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Volume Author/Editor: George J. Stigler

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## CHAPTER 2

# The Flow of Investment and the Pattern of Rates of Return

THE assets and rates of return of manufacturing industries have hitherto been available only for selected years or selected companies. It is only because of the statistical by-products of the collection of a corporate income tax that we now possess annual estimates of the stock of capital, and the rates of return thereon, for numerous manufacturing industries (rising from 96 in 1938 to 109 in later years of our study), for a period of twenty years. We begin by surveying the broad trends of the behavior of investment and returns. It is usually convenient for statistical as well as economic reasons to treat the period dominated by World War II (1938 to 1947) separately from the later period.<sup>1</sup>

We shall be compelled to deal chiefly with the dollar volume of assets and rates of return as they are reported in the balance sheets and income statements of businesses. It would be disingenuous to evade acknowledgment that our inability to adjust these data for price changes is a very serious limitation on their usefulness. In the final section of this chapter we examine so far as possible the relationship between assets and rates of return in book values and the corresponding quantities in stable (1947) prices. The correspondence appears to be sufficiently good for the broad industry categories, so that the larger differences (especially among industries at a given time) probably reflect differences in "real" capital and even more in rates of return.

Before we turn to the behavior of investment and rates of return—the two main subjects of this chapter—over the period of our study, it may be well to glance at a somewhat longer time span for which data for all manufacturing industries can be roughly pieced together.<sup>2</sup> The stock of capital in manufacturing and the rates of return after taxes are presented in Chart 1; the data are reported in book values.

The war and postwar years which constitute our special period form a striking contrast to the decade which preceded it. The stock of capital in manufacturing corporations had reached \$64 billion in 1929; thereafter, it fell by almost \$20 billion in the next six years and did not regain the

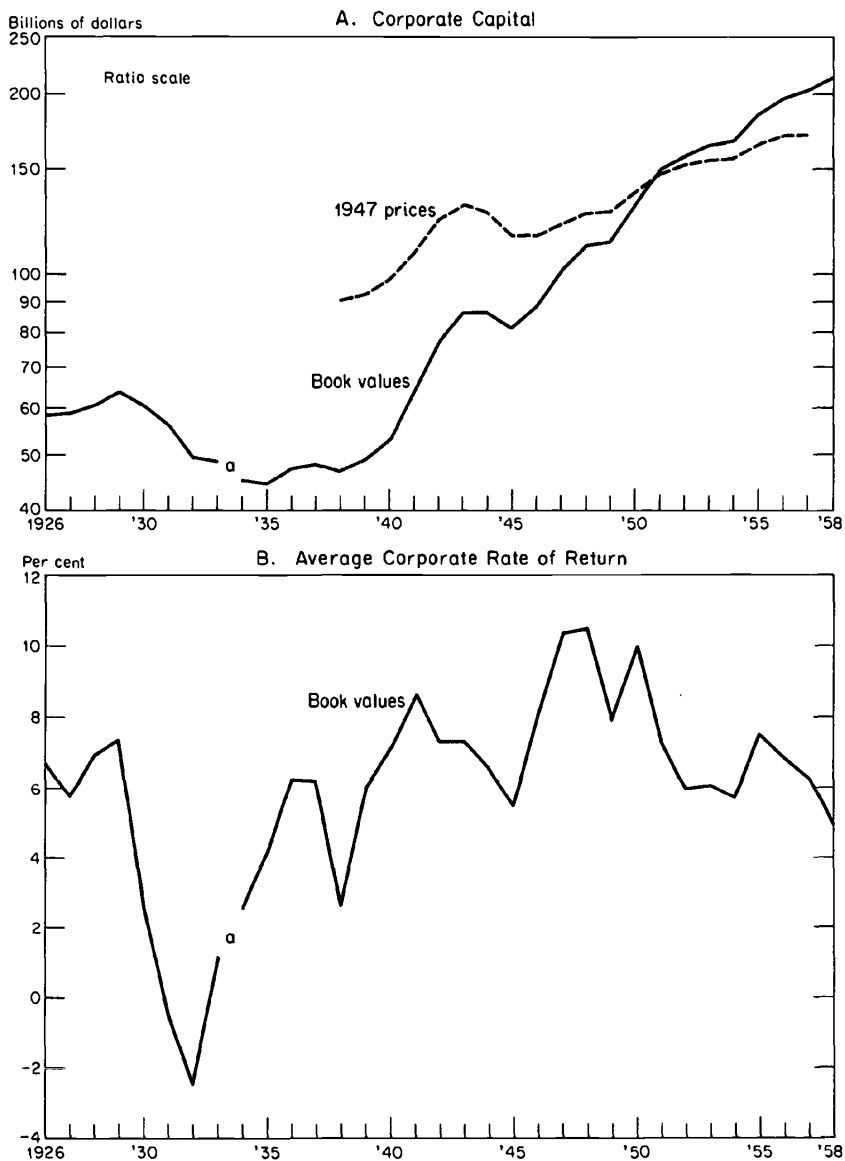
<sup>1</sup> The main statistical reason for the division is that extensive changes in industry classification were made in 1948—and, we may add, 1958.

