

ECONOMIC COMMENTARY

Major Trends in Capital Formation

by Robert H. Schnorbus

Capital formation in the United States has undergone dramatic changes since the 1960s, 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.

Put in the perspective of domestic capital-goods producers, capital goods have not been experiencing the amount of growth that they had in the early post-World War II years, primarily due to less construction of offices and factories. However, even in some sectors of the equipment market, such as the "traditional" goods-producing machinery, demand has been diminishing. And now, to compound these problems, domestic producers in virtually all sectors of the equipment market are facing stiff foreign competition.

In this *Economic Commentary*, we review the reasons for these three trends in capital formation in order to understand the extent to which they represent long-term threats to the future of the domestic capital-goods industry.

Capital Formation Slowdown

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-prone 1970s and early 1980s as economic growth in general slowed. Growth of capital stock, measured by the average annual growth rate of real gross business fixed investment, declined from 4.8 percent during the 1960s to 3.8 percent in the 1970s and early 1980s.¹ Much of the weakness until recently was concentrated in all structures, especially factories as opposed to office buildings.

Growth of producers' durable equipment (PDE) spending was much more stable (falling marginally from 5.5 percent in the 1960s to 5.3 percent in the 1970s), but then also weakened (4.1 percent) in the early 1980s. Although the growth of equipment capital has outperformed structures, domestic equipment producers have not been able to take full advantage of that better performance because of rising imports, which will be discussed later.

The slowdown in the growth of capital stock primarily has two sources—one reflects the sluggishness of the national economy, rather than the "deindustrialization" of the economy, as is often alleged, and the other reflects the changing composition of capital goods.² To begin with, durable goods are particularly sensitive to the business cycle. There were two back-to-back recessions in the early 1970s and the 1980s, but only one mild recession during the 1960s. Moreover, both the 1973-75 recession and the 1982-83

recession broke post-Great Depression records for severity. The sluggishness of the economy is also evident in the steadily rising ratio of net capital stock to gross domestic product from 0.73 in 1962 to 0.82 in 1983.

Net capital stock was expanding rapidly in the 1960s (6.0 percent between 1962 and 1971), but has slowed by nearly a third in the 1970s and early 1980s, as growth in gross domestic product slowed from 4.5 percent in the 1960s to 3.8 percent in the 1970s and early 1980s. The rising ratio, could, therefore, imply that the economy has not been growing fast enough to sustain earlier rates of capital formation.

The deindustrialization issue is, therefore, overemphasized.³ Although the manufacturing sector is not growing as fast as other sectors of the economy, its absolute size (including output, capital stock and, until recently, employment) is expanding. Continuation of the slowing trend in capital formation during the 1980s will depend, in large part, on how long the current economic expansion continues. Until this year, the expansion has displayed record PDE spending, which has been largely associated with the so-called computer revolution.

Another important source of the capital formation slowdown has been the shift from structures to relatively short-lived producers' durable equipment. This shift, in effect, decreased the growth rate of capital formation by increasing its average depreciation

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1. To avoid distortions associated with different phases of the business cycle, growth rates were calculated between the years just preceding a peak year. The growth rates representing the 1960s were computed between 1957 and 1969 and for the 1970s, 1969 and 1979. For the final period, 1979-84, 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 PDE growth. Based on a recent Data Resources, Inc. forecast for 1985, however, real PDE growth during this period would still show a slowing (4.7 percent) from previous periods. See *Review of the U.S. Economy*, Data Resources, Inc., May 1985.

rate, that is, the rate at which the existing capital stock was written off for depreciation purposes.⁴

Equipment's share of total investment rose 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 expenditures on pollution-abatement equipment and other such protections to the environment.

During the 1970s, accelerating inflation made short-term investments with quick pay-offs highly desirable and long-range investments risky.

The Shift in PDE Spending

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

By 1984, their market share had fallen to 42 percent. Indeed, by 1984 the "high-tech" capital goods, identified most closely with information-processing (including computers) and electrical equipment, had supplanted traditional capital goods with nearly 60 percent of the total PDE market.

