Business Review

Why Federal Funds?

Survey of Time and Savings Deposits in the Third District

Electrons at Work

August 1966

Federal Reserve Bank of Philadelphia

This past winter, the Federal Reserve Bank of Philadelphia conducted a questionnaire survey of country member banks in the Third District on their activities in the federal funds market. The survey was designed to find out which banks are presently buyers or sellers of federal funds and how participation has changed in recent years. The major results of the survey were discussed in the article, "Country Banks and the Federal Funds Market," which appeared in the Business Review for April 1966. The present article is an attempt to isolate the main reasons for the marked increase in federal funds activity by country banks in order to answer the question . . .

WHY FEDERAL FUNDS?

by Nevins D. Baxter*

While there is no single explanation which can fully account for the growth in the number of banks using the federal funds market, there are a number of influences which appear to be significant:

Convenience and profitability
Influence of correspondents
Awakening of management
Level of interest rates
The profit squeeze

Convenience and profitability

In a sense, of course, convenience and profitability are catch-all terms which describe the motivations of so many of the actions of business firms and individuals. It is significant, however, that more than half of the country banks active in federal funds replied on the questionnaire that one reason they participate in this market is that "the federal funds market is the most convenient method to adjust positions for reserve settlement dates." About the same number of banks stressed that federal funds is "generally the most profitable very short-term investment." These factors appear to be about equally important for banks of different deposit sizes, for those in urban and and in rural areas and for banks located in different geographic regions of the Third District.[1]

COUNTRY BANKS AND FEDERAL FUNDS: A CAPSULE

Federal funds are deposits held by banks at the Federal Reserve or with correspondent banks. Banks with temporary excess reserves can lend these funds overnight or for a few days, to banks which are experiencing reserve deficiencies, and can earn interest on the transaction at the federal funds rate.

Until a few years ago, activity in federal funds was limited largely to big banks. At the present time, however, almost half of the country banks in the Third Federal Reserve District buy or sell federal funds, at least on occasion. Even some very small banks participate in the federal funds market. Almost invariably, country banks buy or sell federal funds through their big city correspondents with individual transactions as low as $100,000 not uncommon.

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[1] *Urban areas were defined as cities with population of at least 25,000. The Third District was divided into six geographic districts for purposes of analysis. This division is illustrated by map in "Country Banks and the Federal Funds Market,"* Business Review, *April 1966, p. 4.*

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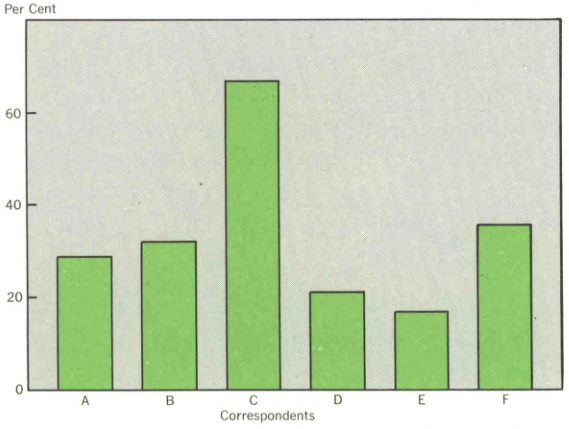
CHART 1

FEDERAL FUNDS AND CORRESPONDENT RELATIONSHIPS

Country member banks—Third Federal Reserve District

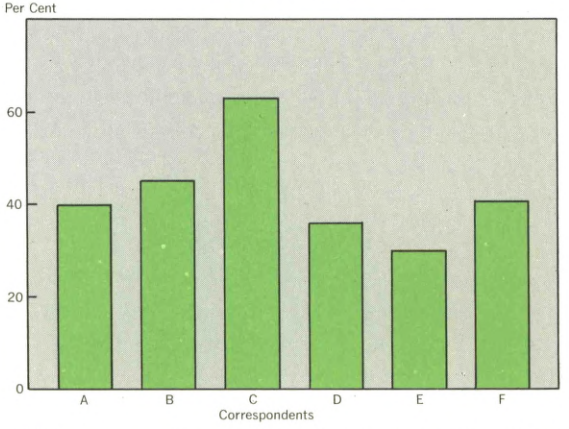
Country member banks in the Third District with certain correspondents are more active in the federal funds market than are banks with other correspondents . . .

*. . . both as buyers**



**Percentage of country member banks which buy federal funds by lead correspondent.*

*. . . and as sellers***



***Percentage of country member banks which sell federal funds by lead correspondent.*

Several banks in the market as buyers suggested that purchasing federal funds is "more convenient" than borrowing from the Reserve Bank. And over one-third of the country banks that deal in federal funds noted that "it is a way to put our balances with correspondent banks to work."

Influence of correspondents

Our earlier survey showed that almost all of the country member banks in the Third District which buy or sell federal funds do so through their big city correspondents. But how important an advisory influence does the correspondent have on whether the country bank will make use of federal funds?

Respondents were asked to provide the name of their lead correspondent; most frequently this was a Philadelphia bank.[2] As the charts above show, there is indeed a relationship between the propensity to use the federal funds market and the choice of lead correspondent. And there is a definite correlation between the influence of correspondents on banks purchasing federal funds and on banks selling federal funds.[3]

Country banks which deal with correspondent bank C (see Chart 1) are much more likely to buy federal funds or to sell funds than are banks which use other correspondents. And banks using correspondents D and E are least likely to be active in federal funds. This appears to suggest that bank C is most aggressive in acquainting its country cousins with the opportunities of the federal funds market, or in some way renders a better federal funds service.

[2]*The five most frequent Philadelphia correspondents will be referred to as banks A through E; all the remaining banks are classified together as bank group F.*

[3]*Correspondents were also deemed to have an important influence on participation in the fed funds market in a study conducted by the Federal Reserve Bank of New York. See "Second District 'Country' Member Banks and the Federal Funds Market," Federal Reserve Bank of New York,* Monthly Review, *May 1966.*

Awakening of management

Since certain correspondent banks are especially likely to influence country banks to utilize the federal funds market, it is reasonable that they do so by informing the small-town bankers about the advantages of this market. How important an obstacle is unfamiliarity with federal funds? Can the recent growth in participation in the federal funds market be attributed to increased awareness of the opportunities the market affords?

The answer is an emphatic "yes." Banks were asked to indicate those factors which were important in influencing their decision to enter the federal funds market for the first time. Nearly one-half of the banks answering this question indicated that prior to their first transactions in federal funds, they "were unaware of the possibilities of using the federal funds market." This high percentage holds for banks of all sizes, in urban areas and in rural districts, and in all geographic regions of the Third District. A few banks noted that they were prompted to enter the federal funds market because electronic computers enabled them to manage reserve positions more closely.[4]

Level of interest rates

Another important reason for the increase in the number of country banks dealing in federal funds is the high level of interest rates in recent years. When interest rates were low, the "penalty" for holding excess reserves was much smaller. For example, $200,000 invested in the federal funds market for one day earns $25 at a rate of 4½ per cent, but only $8.33 at a rate of 1½ per cent. The result is simple: as money gets tighter, funds earn more and banks tend to manage their reserve positions more closely. Federal funds are an ideal vehicle through which to do so, and hence activity in this market has burgeoned.