<sup>2</sup> Before 1938 there was much less detail compiled or published on the manufacturing industries. The basic data for 1926 to 1938 underlying Chart 1 are described in Appendix B.

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CHART 1

Corporate Capital and Rates of Return in Manufacturing Industries, 1926-58



<sup>a</sup> Data for 1926 to 1933 are not strictly comparable to those for the later period. See Appendix B.

Source: The data on which the chart is based are to be found in Table B-1.

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1929 level until 1941. A continuous and often spectacular growth began with the outbreak of World War II, interrupted only once by a moderate decline in 1945. It is doubtful that so sustained a rise in book values (reflecting, of course, price rises as well as real investment) had previously occurred in this country.

The contrast in the behavior of the rates of return in the two periods was less marked. In the late 1920's the rate averaged about 6.7 per cent. It fell to -2.5 per cent in 1932 and then began a rise which brought it back nearly to the level of the late twenties. The great contrast is between the 1930's when the rate never exceeded 6.2 per cent and the 1940's when it fell below this level in only one year (1945). The trend was steadily downward in the 1950's. Our period was characterized by persistent expansion (and inflation) and the absence of widespread business losses, which exclude a range of problems—such as "sick" industries and the mobility of capital in severe depression—which a longer time span would have presented.

### 1. *The Flow of Investment*

The aggregate assets in manufacturing rose by \$161.0 billion, or slightly more than 325 per cent, between 1938 and 1957 (Table 3).<sup>3</sup> A considerable part of this immense increase took place in two great waves of investment: the first dominated by World War II, when \$39.5 billion was added in five years; the second and more sustained wave running from 1945 to the end of our period, when another \$123.4 billion was added.

If we turn to assets measured in 1947 prices, however, the picture changes radically. The total increase in capital is reduced to \$81.8 billion, and the average annual rate of growth for the eighteen years falls from 8.0 to 3.3 per cent. The almost unbroken record of growth of capital in book values—only a 4.5 per cent fall in 1945 breaks the record—becomes wholly transformed: total capital reached a peak in 1943, declined by a tenth in 1946, and it was not until sometime in 1950 that the 1943 level was again reached.

The finding that aggregate capital did not surpass the 1943 peak until 1950 is in substantial disagreement with the Department of Commerce estimates. These estimates (which exclude working capital other than

<sup>3</sup> Unless otherwise qualified, "assets" or "capital" excludes investments in other companies, includes noncorporate business, and is reported in book values. Balance sheets for a given year usually refer to December 31 of that year, but a portion of corporations report on fiscal years falling within six months on either side; see W. L. Crum, *Fiscal-Year Reporting for Corporate Income Tax*, Technical Paper 11, New York, National Bureau of Economic Research, 1956.

