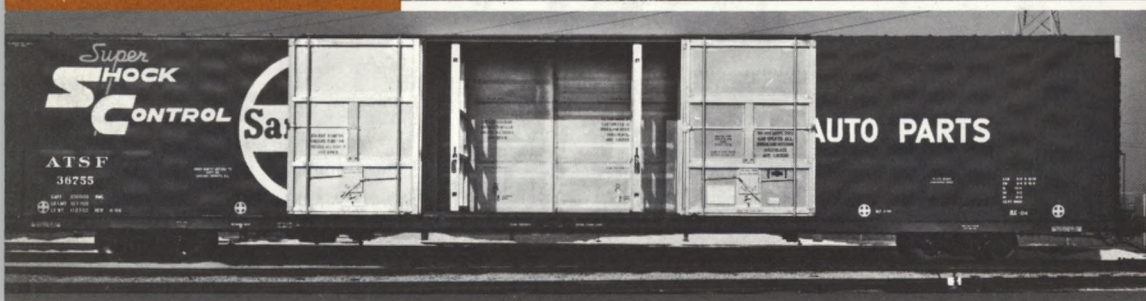
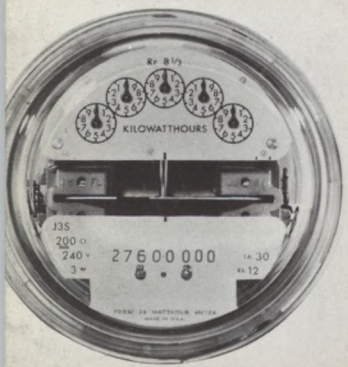
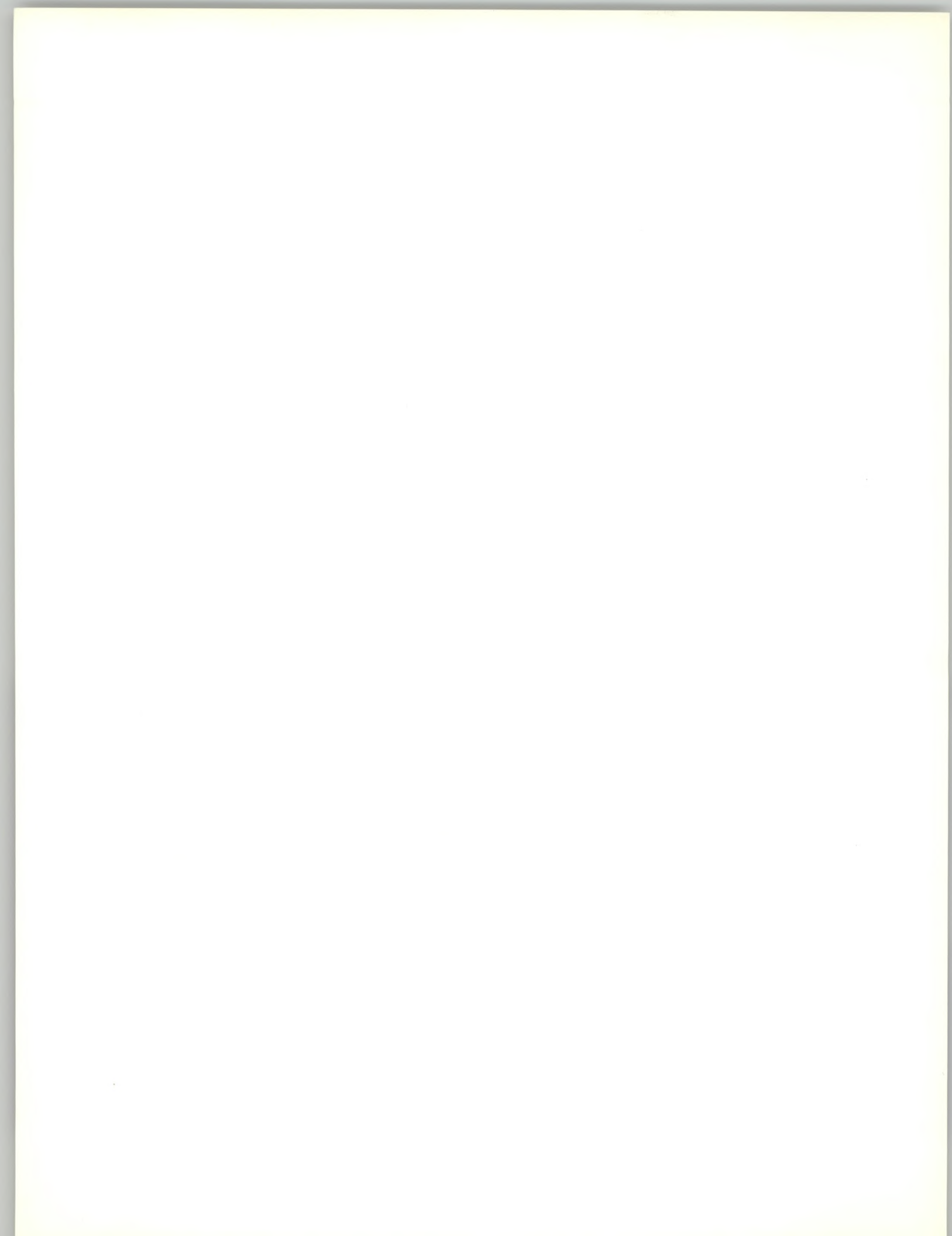


FEDERAL RESERVE BANK OF CHICAGO

annual report 1966

MACHINERY AND EQUIPMENT key industries in the Midwest







**To the Member Banks of the
Seventh Federal Reserve District:**

It is our pleasure to submit to you the Annual Report of the Federal Reserve Bank of Chicago for the year 1966.

Last year combined public and private demands for goods and services pressed closely upon the nation's economic resources and credit growth was restrained to dampen price inflation. The impact of these developments upon the Seventh Federal Reserve District is described briefly at the beginning of this report.

A discussion of the machinery and equipment industries and their role in the economy of the Midwest and the nation is presented on pages 10-33.

The financial statements are presented on pages 34 and 35. The volume of transactions in many departments of the Bank has continued to rise as business activity in the Seventh District has expanded further (pages 36 and 37).

Official appointments and elections during the year are reported on pages 38-40.

On behalf of the directors, officers and staff, I extend to you appreciation for your cooperation and counsel which has enabled us to provide continued high-quality financial services to the public.

Sincerely,


CHARLES J. SCANLON °
President

January 20, 1967



1966 IN REVIEW

Economic

Developments

Resources of men and facilities were utilized more fully during 1966 than at any time since the Korean War, in both the nation and in the Seventh Federal Reserve District. As record demands of consumers, businesses and governments—aided substantially by credit expansion—pressed upon productive capacity, price increases were widespread and persistent.

To prevent snowballing price inflation, monetary policy during 1966 was directed toward reducing the rate of credit growth, while the Government took steps to increase tax receipts and restrain the rise of expenditures. During the latter part of the year, income and total output of goods and services were increasing at a more moderate pace than in earlier months and prices of some goods declined. Neverthe-

less, the economy retained substantial momentum, and prospects for a further increase in activity in 1967 remained favorable.

Defense and business investment

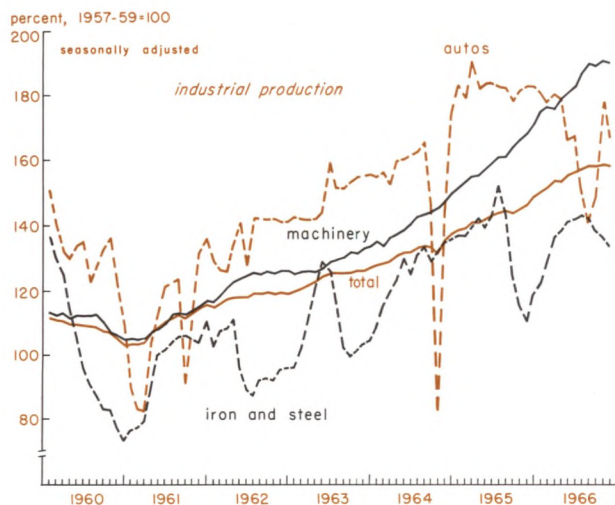
Consumer outlays continued to rise, increasing about 8 percent from the 1965 level. The main impetus to overall business expansion, however, came from military outlays and business investments in new plant and equipment and inventories.

As a result of the Vietnam conflict, national defense outlays rose to a rate of 61.3 billion dollars in the third quarter, up 21 percent from a year earlier. Military orders, although important, did not play a dominant role in the Midwest economy where the prime movers in the expansion were the machinery and equipment industries. The five-state area of the Seventh District produces about one-third of all producers' durable equipment (see article, page 10).

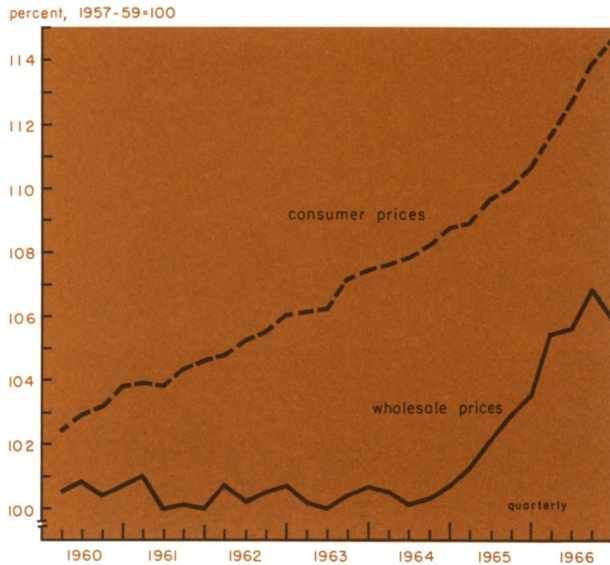
Output of machinery and equipment continued to rise throughout 1966 and was up about 15 percent for the year as a whole. Meanwhile total output of consumer goods increased slowly early in the year and then leveled off. Virtually all producers of machinery and equipment operated at practical capacity limited by availability of facilities, floor space and, most common and most critical, manpower. Supplies of materials and components tended to ease in the fourth quarter, but shortages of skilled workers, especially in the metalworking trades, remained severe.

Orders for construction machinery were at a very high level until the fourth quarter when reductions in housing and commercial construction (and related industries such as logging) were reflected in a sharp decline. Farm equipment output remained strong throughout the year and, for the first time since the Korean War, total output was limited by productive capacity.

Rise in machinery output leads other industries in 1966



Consumer prices continued to rise but the wholesale index declined in late 1966, mainly reflecting lower farm prices



SOURCE: U. S. Bureau of Labor Statistics.

New orders for total machinery and equipment reached a peak in the second quarter and then declined somewhat. Nevertheless, these orders remained above rising shipments through October and unfilled orders continued to rise. Order lead times lengthened and prices of some types of capital goods increased sharply.

Autos, appliances and steel

Auto sales were at an extremely rapid pace in the early months of 1966, allowing for normal seasonal patterns. When the rate of sales slackened in the spring, output schedules for the remainder of the model year were reduced. Planned production of 1967 model passenger cars was curtailed in the fourth quarter as sales proved somewhat disappointing after a fairly strong start.

Passenger car output totaled 8.6 million in 1966, down from 9.3 million in 1965, but far larger than in any earlier year. Truck production was only slightly below 1965's record level, and unfilled orders for heavy trucks remained large throughout the year.

Large gains in sales and output were reported for most major household appliances and for furniture in 1966. Demand slackened in the fourth quarter, however, and layoffs were announced late in the year as some of the major appliance manufacturers moved to reduce inventories. Sales of color television sets

continued strong throughout the year, but makers were prompted to adjust production schedules in favor of lower-priced models to tap a vast market potential.

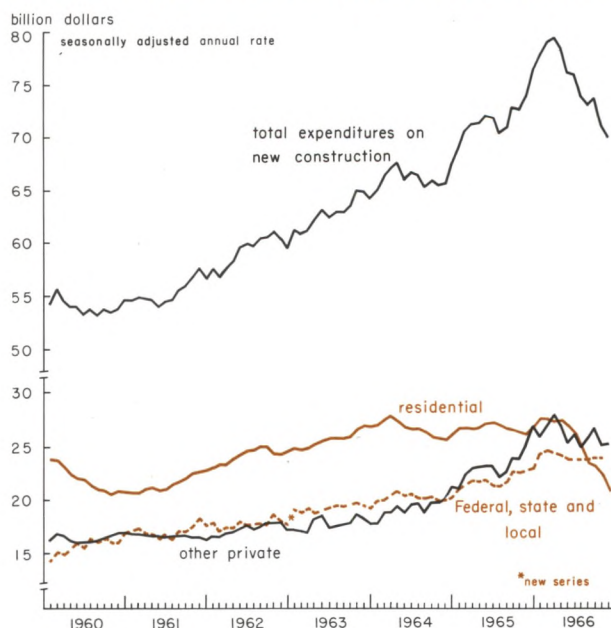
Steel output reached a record 134 million tons in 1966, compared with 131 million tons the year before, but shipments of finished steel were down slightly as mill inventories rose. Imports of steel totaled 10 million tons, about the same as in 1965 when these were stimulated by a strike threat. Steel output reached a peak rate in the spring as new facilities came into production and some older ones were re-activated. The ingot rate declined gradually in the fourth quarter, more because steel users were liquidating inventories than because of reduced consumption.

Construction slides

Total construction activity declined steadily after a peak attained in March. Most of the drop was accounted for by residential building, but the non-residential and government sectors also slowed moderately.

Housing starts for the nation were off about 20 percent from 1965, mainly because of reduced availability of mortgage funds. For the Midwest the decline was much smaller, reflecting the underlying

Residential building declined sharply in 1966 while other construction leveled



SOURCE: U. S. Department of Commerce.

vigor of housing demand and the low vacancy rates reported for certain leading centers.

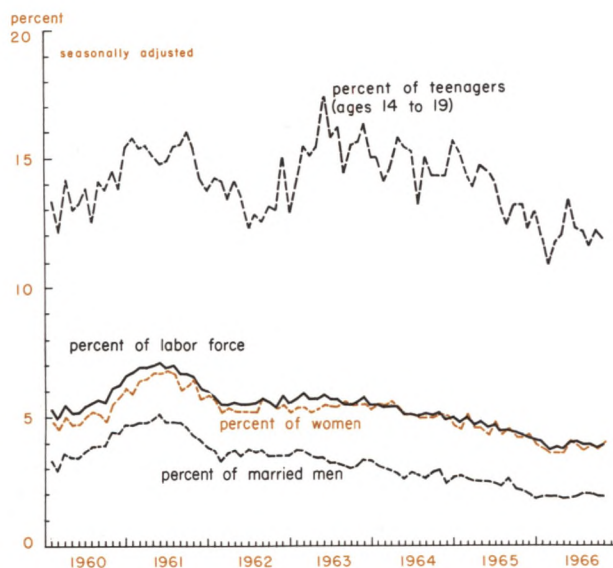
Total construction contracts for the first 11 months of 1966, as reported by F. W. Dodge, were up 5 percent in the Midwest from the same period a year earlier—slightly more than for the nation. For the January-May period, however, construction contracts had exceeded 1965 by 18 percent in the Midwest and 9 percent in the nation. Year-to-year declines in later months, first in the residential and later in the commercial sectors, sharply reduced the margin of gain.

Labor markets tight

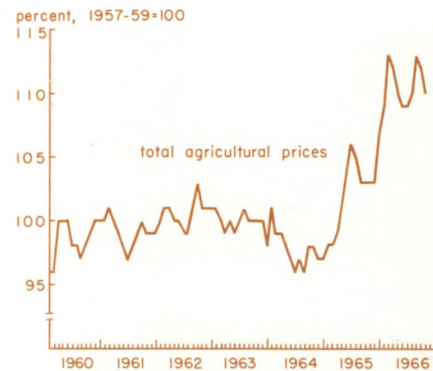
Throughout the Midwest, demands for workers—skilled and unskilled, experienced and inexperienced—remained very strong in 1966. In late November rates of insured unemployment were 1 percent or less in Illinois, Indiana and Iowa, and 1.2 percent in Michigan, compared with 1.9 percent in the United States. These rates were the lowest on record in all states, except for a slightly lower rate in Michigan a year earlier. Increased draft calls aggravated labor shortages resulting from high level activity.

Even building trades workers remained in short supply. Apparently, increases in some types of non-residential construction and repair and modernization activity, together with opportunities in other industries and attrition through retirements prevented an appre-

As employment rose, unemployment was reduced to the lowest level since the Korean War



Prices of farm commodities average well above other recent years



ciable increase in unemployment among construction workers, at least in the Midwest.

Businesses increased recruiting efforts by extensive advertising, lowering of hiring standards, bounties and other measures. Training programs were activated or expanded. Nevertheless, lists of job vacancies continued to lengthen at many firms, and higher labor turnover, increased absenteeism and the use of less qualified workers tended to reduce efficiency.

Farm income rises

The farm sector of the economy reported substantial income gains during 1966. Net income from farming operations advanced further from the high level of 1965 and was the largest since the period immediately following World War II. The continued advance in agricultural prosperity can be attributed primarily to higher prices of farm commodities, virtually across the board.

Prices received for farm products were substantially above year-earlier levels during early 1966, reflecting both relatively small supplies of slaughter livestock, especially hogs, and the expectation that 1966 feed grains and soybean crops would be substantially short of expected consumption. Prices of dairy products and fruits and vegetables also rose sharply in response to reduced supplies and strong consumer demand. As a result of expanded meat production and a larger than expected crop harvest, average farm prices declined in the fourth quarter but continued well above year-earlier levels.

Deposits at most "agricultural" banks rose, reflecting, in part, higher farm income. Demand deposits at these banks increased at about twice the rate of most recent years and in October were about 5 percent

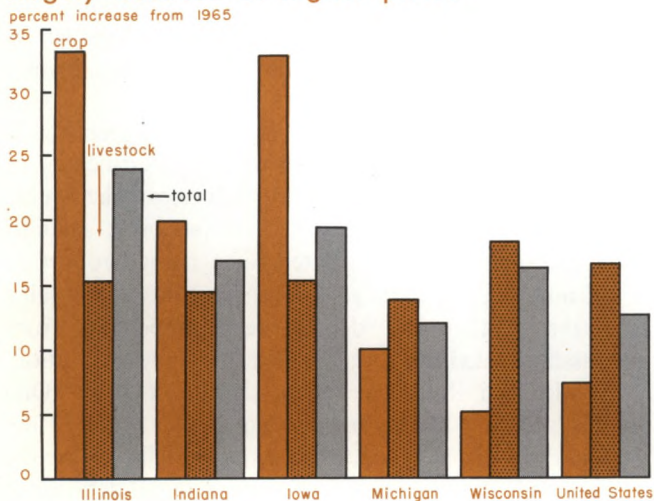
above the same month of 1965. Time deposits in October were 10 percent or more above the year-earlier level in each of the District states.

The marked improvement in farm income, coupled with an optimistic outlook of farmers, led to increased spending for production and capital goods. Expenditures for production items rose about 8 percent. Higher prices were partly responsible, but the physical volume of purchases of most production items such as fertilizers, insecticides, weed inhibitors, seeds and feed also rose.