Forty-five per cent of country member bank respondents indicated that they were influenced to enter the federal funds market because "higher prevailing interest rates on federal funds made them more worthwhile as a short-term investment." The percentage was about the same for country banks in all size groups and in all areas of the Third District.

A profit squeeze?

High interest rates accompanied by the expanding volume of time deposits have resulted in a large growth in interest paid on time deposits in recent years. Interest rates on loans, however, generally have not risen proportionally and hence many banks have been experiencing a real profit squeeze.[5]

Twenty-six per cent of banks active in fed funds indicated that an important impetus to enter the market for the first time was that "a profit squeeze developed" which induced them to seek out any promising opportunity to improve earnings. The federal funds market offered such an opportunity with virtually no sacrifice of bank liquidity. The influence attributed to the profit squeeze varied little among size groups of banks and geographic areas within the Third District.

What were the main causes of the profit

[4] *Since "more sophisticated" management appears to be an influence on the growth of the federal funds market, banks with better examiners' ratings might be expected to be more active in federal funds. However, the composite rating reflects an evaluation of the safety of the bank at least as much as it does an appraisal of managerial ability, and it is not very revealing in explaining whether a bank will participate in the federal funds market.*

[5] *For a discussion of the influence of the profit squeeze based on a study of the federal funds market conducted last year, see "Federal Funds and the Profit Squeeze—A New Awareness at Country Banks,"* Business Review, *March 1965.*

Table 1

PROFIT SQUEEZE AND ACTIVITY IN FEDERAL FUNDS

Of all country member banks that said they entered the federal funds market in response to a profit squeeze, the following proportions referred specifically to each of the following explanations:

	All Banks	Banks in Urban Areas	Banks in Rural Areas
Per cent citing **Higher interest rates paid on time deposits**	69	45	76
Per cent citing **Higher operating costs**	63	64	62
Per cent citing **Higher ratio of time to total deposits**	44	18	51
Per cent citing **Lack of profitable lending opportunities**	10	18	8

squeeze? Higher interest rates on time deposits headed the list and were especially important for smaller banks in rural areas. Higher operating costs were a close second, and appear to have hit rural and urban banks about equally. Greater dependence on time deposits as a source of bank funds was significant, but mostly for smaller banks in rural areas. The lack of profitable lending opportunities does not seem to have been a major problem; it was noted by only 10 per cent of the banks that reported a profit squeeze. These results are summarized in Table 1.

One would expect that banks with higher ratios of time to total deposits and with higher interest rates paid on time deposits, other things equal, would be more inclined to indicate a profit squeeze. Likewise, an institution with a greater net income-to-asset ratio would be less likely to note a profit squeeze.

Table 2 shows how banks reporting a profit squeeze and active in the federal funds market actually compared with respect to several measures bearing on profitability. Logically enough, banks with low ratios of net income to assets, were especially likely to be motivated by a profit squeeze in entering the federal funds market. This result remains even if we hold size of bank constant.

An examination of the other operating ratios in Table 2, however, does not yield the results that might be expected. Banks with low loan-asset ratios, for example, were hardly more likely to note the profit squeeze than were fully loaned-up institutions. And neither the ratio of time to total deposits, nor the rate paid on time deposits appears to be a good indicator of whether banks entered the federal funds market because of a profit squeeze.[6] This result does not imply that the operating ratios are not associated with the likelihood of entering the federal funds market in response to a profit squeeze. Rather the relationship may be so complex that it is impossible to hold all other factors constant.[7]

To summarize, we can say that there appears to be some causality between earnings and a bank's proclivity to seek opportunities to earn some extra money in the federal funds market. The causal link is "a profit squeeze" and low

[6] *For example, 29 per cent of banks with a time deposit ratio of under 35 per cent noted the profit squeeze, as compared with 30 per cent with a time deposit ratio in excess of 60 per cent.*

[7] *Even if we compare banks in the same size group the importance of the profit squeeze is not strongly influenced by the time deposit ratio or the rate paid on time deposits. For example, if we consider only banks with deposits between $25 million and $100 million, 40 per cent with the lowest time deposit ratio noted the profit squeeze as compared to 32 per cent within the highest time deposit ratio group. Still other factors (such as other operating ratios) may be disguising the relationship or it may very well be that heavy dependence on time deposits, while indicative of higher interest costs may be associated with a relatively profitable loan and investment portfolio, and hence not imply a profit squeeze.*

Table 2

FEDERAL FUNDS, PROFIT SQUEEZE, AND BANK OPERATING RATIOS

Country banks active in the federal funds market and reporting a profits squeeze showed significant variation in ratios bearing on their profitability.

Operating Ratio	Banks Participating in Federal Funds Market and Reporting a Profit Squeeze, Classified by Range of Operating Ratio** Per Cent of Banks Active in the Market			
	Having Lowest Ratio	Having Low Ratio	Having Medium Ratio	Having High Ratio
Net income after taxes to total assets	31	34	19	19
Loans to assets	33	26	24	27
Time Deposits to Total Deposits	29	26	22	30
Interest Paid on Time Deposits to Time Deposits	*	*	24	25

*Too few banks to be meaningful.

**Each of the four operating ratios was divided into a frequency distribution with four categories as follows:

	Lowest	Low	Medium	High
Net Income to Assets	Under .5%	.5-.75%	.75-1.00%	Over 1%
Loans to Assets	Under 40%	40-48%	48-55%	Over 55%
Time Deposits to Total Deposits	Under 35%	35-45%	45-60%	Over 60%
Interest Paid on Time Deposits to Time Deposits	Under 2%	2-2½%	2½-3%	Over 3%

ratios of income to assets which have pushed banks into the federal funds market. But, although many banks indicated that higher ratios of time deposits and higher interest rates on these deposits were important causes of the profit squeeze, definitive evidence for this view cannot be isolated from the data.

Characteristics of banks

Can an analysis of operating ratios help to explain whether a particular bank will be active in federal funds either as a buyer or seller? The answer is a qualified "yes."

In the Third Federal Reserve District about 3 out of 10 country banks are buyers of federal funds and 4 out of 10 are sellers. If we separate all the sellers (for example) into high, medium, low, and lowest ratios of time to total deposits, and if we find that a significantly higher number of those in the bag labeled "high time deposits" are sellers of fed funds (say 7 out of 10 compared to the 4 out of 10 country banks in the District as a whole which sell fed funds) then we might conclude that a high ratio of time to total deposits influences banks to sell fed funds.

On Chart 2 the horizontal lines represent the "3 out of 10" and "4 out of 10" figures for all buyers and all sellers respectively. The bars show how banks with high and low operating ratios compare to this overall participation rate.