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TABLE 3  
ASSETS IN MANUFACTURING INDUSTRIES, 1938-57  
(dollar amounts in millions)

Year (Dec. 31)	Total Assets <sup>a</sup>		Increase of Assets <sup>b</sup>		Decrease of Assets <sup>b</sup>	
	Book Values	1947 Prices	Number of Industries	Amount (book values)	Number of Industries	Amount (book values)
1938	48,846	94,189	—	—	—	—
1939	50,955	96,195	57	2,491	25	615
1940	55,049	101,817	70	2,690	12	207
1941	65,892	113,466	78	8,238	4	42
1942	80,303	128,549	62	9,298	20	623
1943	89,675	135,282	58	4,913	24	587
1944	90,511	132,623	63	3,333	19	527
1945	86,445	122,714	48	1,791	34	2,381
1946	93,156	122,186	78	11,048	4	661
1947	106,339	125,911	76	11,982	6	143
1947 <sup>c</sup>	106,580	126,498	—	—	—	—
1948	116,160	131,118	81	10,237	18	508
1949	118,088	132,060	45	3,625	54	1,710
1950	135,142	142,056	95	16,800	4	141
1951	153,948	151,878	90	18,764	9	226
1952	162,853	157,327	—	—	—	—
1953	169,695	160,345	69	17,009 <sup>d</sup>	30	1,369 <sup>d</sup>
1954	173,111	161,229	57	7,005	42	2,787
1955	190,670	171,445	88	18,075	11	496
1956	203,107	175,710	70	13,714	29	1,380
1957	209,892	175,999	65	9,595	34	2,356

<sup>a</sup> Based upon 2-digit industrial categories.

<sup>b</sup> Based upon 3-digit industries; restricted to "basic" set of industries, described on p. 111.

<sup>c</sup> On 1948 industrial classification.

<sup>d</sup> For two-year period, 1951-53.

SOURCE: Tables A-14 to A-59.

inventories) suggest that a wartime peak (reached in 1942) was considerably exceeded by 1946.<sup>4</sup> So far as fixed assets are concerned, a major source of difference is that we accept, and the Commerce study implicitly rejects, the accelerated depreciation allowances permitted on facilities constructed during the war. Some comments on this question are offered in Appendix A; suffice it to say that *some* of the accelerated depreciation undoubtedly represented a correct recognition of the fact that plants constructed to produce munitions had a much reduced peacetime usefulness.<sup>5</sup> The true amount of depreciation that should have been

<sup>4</sup> Donald G. Wooden and Robert C. Wasson, "Manufacturing Investment since 1929," *Survey of Current Business*, Nov. 1956, p. 14.

<sup>5</sup> We also have higher deflated figures for durable capital in the earlier period because of the use of a different set of deflators. Possibly, Commerce's method of finding capital by accumulating previous investment (which requires knowledge of the share of investment goods purchased by manufacturing industries) is less reliable in the early years.

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charged against the defense facilities cannot be known, and one is left with the ambiguous conclusion that it lies somewhere between the accelerated and the normal rates of depreciation.

If we cannot judge conclusively the popular view that the war left the American economy with a rich legacy of modern capital equipment suitable to ordinary peacetime purposes, we can at least shed some doubt on it. For our capital stock grew at the rate of about 5 per cent annually from 1939 to 1944 if most accelerated depreciation properly represented small postwar usefulness. This is not an especially large rate of growth from a depression to a period of high prosperity and, indeed, from 1946 to 1953 the annual rate was 3.9 per cent. It is often—and erroneously—said that, if a warring nation borrows (domestically), it is shifting the burden to future generations; we can at least suggest that World War II offers no support for the view that waging war confers an economic boon on these generations.

The capital movements from 1938 to 1946 were dominated by the mobilization and demobilization of the American economy. Most of the industries that make finished munitions were too small to be reported separately before 1942, but those that were segregated doubled their capital in 1940, again in 1941, and in 1942 quadrupled their capital. In 1939, assets in these industries were \$0.6 billion; in 1943 they amounted to \$13.4 billion, or one-seventh of all manufacturing capital. The subsequent decline was even more abrupt: within three years the capital of the munitions industries (by then chiefly aircraft and ships) had fallen to \$2.4 billion.

Those vast movements of capital into and out of munitions did not occasion comparable movements of capital in the industries supplying material and equipment (see Table 4). In large part, the mobilization consisted simply of redirection of the output of producer goods industries—steel went into tanks instead of into automobiles.

