foreign aid (non-military)</td>
<td>.1</td>
<td>1.1</td>
<td>9.1</td>
</tr>
<tr>
<td>Interior Department</td>
<td>.4</td>
<td>4.9</td>
<td>8.2</td>
</tr>
<tr>
<td>Environmental Protection Agency</td>
<td>.3</td>
<td>4.1</td>
<td>7.3</td>
</tr>
<tr>
<td><strong>Total, Federal Government</strong></td>
<td>40.5</td>
<td>851.8</td>
<td>4.8</td>
</tr>
<tr>
<td><strong>Below-average R &amp; D Ratios</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agriculture Department</td>
<td>.9</td>
<td>37.5</td>
<td>2.4</td>
</tr>
<tr>
<td>Health and Human Services Department</td>
<td>4.5</td>
<td>292.3</td>
<td>1.5</td>
</tr>
<tr>
<td>Transportation Department</td>
<td>.3</td>
<td>23.9</td>
<td>1.3</td>
</tr>
<tr>
<td>Veterans Administration</td>
<td>.2</td>
<td>25.6</td>
<td>0.8</td>
</tr>
<tr>
<td>All other</td>
<td>.4</td>
<td>220.4</td>
<td>0.2</td>
</tr>
</tbody>
</table>

Source: Compiled from data prepared by U.S. Office of Management and Budget.

programs that involve the least amount of outlays for science and technology, notably the Department of Health and Human Services (in the form of transfer payments) and the Department of Agriculture (primarily price-support subsidies).

The Recent Rise in Federal Funding
However, the massive buildup in U.S. defense spending begun in 1981 has ended the slowdown of federal R & D outlays that occurred in the 1970s. Now the largest dollar increases in federal expenditures are budgeted for the Pentagon, a part of the government that spends more than twice the proportion of its budget on R & D than the typical civilian agency. To be sure, there is considerable controversy about the extent to which R & D spending by the military establishment benefits the civilian economy. Certainly not all military R & D has commercial applications. In fact, America has considerable negative experience with past attempts to apply defense technology directly to civilian uses.

A recent analysis of approximately 1,000 large U.S. manufacturing firms concluded that company-financed spending on R & D is more productive than federally-financed research. Presumably, the firm spends money on R & D to raise its productivity and profits, while government-financed R & D is undertaken primarily to fulfill specific research contracts for which the firm is remunerated directly.

It does seem, however, that subcontractors and supplying firms in the electronics and instruments industries, for example, have enjoyed considerable success in commercializing their defense-financed technology. In contrast, the large aerospace firms have demonstrated only limited ability to diversify outside of aviation.

All in all, when the Department of Defense devotes an additional $100 billion to applications of science and engineering in a half decade, there is a great possibility that a larger stream of product and process innovation will occur in the years ahead. That possibility is reinforced by the Pentagon's current tendency to support technological advancement in areas having civilian applications such as computers.

For example, the Department of Defense recently awarded Carnegie-Mellon University a $103 million contract to develop and operate a Software Engineering Institute. The bulk of the Institute's work will be original, unclassified research, including development of better education processes for teaching software. Although its main customers will be defense contractors, a second tier will include companies that build such commercial items as telecommunications and air traffic control systems.

Moreover, some analysts contend that the Pentagon's Strategic Defense Initiative (popularly known as "Star Wars") will yield commercial applications in such areas as supercomputers, software, sophisticated sensors and space technology.

High-yield supercomputers are useful in a wide range of scientific and industrial applications, including telecommunications, weather forecasting, medical research and aircraft design. The need to automate SDI systems is also expected to advance commercial applications in the emerging field of artificial intelligence. Likewise, in order to meet the tracking requirements of SDI, developments will take place in optical design and manufacturing that can have important civilian uses.

There is no need to jump to the conclusion that the most effective way of promoting scientific progress in the United States is to encourage a military buildup. Surely, the direct expenditure of these funds on civilian-oriented R & D, especially of a commercial orientation, would be expected to be far more productive. But the fact remains that the only time when Congress will appro-
The only time when Congress will appropriate tens of billions of dollars on R & D in a half decade is when it elevates national defense and space exploration and energy development to the top of the priority list. In 1984, for example, the Department of Defense spent $23.6 billion for R & D, the Department of Energy $4.7 billion and NASA $3.5 billion.