On the buy side of the market, banks with higher net income to total assets are more likely to buy fed funds as are banks with higher ratios of loans to assets, with greater interest payments in relation to time deposits and lower ratios of time to total deposits.

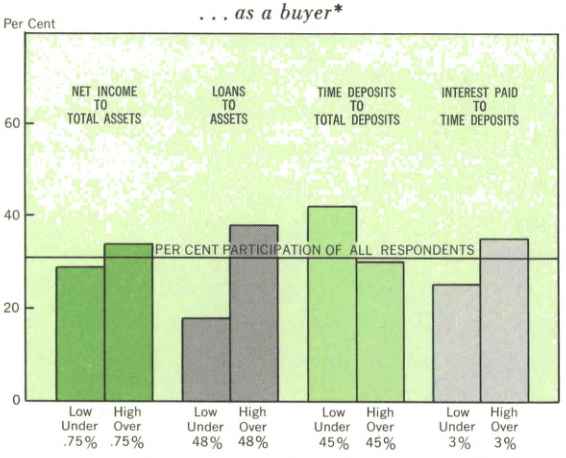
Sellers are more likely to have low net income to total assets, low ratios of loans to assets, low interest payments in relation to time deposits, and high ratios of time to total deposits. In short, there are relationships between a bank's operating ratios and the probability that it will be active

CHART 2
FEDERAL FUNDS AND OPERATING RATIOS

Country member banks—Third Federal Reserve District

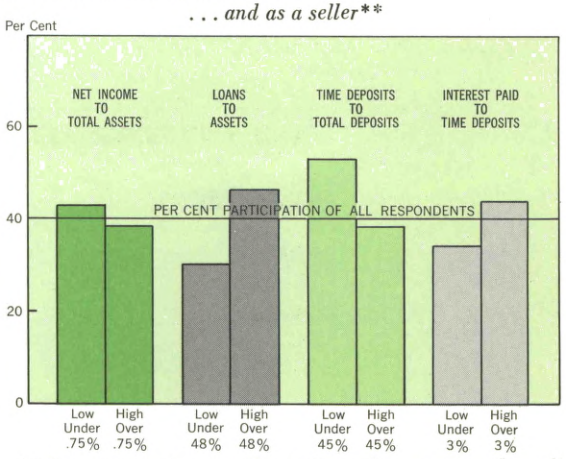
Operating ratios are related to whether a country member bank will deal in federal funds . . .

*. . . as a buyer**



**Percentage of respondents in each category who buy federal funds.*

*. . . and as a seller***



***Percentage of respondents in each category who sell federal funds.*

in federal funds (though, of course, participation of banks in some ratio groupings are more strikingly different from the total participation rate than others).[8]

The abstainers

Why are many banks not presently active in the federal funds market? The reasons appear to fall into the following categories:

1. Nonbuyers: The bank almost always has excess reserves and hence is not a buyer of federal funds.

2. Nonsellers: The bank almost never has excess reserves and hence is not a seller.

For banks that neither buy nor sell:

1. The bank is too small to be active in federal funds.

2. The bank is unfamiliar with the opportunities of the federal funds market.

3. The bank prefers other methods of borrowing or lending to federal funds.

Chart 3 summarizes data on the percentage of banks which are not active in the federal funds market as buyers or sellers for each of the above reasons. It is clear that the existence of excess reserves is an important reason why banks do not buy federal funds, but the lack of excess reserves was cited by a smaller proportion of banks which do not sell federal funds. The smallest banks were

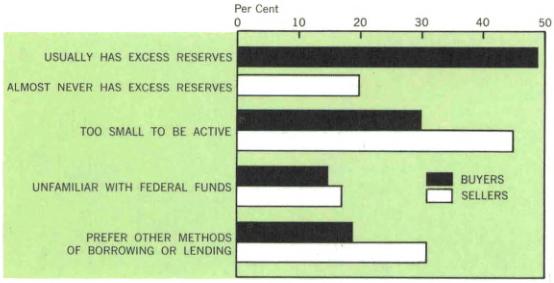
[8] *Smaller banks with high loan-asset ratios are significantly more likely to buy federal funds and to sell federal funds than are institutions not so heavily loaned up. However, there is little correlation between fed funds activity and the loan-asset ratio for banks with deposits over $25 million. Large banks typically have higher loan-asset ratios and are active in the fed funds market. To be sure, high loan-asset ratios and activity in fed funds both characterize the more "aggressive" banks.*

High income banks are somewhat less likely to participate in the market as sellers, a result that holds even if size of bank is held constant. An explanation is not hard to find. Banks with the highest rate of return on assets probably keep more fully invested and also manage their reserve positions more closely. Therefore, they are more likely to be short of reserves than to carry excess reserves and are more prone to participate in the federal funds market as buyers than as sellers.

CHART 3

THERE ARE SEVERAL REASONS WHY SOME COUNTRY BANKS ARE NOT ACTIVE IN THE FEDERAL FUNDS MARKET

Third Federal Reserve District percentage of banks not active in the federal funds market.



somewhat less likely to indicate these explanations for their avoidance of the federal funds market, but there is no apparent difference among banks in various geographic areas of the Third District.

Some 30 per cent of nonbuyers and 45 per cent of nonsellers suggested that they feel they are too small to be active in federal funds. As would be expected, these banks are indeed almost exclusively very small, and typically are located in rural areas. It should be emphasized, however, that there are many banks as small or even smaller that *are* active in the federal funds market. The true explanation is, therefore, that management is either unaware of the opportunities afforded by the market or feels that the potential profit from federal funds transactions does not justify the "trouble" of entering the market.

It is perhaps indicative of well-informed bank management that only 15 and 17 per cent of nonbuyers and nonsellers respectively noted that they were unaware of federal funds, and most of these are the smaller banks. Perhaps most interesting, however, is the fact that correspondents of banks D and E were most likely to express unfamiliarity. These banks apparently have not been so active in acquainting their country correspondents with the federal funds market. Forty eight per cent of nonsellers and 38 per cent of nonbuyers that use correspondent bank E indicated they are unfamiliar with the opportunities of federal funds.

Country member banks which avoided federal funds because they preferred other methods of borrowing and lending were mostly larger institutions, frequently situated in urban areas. Rather than buy federal funds, they borrow directly from correspondents or at the discount window. On the sell side, several banks noted that they prefer to invest surplus funds in Treasury bills, perhaps because of a desire to show a high volume of Government securities on their balance sheets.

Conclusions

Many country banks find federal funds a convenient and profitable vehicle to adjust their reserve positions. The generally higher level of interest rates of recent years has been one factor which has awakened management to the profitable opportunities of the federal funds market. Big city correspondents have also served in this information-providing role and buy and sell fed funds in small quantities as a service. The choice of correspondents appears to be an important influence on whether a particular country bank is active in the federal funds market. Another influence has been a profit squeeze brought about by higher operating costs (including higher interest rates on time deposits) which has prompted many banks to seek out the opportunities of the federal funds market.

What does this all add up to? Certainly there is no reason to believe that activity in the federal funds market is a temporary phenomenon. And there is still a substantial number of relatively

small banks that may enter the market once they become more familiar with its possibilities.