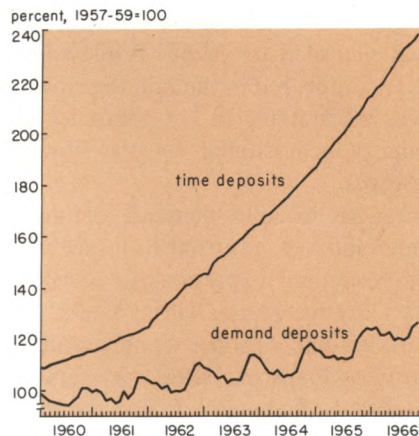
Outlays for most types of equipment increased substantially. For example, purchases of tractors by District farmers—their major equipment expenditure—increased 18 percent from the year-earlier level during the first 10 months of 1966. Meanwhile, demand for farmland remained very strong as additional land was purchased to expand existing farms. Farmland prices in the District were about 9 percent above the previous year at the end of the third quarter.

These developments were accompanied by increased borrowing. At midyear, non-real estate farm loans outstanding at District member banks were up nearly 14 percent from 1965, more than double the increase in the preceding 12 months. Loans secured by farm real estate were about 12 percent higher, nearly equal to the large rise during the 1964-65 period. While demand for new credit continued strong, bankers in many areas reported that repayments of outstanding loans had accelerated and that renewals and extensions had declined.

Farmers' cash receipts from marketings rose sharply, largely because of higher prices



Deposits at agricultural banks rise sharply as farm and other income rose in rural areas



Bank growth moderated

Rising levels of expenditure continued to generate strong demands for credit, especially by the business sector. In the face of upward price pressures and near-capacity utilization of resources, monetary policy was designed to slow the rate of credit growth and at the same time to moderate the unduly heavy impact of monetary restraint on certain sectors of the economy. As credit demands exceeded limited supplies, interest rates rose to the highest levels in 40 years. With yields in the money and capital markets well above the rates that banks and other intermediaries were able to pay for funds, a smaller portion of the total volume of credit was accounted for by the commercial banks, reversing the trend that had prevailed during the preceding five years.

Total loans and investments of all Seventh District member banks were 6 percent above the year-earlier level in early December, compared with a record 10 percent gain in the previous 12 months. Bank credit trends in the District roughly paralleled developments for the nation. In the first half of 1966, credit growth slowed slightly from the rapid 1965 pace, but in late summer both bank credit and money supply, seasonally adjusted, turned down and continued to decline through the fall months. The expansion in aggregate loans and investments of District banks from August through November was only about 40 percent of the increase during the same period of 1965, mainly because of greater net pay-downs of loans at large banks in the major cities.

Despite persistently strong credit demands, over-

all loan expansion in the District was relatively smaller in 1966 than in the previous year for both city and country banks. At the beginning of December, loans and discounts of all member banks were 10 percent above the year-earlier levels—well below the 17 percent gain recorded for 1965. While some easing of loan demand appeared in the fall, the slower pace of lending was attributable in large part to restrictive bank policies necessitated by the slower growth in bank reserves.

The unusual strength in loan demand stemmed mainly from commercial and industrial firms seeking to finance an unprecedented expansion in working capital and facilities. At the large District banks for which information is available on the composition of loan portfolios, business loans increased very rapidly through July but leveled off thereafter. For the year as a whole, these loans rose about 15 percent, much less than the 23 percent gain in 1965 but significantly more than in any other recent year. Other types of borrowers also felt the impact of the squeeze on bank funds. Real estate and consumer loans continued to rise, but at a slower pace, while loans to finance com-

panies and securities dealers failed to show their normal expansion late in the year.

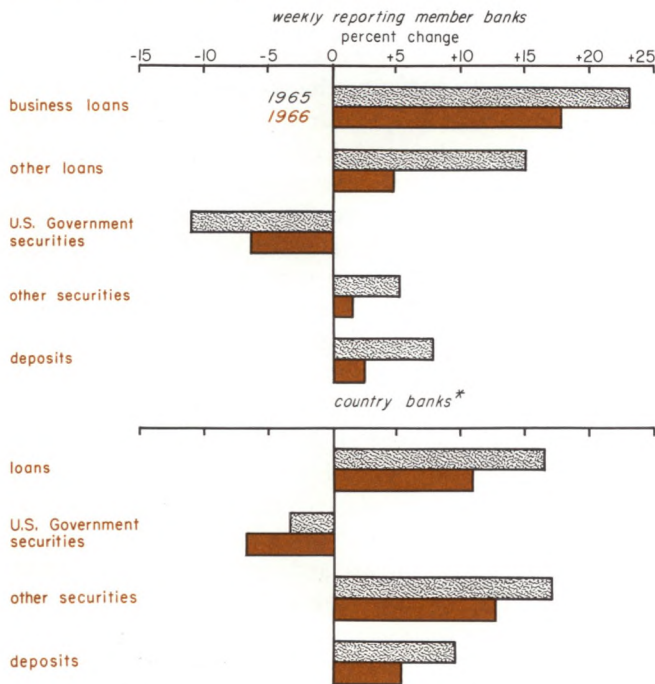
Most banks accommodated loan customers, whenever possible, by further reducing their investments. Holdings of U. S. Government securities declined 7 percent at all District member banks, matching a similar liquidation in the previous year. The reduction at city banks was relatively smaller than in 1965 while at country banks it was greater. This difference reflects the relatively low liquidity positions of the large banks. City banks had only small amounts of Governments remaining in their portfolios that were not pledged against public deposits or required by “dealer” banks for trading purposes. Investments in securities other than Governments rose 8 percent during the year. Acquisitions of these securities—mainly municipals—were concentrated in the early months of the year and were partly offset by later sales.

The late 1966 halt in credit growth at member banks was the counterpart of a downturn in deposits, especially time deposits. For the year as a whole, time and savings deposits of all District member banks rose less than 7 percent compared with annual gains in the previous five years ranging from 12 to 20 percent.

Banks continued to bid aggressively for funds in 1966, within the rate limits set by regulatory action. The maximum interest rate payable on time deposits other than savings had been raised to 5.5 percent in December 1965 (from 4.5 percent on maturities of 90 days or more and 4 percent on shorter maturities), but by midsummer yields on alternative investments, such as Treasury bills and commercial paper, had risen so sharply that even the new ceiling hampered banks in competition for interest-sensitive funds. From mid-August to the end of November, CDs of \$100,000 or more outstanding at the District’s large money market banks declined 450 million dollars, or about 20 percent. Toward year-end, however, CD run-offs slowed as yields on alternative investments declined.

Meanwhile, many banks attempted to attract funds by offering small denomination time certificates to individuals and others at rates well above the 4 percent maximum rate permitted on passbook savings. These instruments accounted for a rising proportion of time deposit money. A large portion of the gains in these “other time” deposits represented shifts from passbook savings, often within the same institution. While such shifts were most significant at the District’s largest banks, smaller banks also reported net withdrawals of savings balances, especially during the second half of the year. Aggregate demand deposits at

Growth in past year less rapid than in 1965 at both city and country banks in Seventh District



*Excludes large country banks which reported weekly in both years.

District banks in December were less than 2 percent above year-earlier levels—a smaller net gain than in 1965. The total dollar volume of time and savings balances combined exceeded demand deposits in February for the first time on record and remained higher through year-end despite the run-off of CDs at large banks in the fall months.

The ratio of loans to deposits is a general indicator of bank liquidity; changes in this ratio strongly influence bank lending policies. Total loans of all District member banks exceeded 62 percent of gross deposits at year-end. Ratios of individual banks varied substantially, ranging up to 80 percent at a few large banks.

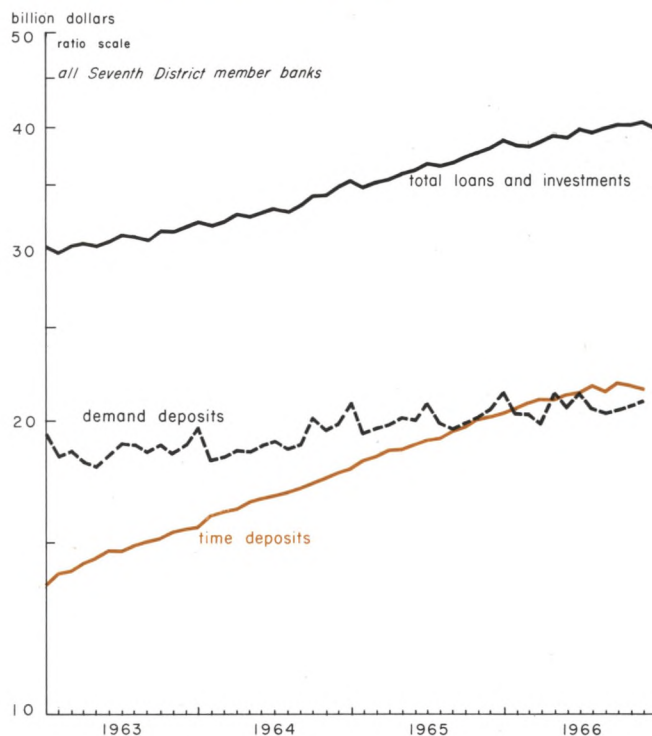
Monetary policy action

Deposit trends, of course, reflected actions of the monetary authorities. The need to restrain aggregate demand in order to contain inflationary forces became persuasive in the late fall of 1965 and was marked by the discount rate increase in December of that year. In the early part of 1966, the Federal Reserve System maintained a restrictive posture by supplying reserves to the banking system less freely than would have been necessary to meet the burgeoning demands for credit as the pace of business accelerated. Under these conditions, although bank credit continued to expand, interest rates continued the rise which had begun in mid-1965. Moreover, the availability of credit was sharply curtailed in certain sectors—notably residential building—while business loans continued to rise.

Concern over the uneven impact of reduced credit availability influenced the nature of monetary policy actions. High rates did not sufficiently deter business borrowing. In view of the objective of slowing the growth in bank credit, especially loans to business, with minimal impact on interest rates, the maximum rates payable on time deposits were not raised and the discount rate remained at the level established in December 1965. With yields on other investments continuing to advance, loan policies became more restrictive. In addition, a number of positive steps were taken that also reduced the banks' ability and incentive to expand their loans.

Percentage reserve requirements against time deposits other than passbook savings in excess of 5 million dollars at any one bank were raised twice—first in July from 4 to 5 percent, and again in September to 6 percent. These changes absorbed reserves and increased the effective cost of time funds to the large banks. In July, the Board also amended Regulations

Credit expansion slowed with decline in time deposits



D and Q (effective September 1) to include short-term promissory notes under the definition of deposits, thereby making them subject to reserve requirements and regulations relating to the payment of interest on deposits. As a result, banks were prevented from avoiding the restrictive effects of policy through the issue of promissory notes. Some banks had issued higher-yield notes in 1965 when the 4.5 percent ceiling on time deposit rates had become an impediment to their deposit growth. All such notes have now been retired.

Another amendment to Regulation Q (effective July 20) reduced the maximum rates payable on "multiple-maturity time deposits" (deposits payable at the depositor's option on more than one date) to 5 percent on such deposits maturing in 90 days or more and to 4 percent on those payable in less than 90 days. In still another amendment to Regulation Q, the maximum rate payable on single-maturity time deposits other than savings in denominations of less than \$100,000 was reduced to 5 percent. This action immediately followed legislation approved September 21 which specifically authorized the Board to prescribe different rate limitations for different classes of

deposits according to size, maturity, nature or location of depositors or other "reasonable bases." Concurrently, the new ceilings were made applicable to insured nonmember banks by the FDIC and, under newly enacted legislation, the Federal Home Loan Bank Board established upper limits on dividend rates paid by savings and loan associations.

These restrictive actions were designed especially to reduce the impact of overall monetary policy on the residential mortgage market. But it was recognized that with deposits leveling off or declining as investors sought more attractive returns elsewhere, the attempt by banks to adjust reserve positions through sales of securities also could have damaging effects on other financial institutions. Evidence of such a development appeared in August when market prices of some long-term municipal obligations dropped precipitously. In these circumstances, the Federal Reserve on September 1 called upon all member banks to reduce lending to businesses in preference to further liquidation of securities. The request reminded banks that discount facilities were available to assist them in case of a shrinkage of deposits and that the System was prepared to extend such accommodation over longer periods of time to the extent that adjustments were made through loan curtailment.

The Federal Reserve discount rate was held constant at 4.5 percent throughout 1966. In view of the already high level of interest rates and the problems encountered by some financial institutions, any further upward pressure on rates which might flow from announcement of a further increase in the discount rate was not considered desirable. Despite the unusually wide spread between the discount rate and the cost of funds obtained through the money market (the Federal funds rate moved in the 5 to 6 percent range during the second half of the year) the volume of member bank borrowing rose only moderately through the summer and declined thereafter. Aggregate borrowing of all member banks in the nation from the Federal Reserve reached a peak of 760 million dollars on average for the month of July compared with a 1965 peak of 560 million in August of that year. More than one-fourth of the Seventh District banks borrowed at the discount window during the past year, the largest proportion since 1960.

The limited amount of reserves borrowed from the Federal Reserve despite the relatively low discount rate reflected, of course, discount administration closely aligned with the principles specified in Regulation A. Except in emergencies, Federal Reserve discounts or advances are available only to cover very temporary needs—usually to adjust to short-run deposit drains.

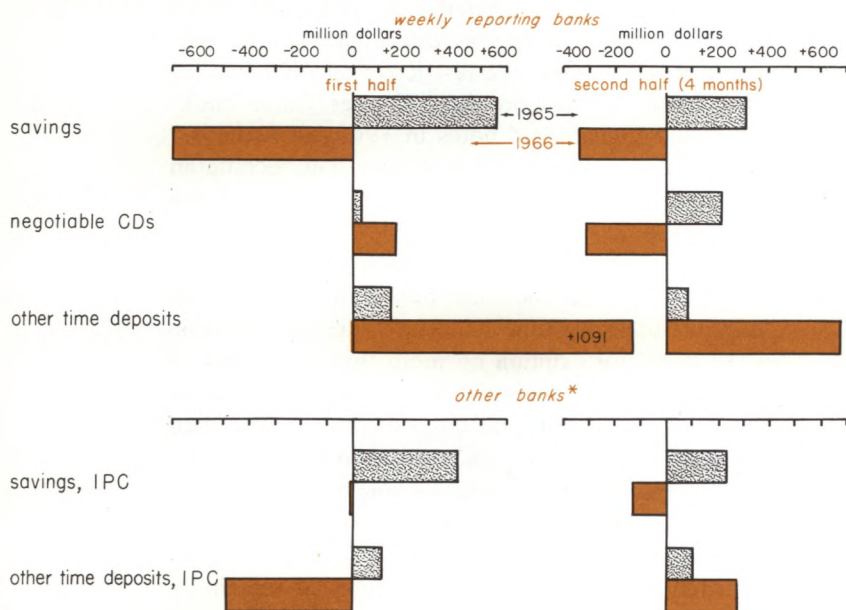
The net amount of total reserves supplied to the banking system by the Federal Reserve was in line with the slower growth of deposits. After rising at an annual rate of 4.6 percent during the first half of 1966, reserves declined (after adjustment for seasonal factors and changes in reserve requirements) during most of the remainder of the year. For the year as a whole, reserve growth amounted to less than 2 percent compared with an expansion of more than 5 percent in 1965.

Role of interest rates

Returns available on new issues of corporate and municipal securities and, to a lesser extent, U. S. Government obligations attracted both large and small investors. As usual in a period of rising interest rates, short-term rates moved up faster than long-term and with greater short-run variation. Fluctuations in rates were larger in all areas of the financial market than in previous years, partly reflecting uncertainties surrounding the course of monetary and fiscal developments as pressures on the economy intensified and then abated somewhat toward year-end.

Paradoxically, the reduction in availability of bank

Time deposit gains at District banks shifted to consumer-type certificates



*Banks in 51 Seventh District urban areas that report IPC (individuals, partnerships and corporations) savings and time deposits monthly.

credit was itself a major factor influencing the pattern of rates. Finance companies—unable to get bank loans—increased sales of short-term notes. In the course of the year, commercial paper outstanding rose more than 20 percent. Corporate treasurers also turned to the capital markets for interim financing previously provided through bank term loans. The rates paid on prime commercial paper reached 5 7/8 percent, attracting funds not only from banks but from other financial intermediaries as well. The difficulties banks encountered in rolling over their maturing CDs last fall were evidenced by secondary market yields on three- and six-month prime bank CDs of 5.85 percent and 6.20 percent, respectively.

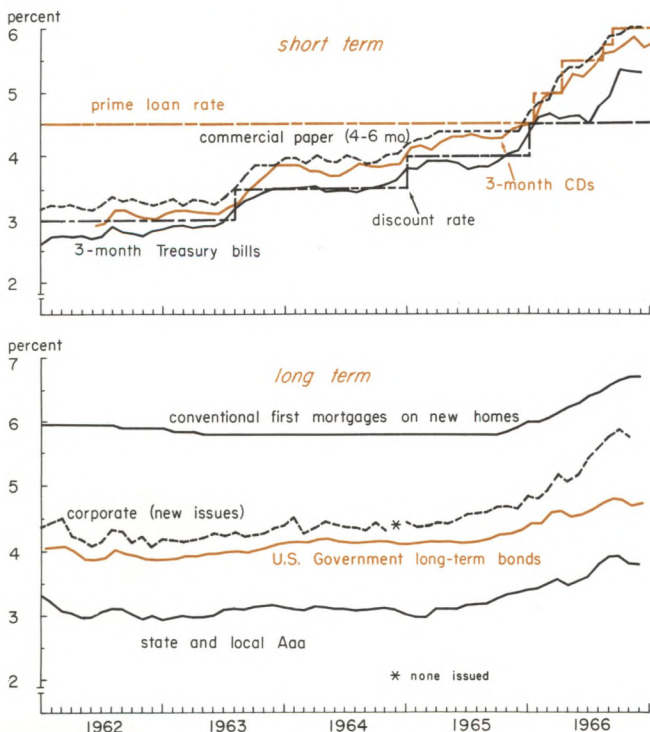
As the availability of funds shrank and costs rose, rates charged borrowers were adjusted upward. The bank charge to prime business customers, which had been boosted from 4.5 to 5 percent in December 1965, was raised to 6 percent in three further steps in March, June and August. Rates to other borrowers were scaled accordingly, and non-rate terms were made generally more restrictive. Mortgage rates moved up sharply, and by autumn a 7 percent rate

in conventional contracts on new homes was not uncommon in some areas.

In a competitive market, interest rate movements and differentials should reflect relative costs and returns on alternative uses of funds and assist in directing real resources into their most productive uses. However, rigidities that limit the effective competition for funds by some borrowers, the long-run importance of certain industries and institutions and anti-cyclical objectives at times argue for modification of the harsh impact of market forces. Much of the regulatory action of 1966 had its roots in these considerations.

As the year drew to a close, pressures in credit markets eased somewhat although rates remained at relatively high levels and a large volume of issues was scheduled in the capital markets. An important factor in this improvement was the widespread change in expectations on the part of both borrowers and investors. With evidence that credit demands had already been effectively tempered by restraint and that fiscal policy would be called upon if further anti-inflation measures proved to be necessary, there was lessened incentive for credit users to try to acquire funds in advance or for suppliers to defer commitments.

Strong credit demands and monetary restraint raised interest rates



SOURCE: Federal Reserve Bulletin, Federal Housing Administration, Salomon Brothers and Hutzler, First National City Bank of New York.