Box 1 Composition of Major Sectors of Producers' Durable Equipment

The five sectors of the capital-goods market discussed in this article were intended to separate distinct groups, particularly high technology products, from more traditional products. A sector may contain an odd mixture of products, such as service industry machinery in information pro-

cessing equipment, however, because of differences in the way data are aggregated by the different data services. The sectors are based on the components of PDE spending in the National Income Accounts as presented in tables 5.6 and 5.7 of the *Survey of Current Business*.

General industrial machinery

General industrial equipment
Metalworking machinery
Engines and turbines

Specialized industry machinery

Special industry machinery, n.e.c.
Agricultural machinery, except tractors
Construction machinery, except tractors
Mining and oilfield machinery

Vehicles

Trucks, buses, and truck trailers
Autos
Aircraft
Ships and boats
Railroad equipment
Tractors

Information processing equipment

Office, computing, and accounting machinery
Service industry machinery
Instruments

Electronic apparatus

Electrical and communication equipment
Electrical transmission, distribution, and industrial apparatus
Communication equipment
Electrical equipment, n.e.c.

Some of the stimuli to the equipment market may have faded in the early 1980s with the sharp decline in inflation. However, falling short-term interest rates relative to long-term rates, new tax incentives (i.e., accelerated depreciation), and the need to modernize capital stock to compete against foreign competition has contributed to a rise in PDE's share of total capital spending during the current economic expansion.

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 burdened with excessive capacity.⁵

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., a shift from human labor to robots). The sharp decline in the real cost of computers during the 1970s made the technological advances that they offer more commercially accessible. As a result,

tighter control of orders, shipments, and inventories was made possible by more efficient storage and organization of information.

More recently, computer technology has substantially increased the potential for direct managerial control of the production process itself.⁶ 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 laborers. Meanwhile, traditional capital-goods producers must contend with the fact that much of the increase in PDE spending 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.

Imports and Equipment Spending

Traditional capital-goods producers 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 market-share erosion in recent years.

The loss of market shares to foreign producers was perhaps unexpected because the capital-goods industry historically had been viewed as one of America's strongest trade performers. The long-standing competitive advantages of domestic PDE producers over foreign producers were shaped by the domestic industry's leadership in such areas as research, innovation, and quality of the work force.⁷ Net exports of producers' durable equipment reached a peak in 1974, and began a sharp decline after 1980, as imports' share of the domestic market rose from 8 percent in 1970 to 26 percent in 1984. Penetration varied among sectors in 1984, ranging from 14 percent in vehicles to 39 percent in

2. For a detailed discussion of the causes of the capital formation slowdown, see Dana Johnson, "Capital Formation in the United States: the Postwar Perspective," *Public Policy and Capital Formation*. Washington, DC: Board of Governors of the Federal Reserve System, April 1981, pp. 47-58.

3. A lucid debunking of the myths of deindustrialization is contained in Robert Z. Lawrence, *Can America Compete?* Washington, DC: The Brookings Institution, 1984.

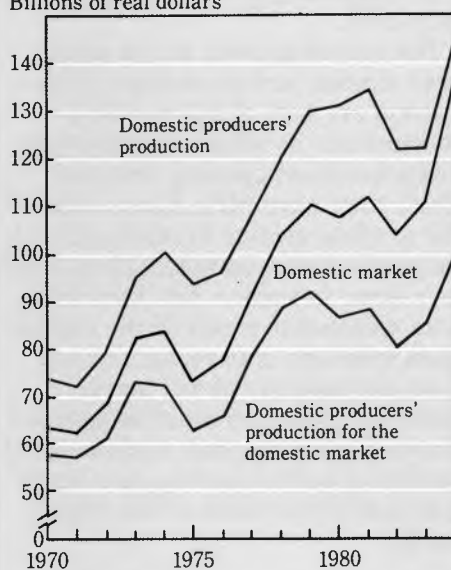
4. Average service life of newly purchased PDE fell 7 percent between 1962 and 1977 to an average of 11.9 years. Since then, the rising share of office machinery, which has an average service life of eight years, has further reduced the average life of total PDE.