For the banks, the federal funds market means a more efficient utilization of reserves, and for the monetary authorities it represents an important monetary indicator. With reserves being mobilized and transferred quickly in a national federal funds market, a given volume of net borrowed reserves may imply a different degree of monetary restraint than it would with a less-developed federal funds market. Also, moral suasion at the discount window may become a less effective tool, because the bank in need of reserves can buy federal funds. This is not to say that the federal funds market provides unsurmountable difficulties for monetary policy. Rather it is to imply that the authorities must now pay increasing attention to the activities of the federal funds market as a rapidly expanding and important part of the American money market.

ELECTRONS AT WORK

by Evan B. Alderfer

An electron weighs next to nothing or, to be specific, and scientific, its mass in grams is expressed by twenty-seven zeros between the decimal point at the left and figure 9 on the tail end of the naughts.

Out of that next-to-nothingness sprang the electronic industry which first began making unassembled battery-powered, earphone, crystal radio receiving sets for the tinker trade. In 1965 the industry made a bewildering variety of electronic products which amounted to an alleged total of $17 billion. The industry is said to employ 875,000 workers in 5,200 manufacturing plants. These numbers are a bit suspect because of the difficulty of defining the industry. All we can be sure of is that it is a big, fast-growing, highly technical industry that serves numerous markets in many ways.

Speedy handling of information is the basic function performed by the industry's products. They transport the sound of a voice or the appearance of a face on the wings of instancy to the four corners of the world. They can count coins or atoms, find deeply buried flaws in metal, guide aircraft through the fog of day or the darkness of night, measure the level of a liquid in an opaque container, or the heartbeat of an astronaut aloft in outer space, and they perform complex mathematical computations in tiny fractions of a second.

Theories and a tube

The electronic industry in all its ramifications is an outgrowth of revolutionary concepts of the nature of matter and energy that shook physics during the first three decades of the present century.

Extending a proposal made by Max Planck, Einstein postulated that a beam of light consisted of small bundles of energy now called photons. Niels Bohr applied these same ideas in explaining his observations on the hydrogen atom which directly contradicated the theories of classical Newtonian physics. This led to the rapid development of quantum theory—the

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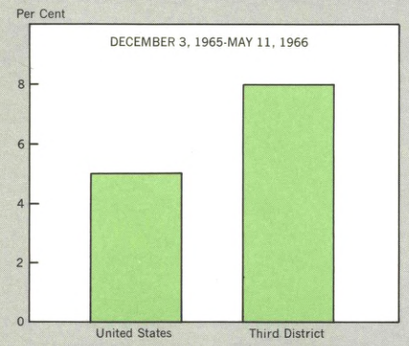
SURVEY OF TIME AND SAVINGS DEPOSITS IN THE THIRD DISTRICT

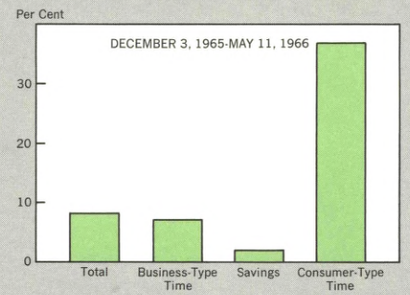
by Kathryn Kalmbach

INCREASES IN TIME AND SAVINGS DEPOSITS



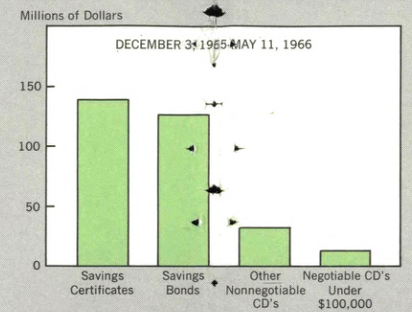
1. Competition for savings has intensified in recent months, but member banks in the Third District managed to increase their deposits more than did member banks in the nation.

PERCENTAGE CHANGE BY TYPE OF DEPOSIT



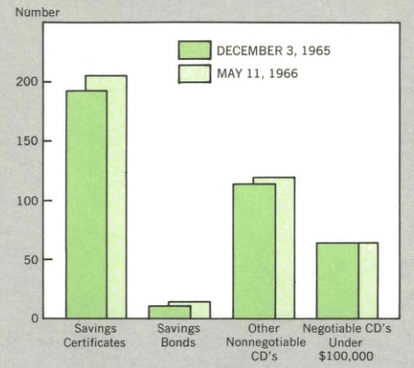
2. Among the many different types of time deposits, consumer-type deposits in the Third District grew most while savings deposits showed the smallest increase.

CHANGE IN CONSUMER-TYPE TIME DEPOSITS



3. Within the broad category of consumer-type time deposits, savings certificates contributed most to growth, with savings bonds running a close second. In percentage terms, the greatest gain was registered by savings bonds . . .

NUMBER OF BANKS OFFERING CONSUMER-TYPE TIME DEPOSITS

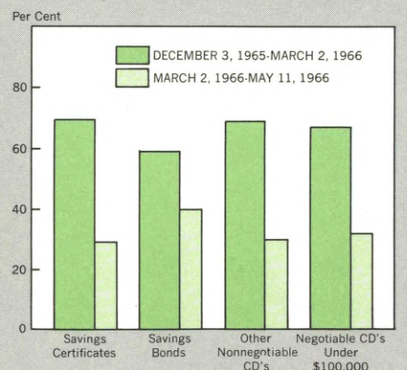


4. . . . despite the fact that the number of banks issuing savings bonds is relatively small.

PERCENTAGE OF ISSUING BANKS RAISING RATES ON CONSUMER-TYPE TIME DEPOSITS

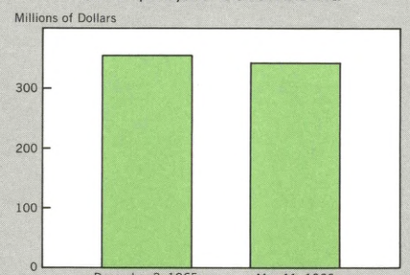
5. An important factor in the favorable showing of the consumer-type time deposits has been the revision of Regulation Q. Many district banks took advantage of the change and raised their rates.

TIMING OF INTEREST RATE RAISING



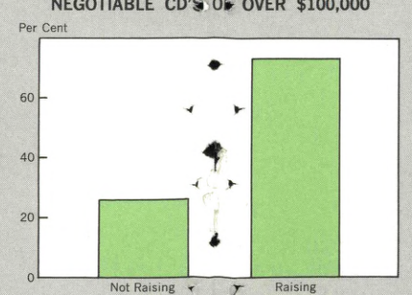
6. Well over half of the banks increasing interest rates on consumer-type time deposits did so almost immediately after the change in Regulation Q.