In striking contrast, when Congress decides to be generous to science and technology per se, it expands the budgets of the major science agencies by only tens of millions or, at best, by several hundred million dollars. In 1984, the total budget of the National Science Foundation came to $1.2 billion. That year the Department of Commerce spent about $300 million on the Bureau of Standards and all of its other scientific activities. The Department of the Interior devoted approximately $400 million to the Coast and Geodetic Survey and other R & D bureaus.

Also, federal funding for R & D tends to fall when income transfer programs are elevated to higher priority in the budget. In the case of the Department of Health and Human Services, R & D expenditures in 1984 comprised 1.5 percent of its budget (mainly for the National Institutes of Health).

The Results of R & D

Of course, it is far easier to measure inputs than outputs in the areas of science and technology. That is, we can more readily quantify the resources going into the performance of research and development than the new or improved products or processes that result.

Nevertheless, several economists have attempted to estimate the overall rate of return from research and development performed in the United States in recent years. As shown in Table 5, the estimates of R & D payoffs range widely. The lower figures usually are limited to benefits to the company performing the R & D, while the higher estimates include uses by the customers of the company and other firms. Surely, we would expect individual analysts to differ in their calculations. What is reassuring is that virtually all of the measured returns to R & D are impressively high.

In addition, the tax reforms of 1981 included a new tax credit for incremental R & D, an incentive in addition to direct federal spending in this area. Preliminary evaluations show limited effects in terms of added private-sector R & D undertakings. However, the temporary nature of the tax credit is cited as an important limitation; the credit is scheduled to expire as of December 31, 1985. In its current consideration of tax reform legislation, the House of Representatives voted last December to extend the life of the tax credit, but not to make it a permanent feature of the Internal Revenue Code.

Table 5

<table>
<thead>
<tr>
<th>Researcher</th>
<th>Rate of Return</th>
<th>Area Covered</th>
<th>Years Covered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scherer</td>
<td>70-104%</td>
<td>Macroeconomy</td>
<td>1973-78</td>
</tr>
<tr>
<td>Terleckyj</td>
<td>29-78</td>
<td>Macroeconomy</td>
<td>1946-66</td>
</tr>
<tr>
<td>Fellner</td>
<td>31-55</td>
<td>Macroeconomy</td>
<td>1953-66</td>
</tr>
<tr>
<td>Nadiri</td>
<td>20</td>
<td>Manufacturing</td>
<td>1958-75</td>
</tr>
<tr>
<td>Griliches</td>
<td>17</td>
<td>Manufacturing</td>
<td>1957-65</td>
</tr>
</tbody>
</table>

Note: Variations within and between studies often depend on the scope of the report (e.g. whether they include benefits to customers of the company doing the R & D).

Source: See bibliography.

In any event, data published by the National Science Foundation show a rapid upturn in growth rates of both federal and private expenditures on R & D in recent years and thus an acceleration in total R & D spending in the United States (see Table 6). During the four-year period from 1980 to 1984, federal spending on R & D in real terms (adjusted for inflation) rose 12.2 percent a year. This was a significantly more rapid growth rate than the 9.4 percent average for the preceding four years. During the same periods, private-sector-financed R & D spending rose at a greater rate—14.2 percent a year since 1980 and 13.9 percent annually in the prior four years.

Some of the specific instances of recent state and local investments in R & D are noteworthy. Since 1983, Michigan has invested more than $50 million in small, new companies. Three other states—Ohio, Illinois and Indiana—have spent more than $250 million on programs for new, high-technology entrepreneurs. In addition, the 13 states of the Midwest Governors Conference each have contributed $250,000 to open the Midwest Technology Development Institute in Minneapolis.