Even in the capital reported in the munitions industries, however, we find a large amount of the capital which in earlier years was reported by other industries. The larger automobile companies disappeared from the automobile industry during the war,<sup>6</sup> because their major receipts then came from aircraft and tanks. The shift of an entire company to a new industry, when its sales may have shifted moderately in composition

<sup>6</sup> The number of companies making motor vehicles (including trucks and industrial trailers) with assets over \$100 million varied as follows:

1942	3	1944	1	1946	0
1943	0	1945	1	1947	5
				1948	9

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TABLE 4  
ANNUAL PERCENTAGE INCREASE OF CAPITAL IN MUNITIONS  
AND OTHER INDUSTRIES, BOOK VALUES, 1938-47

Year	Munitions <sup>a</sup>	Type of Industry		Consumer Goods
		Suppliers to Munitions <sup>b</sup>	Other Producer Goods	
1938-39	35.0	6.8	6.4	2.6
1939-40	96.3	20.9	7.4	6.5
1940-41	115.8	34.0	19.6	15.9
1941-42	355.8	39.2	9.5	7.2
1942-43	103.7	20.7	3.5	4.1
1943-44	-14.3	-1.3	-0.5	5.8
1944-45	-24.9	-12.3	-2.1	3.4
1945-46	-77.6	7.2	12.1	33.9
1946-47	-24.6	15.7	22.0	13.1

<sup>a</sup> Ships, aircraft, firearms, ammunition, tanks, sighting and firing equipment, and munitions n.e.c.

<sup>b</sup> Industrial chemicals, blast furnaces, structural steel, miscellaneous iron and steel, basic nonferrous metals, miscellaneous nonferrous metals, communications, engines and turbines, general industrial machinery, metalworking machinery.

SOURCE: Tables A-14 to A-35.

(although of course the shift was complete for automobiles), is an undesirable statistical source of instability in the capital data, discussed below.

The opposite side of this picture was the much slower rate of growth of capital in the consumer goods industries. But even here there was no reduction of capital, even if capital is measured in 1947 prices: only two industries (furniture and motor vehicles) declined from 1940 to 1945; and the group of industries as a whole showed an increase of 12.6 per cent.

Two main developments dominated the growth of capital from 1947 to 1956. The first was the immense program of construction of housing, plant, and equipment. Between those dates the total assets in manufacturing rose 90.8 per cent, but the construction goods industries much surpassed that growth (Table 5)—indeed, of the larger industries only structural clay failed to exceed the rate of increase of all manufacturing. The expansion of construction was paralleled by a large increase in agricultural supplies (agricultural machinery and fertilizers).

The second development was the retardation of investment in the consumer goods industries. None of the four beverage industries, nor eight food industries (all except cereals), nor the two tobacco industries, nor the thirteen textile and apparel industries, nor footwear, had so large a rate of increase of assets as all manufacturing. The only large consumer goods industry whose capital grew rapidly was motor vehicles (and with it, petroleum refining), and of course it started from a somewhat fictitious

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TABLE 5  
PERCENTAGE INCREASE OF CAPITAL IN CONSTRUCTION  
GOODS INDUSTRIES, BOOK VALUES, 1947-56

Industry	Percentage Increase (total manufacturing = 90.8)
Concrete products	188.1
Fabricated structural products	158.1
Cement	187.3
Glass	137.2
Structural clay	89.1
Miscellaneous lumber	99.1
Machinery	
Office and store	152.1
General industry	128.5
Construction	149.2
Metalworking	112.9
Total manufacturing	90.8

SOURCE: Tables A-36 to A-59.

1947 base. The shift of consumers' expenditures toward services presumably was one cause of the slow growth of capital.<sup>7</sup>

THE DISPERSION OF RELATIVE RATES OF INVESTMENT

The great differences in the rates of increase of capital in munitions and nonmunitions industries has already been noted (Table 5); similar though smaller dispersion is common even among nonmunitions industries, and in peacetime. But before this characteristic is looked at more closely, some cautions with respect to the data are in order.

The annual rates of increase of capital are unfortunately much influenced by deficiencies of data. The reclassification of a single large firm—even among our fairly broad industries—can lead to a fictitiously large increase in one industry and a fictitiously small increase in another. Beginning with 1942 (when the asset-size classes were first given in the *Source Book*), the behavior of large firms was examined in those industries where an annual rate of change of assets fell outside two standard deviations of the rates of increase for that year. When shifting of large firms appeared to be the source of the large rate of change, it was sometimes possible to adjust the data, and in others at least to detect the incomparabilities. But the reclassification of large firms cannot always be detected

<sup>7</sup> Too small a share of service enterprises is incorporated to place much confidence in the asset figures for this category, but it is worth noting that assets of corporations in retail trade and services rose by only 94 per cent over the 1947-56 period—slightly more than the figure for all manufacturing.