NEGOTIABLE CD'S OVER $100,000 OUTSTANDING



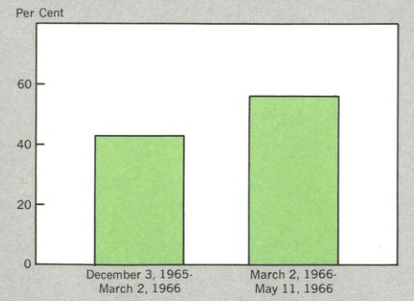
7. The amount of business-type deposits (negotiable CD's in denominations of $100,000 and over) held by district member banks has held steady . . .

PERCENTAGE OF ISSUING BANKS RAISING RATES ON NEGOTIABLE CD'S OF OVER $100,000



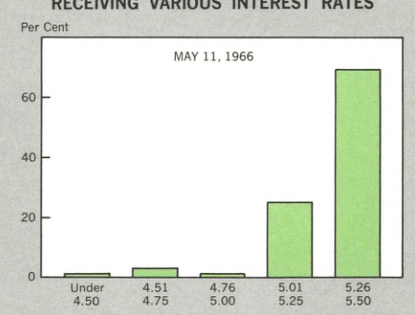
8. . . . though rates were raised by most banks offering business-type time deposits.

PERCENTAGE OF ISSUING BANKS INCREASING RATES BY TIME OF CHANGE



9. To meet competition, rates on business-type deposits were increased not only after the revision of "Q" in December, but in more recent months as well.

PERCENTAGE OF NEGOTIABLE CD'S OUTSTANDING RECEIVING VARIOUS INTEREST RATES



10. By May 11, 1966, some 70 per cent of dollar amount of large negotiable CD's outstanding were getting over 5¼ per cent interest.

(*Continued from Page 9*)

touchstone of modern physics, which considers an electron not simply as a little lump of matter but as a sort of wave spread out through space rather than localized at a given point.

Contemporaneous with the theorizing was the invention in 1906 by an American, Lee De Forest, of the vacuum tube. The Germans were the first to capitalize on the invention when they used short-wave voice transmission in World War I. In 1919, Radio Corporation of America was formed at the behest of the Federal Government to promote the use of radio for national defense.

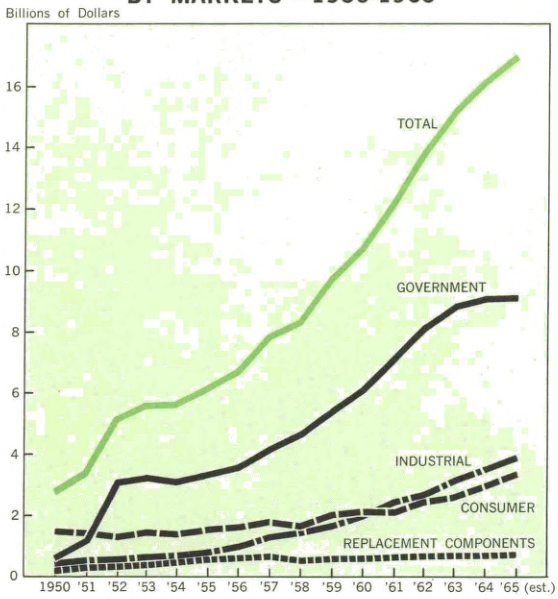
In 1920, Westinghouse Electric & Manufacturing Company built and began operating the first broadcasting station. Thereupon radio, as a medium of advertising and publicity, exploded like a Fourth of July skyrocket. By 1923 there were over 500 stations in operation and the market for factory-assembled receiving sets flourished like crabgrass.

Radar worked wonders in the Battle of Britain. The device enabled the small fleet of British fighter planes to ward off hordes of Nazi bombers bent on destroying London in World War II. In like manner, sonar assisted in overcoming the German U-boat menace. The photoelectric cell found widespread use in numerous industries for grading by color, size, and in temperature control. The invention of the cathode ray tube, which is the heart of TV, launched another branch of the electronic industry that has become a major division.

By 1950, factory sales of electronic gear, amounting to $2.7 billion, flowed into three major markets—consumer, Government, and industrial. Consumer products accounted for 55 per cent of the total, Government products were 24 per cent, industrial products 13 per cent, and the small remainder represented replacement components.

CHART 1

FACTORY SALES OF ELECTRONICS BY MARKETS—1950-1965



Source: Electronic Industries Association.

Growth since mid-century

Factory sales of electronic products in 1965, as already mentioned, were $17 billion, over six times the 1950 volume. Government products, which ranked second at the outset of the period, as shown in Chart 1, quickly assumed leadership and accounted for over half of the total during the past decade. Noteworthy is the fact that Mars, the god of war, has become the industry's best customer. Most of the purchases by the Federal Government are by the Department of Defense. The National Aeronautics and Space Administration is also a heavy buyer and its purchases are defense-related because the Government is not spending billions of dollars to get to the moon just for fun.

Industrial products, as the line on Chart 1

Table 1

ELECTRONIC COMPANIES ASSORTED BY SIZE

Sales Class	Number of Companies	Average Sales per Company (Million Dollars)	Total Sales	
			Million Dollars	Per Cent of Total
Over $400 million	12	788	9,450	48
$100 million to $400 million	25	211	5,280	27
$40 million to $100 million	27	57	1,530	8
$20 million to $40 million	37	27	1,000	5
$1 million to $20 million	300	5	1,500	8
Under $1 million	3,500[a]	0.2	760	4
Total	3,900[a]		19,520[b]	100

[a] Approximate.
[b] Includes all components. Since the major share of these is sold within the electronics industry, the total overstates industry sales.
Source: Battelle Memorial Institute.

shows, forged ahead of consumer products in dollar volume in the early sixties. The largest component in the industrial category consists of computing and data-processing equipment. A close second is the general category of communications, broadcast, commercial sound, and navigational aids.

Black-and-white TV receivers were still the leading item among consumer products in 1964. Color TV was a poor second (though now fast growing), and phonographs a close third. Other consumer items were home radios, auto radios, hi-fi components, and tape recorders. So numerous and diverse is the output of electronic products consumed by the three major markets that a complete list would take on the appearance of a mail-order catalogue.

The producers

The number and diversity of producers are almost as bewildering as their products. Estimates of the number of companies in the electronic industry range from 2,500 to 10,000 concerns. The Battelle Memorial Institute in its 1965 survey*, "The Implications of Reduced Defense Demand for the Electronics Industry," counted 3,900 as the approximate number of electronic companies. Even that is a multitude.

Electronic concerns, as Table 1 shows, come in all sizes. At the bottom of the heap is a host of companies that collectively contribute only 4 per cent of the industry's sales but small companies are not to be despised. No doubt some will fall by the wayside but others will attain greater stature. Indeed, one of the companies rose from annual sales of $15 million to $1 billion in the past decade. Electronic!

At the top of the heap is an even dozen of concerns that produce almost half of the industry's output. Among the biggest in this group are IBM, GE, General Telephone and Electronics, RCA, and Westinghouse.