5. A notable exception to this statement among high-tech products is the computer industry, which currently appears to have excess capacity. The problem might be a temporary difficulty in keeping up with rapid technological changes and need for restructuring, however, rather than a demand-related problem. In 1985, plant closings, may have reduced much of the excess capacity in the industry. See Randall Smith, "Computer

electrical equipment, but still represented substantial gains in each sector over 1970 import shares.

The most often-cited explanation for the recent deterioration in net trade of capital goods is the sharp appreciation of the dollar since mid-1980 which, relative to foreign currencies, has made all domestic goods more expensive in the world market and imports cheaper in the domestic market. During the 1970s, the dollar was generally depreciating. Many exchange-market analysts currently believe that the dollar is overvalued and expect this depreciation to return in the future. If the dollar does depreciate, it will help offset some of the competitive advantage currently being enjoyed by foreign producers.

Chart 1 Producers' Durable Equipment Market with Foreign Trade
Billions of real dollars



NOTE: Data used to construct this chart are based on the combined merchandise trade and PDE spending data for the five sectors described in the box. Other definitions of the equipment market or other sources of trade data may give slightly different levels, but the trend should be unaffected.

SOURCE: U.S. Department of Commerce, Bureau of Economic Analysis, *Survey of Current Business*, various July issues, Tables 5.6 and 5.7, and Table 3; and Bureau of the Census, *Highlights of U.S. Merchandise Trade*, December issues, Tables 6 and I-10.

However, as indicated above, imports were expanding long before the dollar began its rise, which suggests that the increasing competitive-

ness of foreign producers is a more serious threat than the dollar movements to domestic producers. Furthermore, recent research indicates that the adjustment lag to declining import prices of capital goods may last as long as five years.⁸ Even a sudden reversal in the dollar could mean several more years of intense foreign competition.

The difference between domestic producers' share of the domestic market and their total production represents the size of their foreign markets (exports), as distinct from their home market in any given year. The difference between the size of the domestic market and total domestic production represents the trade surplus generated by these capital-goods pro-

Table 1 Market Growth of PDE with Trade Adjustments
Average annual rates

	1969-1979			1979-1984		
	Domestic market (RPDE)	Domestic production for the domestic market (RPDE-M)	Domestic production (RPDE-M+X)	Domestic market (RPDE)	Domestic production for the domestic market (RPDE-M)	Domestic production (RPDE-M+X)
Total PDE spending	5.4	4.3	5.5	4.4	1.8	2.0
Specialized industry machinery	3.1	2.3	3.4	-4.4	-5.2	-5.6
General industrial machinery	2.6	1.0	2.5	-4.0	-6.2	-5.4
Information processing equipment	11.4	10.5	12.0	13.7	9.3	10.4
Vehicles	3.9	3.0	4.0	1.3	1.1	0.7
Electrical equipment	6.0	3.7	5.5	4.0	0.9	0.4

SOURCE: U.S. Department of Commerce, Bureau of Economic Analysis, *Survey of Current Business*, various July issues, Tables 5.6 and 5.7, and Table 3; and Bureau of the Census, *Highlights of U.S. Merchandise Trade*, December issues, Tables 6 and I-10.

Relationship of Market Growth and International Trade

Imports are only part of the story concerning the impact of international trade on domestic capital-goods producers. As net exporters, at least until 1984, domestic producers consistently benefited from world trade.

By comparing three relationships, chart 1 shows how both imports and exports of capital goods affect domestic PDE producers: 1) the domestic market (real PDE spending), 2) domestic PDE producers' share of that domestic market (PDE minus imports), and 3) total domestic production (excluding changes in inventories) for home and overseas markets (PDE minus imports plus exports).

ducers. Consequently, as long as domestic production is larger than the domestic market, the domestic industry benefits from trade. Only if total domestic production drops below the size of the domestic capital-goods market could it be said that the domestic capital-goods industry was not a net beneficiary from world trade.