There are already some promising indicators of the effects of the stepped up
Table 6
REAL OUTLAYS FOR R & D, 1975-1984
(dollars in billions)

<table>
<thead>
<tr>
<th>Year</th>
<th>Federal Government</th>
<th>Percent Change</th>
<th>Private Industry</th>
<th>Percent Change</th>
<th>Total</th>
<th>Percent Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1975</td>
<td>16.6</td>
<td></td>
<td>14.5</td>
<td></td>
<td>32.2</td>
<td></td>
</tr>
<tr>
<td>1976</td>
<td>18.9</td>
<td>13.9%</td>
<td>16.8</td>
<td>8.5</td>
<td>37.1</td>
<td>15.2%</td>
</tr>
<tr>
<td>1977</td>
<td>20.5</td>
<td>8.5</td>
<td>18.6</td>
<td>10.7</td>
<td>40.5</td>
<td>9.2</td>
</tr>
<tr>
<td>1978</td>
<td>22.3</td>
<td>8.8</td>
<td>20.9</td>
<td>12.4</td>
<td>44.9</td>
<td>10.9</td>
</tr>
<tr>
<td>1979</td>
<td>24.7</td>
<td>10.8</td>
<td>24.0</td>
<td>14.8</td>
<td>50.6</td>
<td>12.7</td>
</tr>
<tr>
<td>1980</td>
<td>27.2</td>
<td>10.1</td>
<td>28.2</td>
<td>17.5</td>
<td>57.4</td>
<td>13.4</td>
</tr>
<tr>
<td>1981</td>
<td>30.8</td>
<td>13.2</td>
<td>32.8</td>
<td>16.3</td>
<td>65.8</td>
<td>14.6</td>
</tr>
<tr>
<td>1982</td>
<td>34.5</td>
<td>12.0</td>
<td>37.7</td>
<td>14.9</td>
<td>74.5</td>
<td>13.2</td>
</tr>
<tr>
<td>1983</td>
<td>38.2</td>
<td>10.7</td>
<td>42.7</td>
<td>13.3</td>
<td>83.3</td>
<td>11.8</td>
</tr>
<tr>
<td>1984</td>
<td>42.9</td>
<td>12.3</td>
<td>47.9</td>
<td>12.2</td>
<td>93.4</td>
<td>12.1</td>
</tr>
</tbody>
</table>

*1 Includes universities and other non-profit institutions.

Note: Actual data have been deflated by GNP price deflator, 1972 = 100.

Source: U.S. National Science Foundation.

Investments in R & D. According to the Federal Reserve Bank of Chicago, more than 15,000 companies make high-technology equipment in the eight states bordering on the Great Lakes. At least 100 new companies specializing in biomedicine and computer software have located within 50 miles of the Mayo Clinic in Rochester, Minnesota. Based on historical experience, we can expect that recent investments in research and development will create some new product lines and perhaps even new industries with high growth potential.

This process of “creative destruction” described by Schumpeter implies that some industries will likely decline while others take their place. As pointed out by Sven Arndt of the American Enterprise Institute, domestic products that incorporate substantial amounts of research and development become competitive while more mature items are increasingly replaced by imports.

Thus, products with well-established design and production technology often can be manufactured more economically abroad by producers who acquire blueprints, technological know-how and even factories in world markets. Their quality control is frequently superior, and a large part of the production costs is relatively cheap factory labor. High-priced workers in the United States using technologies that are available to their lower-cost competitors find it increasingly difficult to compete.

**Investments in research and development constitute an important way in which American industry can hold its own in the face of virulent foreign competition.**

Hence, investments in research and development constitute an important way in which American industry can hold its own in the face of virulent foreign competition. Improving process technology or offering new and superior products is a far more positive—and essentially more effective—approach than seeking government protection.

In many industries, designing and marketing new and better goods makes the future bright for an advanced economy such as the United States. That is, this country frequently maintains its comparative advantage in R & D-intensive industries. Table 7 lists 14 examples of successful penetration by U.S. companies in Japanese markets. In most cases, product development and technological skills are listed by the Japanese as the keys to the sales penetration by American firms. Thus, increased application of the fruits of science and technology to American industry is an important reason for expecting that today's gloom-and-doom expectations will turn into tomorrow's non-linear economic recovery.

The Outlook for the 1990s

Highlights of the Report

Let us now sum up the key points we have made. Throughout America's economic history, feedback effects have helped to end both upswings and downturns. The United States is experiencing such a change during the current period of economic slowdown. The feedback effects are arising from such diverse factors as the deep recession of 1981-82, intense international competition and rapidly expanding defense spending.