The 101 largest firms (those with sales of $20 million and up) account for 88 per cent of the

**A study made for the United States Arms Control and Disarmament Agency.*

industry's total sales. They also employ about the same proportion of all the workers. Because of their overriding position, they largely determine the nature of the industry. Perusal of a 50 per cent sample of the annual reports of these companies gives the impression that almost all of them are flourishing and prosperous. They are highly diversified in the products they make, the materials they use, the processes they employ, and the markets they serve. It is a singular industry in its very plurality.

The products

The multiplicity of products may be divided into three general classes: complete assemblies, subassemblies, and components and parts.

Complete assemblies are familiar items such as radios, television sets, tape recorders, and computers; also unfamiliar items such as electronic microscopes, missile guidance systems, oscilloscopes, and telemetry systems. Prices of finished products range from a few dollars to $100 million. The latter, of course, are made chiefly by the big blue-chip companies.

Some companies specialize in subassemblies—such things as amplifiers, timers, tuners, and the like. Prices of products in this category usually sell at prices up to a $100,000 maximum.

Still other companies specialize in the production of components and parts, such as tubes, transistors, switches, and antennae. Prices of products in this category range from a few cents to several thousand dollars.

Product specialization is often accompanied by considerable diversification, especially among the 101 companies. That is to say, a company best known for its radio or television receivers may also make space-tracking systems, hearing aids and parts such as color picture tubes and transistors. Some of the larger companies are partially or completely integrated in that they produce some or all of the subassemblies and components they require.

Company policy with respect to market orientation—government, industrial, or consumer products—is likewise anything but uniform except perhaps that the larger the company, the more it is likely to cater to all three markets. Among the dozen or so largest companies, for example, Government sales range from as low as 10 per cent of total sales in some companies to as high as 90 per cent in others. It is a complex industry defying generalization in many respects.

Plant location

The country is peppered with electronic plants; however, certain regions are more electronic than others. On the basis of employment, three regions account for 69 per cent of the total: the Middle Atlantic with 21 per cent, the Pacific 22 per cent, and the East North Central (Ohio, Indiana, Illinois, Michigan, and Wisconsin) with 16 per cent.

Within those areas there is rather heavy concentration of employment in the leading metropolitan areas—Boston, New York City-New Jersey, Philadelphia, and Washington, D.C. along the East Coast; Ohio-Indiana cities, Detroit, Chicago, Minneapolis-St. Paul, Dallas, and Phoenix in the interior; and Los Angeles and San Francisco on the West Coast.

Nevertheless, electronic plants may be found in some of the most unexpected places. For example, a plant employing over 1,000 workers shares a central office building with other organizations within a few minutes walking distance from this Bank. The industry is urban, suburban, and semi-rural—little short of ubiquity.

Inside a plant

What you see in an electronic factory depends

on which one you visit. A radio or TV factory looks very much like any other mass-production process—workers aligned along a moving belt attaching bits and pieces to an endless parade of amorphous objects that gradually assume shape and utility as they approach the end of the line. There, final inspection transforms a cacophony of squawking and a mockery of flickering into sensible talking and colorful picturing.

A resistor plant is different. To begin with, a resistor is a tiny thing that offers resistance to the flow of electric current and looks like a Lilliputian firecracker with metal fuses sticking out at both ends. Dimensions are exceedingly fine and precise, machines are likely to be tailor-made on the premises instead of being purchased. Some operations must be performed with the aid of tweezers and magnifying glass; and workers are predominantly women who, unlike men, have the required patience and manual dexterity for deft and delicate manipulation.

The mad men

"These are the mad men," said one of our guides, referring to the chemists, engineers, mathematicians, and physicists behind closed doors. Their major function seems to be speeding the obsolescence of products currently on the production line.

Rapid growth of the industry is largely attributable to generous expenditures on research and development. The industry spends about twice the all-manufacturing industry outlay for R & D, measured as a percentage of sales, and electronic companies heavily involved in defense products are generally the heaviest spenders on research.

Numerous breakthroughs of ultimate benefit to the industrial and consumer markets had their origin in R & D originally directed toward defense needs. Examples are: the transistor which was the result of research on silicon detectors for radar; the digital computer for scientific and engineering computation; integrated circuits which fill the need for low-power, lightweight computers for aircraft and missiles; the maser and laser for military use in high-frequency devices.

Microcircuits—the combination of a number of electronic components into miniature packages is a result of solid-state technology which has been a major development in the industry. Another aspect of technology that has contributed to fast growth of the industry is the systems approach; that is, the interconnection of a group of components to perform a function or a group of related functions. Examples are: navigation, feedback and process control, electronic data processing.

The competition

Vigorous growth and above-average profits enjoyed by the industry might give the impression that competition is gentle as a lamb. The multitude of producers in the arena, however, might suggest that competition is sharp as a fox. The truth seems to lie somewhere between these extremes.

The most important aspect of competition peculiar to the entire industry is the changing over-all market. The Government market, though still the largest, is leveling off as Chart 1 shows and the industrial and consumer markets are continuing to grow. Consequently, there is a scramble for greener pastures, especially since the non-Government markets offer better profit potentialities. Jumping the fence into a different market, however, is not so easy as it may seem because, first, the big blue-chip concerns already are well entrenched in all three markets and second, each market is different. Let us take a

CHART 2

GOVERNMENT ELECTRONICS MARKET—1965

(Fiscal Year)

Source: Electronic Industries Association.

look at each of the three major markets.

The government market

This market embraces an outrageous assortment of defense equipment such as Nike-X, F-111, Manned Orbiting Laboratory, Defender, Advanced Ballistic Reentry System, military communication satellites, anti-missiles, guidance systems, nuclear-powered marine craft, bioastronautics, and many other systems and devices. The reason Chart 2 contains so little information is that much of the undisclosed detail information is classified.

Defense needs call for the most highly sophisticated of electronic products with much engineering and extremely rigid specifications. Moreover, the electronic content in terms of dollars as a percentage of total cost is steadily mounting. Other characteristics of the Government market are manufacturing to order instead of for inventory, and rapid obsolescence which means frequent change of orders or cancellation. Profits on Government orders are usually smaller than on industrial or consumer products. Nevertheless, so great and diversified have been national defense demands that Government business attracted many new concerns to enter the industry. A substantial number of these concerns with accumulated know-how and no longer in the lowest size class, are now actively seeking business in the industrial and consumer markets.

The industrial market

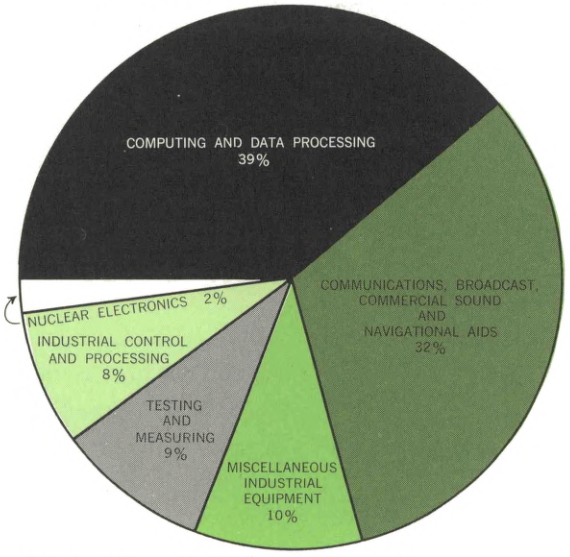
The industrial and consumer markets, unlike the Government market, take more or less standard articles manufactured in large volume for shipment out of inventories *after* orders are received. Newcomers to these markets are therefore confronted with the dual task of establishing internal facilities for mass production and external facilities for the sale of finished products out of inventory. The more difficult of these tasks is usually to build an effective sales and distributive organization.