Domestic production of PDE in total has kept pace with the growth of the domestic market between 1969 and 1979, even though imports were taking a larger share of the domestic PDE market, because export growth was strong as well. This pattern has been more or less true of all sectors, despite a wide variation in domestic market growth among sectors (see table 1).

Industry Called Ripe for Mergers," *Wall Street Journal*, June 19, 1985.

6. For examples of extending management control to daily plant operations, see Robert Harvey, "Computers in Manufacturing," *Iron Age*, March 15, 1985. For a history of the development of computer-controlled machine tools, see David F. Noble, *Forces of Production*. New York, NY: Alfred A. Knopf, 1984.

7. For further discussion, see Thomas C. Lowinger, "The Technology Factor and Export Performance of U.S. Manufacturing Industries," *Economic Inquiry*, vol. 13, no. 2 (June 1975), pp. 221-36.

8. See Irving B. Kravis, Robert E. Lipsey, and Dennis M. Bushe, "Prices and Market Shares in International Machinery Trade," *Working Paper No. 521*, National Bureau of Economic Research, July 1980.

9. The size of the world PDE market, usually defined as total PDE exports of the largest (usually 18) capital-goods exporting nations, was not computed for this study. Other research clearly indicates, however, that the United States has been losing its share of the world market because of declining competitiveness, even though its exports have been growing. See, for example, C. Michael Aho, Harry P. Bowen, and Joseph Pelzman, "Assessing the Changing Structure of

For example, the general industrial machinery and vehicles sectors experienced near-parallel growth of domestic production (for both domestic and foreign markets) and the domestic market between 1969 and 1979. Production of specialized industry 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 when the dollar-dominated 1980s 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 some extent successful in offsetting losses in their domestic market with gains in their foreign markets—until the dollar's appreciation damaged their world competitiveness in terms of both imports and exports.

Although exports of domestically produced capital goods continue to rise, relative competitiveness of domestic PDE producers has been declining as evidenced by their declining share of the world market.⁹ Rather than capturing a larger share of the world market, domestic producers have merely ridden a rising wave of world

demand for capital goods. While the largest proportion of exports has gone to western European countries (32 percent) and newly industrializing countries (30 percent), only the latter have been consistently increasing their share of domestic exports since 1969. Domestic capital-goods producers seem to have been dependent on strong growth in world demand, particularly among newly industrializing countries, to offset their loss of world market share.

While domestic capital-goods producers, for the most part, benefit from trade, the trade patterns are not encouraging for the years ahead. Domestic producers most likely will continue to lose their competitive position in the world market. Even if the dollar declines, market losses in earlier years are unlikely to be reversed easily. Regaining domestic market share may be particularly difficult, as auto and steel producers have already discovered. As concerns about quality of product and reliability of service are resolved, price competition intensifies, and many imports still have the same labor-cost advantages over domestically produced capital goods that have troubled domestic steel and auto producers. Once domestic capital-goods buyers overcome the threshold problems of finding reliable trading partners, trade between the partners could quickly expand.

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. All three of the capital-formation trends discussed above have been detrimental to domestic capital-goods producers.

In some cases, such as the slowdown in capital formation, the trend should not be considered irreversible—although some overbuilding of structures may have occurred in recent years and may take a few years to be absorbed. The 1982–84 boom in information-processing equipment is an encouraging sign for producers of equipment. However, part of that strength was linked to an expansionary phase of the business cycle and presumably will weaken as the economy itself loses steam, as appears to be happening in late 1984 and early 1985.

The overall growth of the equipment market and its changing composition are part of the economic environment in which capital-goods producers must operate, but over which they have little direct control. The gradual decline in international competitiveness, on which they might have some influence, has been a far more worrisome trend. If the capital-goods industry is to remain strong in an increasingly global market, domestic producers must be aggressive in preserving their technological leadership and in finding new ways to expand their share of the world market.

U.S. Trade in Manufactured Goods: An Analysis and Comparison of Various Indicators of Comparative Advantage and Competitiveness," *Eco-*

nomic Discussion Paper II, U.S. Department of Labor, Bureau of International Labor Affairs, October 1980.

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