For example, the general industrial machinery and vehicles sector experienced near-linear growth in the annual rate of capital formation (for both domestic and foreign markets) and the domestic market between 1969 and 1979. Production of specialized machinery and information-processing equipment expanded slightly faster than their domestic market growth over that period, while production of electrical equipment slightly lagged its domestic market growth.

These variations are nevertheless quite small compared to the growth of the PDE market and the domestic producers' share of that market. Only with exports do the trends for some years appear to be reversed. Domestic producers are included, does domestic production consistently and substantially lag domestic market growth. Indeed, production more nearly paralleled the growth of domestic producers' share of the domestic market. In other words, domestic producers were to import the dollar's appreciation damaged the quality of their exports and information-processing equipment. But even in some sectors, domestic equipment producers have not been able to take full advantage of the improving penetration of imported capital goods into domestic capital-goods markets.

In the perspective of domestic capital-goods producers, capital goods have not been experiencing the amount of growth that they had in the early-to-mid-1980s. In the 1980s, particularly for domestic capital-goods producers. Two of many (often related) trends are the overall slowdown in capital formation, and the shift in the mix of capital goods being formed. A third major trend, only recently gaining prominence, is the expanding penetration of imported capital goods into domestic capital-goods markets.

Concluding Remarks

While the capital-goods industry is still rightfully seen as one of the strongest industries in the United States, recent trends in capital formation raise concern about its potential for future growth. The capital-goods industries produce a large share of the world market and its changing composition. The views expressed are those of the author and not necessarily those of the Federal Reserve Bank of Cleveland or the Board of Governors of the Federal Reserve System.

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1. To avoid distortions associated with different phases of the business cycle, growth rates were calculated using the average annual growth rate for the 1962 to 1965 period and the 1975 to 1978 period. The growth rates represent the 1962 to 1965 period and the 1975 to 1978 period. For the final period, 1979 to 1984, the end year was the latest data available and was the second year of an exceptionally robust economic expansion. If the current expansion continues through 1985, the comparison for the 1979-84 period may understate the strength of the economy. Major Trends in Capital Formation by Robert H. Schnorbus

ECONOMIC COMMENTARY

Despite some concern that the nation is deindustrializing, our stock of capital has not actually been shrinking. However, the overall growth of capital stock has slowed during the recession and is still below the dot-line for economic growth. Capital formation is deindustrializing, our stock of capital has not actually been shrinking. However, the overall growth of capital stock has slowed during the recession and is still below the dot-line for economic growth.
rate, that is the rate at which the existing capital stock was written off for depreciation purposes.2

Equipment spending as a share of total investment fell from a low of 55 percent in 1962 to roughly 70 percent in 1978 before flattening out. The Revenue Act of 1962 began the trend by establishing a tax structure that favored investment in equipment over structures. Other government regulations in the 1960s mandated capital expenditure on pollution-abatement equipment and other environmental protections to the environment.

During the 1970s, accelerating inflation made short-term investments with quick pay-offs highly desirable and long-range investments risky. However, falling short-term interest rates on capital goods propelled 60 percent of the total PDE market.

The Shift in PDE Spending
Demand has not been changing uniformly across all types of PDE during the current expansion. As recently as 1970, traditional capital equipment, including vehicles, general industrial machinery, and specialized industry machinery, accounted for 65 percent of the domestic PDE market (see box).

By 1984, their share had fallen to 42 percent. Indeed, by 1984 the "high-tech" capital goods identified most closely with innovation (including computers) and electrical equipment, had supplanted traditional equipment and other such protections to the environment.

As a result, during the current economic expansion, capacity has been strained for many high-tech capital goods producers. Surprisingly, high-tech producers have also experienced share erosion in recent years. The loss of market shares to foreign producers is particularly noted because the capital-goods industry historically had been viewed as one of America's strongest sectors. The long-standing competitive advantages of domestic PDE producers over foreign producers were shaped by their access to domestic knowledge and in such areas as research, innovation, and quality of the workforce.3

Recent developments in productivity performance, chart 1 shows how both imports and exports of capital goods affect domestic producers. As net exporters, at least until 1984, domestic producers consistently benefited from world trade. However, as long as five years ago, the nature of the world trade relationship has been changing such that foreign producers have been growing. See, for example, Dennis M. Bushe, "Prices and Market Shares in International Capital-Goods Markets," Washington, DC, Board of Governors of the Federal Reserve System, June 1980, pp. 47-58.

Imports and Equipment Spending
Traditionally, producers of durable goods have bigger worries than losing their share of PDE spending; they have been steadily losing larger and larger shares of their own domestic market to foreign producers. Surprisingly, high-tech producers have also experienced share erosion in recent years.

As a result, during the current economic expansion, capacity has been strained for many high-tech capital goods, while most traditional capital goods have been buffered with excess capacity.4

The shift in the mix of investment within the PDE market reflects a dramatic change in the control of large-scale enterprises and in the production process itself (i.e., shift from human labor to robots). The sharp decline in the real cost of capital during the 1970s made the technological advantages that they offer more commercially accessible. As a result, tighter control of orders, shipments, and inventories was made possible by more efficient storage and organizing technology.

More recently, computer technology has substantially increased the potential for direct managerial control over the PDE itself. Machining centers and factory robots are prime examples of the rising wave of programmable manufacturing processes that are under the direct control of managers rather than skilled workers. Traditional capital-goods producers must contend with the fact that much of the increase in the domestic industry's market will go to the high-tech sectors. Traditional producers can only expect thriving market growth if they can link their product to new technologies as, to some extent, has been the case with machine tools and robotics.

The difference between domestic producers' share of the domestic market and their total production respectively reflected the size of the largest (usually 30) capital-goods exporting nations, as distinct from their home market in any given year. The difference between domestic and total production represents the trade surplus generated by these capital-goods producers.