Electronic-data processing systems, as Chart 3 shows, are the leading items made for the industrial market. The number of computers in use has grown from less than 100 in 1951 to about 23,000 today. The original distinction between analog computers—sort of super slide rules used in scientific computations—and digital, or "yes-no" computers used in business is beginning to blur. The latest models now appearing on the market are third generation although their clumsy grandfathers made news only a few years ago. Already out of date is the custom of referring to the computer in the singular for actually it is a plural contraptional arrangement of equipment referred to in the trade as a "system."

Important adjuncts of a system are the "soft-

CHART 3

FACTORY SALES OF INDUSTRIAL PRODUCTS—1964



Source: Electronic Industries Association.

ware"—the programming, planning, information handling, and other auxiliaries in contradistinction to the "hardware"—the machinery. Software is steadily assuming more importance in the competition among producers of EDP systems.

IBM, the acknowledged leader, is said to have about three-fourths of the electronic data-processing market. The chief competitors—though not necssarily in the order listed—are Sperry Rand, Control Data, Honeywell, GE, Burroughs, and National Cash Register.

Competition turns on price, performance, and service. The biggest systems are frightfully expensive to buy, hence rental has become a widespread practice. But rental ties up a lot of the manufacturer's capital, so corporate "middlemen" have stepped into the breach. They buy the system from the manufacturer and lease it to the user on purchase-lease deals which undercut manufacturers' rental rates.

You ask—how can that be? Well, suppose the manufacturer establishes his rental rate on a five-year depreciation basis. By doubling the depreciation to, say, ten years, a third-party lessor can rent the same equipment for less than the manufacturer charges and still make a nice profit. Of course if the equipment becomes obsolete in less than ten years, the third-party lessor loses some or all of his anticipated profit. It's a business that takes a lot of nerve and capital but about four-score companies are already in the leasing business.

Not all computer installations bear price tags running into seven digits. There are smaller systems that perform "real time" operations, for example, instantaneous calculating and bookkeeping at customers' windows of commercial banks, savings banks, and savings and loan associations.

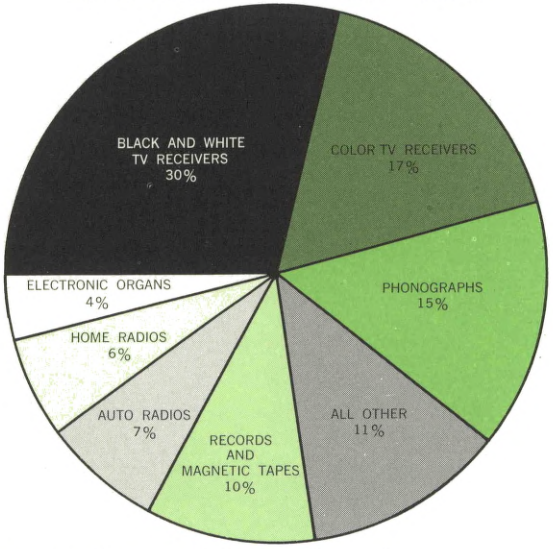
Data-processing technology is highly dynamic and much of the competition originates in the producers' laboratories. But there is also competition in prices of finished products, in software, and in special services rendered. In the latest annual report, one company president says, "It is difficult to predict the immediate profitability of ———— Division because of highly competitive conditions existing in the data processing industry today."

The consumer market

Since Chart 4 made its appearance, color TV has replaced black-and-white sets as the glamour girl of the consumer market. Long heralded, color TV was slow in coming because of tube trouble but ultimately the engineers triumphed and last year consumers spent more money for color TV than for black-and-white receivers. In fact, the market was so good that the industry could have sold more than its 2¾ million sets

CHART 4

FACTORY SALES OF CONSUMER PRODUCTS—1964



Source: Electronic Industries Association.

last year but for tube trouble of another sort—the tube makers just couldn't make enough of them.

At the outset of this year there were 5.5 million color sets in homes throughout the country, equal to only 10 per cent of black-and-white receivers in use. To fill the huge potential void in demand, producers are stampeding the construction of additional productive facilities.

RCA pioneered in both color tubes and color sets and is still the leader. In its latest annual report, the company told its stockholders that the Home Instruments Division offering 37 models ranging from an optionally priced $349 table model to a combination home entertainment center for $1,500 was the company's most profitable production line.

Some of the other famous names in the color business are Admiral, Emerson Radio and Phonograph, Ford's Philco, General Telephone and Electronics Corporation's Sylvania, GE, Motorola, National Video, and Zenith. There are 21 major assemblers of color sets but only nine of them make picture tubes; the others buy their tubes from producers. The last sentence, however, is subject to change between the writing and the reading.

Exhilarating is perhaps the best word to characterize competition in this branch of the consumer market. Heroic efforts being made to accommodate the hungry market might, however, lead to overcapacity and change competitive conditions from a seller's to a buyer's market with its attendant erosion of prices and profits, as has already taken place in other consumer products such as black-and-white TV and radios. In fact, some price cutting has already begun in color sets.

Electronic components

Electronic component manufacturers make electron tubes, semiconductors, parts, and integrated circuit packages. The latter are combinations of two or more components, excluding electron tubes which are discrete items. Total output of components in 1964 was about $4 billion. Most of these components are original equipment incorporated in Government, industrial, and consumer products; the remainder consists of exports and replacements for the domestic market.

This branch of the industry in which many companies are operating is highly competitive owing to developments both at home and abroad. The trend toward integration of electronic-circuit functions into microminiature packages, which require less assembly labor and permit reductions in size and weight of equipment as well as improved reliability, enforces make-or-buy decisions upon the producers of systems. All too often these decisions are adverse to the makers of semiconductor integrated circuits.

Producers of electronic components also encounter serious competition from abroad. Although the electronics industry as a whole enjoys a favorable balance of trade with exports about three times the dollar value of imports; in the consumer division, there is an adverse balance with imports over three times the dollar value of exports. Increasing imports of consumer products, such as transistor radio and television receivers—notably from Japan and the United Kingdom—are biting into the domestic market for electronic components. Imports of resistors in 1965 were double those of the year before, and portable radios of foreign origin have gobbled up over half of the domestic market.

Whitherward electronics?