The resulting new and positive forces are:

1. Managerial and governmental actions that reduce the cost of producing goods and services in the United States.
Table 7
SOME U.S. SUCCESS STORIES IN JAPAN

<table>
<thead>
<tr>
<th>Company</th>
<th>Product</th>
<th>Share of Japanese Market</th>
<th>Keys to Success (as seen by Japanese)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Consumer Goods (Imported)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eastman Kodak</td>
<td>film</td>
<td>20%</td>
<td>brand name; lack of early competition</td>
</tr>
<tr>
<td>Procter &amp; Gamble</td>
<td>disposable diapers</td>
<td>50</td>
<td>new product; acquisition of Japanese company's sales network</td>
</tr>
<tr>
<td>Warner-Lambert</td>
<td>razors</td>
<td>70</td>
<td>new product; use of Japanese company's sales network</td>
</tr>
<tr>
<td><strong>Consumer Goods (Local Production)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coca-Cola</td>
<td>soft drinks</td>
<td>60</td>
<td>active advertising; distinctive production and sales setup (franchises)</td>
</tr>
<tr>
<td>Corning Glass</td>
<td>heat-resistant glassware</td>
<td>30</td>
<td>new product</td>
</tr>
<tr>
<td>Kimberly-Clark</td>
<td>tissue paper</td>
<td>20</td>
<td>use of business partner's distribution network; technological and product-development skills</td>
</tr>
<tr>
<td>Johnson &amp; Johnson</td>
<td>bandages</td>
<td>31</td>
<td>new product; active advertising</td>
</tr>
<tr>
<td>S. C. Johnson &amp; Son</td>
<td>floor wax</td>
<td>30</td>
<td>technological and product-development skills</td>
</tr>
<tr>
<td><strong>Capital Goods (Imported)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boeing</td>
<td>jet airplanes</td>
<td>60</td>
<td>careful market research; strong after-sales service</td>
</tr>
<tr>
<td>IBM</td>
<td>computers</td>
<td>40</td>
<td>technological skills</td>
</tr>
</tbody>
</table>

Table 7 (cont.)
SOME U.S. SUCCESS STORIES IN JAPAN

<table>
<thead>
<tr>
<th>Company</th>
<th>Product</th>
<th>Share of Japanese Market</th>
<th>Keys to Success (as seen by Japanese)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Capital Goods (Local Production)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caterpillar</td>
<td>bulldozers</td>
<td>43%</td>
<td>technological and product-development skills; strong after-sales services</td>
</tr>
<tr>
<td>Martin Marietta</td>
<td>concrete mixing agents</td>
<td>50</td>
<td>new products</td>
</tr>
<tr>
<td>Dow Corning</td>
<td>silicon resins</td>
<td>20</td>
<td>use of Japanese partner's distribution network; technological and product-development skills</td>
</tr>
<tr>
<td>Xerox</td>
<td>copiers</td>
<td>20</td>
<td>technological and product-development skills; distinctive sales system (rentals)</td>
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</tbody>
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(2) Enhanced personal responsibility for the quality of what Americans produce.
(3) More rapid domestic growth in research and development, the basic fuel for innovation and technical progress.

The often-painful changes provoked by greater competition, at home and abroad, range from out-sourcing to reducing labor costs to fundamental corporate restructuring. Simultaneously, many U.S. firms are discovering that product quality rests primarily with the workers on the front lines of production rather than in quality control departments. At the same time, the expansion of military spending has resulted in an upturn in federal research and development that has powerful spillover effects in the civilian economy.

None of these three factors yields quick or dramatic changes. Yet the cumulative and interactive effects that they generate are likely to endure and to reinforce each other. Virtually all of the changes work in the same direction—
toward generating new and better products that will result in more orders, production, employment, income and profits for American investors, managers and workers. These changes surely will not prevent the possibility of another recession during the second half of the 1980s. But they do make for a brighter outlook for the period beyond, that is, for the decade of the 1990s.

Thus, there is a reasonable basis for expecting that the ability of American firms to compete in world markets in the years ahead will be substantially improved. Likewise, the relative attractiveness of domestically produced products to American consumers should increase significantly. In the process, the real standard of living of the American people should rise noticeably.