Looking toward 1967

Late in 1966, for the first time in four years, the view that the economy was at or near a cyclical peak became increasingly prevalent. A progressive slowing in the rate of rise of plant and equipment outlays, heavy and partly involuntary inventory accumulations, declines in the construction, auto, appliance and steel industries were coupled with a reduction in bank credit, high interest rates and a weak stock market. All these appeared as "classic" signs heralding a general business decline.

Economic developments in 1967 are not likely to follow a classic pattern. Most important, a war effort involving the expenditure of many billions of dollars is taking a growing share of the nation's resources of men and materials. Changes in prospective military requirements, up or down, could quickly overwhelm other recent developments. Moreover, most of the tendencies of recent months are the result, directly or indirectly, of actions to restrain credit growth, reduce non-military Government outlays and raise additional revenues, steps which would not have been taken but for the continued threat of further general price inflation. The emergence of substantial margins of unused resources of men and facilities would signal a reversal of these efforts.



Machinery and equipment

key industries in the Midwest

During 1966 purchases of producers' durable equipment by United States businesses reached a record total of more than 51 billion dollars—up 15 percent from the level of the previous year. Together with rising defense spending, these outlays constituted the main driving force behind the development of an extremely tight labor market and upward pressure on prices.

The rise in equipment expenditures has been of particular importance to the five states of the Seventh Federal Reserve District—Illinois, Indiana, Iowa, Michigan and Wisconsin. With 16 percent of the nation's population, this area accounts for about one-third of total output of capital equipment. For some categories the proportion is much higher. These states pro-

duce two-thirds of the nation's farm and construction equipment, more than half of the motor vehicles and two-fifths of the metalworking machinery. High-level activity in these industries was largely responsible for extremely low unemployment rates in the Midwest in 1965 and 1966, well below the national average.

Virtually all machinery and equipment producers were working at practical capacity during 1966. Output would have increased even more but for limitations of resources—especially, engineers and virtually all types of skilled manpower. Orders for machinery and equipment reached a peak in the second quarter of the year and then declined slightly, but backlogs continued to grow through October despite rising shipments.

Demand pressures on capital goods industries in 1965 and 1966 resulted in higher prices and lengthened lead times on new orders. After an appeal for restraint on new investment spending,

President Johnson, in September, asked Congress to suspend the 7 percent investment tax credit on equipment purchases. This measure had been enacted in 1962 to stimulate demand for capital goods at a time when orders were relatively sluggish.

Prosperity and heavy demand for machinery and equipment go hand-in-hand. Rapid increases in output narrows margins of unused productive capacity. Rising profits provide both the incentive and the financial capacity for new investments. Business expansions, therefore, typically are accompanied by a more than proportionate growth in purchases of machinery and equipment. During recessions, conversely, capital spending usually declines more rapidly than the total economy.

Purchases of producers' durables were 80 percent higher in 1966 than in 1961 while total

spending was up only half as much. From 1960 to 1961, when total spending increased only slightly, purchases of producers' durable goods declined 6 percent. Clearly, the concentration of capital goods production in the Midwest gives this region a special stake in the maintenance of a vigorous national economy and achievement of greater stability of demand for these goods.

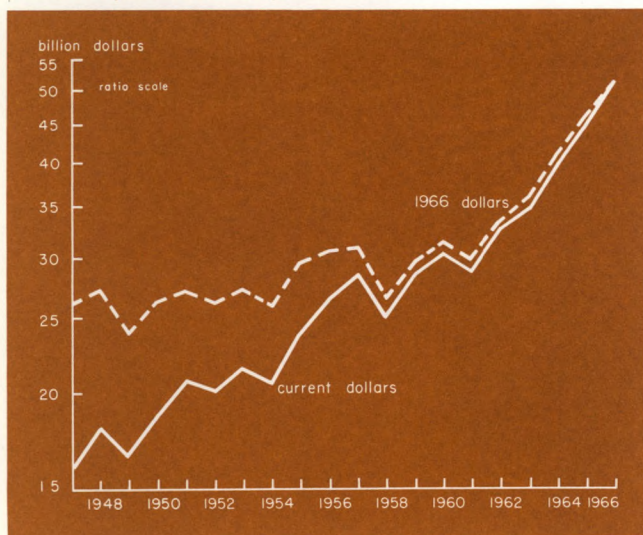
When capital expenditures are rising sharply, businesses bid vigorously for resources and contribute to inflationary pressures. As productive capacity is increased, however, shortages are eased and prospects for stable noninflationary growth are improved. In the final months of 1966, increased availability of goods and services—reflecting, in part, the large capital investments of recent years—appeared to be gaining on the demands of consumers, businesses and Government.

Machines and progress

A great Centennial Exposition was held in Philadelphia in 1876 to celebrate the 100th anniversary of the Declaration of Independence. Although the largest share of the nation's wealth still was produced in agriculture, the theme of the exposition was industrial progress. The principal exhibits were newly developed steam engines, dynamos, farm and railroad equipment and the first workable telephone. Motor vehicles and movies were still 20 years in the future, but the stage already was set for the steady advance in technology and industrial capacity that would relieve men and women (and children) of unrelenting toil while providing them with an increasing abundance of necessities and luxuries.

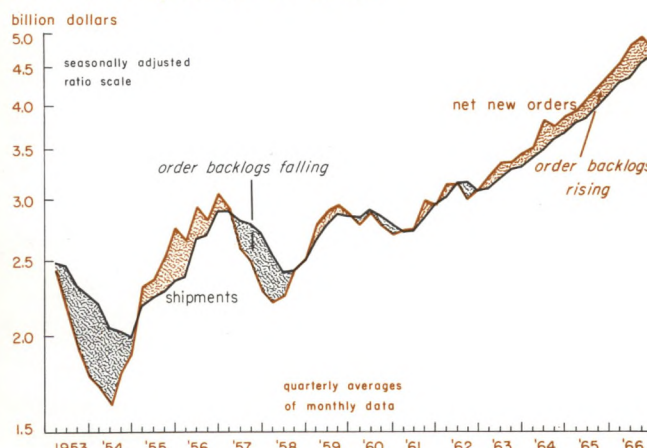
Half of all gainfully employed workers in 1870 were in agriculture. Fifty years earlier the proportion had been more than 70 percent. Already John Deere's steel

Rise in purchases of producers' durable equipment since 1961 has dwarfed earlier postwar expansions



SOURCE: U. S. Department of Commerce.

New orders for machinery and equipment rose faster than shipments until last quarter of 1966



SOURCE: U. S. Department of Commerce.

plow and Cyrus McCormick's reaper, supplemented by other machines for seeding and cultivating, were releasing farm workers for jobs in industry. Mainly as a result of the steady substitution of machines for human and animal power, this process has continued. Today, record production of crops and meat requires only about 5 percent of the civilian labor force.

The nation's total output—farm and nonfarm—was valued at about 10 billion dollars in the 1870s. Allowing for higher prices, output since then has increased 30-fold. On a per capita basis, output has risen about seven times. Mechanization in all sectors of the economy has been largely responsible for this gain.

During most of the early history of the United States, too few workers were available to fully exploit the nation's abundant land and other resources. (Until the 1920s, immigration from Europe was not restricted.) A limited labor supply encouraged the mechanical ingenuity of farmers and craftsmen. Unencumbered by the restrictive customs and traditions of the old world, these innovators devised a large share of the labor-saving devices introduced in the nineteenth century.

Important new industries developed as a result of the dedicated work of individual men. The forerunner of these was Whitney with his cotton gin, and, later, the principle of interchangeable parts employed first in the manufacture of firearms. He was followed by Fulton and the steamboat, Morse and the telegraph, Howe and the sewing machine, Goodyear and the vulcanization of rubber, Bell and the telephone, Eastman and the modern camera, and Westinghouse

and Edison—who developed a multitude of basic electrical and mechanical devices.

Europeans took the lead in scientific research, but the United States outdistanced other nations in the development and use of machinery and equipment.

Combinations of machines and scientific management led to the great mass production industries of the twentieth century—the *American* system of manufacture. The individual inventor, working with few assistants and scanty resources, gave way to the great research laboratories of industry, government and the universities, continually developing new products and techniques, while utilizing advanced scientific information.

Productivity and automation

At the turn of the century, the average workday in manufacturing and most other industries was 10 hours, and the average workweek was 60 hours. Paid vacations, moreover, were rare. As late as the mid-1920s, the 50-hour week was

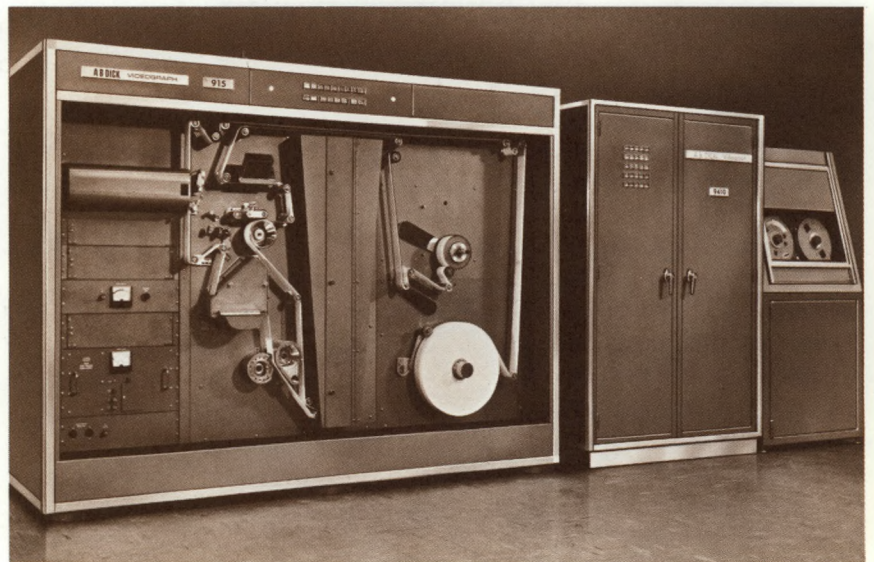
the norm in manufacturing.

Gradually, the eight-hour day replaced the working day of 10 hours or more. With the growth of unionization and the minimum wage-maximum hour legislation of the 1930s, the five-day, 40-hour week with time-and-one-half for overtime spread throughout most industries.

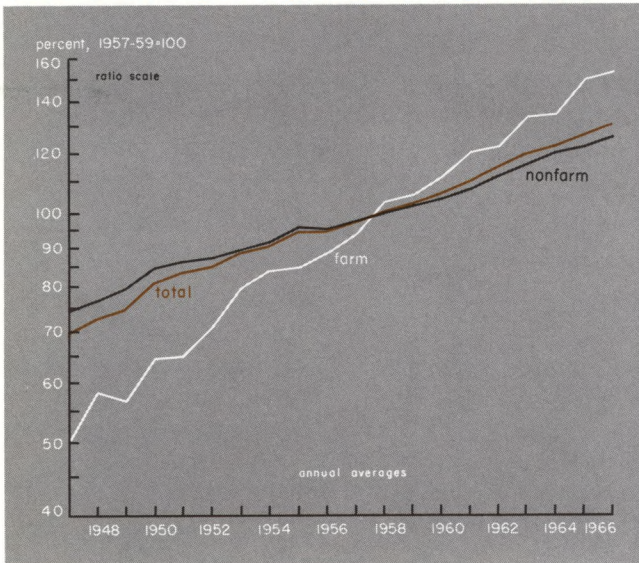
In only a few industries have standard workweeks been reduced below 40 hours. In fact, heavy demands for workers have stretched the average workweek in recent years. Additional leisure has been provided, however, through longer vacations, commonly in excess of two weeks, additional paid holidays and earlier retirement. Nevertheless, the real earning power of most workers has increased virtually every year. This has been possible only because of increases in productivity—*output per man-hour*.

The long-term increase in average output per man-hour of all United States workers has been estimated at slightly more than 2

Modern address-label printer turns out 135,000 labels per hour



Gains in output per man-hour have been especially large in agriculture



SOURCE: U. S. Bureau of Labor Statistics.

percent annually. In the period since World War II, this rate of gain has accelerated.

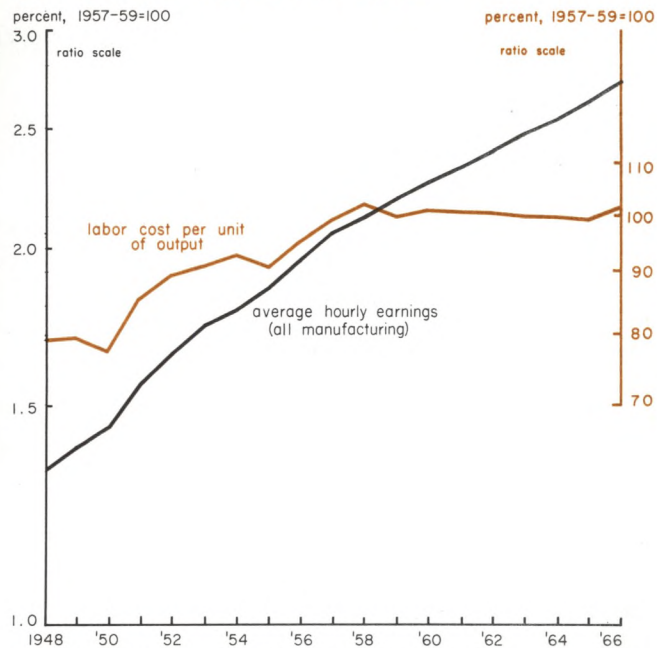
From 1947 through 1960, productivity in the private economy increased at an average rate of 3.3 percent a year—6.5 percent in the farm sector and 2.7 percent in the nonfarm sector. For the 1960-65 period, the average rise was 3.6 percent—6.2 percent in agriculture and 3.2 percent in other industries. Since 1964, with shortages of labor and most industries operating close to capacity, the rate of increase apparently has slowed to less than 3 percent.

Productivity changes are the result of the interaction of several factors: better worker education, improved management techniques, absence of work stoppages, high rates of utilization of men and facilities and favorable climatic conditions. Of crucial importance, however, are increases in the quantity and quality of capital equip-

ment developed and used by private industry. Increases in productivity often are thought of as applying exclusively to manufacturing, utilities and agriculture. Some of the most impressive gains of the past 20 years, however, have been the mechanization, or computerized automation, of white-collar jobs in trade, finance and other service industries.

Growth in productivity provides the only means whereby managements can pay higher wages while avoiding price increases and maintaining profit margins. From 1958 until quite recently, labor costs per unit of output for all manufacturing remained remarkably stable, even declining slightly in some years. In 1966 an acceleration in the rise of wage rates together with increased absenteeism and high labor turnover as well as the use

Labor costs per unit of output in manufacturing rose in 1966 for the first time since 1960



SOURCE: U. S. Bureau of Labor Statistics.

of marginal facilities and less qualified labor caused labor costs to rise to the highest level since early 1961.

Payroll expense comprises only one, although often the most important, of the costs incurred by business firms. Costs of capital, taxes and prices of services and raw materials also must be considered. Nevertheless, stabilization of labor costs probably is a prerequisite to general price stability. More and better capital goods provide the major means of reducing or dampening increases in labor costs.

Capital invested in various industries sometimes is divided by the average employment to obtain figures that are represented as the "cost of creating a job." Many capital expenditures, however, are undertaken to reduce labor requirements. Managements often are

faced with competing equipment purchase plans, with the most expensive of the alternatives requiring the fewest operatives.

Almost any production job could be mechanized further today by utilizing modern technology. In many cases, however, costs of such installations are prohibitive. If demand declines, idle capital investments continue to be reflected in fixed costs. Moreover, highly automatic facilities are not always readily adaptable to new products and therefore often have a high rate of obsolescence.

In periods of recession or slow economic growth, excessive unemployment commonly is attributed to increased use of labor-saving machines and equipment. Most recently this view was emphasized in the early 1960s. Nevertheless, as the expansion accelerated in 1965 and 1966, widespread labor shortages, even of inexperienced and unskilled workers, developed.

Unlike the situation in some industrialized nations, organized labor in the United States has not, as a general rule, attempted to hamper or prevent the introduction of more efficient equipment. Unions, however, have insisted upon steps to ameliorate the impact on workers during periods of transition.

Mechanization, and its ultimate refinement automation, has permitted the gradual elimination of many onerous, dangerous, dirty and tedious jobs that tended to degrade men and women physically and mentally. Moreover, in the long run, all workers benefit from increased productivity through higher real wages and reduced prices of consumer goods that would have remained luxuries but for the introduction of better machines.

Private purchases of producers' durable equipment

Industry	1960 (billion dollars)	1965	Distribution	
			1960 (percent)	1965
Total private purchases	30.28	44.82	100.0	100.0
Nonelectrical machinery				
Engines and turbines	0.60	0.45	2.0	1.0
Tractors	0.68	1.41	2.2	3.1
Agricultural machinery (except tractors)	1.11	1.64	3.7	3.7
Construction machinery	0.94	1.65	3.1	3.7
Mining and oilfield machinery	0.50	0.80	1.7	1.8
Metalworking machinery	1.67	2.93	5.5	6.5
Special industry machinery	2.13	2.67	7.0	6.0
General industrial (including materials handling equipment)	1.91	2.66	6.3	5.9
Office, computing and accounting machinery	1.66	2.86	5.5	6.4
Service industry machinery	1.48	2.07	4.9	4.6
Total	12.68	19.14	41.9	42.7
Electrical machinery				
Electrical transmission, distribution and industrial apparatus	2.16	2.81	7.1	6.3
Communication equipment	1.97	2.49	6.5	5.6
Other electrical equipment	0.29	0.62	1.0	1.4
Total	4.42	5.92	14.6	13.2
Transportation equipment				
Trucks, buses and truck trailers	3.64	5.37	12.0	12.0
Passenger cars	3.09	4.47	10.2	10.0
Aircraft	0.83	1.39	2.7	3.1
Ships and boats	0.45	0.59	1.5	1.3
Railroad equipment	0.75	1.16	2.5	2.6
Total	8.76	12.98	28.9	29.0
Other				
Fabricated metal products	0.98	1.25	3.2	2.8
Furniture and fixtures	1.55	2.35	5.1	5.2
Instruments	1.07	1.94	3.5	4.3
Miscellaneous equipment	0.89	1.34	2.9	3.0
Total	4.49	6.88	14.8	15.4

SOURCE: U.S. Department of Commerce.

The capital goods producers

Producers' durable equipment, as the term is used by the Department of Commerce, includes machines and equipment for agriculture, construction, manufacturing, mining and oil well drilling, communications, public utilities, transportation, commerce and the service industries. Most of these goods are relatively long-lived and represent fixed assets that are depreciated over some anticipated life span.

Because of the large outlays involved and because of the special requirements of individual purchasers, more than half of all capital goods, by value, are produced to order rather than for stock. Order backlogs of the manufacturers of these goods, therefore, usually are large relative to shipments. On the average, orders for custom-built machinery and equipment

must be placed about nine months in advance of delivery. If demand is strong and a given piece of equipment is large and complicated, as for rolling mills or electrical generating facilities, two or three years may elapse from order to delivery—a portion of this time is required for the design stage.