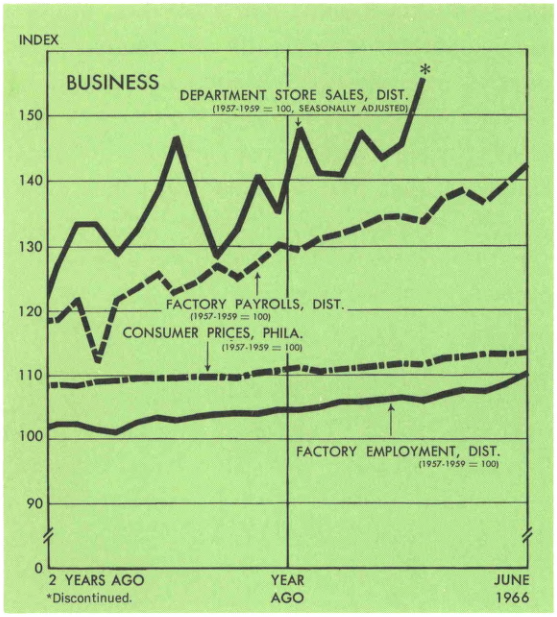
Electronics is still a comparatively young industry with all the characteristics of industrial immaturity—fast growth, good earnings, rapidly changing technology, fearless spending for research, a constant stream of new products, and rapid obsolescence; a constant stream of new companies, many of which are spin-offs of established concerns, also many companies disappearing via corporate marriage, absorption, and consolidation. Some seek larger profits by product specialization, others by diversification, and still others by integration. Many establish branch plants abroad or enter into licensing agreements with overseas concerns. And there are occasional mistakes.

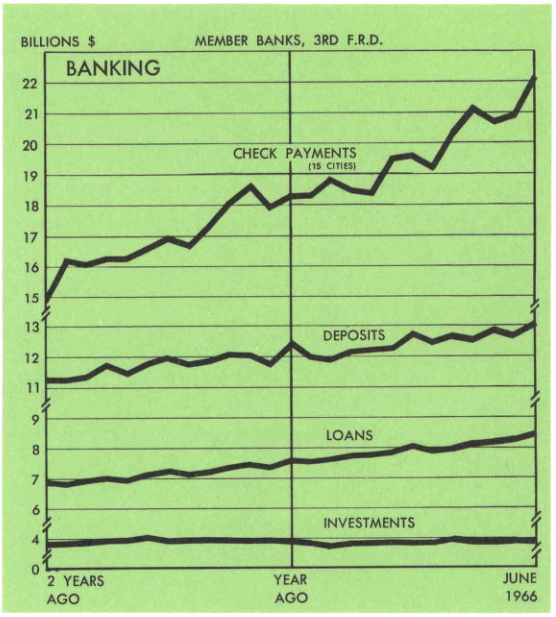
Thus far, not many fixed industry-wide patterns have been established. A few giants have emerged and near-giants are in pursuit, but numerous middle-sized concerns and innumerable pygmies are also prospering.

The industry's trade association expects the industry to grow from an estimated size of $17 billion in 1965 sales to $24 billion in 1970, a 40 per cent increase. The fastest growth, 62 per cent, is anticipated in the industrial market, followed by 33 per cent in the Government market, and 31 per cent in the consumers' market. These are reasonable expectations on the basis of past performance but forecasts are often too conservative.

As a science-based industry that has already opened many doors, it should not be surprising if the "mad men" discover still more uses for electrons. Further application of electronic instrumentation is already foreseen in industries accustomed to mechanical, hydraulic, pneumatic, and magnetic devices. Some of the biggest surprises may be future electronic applications in the fields of education, highway safety, medicine, national defense, and space navigation.

FOR THE RECORD . . .





SUMMARY

	Third Federal Reserve District — Per cent change			United States — Per cent change		
	June 1966 from		6 mos. 1966 from year ago	June 1966 from		6 mos. 1966 from year ago
	mo. ago	year ago		mo. ago	year ago	
MANUFACTURING						
Production	.....	.....	.....	+ 2	+10	+10
Electric power consumed	+ 1	+ 8	+ 9	.....	.....	.....
Man-hours, total*	+ 1	+ 5	+ 5	.....	.....	.....
Employment, total	+ 1	+ 4	+ 4	.....	.....	.....
Wage income*	+ 2	+ 9	+ 9	.....	.....	.....
CONSTRUCTION**	—15	— 2	— 4	— 5	+ 5	+ 8
COAL PRODUCTION	— 1	0	— 3	+ 2	+ 3	+ 2
BANKING						
(All member banks)						
Deposits	+ 3	+ 5	+ 6	+ 2	+ 6	+ 8
Loans	+ 3	+12	+11	+ 3	+13	+13
Investments	0	— 1	— 1	— 1	— 1	0
U.S. Govt. securities	— 2	—10	— 9	— 2	—10	— 8
Other	+ 1	+11	+11	0	+11	+12
Check payments***	+ 2†	+13†	+14†	+ 1	+10	+15
PRICES						
Wholesale	.....	.....	.....	0	+ 3	+ 4
Consumer	0‡	+ 2‡	+ 2‡	0	+ 3	+ 3

*Production workers only
**Value of contracts
***Adjusted for seasonal variation

†15 SMSA's
‡Philadelphia

LOCAL CHANGES

Standard Metropolitan Statistical Areas*	Manufacturing — Employment — Per cent change June 1966 from		Manufacturing — Payrolls — Per cent change June 1966 from		Banking — Check Payments** — Per cent change June 1966 from		Banking — Total Deposits*** — Per cent change June 1966 from	
	mo. ago	year ago	mo. ago	year ago	mo. ago	year ago	mo. ago	year ago
Wilmington	+ 1	+ 4	+ 2	+ 7	—15	+18	+ 6	— 8
Atlantic City	.....	.....	.....	.....	+ 8	+ 9	+ 2	+ 8
Trenton	+ 1	— 1	+ 1	+ 4	+47	+42	+ 1	+10
Altoona	+ 2	+14	+ 3	+14	+10	+10	+ 2	+ 8
Harrisburg	+ 2	+ 6	+ 2	+ 8	+ 3	+10	+ 3	+ 7
Johnstown	+ 2	+ 3	+ 2	+ 4	+ 7	+10	+ 2	+ 6
Lancaster	+ 3	+ 7	+ 2	+15	0	+13	+ 1	+ 8
Lehigh Valley	+ 1	+ 2	0	+ 6	— 4	+10	+ 2	+ 5
Philadelphia	+ 1	+ 4	+ 2	+11	+ 4	+10	+ 3	+ 5
Reading	+ 1	+ 3	+ 2	+ 9	— 6	+ 4	+ 2	+11
Scranton	+ 2	+ 6	+ 3	+11	— 9	+ 7	+ 2	+ 8
Wilkes-Barre	+ 1	+ 7	+ 1	+14	— 1	+ 6	+ 2	+ 4
York	+ 3	+ 5	+ 3	+13	+13	+23	0	+ 3

*Not restricted to corporate limits of cities but covers areas of one or more counties.
**All commercial banks. Adjusted for seasonal variation.
***Member banks only. Last Wednesday of the month.