In any event, we need to realize that the industrial sector of the American economy is far from being in the sad shape that many fear. In a journalistic version of Gresham's Law, it sometimes seems that bad news drives out good. It surely is not widely known that industrial production in the United States hit a new high in 1984 when the Federal Reserve's Index reached 122 (1977 = 100). During 1985, the Index of Industrial Production reached a plateau averaging 124 (see Figure 3). In fact, manufacturing's share of the real gross domestic production has held steady for the last 30 years—at about 25 percent (see Figure 4). Economic naysayers do not have a factual basis for their unalloyed pessimism. Manufacturing in the United States is not going “down the tube,” nor are we becoming a nation whose major employers are hamburger stands and clothing stores.

Foreign Counteractions

On the other hand, the positive developments stressed in this report are not foregone conclusions. For one thing, foreign competitors can improve on their current strategies while U.S. companies try to catch up.

Signs of such a development are showing in the automobile industry. While a Wall Street Journal/NBC News poll in November 1985 reported that the percentage of Americans choosing to buy foreign-made cars had declined from 25 percent to 21 percent, it also found that one-third of college-educated Americans and 30 percent of Americans under 35 years of age said they would purchase a foreign car. Auto makers emphasize the importance of those groups: College-educated Americans tend to buy the most expensive cars and acquire them more frequently. And auto companies have also learned the hard way that if a young American's first car is foreign-made, it is harder to convince him or her to “buy American” in the future.

There is no certainty that America's Big Three car makers will succeed in closing the gap. Simultaneous with the improvements in U.S. automaking, Japanese motor vehicle manufacturers are becoming very different and more dangerous competitors. They are doing so by differentiating their products according to function, price and appearance as well as size, attacking the American Big Three from many directions at once. The Japanese have increased the 21 nameplates and 46 separate models made in 1980 to 34 nameplates and 74 separate models last year. “It won't be enough to have both fuel-efficient and high-quality cars,” says Gerald Hirshberg, director of design at Nissan in California. “What's left is sheer creativity and agility that will dictate success and failure of new entries.”
Nor are the Japanese the only competitors with whom American companies must deal. The South Koreans are pinning their hopes of opening U.S. markets to their products on the Excel, a subcompact car introduced in 1985. If the Excel is successful, it will add to the quieter successes of Korean-made products such as the Leading Edge D personal computer, which was the fastest-selling product in its industry during the last Christmas shopping season. In fact, Korean companies also have entered many U.S. consumer-goods markets such as color televisions as manufacturers for American brand distributors. "As the Japanese keep moving 'upmarket,'" says David Cole, Far East specialist at the Harvard Institute for International Development, "the Koreans can move in and take over."

Other countries also are improving their competitive positions and the changing relationships at times may be indicative of future trends. For example, Korean construction companies— who have increasingly been giving their American counterparts tough competition in bidding on overseas projects—are now complaining about the low-cost rivalry from Turkish and Indian firms.

Public Policies May Alter the Economic Course

Another factor that may hurt the chances of an improved economy in the 1990s is further public policy changes that may not all be benign. Pressures to reduce the budget deficit, for example, may result in raising the tax burden on saving and investment, reducing these basic factors for economic growth. Indeed, the tax reform bill that the House of Representatives passed in December 1985 eliminates the investment tax credit, reduces the R & D credit, and tightens up on depreciation allowances.

Also, should protectionist pressures succeed in leading to the erection of additional trade barriers, much of the resultant burden would be born in the form of higher costs imposed on the industries using higher-priced protected inputs. U.S. export industries would be especially hard hit—and would be vulnerable to retaliation.

In addition, a new round of burdensome domestic government regulation would both raise the cost of compliance and deter companies from investment and innovation. Moreover, another shift in federal budget priorities—from defense to transfer payments—could dampen the upward trend in R & D spending. Yet the three key forces for enhanced competitiveness identified here appear to have considerable momentum, and the prospects for their durability are quite bright.

Our upbeat conclusion is more than merely taking an optimistic position for the future. It relies on the powerful importance of feedback effects. The 1990s look good because downward trends tend, after awhile, to be reversed in the non-linear American economy. But that phenomenon also alerts us to another, related fact that likely will be more germane for the decade that follows: Upward trends breed a complacency that erodes the progress made during the doldrums. That underscores a far more basic point—in change there is both opportunity and challenge.

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