Most capital goods are produced by manufacturers classified in the electrical machinery (less household appliances and radio-TV), the nonelectrical machinery and the transportation equipment industries (less military aircraft and missiles and the 85 percent share of total passenger auto output purchased by consumers). A large share of the production of steel and nonferrous metals is incorporated in producers' durable equipment, often after fabrication by foundries or forging mills. Output of items classified as producers' durable equipment is substantially in ex-

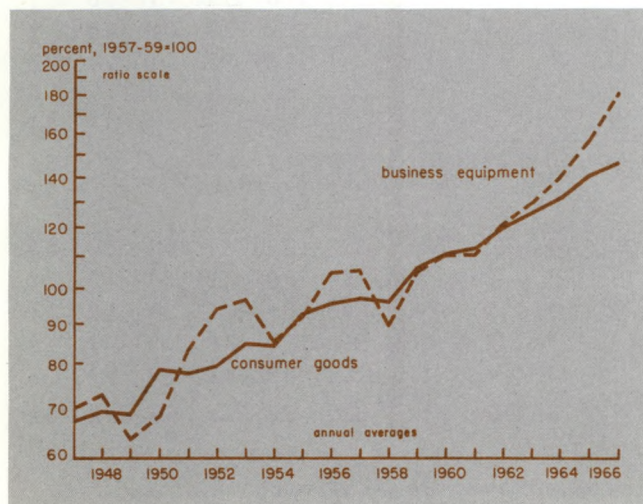
cess of the total purchases by private business firms, as a sizable share is sold to governments or exported.

Capital goods producers vary greatly in size and diversification, from small enterprises to such giant corporations as International Harvester, General Electric and General Motors. Some capital goods producers, such as Cummins (diesel engines), concentrate on a single product line. Others, such as Allis-Chalmers, make a wide variety of products, including in this case farm machinery, construction equipment, electrical generating equipment and cement kilns. Another example is A. O. Smith, producing motor vehicle frames, water heaters, line pipe, oil well casing and glass lined tanks for a variety of purposes. Still another is Link-Belt which produces excavating machinery but also engineers and manufactures processing and materials handling systems for virtually all major extractive and manufacturing industries.

The Midwest contains many relatively small firms that produce vital capital goods components—for example, fluid drives, speed reducers, clutches, gears, bearings, pumps, valves and castings—that are sold to producers of finished goods. Some large corporations have divisions producing a portion or all of their requirements of similar components. Many of these were independent companies before acquisition.

Some of the large capital goods producers also manufacture consumer goods and have one or more divisions serving the defense and space establishments. The varied nature of these firms closely limits the usefulness of aggregative financial data, for analytical purposes,

Output of business equipment has increased much faster than output of consumer goods since 1961



SOURCE: Board of Governors of the Federal Reserve System.

or composite stock price indexes.

Midwest leads in output

Capital goods producers employ directly about 3 million United States manufacturing workers and account for about 15 percent of the

value added by all manufacturing. A century ago the forerunners of these firms were concentrated in the northern states of the eastern seaboard. Even then, however, the center of gravity was shifting to the Midwest. In recent years California

has advanced rapidly as a center of production, especially aircraft and electronic apparatus associated with the aerospace industries.

At present the top 10 states producing electrical and nonelectrical machinery, with the exception of

Employment and value added in machinery and equipment industries

SIC code	Industry	Average employment in 1963						Value added by manufacture in 1963					
		United States	Illinois	Indiana	Iowa	Mich.	Wis.	Five States	Ill.	Ind.	Iowa	Mich.	Wis.
		(thousands)						(percent of United States)					
Total manufacturing		16,352	1,151	600	178	879	448	22.7	7.7	4.1	1.2	6.9	2.8
35 Machinery (except electrical)													
351	Engines and turbines	85	9	^D	*	13	17	^D	9.0	^D	†	17.0	18.6
352	Farm machinery and equipment	119	24	5	22	5	12	63.6	21.1	3.6	21.0	7.6	10.3
353	Construction and like equipment	212	53	4	6	12	16	47.0	27.6	2.1	3.2	6.4	7.7
354	Metalworking machinery	258	30	8	2	50	10	40.9	12.0	2.9	0.6	21.9	3.5
355	Special industry machinery	171	14	3	2	7	9	22.4	9.1	1.8	0.7	5.2	5.6
356	General industrial machinery	232	20	17	2	16	11	31.0	9.9	7.4	0.8	7.6	5.3
357	Office machinery	141	8	*	*	1	*	7.7	7.5	†	†	0.2	†
358	Service industry machinery	112	10	5	1	8	5	27.2	8.4	3.8	2.3	8.0	4.7
359	Miscellaneous machinery	133	11	*	1	^D	^D	^D	8.7	†	0.5	^D	^D
	Total	1,463	179	55	35	134	85	36.7	13.4	4.0	2.8	10.6	5.9
36 Electrical machinery													
361	Electrical distribution products	140	15	4	*	3	4	17.8	10.0	3.1	†	1.8	2.9
362	Electrical industrial apparatus	161	10	12	*	8	21	31.4	6.0	6.7	†	4.0	14.7
363	Household appliances	145	24	9	4	8	6	34.5	14.0	7.2	4.1	5.4	3.8
364	Lighting and wiring devices	142	16	7	*	2	*	17.2	11.0	5.4	†	0.8	†
365	Radio and TV receiving equipment	96	29	17	1	1	*	54.0	29.7	22.7	0.8	0.8	†
366	Communication equipment	414	44	13	^D	2	9	^D	11.3	2.7	^D	0.4	2.3
367	Electronic components	283	24	11	3	3	3	13.9	6.6	3.8	1.3	1.2	1.0
369	Other electrical components	91	6	19	*	7	5	42.6	6.5	22.9	†	8.1	5.1
	Total	1,472	168	91	20	32	50	25.4	11.1	6.9	1.5	2.3	3.6
37 Transportation equipment													
371	Motor vehicles and equipment	697	22	60	1	263	38	53.3	2.9	6.1	0.1	38.7	5.5
372	Aircraft and parts	691	6	21	*	10	*	5.1	0.8	3.0	†	1.3	†
373	Ship and boat building	141	1	2	*	2	2	4.3	0.4	1.1	†	1.2	1.6
374	Railroad equipment	45	10	4	*	*	*	35.8	28.0	7.8	†	†	†
375, 379	Other transportation equipment	44	*	5	1	4	*	26.6	0.3	14.1	1.8	9.9	0.5
	Total	1,618	41	91	3	282	43	33.2	2.6	4.9	0.1	22.4	3.2

*Less than 500 workers. †Less than \$500,000 value added.

^DWithheld to avoid disclosing figures for individual companies; amounts are included in two-digit industry totals.

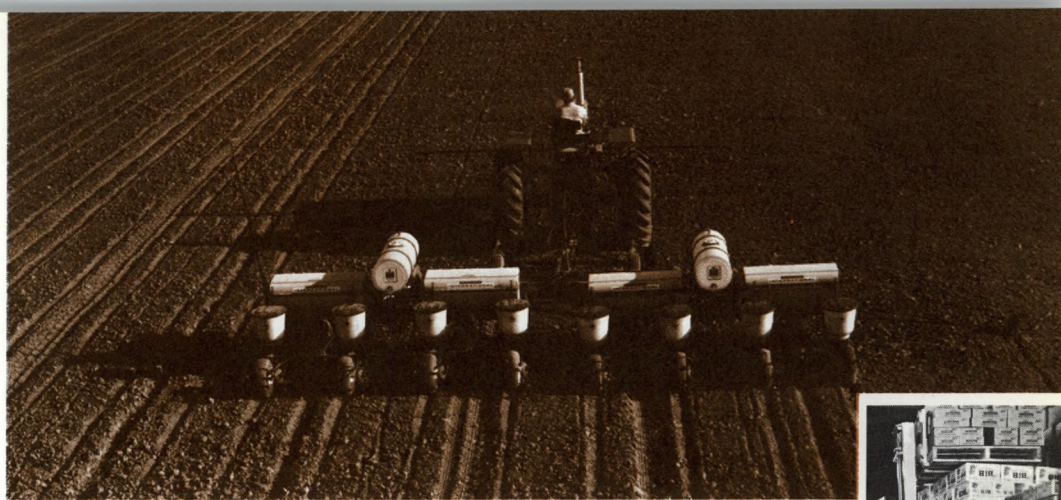
SOURCE: 1963 Census of Manufacturers.

California, form a solid block from Illinois and Wisconsin on the West to Massachusetts and New Jersey on the East. The top ranking state in the production of machinery, and also total capital equipment, is Illinois—followed by New York, Michigan and Ohio.

Illinois, with 5.5 percent of the nation's population, produces about 13 percent of all capital equipment. It accounts for 21 percent of all farm machinery, 48 percent of construction machinery and 28 percent of railroad equipment. The state's development as a great industrial area was based, in part, upon its advantageous location with access to raw materials and markets. Water transportation was available on both the Great Lakes and the Mississippi. Chicago's position at the foot of Lake Michigan made inevitable its development as a great railroad center and as a producer of railroad equipment.

Farm machinery production in Illinois began with the establishment in the 1840s of McCormick's first major factory in Chicago and John Deere's plow works in Moline. Gradually, Chicago became a center for the production of a wide variety of goods for use in agriculture, construction, transportation and communications.

The Chicago area now includes important plants of Western Electric (communication equipment), International Harvester (farm and construction machinery), Motorola (communication equipment), Miehle-Goss-Dexter (printing presses) and many other capital goods producers. In the railroad equipment field, the Chicago area has General Motors' Electro-Motive Division (diesel locomotives), Pullman-Standard, Union



Two-thirds of all farm and construction equipment and a large proportion of materials handling equipment is produced in the Seventh District

Tank Car, GATX and Thrall (all producers of freight cars) as well as manufacturers of signals, track components and other railroad supplies.

Moline, along with Rock Island, East Moline and Davenport (the Quad Cities), became a center for farm equipment production with International Harvester, Deere and J. I. Case now represented. Peoria developed as a center for the manufacture of construction machinery, mainly because it happened to be the home of the small firm, Caterpillar Tractor, that developed the first crawler tractor and grew to become the world's largest producer of construction machinery, especially earthmoving equipment. Caterpillar also has important factories in Joliet, Decatur, Aurora and Mossville—all in Illinois. Wabco's construction machinery division (formerly Le Tourneau-Westinghouse) also is in Peoria. Rockford became an important producer of machine tools and other equipment. Springfield has Sangamo Electric and an Allis-Chalmers plant.

Michigan did not become a highly industrialized state until the

motor vehicle industry began to expand sharply after the turn of the century. With 4.2 percent of the nation's population, Michigan now accounts for almost 40 percent of all motor vehicle output. This state also produces large numbers of engines for nonautomotive uses. Partly because of the requirements of the auto industry, Michigan also produces about 10 percent of the nation's nonelectrical machinery and 21 percent of the metalworking machinery. In addition, Detroit has an important firm that makes office equipment and computers (Burroughs).

Muskegon has Continental Motors, Brunswick (automatic pin-setters) and some large foundries. Clark Equipment (construction equipment) has plants in Buchanan and other Michigan cities.

Wisconsin, with only 2.1 percent of the nation's population, ranks sixth among the states as a producer of nonelectrical machinery with almost 6 percent of the total. Like Michigan, Wisconsin does not possess the locational advantages and rich soil of Illinois. Wisconsin's prosperity, like Michigan's, has been based on the initia-

tive and ingenuity of firms that chanced to begin operations there. Once established, these plants attracted satellite industries, skilled workmen and engineers—to a large extent from Europe.

Among the larger industrial centers, none is so dependent upon producers' durable equipment as Milwaukee. This city's name often is associated with its breweries. Actually, the bulk of Milwaukee's income long has been generated by plants that produce agricultural equipment, construction machinery, machine tools and electrical apparatus. Milwaukee has the principal plants of Allis-Chalmers, A. O. Smith, Falk, Harnischfeger, Rex Chainbelt, Nordberg, Koehring, Bucyrus-Erie, Louis Allis, Kearney and Trecker, Allen-Bradley, Cutler-Hammer and many others with famous names. Other Wisconsin cities—Racine (J. I. Case and Massey-Ferguson), Fond du Lac, Madison and Beloit—produce capital goods, but the great center is Milwaukee.

Indiana, with 2.5 percent of the nation's population, produces more than 5 percent of all electrical and nonelectrical machinery combined. This state is relatively more important in electrical goods, with large establishments of Western Electric and General Electric located in Indianapolis, where Link-Belt and General Motors' Allison Division also have plants. Fort Wayne has a General Electric plant, a Fruehauf plant (trailers) and the heavy truck assembly facilities of International Harvester. Bendix, with a wide variety of products for industry and aerospace industries, has its principal operations in the South Bend area. Cummins, the foremost producer of truck diesel engines, has its main

plant in Columbus.

Iowa, one of the richest farm states, is less heavily industrialized than other Midwest states. It is, however, a major producer of farm machinery, with 21 percent of the nation's total. Major plants are located in Davenport, Waterloo and Des Moines. Cedar Rapids has the largest plant of Collins Radio, a leader in the production of advanced communication equipment for use in aviation, aerospace and industry.

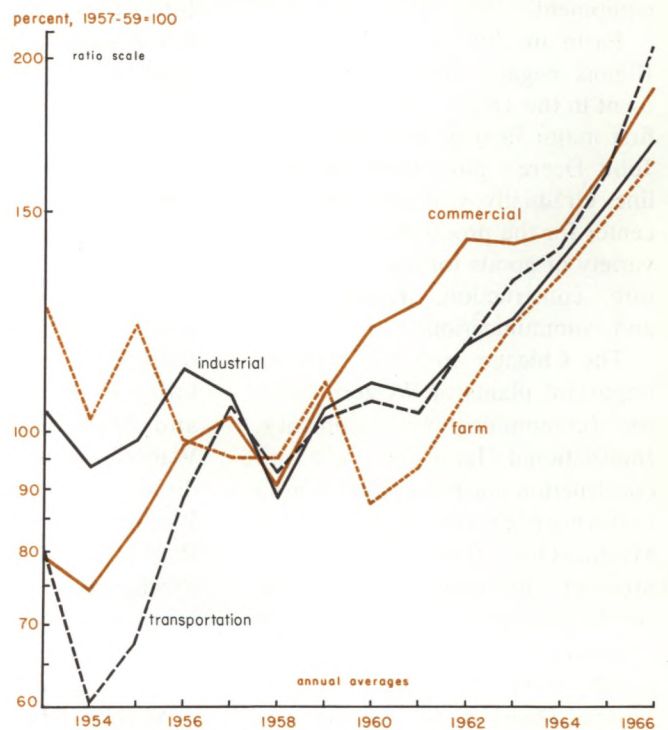
The concentration of producers' durable equipment production in the Midwest has been largely responsible for the high-level prosperity of these states in recent years. With the unemployment rate

nationally averaging about 4 percent in 1966, most Midwest centers reported rates well below 3 percent. Labor shortages, particularly of engineers and skilled workers in the metalworking and electrical trades, hampered output. To alleviate these strains, many firms increased recruiting efforts (even in Europe) and activated or expanded training programs for less skilled employes.

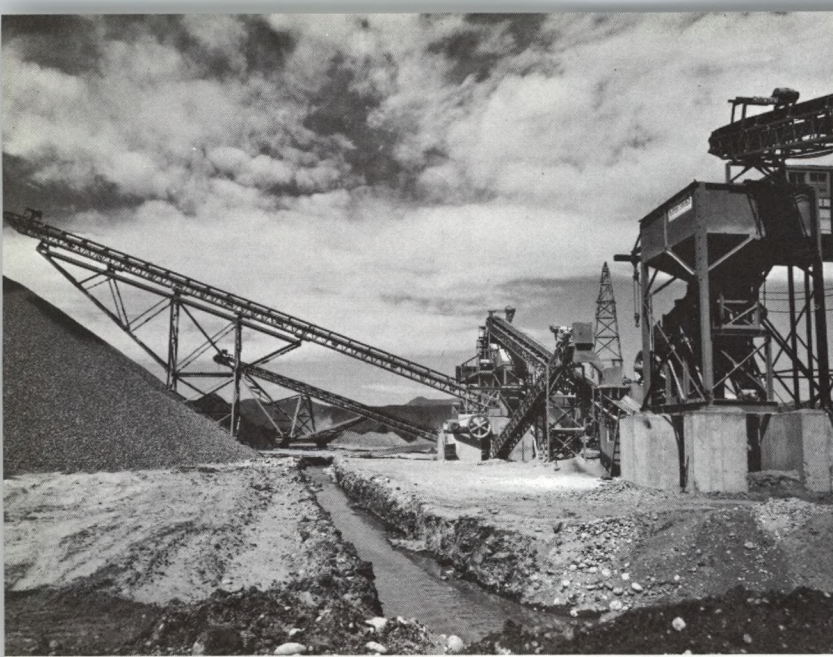
Capital outlay motives

A basic force motivating business capital investments is the desire to maximize profits. The value of any machine or equipment to a purchaser is his estimate of the stream of earnings, net of all ex-

Output of all major groups of machinery and equipment have increased sharply in recent years



SOURCE: Board of Governors of the Federal Reserve System.



Stationary rock crushing, screening and washing plant is made in Cedar Rapids



Mechanized coal processing facility sharply reduces manpower requirements

penses, that will be generated through the facility's useful life, discounted to present worth. This present value, of course, must equal or exceed the purchase price. In short, purchasers assess capital goods in much the same manner as buyers of bonds, common stock or real estate value these assets, but there are important differences.

Evaluations of the desirability of prospective purchases of capital goods often involve personal judgments of a type not involved in the selection of fixed income securities. The future dollar payments on a high-grade bond are known beyond a serious doubt. The profits to be derived from new capital goods, on the other hand, are frequently known only imperfectly. In fact, some purchases involve financial loss. Judgments of expected returns on capital goods may prove to be far wide of the mark, because of faulty evaluations of the course of general economic activity, market potentials, the actions of competitors or the performance capabilities of the facility.

Some business firms use a rule of thumb that any new project should "pay out" in after-tax profits and depreciation within five years. Fulfillment of this goal requires net profits of 10 to 15 per-

cent a year, depending on the rate of depreciation taken for tax purposes.

The expected return on new investments sometimes is termed the "marginal efficiency of capital." Investments are presumed to take place when the marginal efficiency of capital exceeds the interest rate paid on borrowed funds, or the rate that could be earned on high-grade investments. The great bulk of investments in machinery and equipment, however, does not involve a close relationship between expected earnings and interest rates. For one thing, interest is tax deductible and must be halved for most corporations to be compared with after-tax earnings. More important, contract interest is a precisely known quantity, quite unlike the uncertain prospective earnings on capital goods.

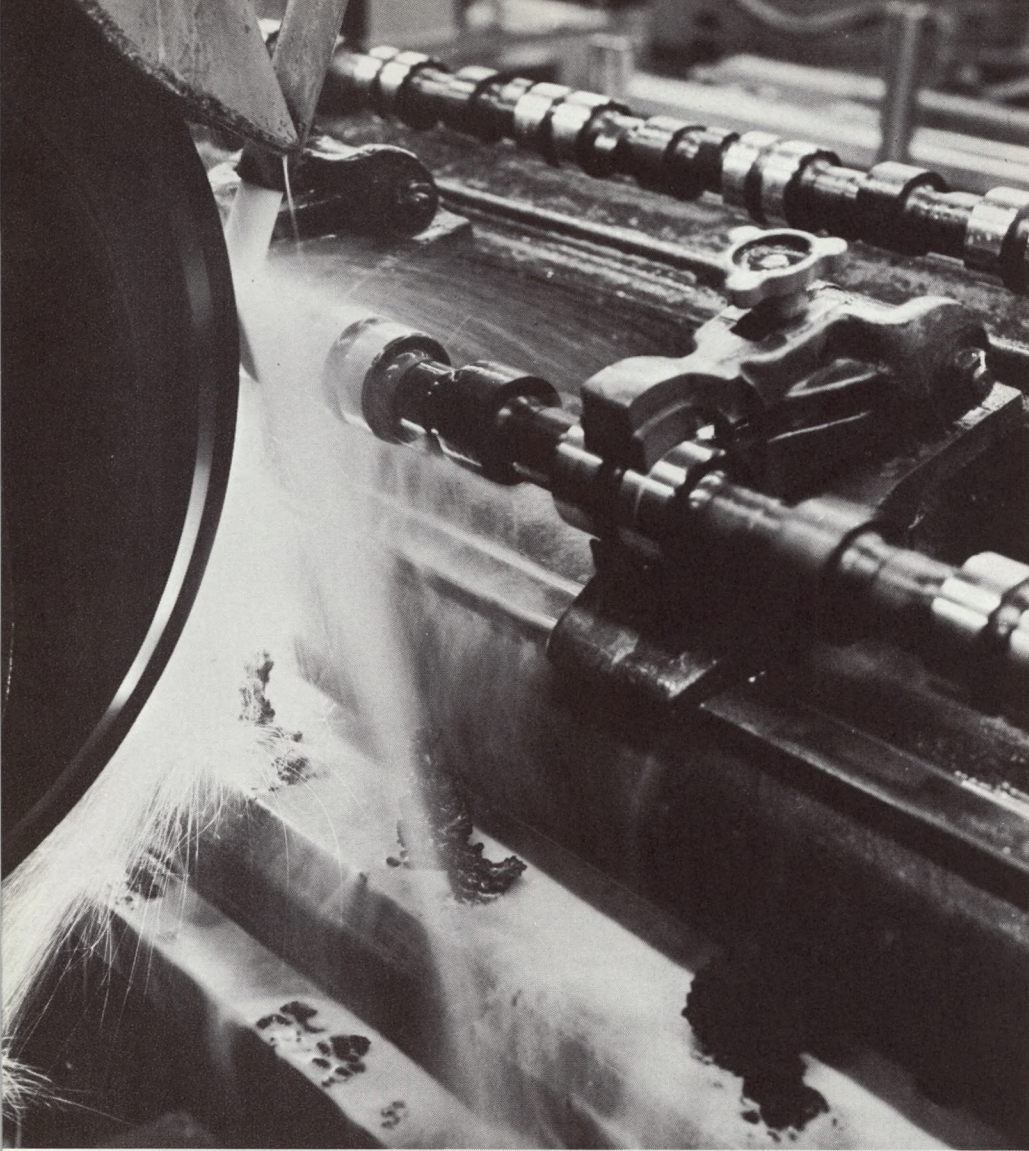
Higher interest rates, of course, will tend to discourage investments—"other things equal." This relationship, however, often is obscured by other factors. Typically, capital investment and interest rates move in the same direction, up in prosperity, when profit prospects improve, and down in recession. During each postwar business cycle, capital expenditures have changed in the same direction as

rates on new corporate bonds.

Although interest as a cost can be placed in a subordinate role for most purchasers of capital goods, decisions of such firms *are* influenced by the quantity of funds available to them. The great bulk of funds utilized by United States business are generated "internally" through retained earnings and depreciation. In prosperity, earnings tend to rise faster than dividends, thus increasing internal funds available for investment. But, as prosperity continues, capital expenditures usually rise faster than internally generated funds, with the result that businesses turn increasingly to the money and capital markets to supplement their financial resources.

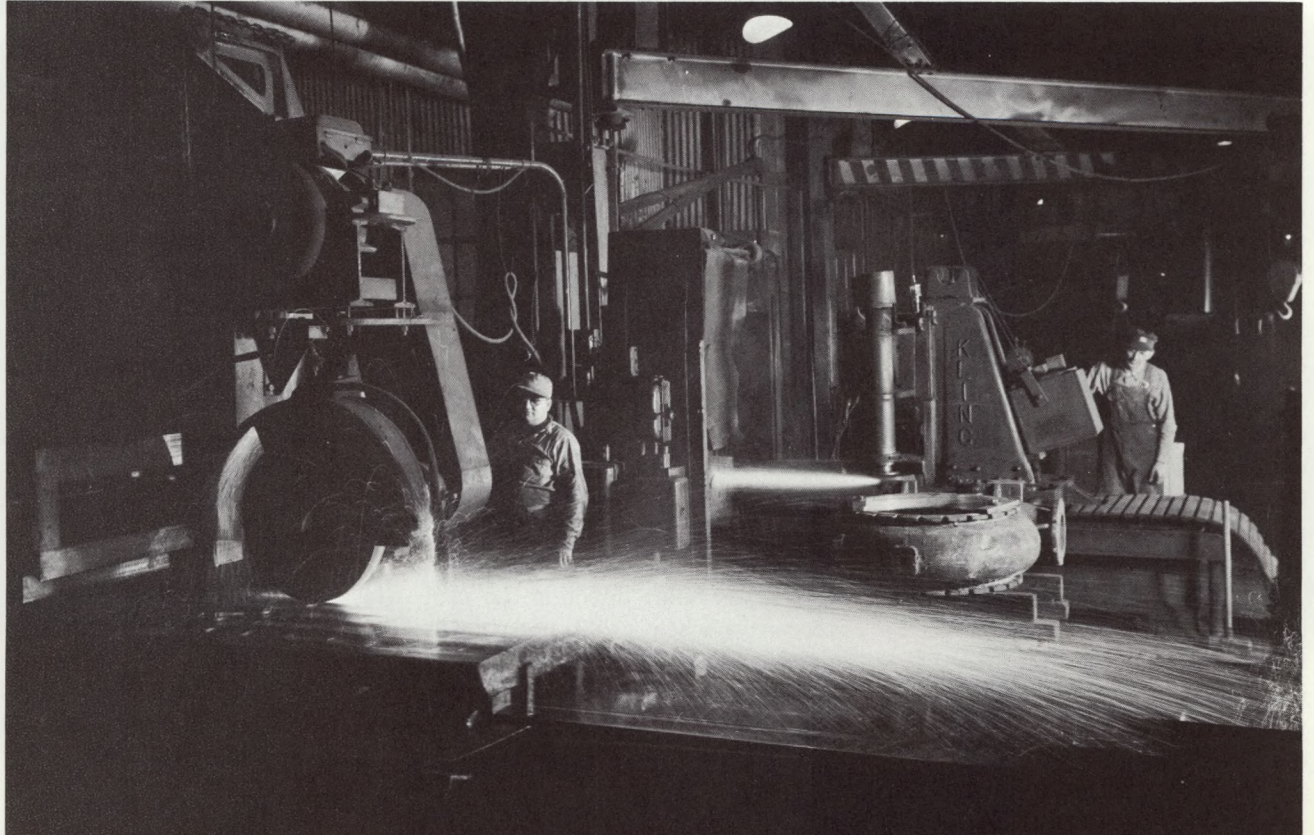
When credit demands are very large, new credit necessarily must be rationed by lenders. Profitable business firms are able to compete successfully for available funds in comparison to certain other activities, notably homebuilding and commercial construction. Nevertheless, businesses with unused credit potential may tend to restrict capital outlays under conditions of "tight money," either because of a reluctance to borrow for long terms at high rates or because of the increased uncertainty concerning future prospects for the

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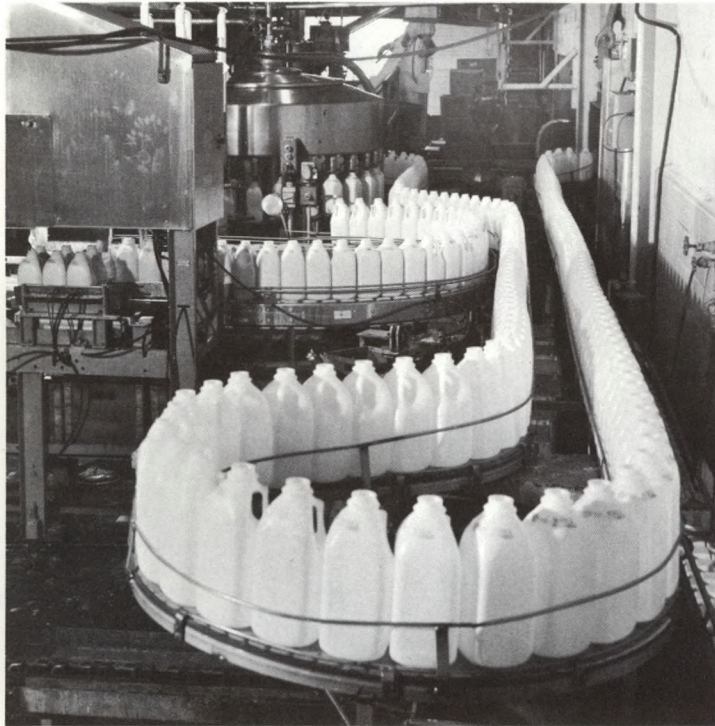


Camshaft for truck diesel engine receives final processing

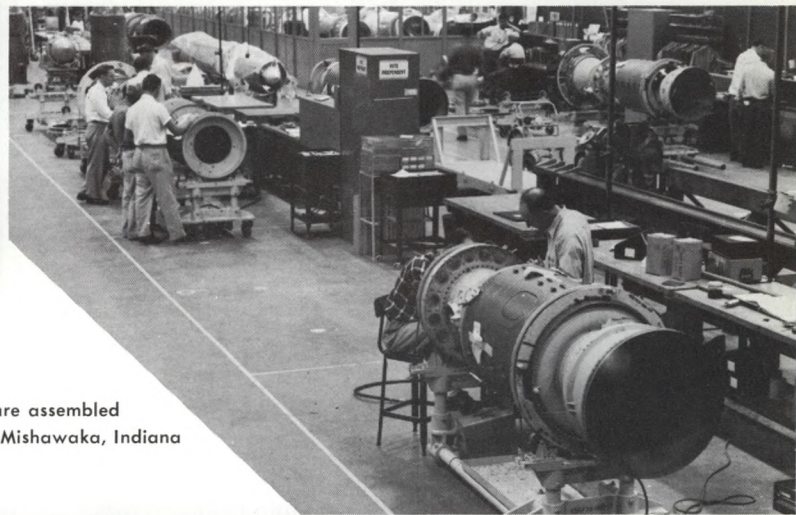
Manganese steel castings, too tough to machine, are ground to dimension



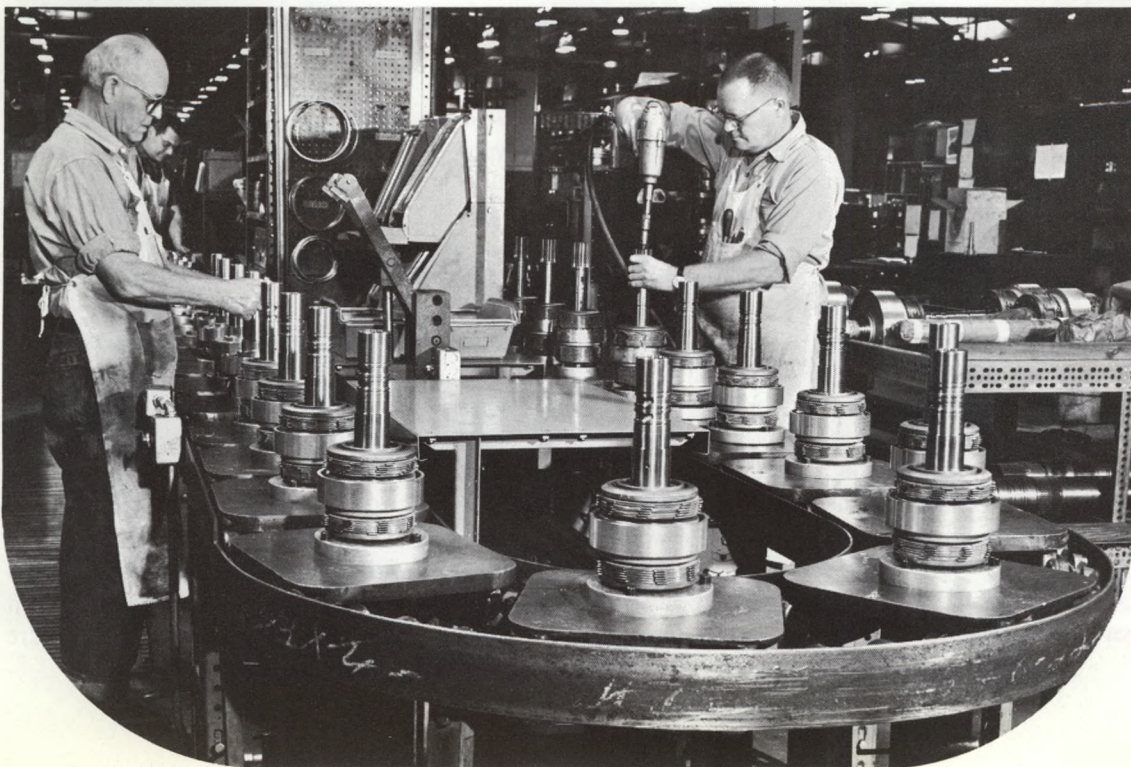
Plastic milk containers are filled,
capped and cased automatically



"Moving sidewalk" carries men and tractors
through assembly process in Racine, Wisconsin



Talos guided missiles are assembled
by prime contractor in Mishawaka, Indiana



Hydraulic clutches
for heavy-duty construction
equipment are manufactured
in Rockford, Illinois

economy that may accompany a period of rising interest rates.

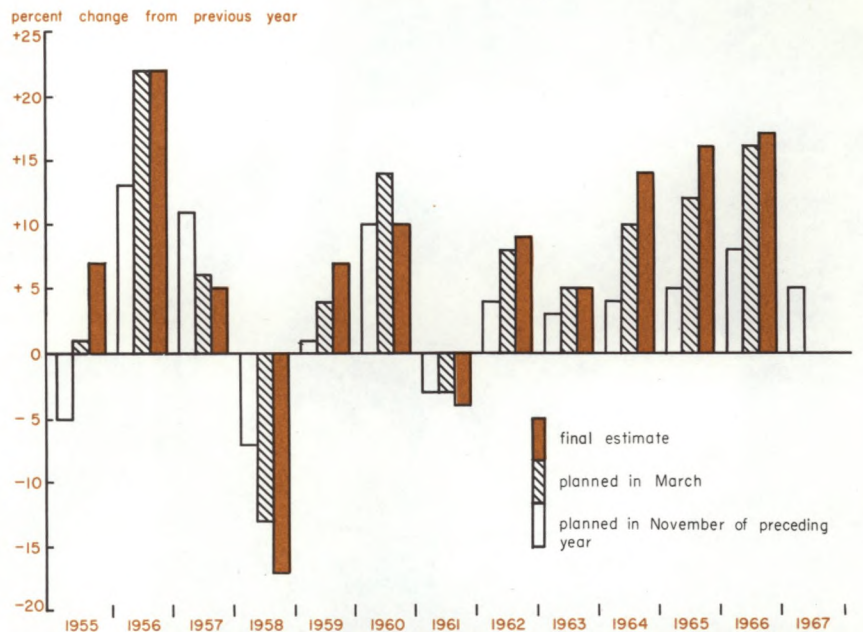
Capital expenditure projects often are classified as representing expansion or modernization and replacement. About two-thirds of estimated total plant and equipment expenditures are for expansion at the present time. In many cases this distinction is arbitrary. A new plant may represent expansion at the time it is conceived, planned and completed, but at a later time of slack demand, the existence of the new facility may permit retirement of older installations.

Expansion may mean either larger production of existing products or the initial production of new products. Modernization and replacement may be motivated by the possibility of reducing costs, increasing speed of operation or improving product quality. Each of these motives arises from the desire to increase sales and profits over what these might have been in the absence of such investments.

It is not enough that a new capital good represent an improvement over an existing facility to warrant its acquisition. A prospective replacement for existing equipment must be *sufficiently* superior in terms of lower operating costs, improved product quality, better customer service or reliability to indicate the desirability of scrapping or selling older facilities. Sums realized from disposal of equipment may be minimal compared to original cost or depreciated book value. Purchases of new equipment, therefore, usually are desirable only if total costs, including depreciation, compare favorably with out-of-pocket operating costs of existing units.

A recent McGraw-Hill survey showed that 36 percent of all manu-

Plant and equipment expenditure plans often are revised substantially



SOURCE: U. S. Department of Commerce, Securities and Exchange Commission and McGraw-Hill.

facturing capacity was less than five years old, compared with 33 percent in 1961. Even some of these relatively new facilities may be obsolescent at the present time, however. Only 24 percent of current capacity was installed before 1950, compared with 40 percent five years ago. Some relatively ancient capital goods continue to perform adequately in various applications. For example, some machine tools and vessels 50 years or more old and long since fully depreciated, remain in service.

History provides examples of modernization programs involving large investments that took place in times of depressed demand when the industries concerned were operating well below capacity. In the 1930s, for example, steel mills converted to continuous rolling mill equipment, the railroads began

quantity purchases of diesel locomotives, and motor vehicle firms introduced coordinated batteries of tools to perform a series of machining operations on engine blocks. In recent years basic oxygen furnaces have offered steel producers cost advantages sufficient to cause some firms to dismantle open hearth furnaces that had been modernized only a few years previously.

A cyclical industry

During the postwar period, the Department of Commerce and the Securities and Exchange Commission (SEC) have surveyed nonfarm business firms quarterly concerning their past and prospective expenditures on new plant and equipment. Because of the importance of these outlays and their impact on total business activity, the results of each new survey are analyzed with care

by those seeking clues to future trends in economic activity.

In some activities, notably oil well drilling, petroleum refining, chemicals and utilities, the line between construction and equipment is not clear. Many business firms do not attempt to separate these aggregates and report a total of plant *and* equipment in their financial statements. The Commerce-SEC survey does not divide expenditures between plant and equipment.

Total plant and equipment expenditures are estimated to have totaled almost 61 billion dollars in 1966, a rise of 17 percent from 1965. This followed increases of 15 and 16 percent in the two previous years. Preliminary soundings suggest that any gain in 1967 will be much smaller.

Some firms have passed the crest of plans adopted one, two or more years ago. Suspension of the investment tax credit and accelerated depreciation on commercial buildings are tending to dampen certain new outlays. Some plans, particularly for commercial buildings, are being curtailed because of credit stringencies. Certainly, the capital spending boom entered a new phase in late 1966, with the possibility that a "turn" was in the making.

Capital expenditures have been rising since the second quarter of 1961, following the mild 1960-61 recession. On an annual basis these outlays have risen five years in succession. The longest previous post-war upswing was from 1949 to 1953, a period encompassing the Korean War.

During 1966 capital expenditures as defined in the Commerce-SEC survey amounted to 8.2 percent of total spending on goods and

services—the gross national product (GNP). The proportion of plant and equipment expenditures to total spending for 1966 is not a record, having been exceeded in 1947, 1948, 1956 and 1957. For equipment alone the 1966 proportion was a record.

From 1961 through 1963 the

proportion of capital outlays to total spending remained at a post-war low of 6.6 percent, instead of rising as in earlier expansions. This occurred despite the enactment of the investment tax credit and the issuance of new guidelines for faster writeoffs by the Treasury in 1962.

Expenditures for new plant and equipment by United States businesses

Industry	1961	1965	1966	Change	
				1961-66	1965-66
	(billion dollars)			(percent)	
Total all industries	34.37	51.96	60.56	76	17
Manufacturing	13.68	22.45	27.01	97	20
Durable goods					
Primary iron and steel	1.13	1.93	2.16	91	12
Primary nonferrous metal	0.26	0.68	0.82	215	21
Electrical machinery and equipment	0.69	0.85	1.18	71	39
Machinery (except electrical)	1.10	2.21	2.89	163	31
Motor vehicles and parts	0.75	1.98	1.96	161	-1
Transportation equipment (except motor vehicles)	0.38	0.58	1.10	190	90
Stone, clay and glass	0.51	0.78	0.89	75	14
Other durable goods	1.45	2.41	3.03	109	26
Total	6.27	11.40	14.04	124	123
Nondurable goods					
Food and beverage	0.98	1.24	1.39	42	12
Textile	0.50	0.98	1.18	136	20
Paper	0.68	1.12	1.50	121	34
Chemical	1.62	2.59	2.95	82	14
Petroleum	2.76	3.82	4.42	60	16
Rubber	0.22	0.34	0.41	86	21
Other nondurable goods	0.65	0.96	1.12	72	17
Total	7.40	11.05	12.97	75	17
Mining	0.98	1.30	1.47	50	13
Railroad	0.67	1.73	1.94	190	12
Transportation (except rail)	1.85	2.81	3.48	88	24
Public utilities	5.52	6.94	8.31	51	20
Communication	3.22	4.94	18.36	57	10
Commercial and other	8.46	11.79			

SOURCE: U. S. Department of Commerce and Securities and Exchange Commission.

Examination of the postwar record does not reveal a clear relationship between changes in plant and equipment expenditures and changes in GNP. Cyclical peaks in total spending and capital spending were reached in the same quarter in both 1957 and 1960 but not in 1948 or 1953. At the low points, troughs in total spending and capital spending were coincident in 1949, but capital spending lagged by one to three quarters in the other cycles.

Cyclical fluctuations in these outlays, however, consistently have been much greater than similar changes in total spending. For example, in the sharp 1957-58 recession, capital outlays dropped 21 percent while total spending declined less than 3 percent. Since early 1961, capital outlays have risen almost 90 percent while GNP increased 50 percent.

Many capital expenditure programs, once initiated, are pushed through to completion despite any subsequent deterioration in economic conditions because of losses

that would be incurred in the event of cancellation. Often the rate of progress on such projects can be adjusted, however, through elimination of extra crews, overtime and other costly measures associated with speed. Other programs, as for example those involving the purchase of trucks or office equipment, can be changed very rapidly.

A comparison of final results with first estimates of capital spending plans, made by the Department of Commerce and the SEC in March and by McGraw-Hill in November of the previous year, reveal a fairly consistent "procyclical" pattern. Business firms tend to enlarge and accelerate their capital expenditure plans during expansions and reduce these plans in recessions. As a result, large order backlogs for capital goods and a heavy volume of advance planning do not necessarily assure continued growth in plant and equipment spending.

Much has been written about the direction of the cause and effect relationship between capital

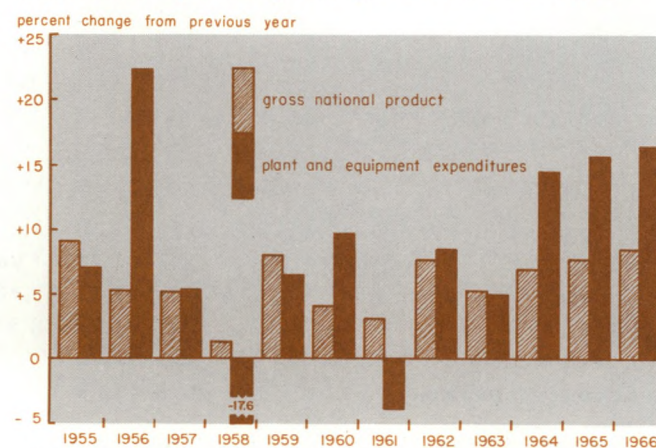
spending and total activity. An explanation of the linkage between business capital outlays and total spending is the principle of the "investment multiplier," under which new investment has a more than proportional impact on total income. But the course of income clearly has an impact upon spending for equipment. This effect is described by the "acceleration principle" under which given increases in spending on final products may induce much larger proportionate gains in output of machinery and equipment used in producing them. On the downside these tendencies, of course, are reversed. Obviously, the multiplier and accelerator interact along with other factors to determine the course of general activity.

Capital outlays by industry

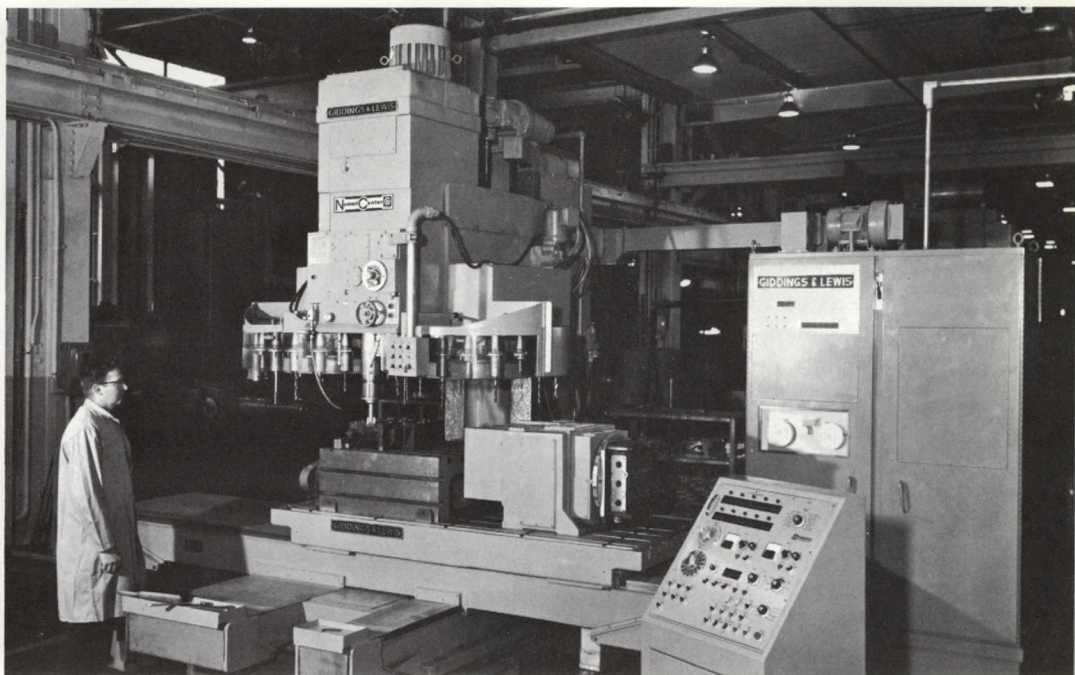
During the postwar period, the proportion of total plant and equipment spending accounted for by manufacturing firms has been as high as 46 percent and as low as 36 percent. This ratio has tended to rise during economic expansions and to decline during recessions.

Capital spending of durable goods manufacturers, at 14 billion dollars, in 1966 was somewhat higher than similar outlays of nondurable goods manufacturers. In most recent years, total outlays for these industry groups have been approximately equal. During the 1962-66 period, for example, capital spending of durable goods firms exceeded nondurables by only 2 percent. Employment in durable goods manufacturing, however, averages about 30 percent more than in nondurable goods. Nondurable goods manufacturers as a group, therefore, have higher fixed capital investments per

Plant and equipment expenditures show much greater fluctuations than total spending on goods and services



SOURCE: U. S. Department of Commerce, Securities and Exchange Commission.



Advanced numerically controlled machining center automatically changes tools for multiple boring, drilling, milling and tapping work

worker than the durable goods group. The reason is that certain important nondurable goods facilities—for example, in the petroleum, chemical and food processing industries—consist of batteries of automatic machines manned by small numbers of operators and maintenance personnel. Many durable goods industries, particularly machinery, have relatively high labor inputs.

Outside of manufacturing, commercial and service industries accounted for about 23 percent of total plant and equipment expenditures in 1966 with a large share of this, probably well over half, represented by buildings. Public utilities accounted for 13 percent of the total, and mining, railroads and non-rail transportation combined for about 11 percent.

All industry categories and all groups of manufacturers, except motor vehicles, reported record capital expenditures in 1966. This experience contrasts with the 1957 peak when outlays of such major industries as motor vehicles, foods, textiles and the railroads fell far short of levels reached earlier in the postwar period.

The largest proportional in-

creases in the current capital goods expansion have been accounted for by the nonferrous metals, nonelectrical machinery, motor vehicles, aircraft, textile, paper and chemical industries. Outlays of most of these industries had lagged in prior years. In short, this capital expenditure boom has been better balanced than its predecessor of the mid-1950s, which helps account for its longevity.

From the end of World War II until the recovery from the second relatively mild postwar recession in 1955, it was widely believed in business circles that prosperity was a transient phase certain to be followed by a severe postwar adjustment similar to the setback after World War I. Many firms, therefore, hesitated to embark on costly expansion projects. As a result, successive supply bottlenecks were reached in such basic materials as steel, nonferrous metals and cement. Shortages of these key products placed a damper on each business expansion that occurred during this period.

The capital outlays of the 1954-57 expansion effectively removed the bottlenecks until the current upswing gathered momentum in

the mid-1960s. Federal Reserve System estimates of the relation of total manufacturing to capacity indicate that output reached 91 percent of capacity in the second half of 1955, a rate not realized again until 1966.

Machines to make machines

Machine tools comprise a small but vital part of total producers' durable goods. Although purchases of these tools account for only about 2 percent of the dollar value of all equipment purchases by United States firms, these "machines that make machines" are a prerequisite to the operation of modern industry.

The basic types of machine tools include lathes and drilling, boring, milling, planing and grinding machines that remove metal in chips and shavings to produce parts to meet exacting dimensional tolerances. Machine tools may be used to produce parts on a custom basis or may be incorporated in mass production processes.

Few industries, even in the capital goods fields, experience as large fluctuations in orders and shipments as does the machine tool industry. During World War II

machine tool shipments reached a peak of 1.3 billion dollars in 1942 and then declined to a low of 250 million dollars in 1949. A Korean War peak of 1.2 billion dollars in shipments was reached in 1953. Two years later shipments were only about half this amount. From 1957 to 1958 shipments declined by somewhat more than half.

The abortive recovery of 1958-60 witnessed only a moderate rise in machine tool shipments. Only when the expansion of the Sixties was well under way did machine tool shipments and orders begin to approach earlier peaks. Shipments in the first 10 months of 1966 were up 20 percent from the advanced level of the previous year and new orders were up 40 percent. For 1966 as a whole, shipments probably totaled more than 1.1 billion dollars, the largest volume since 1953. New orders probably exceeded 1.6 billion dollars, the highest level since 1942. The surge in machine tool orders and shipments partly has reflected the general prosperity, but also the technological progress, that has tended to outmode existing equipment.

Among the major machine tool producers of the Seventh Federal Reserve District are Giddings and Lewis (Fond du Lac), Gisholt (Madison), recently merged with Giddings and Lewis, Sundstrand and Ingersoll (Rockford), Kearney and Trecker (Milwaukee) and Ex-Cell-O (Detroit). Other important firms are located in Ohio and New England. Midwestern machine tool producers have been leaders in the development of numerically controlled units that operate from taped instructions and permit relatively unskilled operators to produce metal parts of a high degree of uniformity and pre-

cise dimensions at high speed.

Machinery in foreign trade

Exports of machinery and equipment have been a major factor enabling the United States to maintain a favorable balance in merchandise transactions with other nations. In recent years shipments of these goods to foreign customers have accounted for about 40 percent of all nonagricultural exports. This proportion rose to 47 percent during 1965.

The strong competitive position of United States capital equipment in world markets is of special interest because wage rates here are by far the highest in the world and capital equipment contains a higher labor component (about 38 percent) than total manufacturing (about 26 percent). The explanation lies in the advanced technology employed by United States firms.

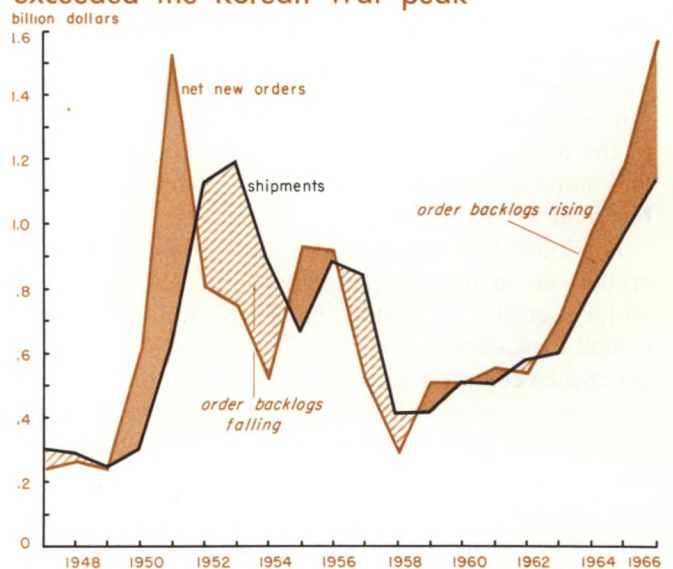
In many sectors—particularly construction machinery, commercial aircraft, computers and ad-

vanced types of machine tools—United States products have been markedly superior in efficiency, durability and quality of product to counterparts produced abroad. Were it not for limitations determined by availability of funds and import restrictions imposed by foreign governments, exports would be much larger.

Exports of capital equipment totaled almost 10 billion dollars in 1965. During the first nine months of 1966, these exports rose 12 percent from the comparable year-ago period. Imports of capital equipment also have risen in recent years but have been only about 15 percent as large as exports.

Rapid acceleration of domestic demand in 1965 and 1966 together with sharply increased military requirements have moderated one of the competitive advantages, relatively short delivery times, offered by United States capital goods producers to foreign buyers in the late 1950s and early 1960s. Large un-

Machine tool orders in 1966 exceeded the Korean War peak

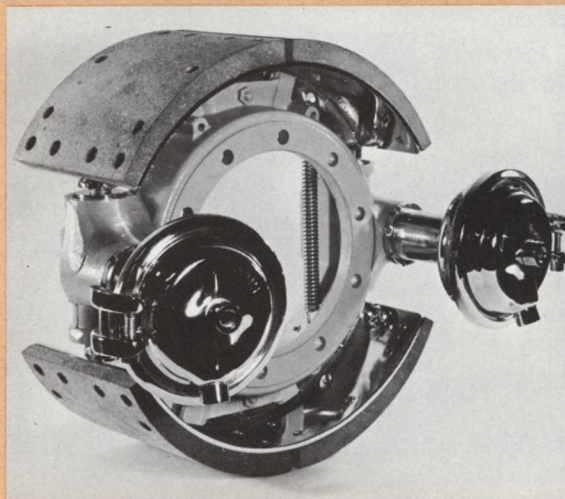
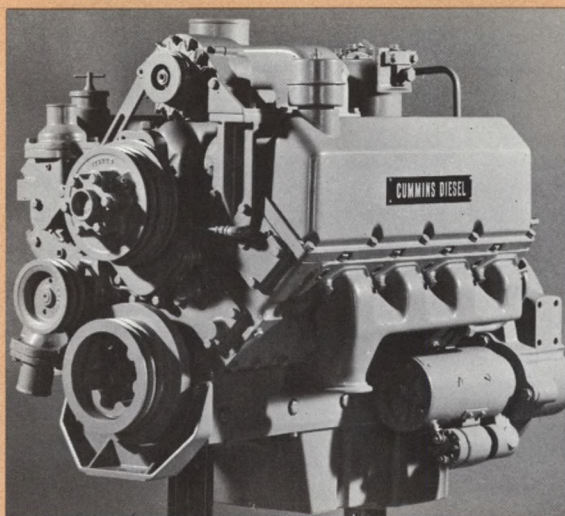


SOURCE: National Association of Machine Tool Builders.

United States exports of capital equipment

	Dollar value 1965 (billions)	Change, Jan.-June 1965 to 1966 (percent)
Total	9.87	13
Aircraft and parts (civilian)	1.04	18
Auto parts and accessories	0.99	17
Agricultural machinery	0.87	-1
Engines (except aircraft)	0.59	36
Instruments	0.48	19
Power machinery and switchgear	0.47	1
Office machines	0.47	19
Materials handling equipment	0.33	10
Metalworking machinery	0.33	1
Construction machinery	0.32	-2
Broadcasting equipment	0.30	7
Trucks (civilian)	0.28	13
Textile machinery	0.21	26
Pumping equipment	0.14	31
Miscellaneous	3.05	13

SOURCE: U.S. Department of Commerce.



Engines, automotive components and machine tools comprise a sizable share of United States exports



used capacity had caused these firms to push exports vigorously. The reversal of this trend has been particularly marked in the case of machine tools during the past two years.

The importance of exports to capital equipment producers was highlighted in the 1960-61 recession when output and shipments of these goods declined only slightly because a rise in exports partially offset a decline in domestic demand. As a proportion of all shipments of United States machinery and equipment producers, domestic and foreign, exports rose from about 15 percent in the late 1950s to more than 20 percent in 1965. Apparently this proportion declined somewhat in 1966.

An important aspect of the international picture in capital goods concerns the large investments of

United States firms in other nations in recent years, most prominently in Canada and Europe. According to the Department of Commerce, new foreign investments of business firms totaled a record 9 billion dollars in 1966. In some cases, capital expenditures abroad by American firms or their affiliates involve shipments of capital goods manufactured in this country.

A large proportion of United States machinery and equipment producers have become international firms in the past decade, both through construction of new facilities and acquisitions of existing foreign firms. Lower costs of labor and transportation have been partially responsible, but, commonly, these foreign markets could be served more efficiently from domestic plants. In the latter instances the principal motivation has been the

desire to produce behind trade barriers imposed by foreign governments either individually, or in combination, through the Common Market.

Sales of foreign affiliates of machinery firms totaled more than 9 billion dollars in 1965. Only about 2 percent of these shipments were exported to the United States, compared with more than 4 percent for all classes of manufactures. In addition to some return flow of goods, foreign investments also have resulted in a reciprocal exchange of technology and processing techniques.

Pricing capital goods

Average prices of producers' durable equipment were remarkably stable during the 1959-63 period. As demand for these products accelerated, prices began to

rise. The average for 1966 was up about 4 percent from 1963, an increase that about matched the rise for all wholesale prices other than farm products and processed foods.

During the 1954-57 expansion, prices of producers' durables rose 16 percent while nonfarm wholesale prices increased 10 percent. Doubtless, some buyers were priced out of the market in the later stages of that expansion.

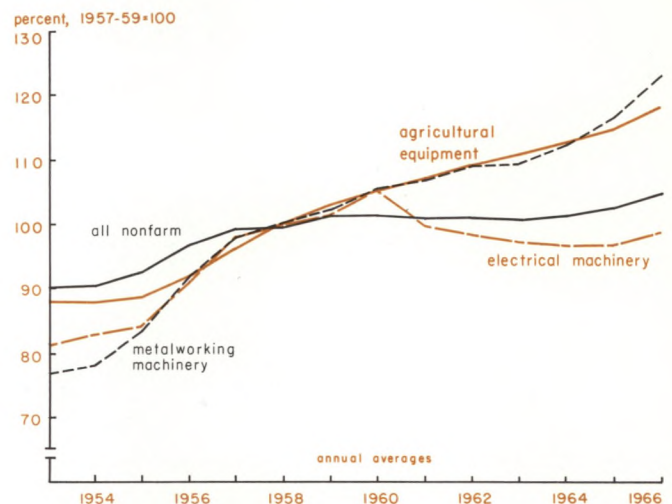
Price trends have varied among the major types of machinery and equipment since 1963. While average electrical machinery and equipment prices have remained virtually stable, farm equipment increased 7 percent, construction machinery 8 percent and metalworking machinery about 12 percent.

Price comparisons can be only rough guides in time periods when new products are introduced and existing lines are improved and modified. Few classes of goods change in quality, or performance characteristics as much as producers' durables. If earthmoving equipment were priced on the basis of capacity to move a given volume of material, electrical generating equipment on kilowatts of capacity and locomotives on horsepower or tractive effort, some contemporary models would be found to be cheaper than their counterparts of 30 or 40 years ago.

Quality changes in many cases cannot be measured in units of capacity. What is to be done with factors such as ease of loading and unloading, safety, durability or higher quality of goods produced by new equipment? Even more perplexing, how should such new developments as solid state electrical circuits and vacuum-degassed steel affect measures of price change?

The Bureau of Labor Statistics

Prices of machinery and equipment have increased less in the current upswing than in the 1954-57 period



SOURCE: U. S. Bureau of Labor Statistics.

attempts to make adjustments for quality change, but apparently these must be somewhat arbitrary. Probably existing price indexes overstate prices of capital goods, currently, in comparison with the past.

Producers' durable equipment purchases amounted to 7.0 percent of GNP in 1966, up from 5.5 percent in 1961—a proportion equaled in only one year, 1948, since the series began in 1929. After adjustment for price changes in both series, producers' durables outlays amounted to 7.5 percent of GNP in 1966, indicating an even sharper rise relative to total spending in recent years although not in comparison with the early postwar period.

Financing capital outlays

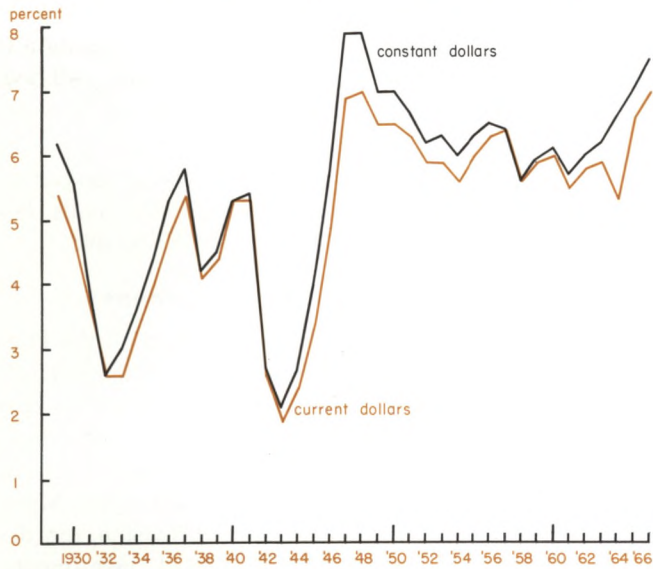
A favorable evaluation of the profit prospects for a proposed capital investment is not followed automatically by negotiation of a

contract to purchase. No less important is the expectation that sufficient funds will be available from sales, liquidation of other assets, anticipated cash flow or borrowings that the firm is able and willing to undertake.

Some firms make it a practice to restrict capital expenditures to the sums made available from internal sources, undistributed profits and depreciation, thus avoiding outside borrowings. More commonly, firms are willing to use long-term debt, within some limit, to undertake desired capital outlays. As a result, long-term corporate borrowing typically rises when capital expenditures increase.

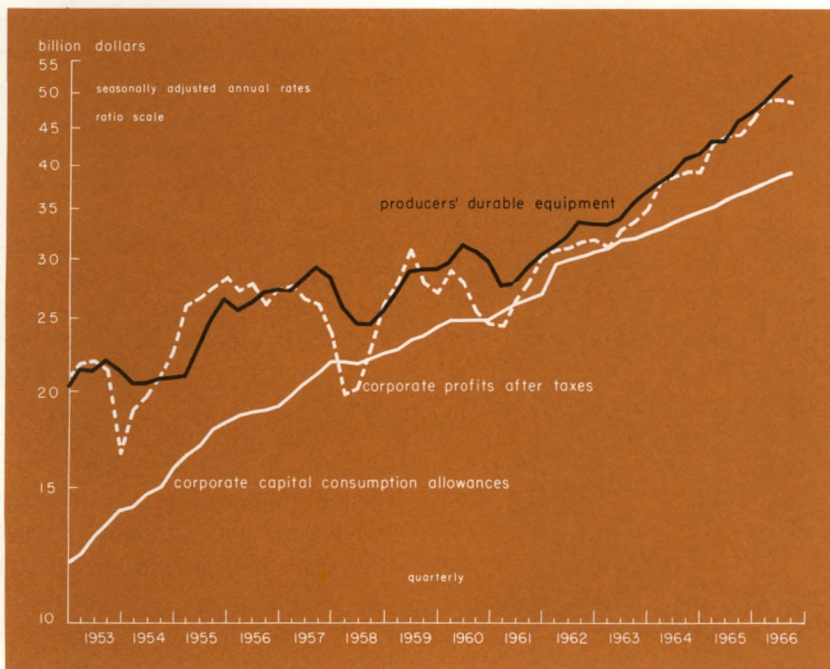
About two-thirds of all funds used by nonfinancial corporations throughout the postwar period have come from internal sources. During recent years depreciation has exceeded undistributed profits by about two to one and has constituted by far the most important

The proportion of gross national product accounted for by producers' durable equipment neared early postwar peak in 1966



SOURCE: U. S. Department of Commerce.

Corporate profits and purchases of producers' durables have followed similar patterns in the postwar period



SOURCE: U. S. Department of Commerce.

single means of financing United States business.

Undistributed profits and depreciation of nonfinancial corporations were approximately equal to plant and equipment expenditures of these firms in the first three quarters of 1966. These sources of funds were 8 percent larger than capital outlays in 1965 and 15 percent larger in the previous year, the highest ratio since 1950. That cash flow remained large relative to needs until 1965 reflects the maintenance of profit margins—in contrast to earlier expansions—and more rapid depreciation permitted for tax purposes after 1962. From 1955 to 1957 the ratio of cash flow to capital expenditures had dropped from 120 to 96 percent. Individual firms, of course, greatly vary their willingness and ability to rely upon internal funds for expansion needs.

When capital expenditures rise in prosperity, working capital requirements usually are increasing as well. Under these circumstances it is not feasible to relate particular sources of funds to particular uses. Businesses may list proposed capital expenditures as the reason for a new bond issue, for example, when the reason might as well be given as “higher financial requirements, beyond the scope of our internal sources of funds.” Plant and equipment expenditures amounted to about 58 percent of total corporate uses for funds in 1965 and 1966, slightly less than the proportion of the early 1960s and much less than in several previous postwar years.

The rate at which internal funds were acquired in the first nine months of 1966 declined sharply to 58 percent of total sources of funds, compared with 63 percent in 1965 and 72 percent

the previous year. Security issues, net of repayments, and outstanding borrowings of corporations increased 13.6 billion dollars in 1964 and 18.6 billion in 1965, with more rapid expansion of commercial bank loans accounting for virtually all of the difference between the two years. Total net borrowing increased to an annual rate of 25.6 billion dollars in the first three quarters of 1966, with a rise in bond issues mainly responsible for the change from 1965.

Some types of equipment financing arrangements are directly related to particular expenditures. When equipment trust certificates are offered by railroads, trustees retain title to rolling stock and repayments are scheduled to reduce

the outstanding debt more rapidly than the decline in the depreciated value of the asset. Instalment sales contracts used in purchases of cars, trucks, trailers and farm and construction equipment are similar.

Often "unsecured" term loans, or revolving credits, from banks are used to purchase fleets of trucks, aircraft or construction equipment. These loan agreements contain various restrictive covenants, including negative pledge clauses, that substitute for direct liens.

Increasingly, businesses—especially smaller firms—have leased new equipment of a wide variety of types to conserve working capital and borrowing potential. Some lease agreements, most notably in

connection with commercial aircraft, have enabled lessees to take advantage of the investment credit otherwise unavailable to them because of inadequate profits.

Whatever the methods used, some purchases of machinery and equipment were deferred in 1966 because of credit stringencies. Presumably, many of these plans could be reactivated should funds become more readily available.

Depreciation changes

Until the enactment of the Federal income tax in 1913, business accounting records often were kept on a haphazard basis with little uniformity, even among firms engaged in similar activities. Many firms made no provision for depreciation on fixed investments, taking the view that assets properly maintained do not depreciate.

The need to recognize depreciation as a part of the cost of doing business—to reflect wear and tear and obsolescence—now has been firmly established. At times it has been argued that depreciation should be determined on some basis other than original cost, substituting some measure of replacement or reproduction cost. This view was pressed with vigor in the early postwar years after the substantial upthrust of the general price level associated with World War II. But replacement cost depreciation gained little political support.

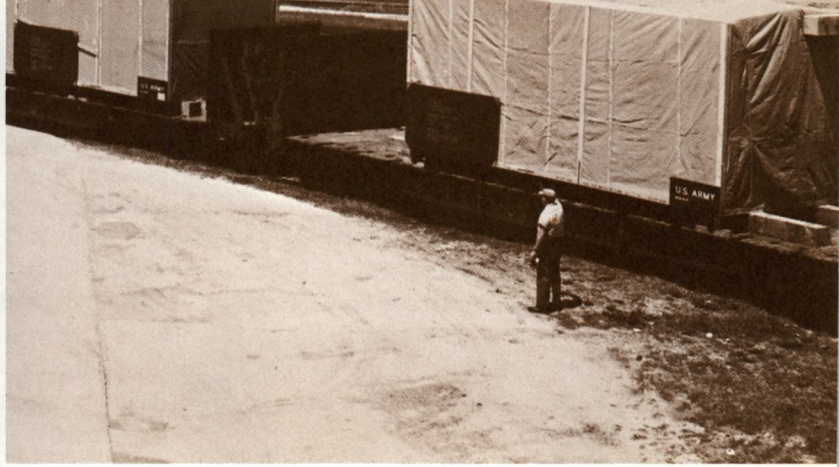
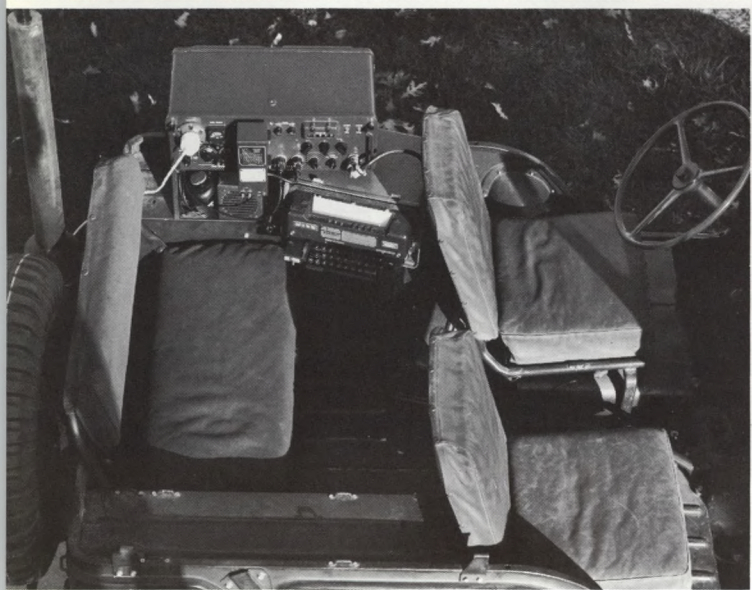
Another plan for depreciation reform was incorporated by Congress in the Revenue Act of 1954. Previously, only straight-line depreciation for the expected useful life of the asset was permitted. Starting in 1954, most businesses have been able to elect to take depreciation on the basis of the de-

Net sources and uses of funds of corporate nonfinancial business

	1961	1962	1963	1964	1965	1966*
	(billion dollars)					
Sources						
Depreciation	25.4	29.2	30.8	32.8	35.1	37.2
Undistributed profits	10.1	12.6	13.1	18.1	20.2	21.0
Security issues	7.1	5.2	3.6	5.4	5.4	12.5
Loans	2.2	6.1	6.9	8.2	13.2	13.1
Payables	6.6	4.5	6.0	3.4	7.9	9.8
Other liabilities	3.1	5.8	5.5	2.7	6.2	6.1
Total	54.5	63.4	65.9	70.6	88.0	99.7
Uses						
Plant and equipment	33.2	37.0	38.6	44.1	51.3	58.4
Inventories	1.5	4.7	4.3	4.4	6.8	9.8
Receivables	10.1	9.1	9.2	10.1	14.9	16.8
Liquid assets	3.5	4.2	4.3	0.8	0.6	3.4
Other assets	6.6	6.7	9.4	7.9	13.9	10.9
Total	54.9	61.7	65.8	67.3	87.5	99.3
Discrepancy						
Sources less uses	-0.4	1.7	0.1	3.3	0.5	0.4

*Based on rate for first three quarters.

SOURCE: Board of Governors of the Federal Reserve System.



Portable diesel power units and mobile high frequency communications equipment aid the nation's effort in Vietnam

clining balance and sum-of-the-years-digits methods. Accelerated depreciation calculated on these formulas permits much faster write-offs for tax purposes in the early, and most profitable, years of an asset's life, thereby reducing uncertainty by providing a more prompt recovery of the cost of capital goods in depreciation and after-tax profits.

A further step to accelerate depreciation was taken in 1962 when the Treasury published new guidelines of suggested useful lives for broad classes of producers' durable equipment. In many cases these were much shorter than the lifespans in common use for tax purposes.

The investment credit

Another 1962 step intended to stimulate capital outlays was the enactment of the Investment Tax Credit. Seven percent of the cost of fully eligible producers' durable goods, with eight years or more of expected useful life, could be deducted from the purchaser's tax

liability. Credits were limited to 25 percent of a firm's tax liability, but liberal carry-forward and carry-back provisions were provided. Originally, only 93 percent of the cost of an asset covered by the tax credit could be depreciated on the ground that the credit was equivalent to a 7 percent Government subsidy and reduced the initial cost of the investment by an equivalent amount. In 1964 firms were permitted to depreciate the full purchase price of covered assets, making the tax credit the equivalent of a price cut of more than 7 percent.

During the 1962-64 period, businesses reduced their taxes by 4 billion dollars—1.6 billion dollars in 1964 alone—as a result of the tax credit. Almost half of these credits were claimed by manufacturers and 80 percent by corporations.

In September 1966 the Administration asked Congress to help relieve inflationary pressures by suspending the tax credit on equipment and accelerated depreciation

on new buildings that were ordered or delivered between that time and the end of 1967. As subsequently enacted by Congress, the effective date of the suspension became October 10, 1966, and purchases valued up to 20,000 dollars were exempted, thereby reducing the effect of the change on small firms which are important purchasers of farm machinery and trucks. In suspending the tax credit, Congress also provided that after 1967 the limit will rise to 50 percent of a firm's tax liability, and the carry-forward provision will be extended from five to seven years.

Estimates of the effect of the suspension of the tax credit on capital spending are highly tentative, and the amount of any cut-backs probably never will be known with precision. Too many other factors are involved in capital expenditure decisions.

Equipment needs still large

An important feature of the postwar period has been the growing emphasis on Research and

Development (R and D) by United States businesses. R and D expenditures of private industry grew rapidly after World War II, amounting to 3.6 billion dollars in 1953, according to the National Science Foundation. A decade later the total was estimated at 12.7 billion dollars and was still growing rapidly. A survey by McGraw-Hill indicates that private R and D outlays exceeded 15 billion dollars in 1966 and may rise a further 3 billion by 1969.

Research work can be classified as basic, applied and product development. Eastman-Kodak, General Electric, the Bell System Laboratories and du Pont were among the pioneers in basic research not necessarily directed to the solving of immediate technical problems. During recent years virtually all businesses of substantial size have instituted similar programs. Efforts of business firms have benefited by research in the universities, government and private laboratories. The result has been a steady proliferation of new and better products that often require large outlays on new equipment.

The largest R and D spenders have been in the aircraft and mis-

sile, electrical equipment, communication, chemical, pharmaceutical, motor vehicle and nonelectrical machinery industries. A recent tabulation lists more than 60 important firms, in a wide variety of industries whose R and D expenditures total 2 percent or more of annual sales volume.

R and D affects three types of capital spending: first, facilities used directly in research; second, facilities necessitated by decisions to place new items in production, and, third, sufficiently superior new equipment to replace existing models.

The day has long since passed when capital goods producers could "sit tight" with accepted products, expecting that customers would not be lured away by competitors. When new product lines are introduced, one or more later generations already are in the development stage to be introduced when matured and fully tested.

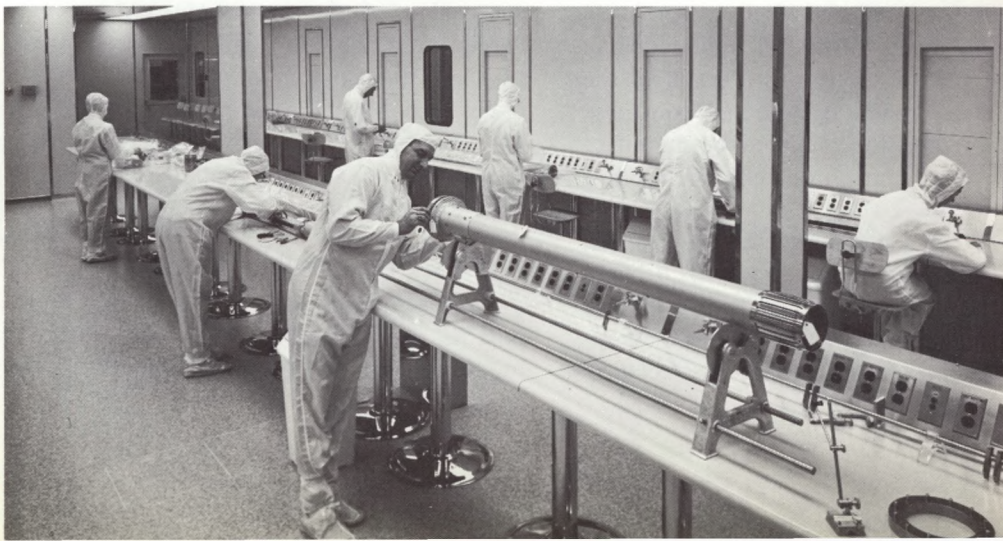
The day is also past when important new scientific or technical discoveries are allowed to lie fallow for years awaiting exploitation. Recent dramatic examples of the swift adaptations of new technology are found in the use of computers,

micro-circuitry and lasers in industrial applications.

A number of reasons can be offered for the more rapid pace of technological development of the postwar period. The cooperation of industry and government in maintaining the nation's military strength in the cold war has speeded the development of many types of research that have civilian applications. This process has been aided by the ever-growing number of scientists, engineers and technicians that have received advanced training in universities, industry and government.

Technological progress also has been spurred by the highly competitive nature of the United States business structure. Unlike some nations, where private cartels and government-sponsored firms are dominant, each major United States industry includes a number of independent firms, each striving to increase its share of the various markets. Anti-monopoly policies have been supplemented by court decisions that have gradually narrowed the role of patents in restricting competition. Domestic competition also has been stimulated in the past decade by the growing im-

Missile components in an environmentally controlled white room and an astronaut's space suit illustrate advanced technology of Midwest defense contractors



portance of imports of a wide variety of products.

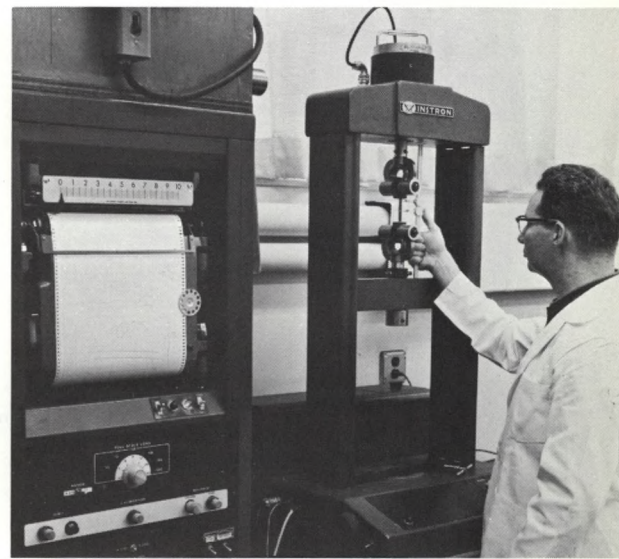
Capital outlays have been encouraged in the postwar period by favorable profit trends and the ready availability of credit. Under the circumstances, facilities to produce new products were not delayed because of an inadequate supply of funds. Large firms with surplus cash and borrowing power have acquired smaller firms of demonstrated profitability with noncompeting product lines. As semi-independent divisions of parent corporations, these merged firms have been supplied with ample funds to help achieve their full growth potential.

But technology and competition will not maintain capital outlays in the future in the face of declines in general activity. Major investment decisions involve extended commitments that require confidence in the long-run economic growth of the nation. Any recession, even a moderate setback, could have a pronounced effect on sales of producers' durable goods. An extended period of recession or sluggish growth, as in the 1957-63 period, would be accompanied by a marked slowing of investment outlays resulting in a barrier to achievement of full growth potential when prosperity returned.

In early 1967 the economic outlook will continue to be clouded by

the requirements of the war in Southeast Asia. Private capital outlays probably will be rising but at a slower rate than in 1966. Nevertheless, barring an unforeseen jolt to business confidence, the capital spending upsurge that began in 1961 retains substantial momentum. During 1966 many planned private equipment purchases were delayed or postponed because of labor and material shortages, excessive costs or military priorities.

The longer-run needs for producers' durable goods are immense. Huge outlays are contemplated in connection with projects of government and industry to reduce air and water pollution, to improve water supplies and for airports, highways and urban transport. Implementation of these programs will coincide with an impending surge in family formation resulting from the maturing of those born in the early postwar years. Demands of these families together with programs to raise the economic status of disadvantaged groups will require continued growth in output of consumer goods and of the machinery and equipment used in producing them. The future prosperity of the Seventh Federal Reserve District centers that concentrate on output of producers' durable equipment will be determined in large part by the degree of success achieved in meeting these goals.



Instruments to test materials and posture studies to reduce worker fatigue—part of the continuing effort to improve product quality

Acknowledgments

Cover—Sangamo Electric Company, Barber Greene Company, Thrall Car Manufacturing Company, Federal-Mogul Corporation; Page 12—A. B. Dick Company, Page 17—International Harvester Company, Le Tourneau-Westinghouse Company, Allis-Chalmers Manufacturing Company; Page 19—Iowa

Manufacturing Company, Link-Belt Company; Page 20—Cummins Engine Company, Incorporated (Ezra Stoller Associates), Abex Corporation; Page 21—Hoover Ball & Bearing Company (Levers' Studio), J. I. Case Company, The Bendix Corporation, Borg-Warner Corporation; Page 25—Ex-Cell-O Corporation, Giddings & Lewis Machine

Tool Company; Page 27—Cummins Engine Company, Incorporated, Electro-Motive Division, General Motors Corporation, Amsted Industries, Incorporated; Page 31—The Bendix Corporation, Collins Radio Company; Page 32—The Bendix Corporation, Federal-Mogul Corporation; Page 33—Brunswick Corporation, J. I. Case Company.



STATEMENT OF CONDITION

Assets	December 31, 1966	December 31, 1965
Gold certificate account	\$ 1,826,731,583	\$ 2,209,495,047
Redemption fund for Federal Reserve notes	331,433,927	318,065,650
Total gold certificate reserves	\$ 2,158,165,510	\$ 2,527,560,697
Federal Reserve notes of other Banks	86,035,000	84,885,000
Other cash	45,994,210	21,681,905
Discounts and advances:		
Secured by U. S. Government securities	\$ 19,660,000	\$ 15,150,000
Other	—	5,822,000
Total discounts and advances	\$ 19,660,000	\$ 20,972,000
U. S. Government securities	7,322,144,000	6,741,835,000
Total loans and securities	\$ 7,341,804,000	\$ 6,762,807,000
Cash items in process of collection	1,742,169,962	1,508,172,050
Bank premises	19,584,651	20,490,517
Other assets	179,549,484	139,775,425
Total assets	\$11,573,302,817	\$11,065,372,594
Liabilities		
Federal Reserve notes	\$ 7,293,072,292	\$ 6,890,642,145
Deposits:		
Member bank reserves	\$ 2,753,909,091	\$ 2,814,282,453
U. S. Treasurer—general account	521,263	49,264,892
Foreign	22,880,000	21,300,000
Other	28,659,766	21,549,218
Total deposits	\$ 2,805,970,120	\$ 2,906,396,563
Deferred availability cash items	1,270,135,969	1,080,076,243
Other liabilities	38,890,236	30,930,843
Total liabilities	\$11,408,068,617	\$10,908,045,794
Capital accounts		
Capital paid in	82,617,100	78,663,400
Surplus	82,617,100	78,663,400
Total liabilities and capital accounts	\$11,573,302,817	\$11,065,372,594
Contingent liability on acceptances purchased		
for foreign correspondents	\$ 27,427,400	\$ 20,391,200
Ratio of gold certificate reserves		
to Federal Reserve note liabilities	29.6%	36.7%



STATEMENT OF EARNINGS AND EXPENSES

	1966	1965
Current earnings:		
Discounts and advances	\$ 6,050,335	\$ 3,933,396
U. S. Government securities	309,998,076	253,958,466
Foreign currencies	3,143,519	1,979,944
All other	108,538	68,997
Total current earnings	<u>\$319,300,468</u>	<u>\$259,940,803</u>
Current expenses:		
Operating expenses	\$ 29,070,302	\$ 27,909,462
Federal Reserve currency	4,078,113	4,003,946
Assessment for expenses of Board of Governors	1,292,300	1,223,900
Total	<u>\$ 34,440,715</u>	<u>\$ 33,137,308</u>
Less reimbursement for certain fiscal agency and other expenses	<u>3,805,131</u>	<u>3,724,823</u>
Current net expenses	<u>\$ 30,635,584</u>	<u>\$ 29,412,485</u>
Current net earnings	<u>\$288,664,884</u>	<u>\$230,528,318</u>
Additions to current net earnings	\$ 267,229	\$ 195,230
Deductions from current net earnings:		
Loss on sales of U. S. Government securities (net)	414,108	1,301
All other	1,229	40,359
Total deductions	<u>\$ 415,337</u>	<u>\$ 41,660</u>
Net deductions from (—) or additions to current net earnings	<u>\$ —148,108</u>	<u>\$ 153,570</u>
Net earnings before payments to U. S. Treasury	<u>\$288,516,776</u>	<u>\$230,681,888</u>
Dividends paid	4,855,838	4,626,284
Payments to U. S. Treasury (interest on Federal Reserve notes)	279,707,238	221,995,054
Transferred to surplus	<u>\$ 3,953,700</u>	<u>\$ 4,060,550</u>
Surplus account		
Surplus, January 1	\$ 78,663,400	\$ 74,602,850
Transferred to surplus—as above	3,953,700	4,060,550
Surplus, December 31	<u>\$ 82,617,100</u>	<u>\$ 78,663,400</u>



OPERATIONS

Clearing and collection

	1966	1965
Dollar amount (in millions)		
Commercial bank checks	308,990	262,867
Government checks*	19,407	17,186
Other items	682	1,127
Number of pieces (in thousands)		
Commercial bank checks	810,381	745,431
Government checks*	94,184	94,692
Other items	1,800	1,794

Currency and coin

Dollar amount (in millions)		
Currency received and counted	4,862	5,578
Coin received and counted	98	38
Coin wrapped	30	83
Unfit currency withdrawn from circulation	1,219	1,099
Number of pieces (in millions)		
Currency received and counted	759	866
Coin received and counted	913	536
Coin wrapped	256	969
Unfit currency withdrawn from circulation	276	195

Safekeeping of securities†

Dollar amount (in millions)		
Securities received	14,739	15,957
Securities released	15,096	16,118
Coupons detached	271	260
In safekeeping on December 31	8,120	8,476
Number of pieces (in thousands)		
Securities received	364	383
Securities released	365	350
Coupons detached	3,072	3,008
In safekeeping on December 31	1,525	1,526

Discount and credit

Dollar amount (in millions)		
Total loans made during year	15,908	11,033
Daily average outstanding	132	95
Number of banks accommodated during year	268	171

Investment

Purchases and sales of securities for member banks		
Dollar amount (in millions)	1,680	1,812
Number of transactions	17,669	18,075

Transfer of funds

Dollar amount of funds transferred (in millions)	889,847	686,256
Number of transfers (in thousands)	751	672

*Includes postal money orders.

†Including collateral custodies.

**Services to the
U.S. Treasury**

	1966	1965
Marketable securities		
Dollar amount (in millions)		
Issued.....	13,929	15,513
Servicing:		
Securities received.....	17,297	18,021
Securities delivered.....	22,263	21,439
Redeemed.....	18,952	19,280
Number of pieces (in thousands)		
Issued.....	433	344
Servicing:		
Securities received.....	242	212
Securities delivered.....	754	551
Redeemed.....	805	664
Savings bonds		
Dollar amount (in millions)		
Issued.....	1,628	1,528
Servicing:		
Bonds received for reissue.....	150	154
Bonds delivered on reissue.....	150	154
Bonds delivered on replacement.....	6	5
Redeemed.....	1,182	1,068
Number of pieces (in thousands)		
Issued.....	25,551	24,127
Servicing:		
Bonds received for reissue.....	702	699
Bonds delivered on reissue.....	790	784
Bonds delivered on replacement.....	68	70
Redeemed.....	17,319	16,393
Federal tax receipts processed		
Dollar amount (in millions).....	10,891	8,201
Number of pieces (in thousands).....	2,132	1,937

Requests for additional copies of this Annual Report should be addressed to:

Federal Reserve Bank of Chicago
Box 834
Chicago, Illinois 60690



DIRECTORS

FRANKLIN J. LUNDING

Chairman of the Finance Committee
Jewel Companies, Inc.
Chicago, Illinois
Chairman and Federal Reserve Agent

JOHN W. SHELDON, President

Chas. A. Stevens & Co.
Chicago, Illinois
Deputy Chairman

JOHN H. CROCKER, Chairman of the Board

The Citizens National Bank of Decatur
Decatur, Illinois

GERALD F. LANGENOHL, Treasurer and Assistant Secretary (Retired)

Allis-Chalmers Manufacturing Company
Milwaukee, Wisconsin

WILLIAM E. RUTZ, Director

and Member of the Executive Committee
Giddings & Lewis Machine Tool Company
Fond du Lac, Wisconsin

HARRY W. SCHALLER, President

The Citizens First National
Bank of Storm Lake
Storm Lake, Iowa

ELVIS J. STAHR, President

Indiana University
Bloomington, Indiana

JOSEPH O. WAYMIRE

Vice President and Treasurer
Eli Lilly and Company
Indianapolis, Indiana

KENNETH V. ZWIENER, Chairman of the Board

Harris Trust and Savings Bank
Chicago, Illinois

DETROIT BRANCH

GUY S. PEPIATT, Chairman of the Board

Federal-Mogul Corporation
Detroit, Michigan
Chairman

JOHN H. FRENCH, JR., President

City National Bank of Detroit
Detroit, Michigan

MAX P. HEAVENRICH, JR., President

Heavenrich Bros. & Company
Saginaw, Michigan

JAMES W. MILLER, President

Western Michigan University
Kalamazoo, Michigan

FRANKLIN H. MOORE

Chairman of the Board and President
The Commercial and Savings Bank of St. Clair County
St. Clair, Michigan

RAYMOND T. PERRING, Chairman of the Board

The Detroit Bank and Trust Company
Detroit, Michigan

B. P. SHERWOOD, JR., President

Security First Bank & Trust Co.
Grand Haven, Michigan

MEMBER OF FEDERAL ADVISORY COUNCIL

HENRY T. BODMAN, Chairman of the Board

National Bank of Detroit
Detroit, Michigan

December 31, 1966



OFFICERS

CHARLES J. SCANLON, President

HUGH J. HELMER, First Vice President

ERNEST T. BAUGHMAN, Vice President

JOHN J. ENDRES, General Auditor

ARTHUR M. GUSTAVSON, Vice President

PAUL C. HODGE, Vice President,
General Counsel and Secretary

LAURENCE H. JONES, Vice President

RICHARD A. MOFFATT, Vice President

HAROLD J. NEWMAN, Vice President

LELAND M. ROSS, Vice President

HARRY S. SCHULTZ, Vice President

BRUCE L. SMYTH, Vice President

RUSSEL A. SWANEY, Vice President

JACK P. THOMPSON, Vice President

CARL E. BIERBAUER, Cashier

GEORGE W. CLOOS, Senior Economist

LE ROY A. DAVIS, Assistant Vice President

LE ROY W. DAWSON, Assistant Vice President

FRED A. DONS, Assistant General Auditor

DANIEL M. DOYLE, Assistant Vice President

ELBERT O. FULTS, Assistant Vice President

VICTOR A. HANSEN, Assistant Vice President

EDWARD A. HEATH, Assistant Vice President
and Assistant Secretary

WILLIAM O. HUME, Assistant Vice President

WARD J. LARSON, Assistant General Counsel
and Assistant Secretary

JAMES R. MORRISON, Chief Examiner

KARL A. SCHELD, Assistant Vice President

ROBERT E. SORG, Assistant Vice President

JOSEPH J. SRP, Assistant Vice President

LYNN A. STILES, Senior Economist

CHARLES G. WRIGHT, Assistant Vice President

ARNOLD J. ANSCHUTZ, Assistant Cashier

HARRIS C. BUELL, JR., Assistant Chief Examiner

JOHN J. CAPOUCH, Assistant Cashier

RUDOLPH W. DYBECK, Assistant Cashier

FRANCIS C. EDLER, Assistant Cashier

ERICH K. KROLL, Assistant Cashier

RAYMOND M. SCHEIDER, Assistant Cashier

ADOLPH J. STOJETZ, Assistant Cashier

CARL W. WEISKOPF, Assistant Chief Examiner

DETROIT BRANCH

RUSSEL A. SWANEY, Vice President

GORDON W. LAMPHERE, Assistant Vice President
and Assistant General Counsel

PAUL F. CAREY, Assistant Cashier

LOUIS J. PUROL, Assistant Cashier

W. GEORGE RICKEL, Assistant Cashier

RONALD L. ZILE, Assistant Cashier

December 31, 1966



Appointments,

Elections and Retirements

During 1966 the following appointments and elections were announced:

Henry T. Bodman, Chairman of the Board, National Bank of Detroit, Detroit, Michigan, was reappointed Member of the Federal Advisory Council from the Seventh Federal Reserve District for 1967.

William H. Davidson, President, Harley-Davidson Motor Co., Milwaukee, Wisconsin, was elected Director for a three-year term beginning January 1, 1967, to succeed Gerald F. Langenohl, Treasurer and Assistant Secretary (Retired), Allis-Chalmers Manufacturing Company, Milwaukee, Wisconsin.

John H. French, Jr., President, City National Bank of Detroit, Detroit, Michigan, was reappointed Director of the Detroit Branch for a three-year term beginning January 1, 1967.

Max P. Heavenrich, Jr., President, Heavenrich Bros. & Company, Saginaw, Michigan, was reappointed Director of the Detroit Branch for a three-year term beginning January 1, 1967.

Emerson G. Higdon, President, Maytag Company, Newton, Iowa, was appointed Director for a three-year term beginning January 1, 1967, to succeed John W. Sheldon, President, Chas. A. Stevens & Co., Chicago, Illinois.

Franklin J. Lunding, Chairman of the Finance Committee, Jewel Companies, Inc., Chicago, Illinois, was redesignated Chairman of the Board and Federal Reserve Agent for 1967.

Guy S. Peppiatt, Chairman of the Board, Federal-Mogul Corporation, Detroit, Michigan, was redesignated Chairman of the Branch Board for 1967.

Elvis J. Stahr, President, Indiana University, Bloomington, Indiana, was designated Deputy Chairman of the Board for 1967.

George L. Whyel, President, Genesee Merchants Bank & Trust Co., Flint, Michigan, was appointed Director for a three-year term beginning January 1, 1967, to succeed Franklin H. Moore, Chairman of the Board and President, The Commercial and Savings Bank of St. Clair County, St. Clair, Michigan.

Kenneth V. Zwiener, Chairman of the Board, Harris Trust and Savings Bank, Chicago, Illinois, was reelected Director for a three-year term beginning January 1, 1967.

Gordon W. Lamphere, Assistant General Counsel, was promoted to Assistant Vice President and Assistant General Counsel at the Detroit Branch on September 1.

Adolph J. Stojetz was appointed Assistant Cashier on August 1.

Jack P. Thompson was appointed Vice President on October 1.

Ronald L. Zile was appointed Assistant Cashier at the Detroit Branch on September 1.

Gerald F. Langenohl, Franklin H. Moore and John W. Sheldon retired as directors on December 31, 1966. Mr. Langenohl was Director of the Bank since 1958. Mr. Moore was Director of the Detroit Branch since 1961. Mr. Sheldon was Director since 1961 and Deputy Chairman since 1966.

Lester A. Gohr, Assistant Cashier, retired on August 1 after 47 years of service at the Bank.

Clarence T. Laibly, Vice President, retired October 1 after 48 years of service at the Bank.

Richard W. Bloomfield, Assistant Vice President, retired on September 1 after 37 years of service at the Detroit Branch.

The employees listed below, all with service records of more than 25 years, retired within the course of the year from the Head Office or Detroit Branch:

Matt L. Donovan	Hertha M. Moehlig
Joseph H. McHale	James I. Molloy
Esther H. Martin	John L. Reynolds
Gregory J. Smith	

The following employees retired after more than 40 years association with the Head Office or Detroit Branch:

Raymond Carroll	Louise Harris
Margaret E. Clapp	Walter C. Schaack
Marion L. Daus	Zella E. Towne

The 16 retired officers and employees of the Bank represent more than 618 years of service to this institution.