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and that of smaller firms is even more elusive, accounting for a portion of the observed dispersion. Where the reclassification of firms was detected but adjustments were not feasible, the industry was excluded from the "basic" set of industries, described on p. 111.

In only five years of the entire period was the average rate of increase of assets as large as the standard deviation of the rates (Table 6), despite the

TABLE 6  
PERCENTAGE INCREASE IN TOTAL ASSETS IN  
MANUFACTURING INDUSTRIES, 1938-57

PERIOD	Number of Industries	PERCENTAGE INCREASE OF ASSETS			
		Average	Standard Deviation	Quartile	
				Q <sub>1</sub>	Q <sub>3</sub>
1938-39	82	3.72	9.42	-1.73	7.92
1939-40	82	7.93	10.37	1.77	13.39
1940-41	82	17.38	12.81	8.27	25.36
1941-42	82	11.10	14.53	1.94	20.75
1942-43	82	5.85	10.79	-1.25	11.94
1943-44	82	4.63	7.53	0.09	9.83
1944-45	82	2.01	9.58	-3.21	7.36
1945-46	82	19.94	16.27	10.58	27.19
1946-47	82	15.06	10.43	8.83	20.28
1947-48	99	7.60	8.44	2.42	12.85
1948-49	99	1.04	7.08	-3.66	4.60
1949-50	99	15.78	10.47	9.61	21.02
1950-51 <sup>1</sup>	99	12.45	12.68	4.38	18.83
1951-53 <sup>a</sup>	99	3.06	6.19	-1.14	6.74
1953-54	99	1.34	7.78	-3.45	5.10
1954-55	99	9.77	8.30	4.67	15.00
1955-56	99	3.86	8.05	-1.11	9.00
1956-57 <sup>b</sup>	99	1.89	8.62	-2.19	6.80

<sup>a</sup> Annual rate for two-year period.

<sup>b</sup> For percentage increase in corporate assets only.

SOURCE: Tables A-14 to A-59.

fact that ordnance industries and other industries with obvious incomparabilities were excluded. In five years, more than a fourth of the industries increased their assets by 20 per cent or more and, despite the almost continuous rise of price levels, in eight of the nineteen years more than one-fourth of the industries had decreases of assets. Rather systematically, the dispersion of rates is larger, the larger the average rate of increase, but the dispersion of rates varies less than the average rate, so the dispersion of rates is smaller relative to the average rate in years of large investment. The distributions of rates of increase are presented in the various panels of Chart 2.

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One might conjecture that the largest and smallest rates of increase are found in the smallest industries, where smaller absolute increments or decrements of investment will suffice for large relative movements of capital.<sup>8</sup> There is scarcely any relationship, however, between the standard deviations of the rates of increase of capital of individual industries from 1947 to 1954 and the size of the industry (measured by 1950 assets).<sup>9</sup>

The mobility of capital among industries can be defined in such a way that it is measured by the dispersion of rates of increase of capital. Mobility must be measured from a base representing immobility, and one base would be provided by the assumption that the assets of all industries grow at the same rate: then capital could be considered to be moving from slowly growing to rapidly growing industries. An industry's actual rate of increase minus the average (weighted) rate of increase would be a measure of absolute mobility in this particular sense.

On this interpretation, the dispersion of rates of increase of assets measures also mobility, and the interpretation is in keeping with expectations. The greatest single year of mobility was 1946, when a large part of the demobilization of the economy took place. The two periods of mobilization, 1939-43 and 1949-51, witnessed almost as large a shift of capital. But even in years such as 1949, when capital was not increasing, the differential movements of capital were almost as large as in relatively prosperous years such as 1944 and 1948.

### INSTABILITY OF INVESTMENT

The annual rate of investment is a relatively volatile magnitude even when it is restricted to durable goods, and the addition of inventories and other forms of working capital increases the instability. The average of the annual rates of increase of capital over the period is 8.43 per cent, but the standard deviation of these rates is 6.57 per cent. This instability is of course the Great Commonplace of all theories of business fluctuations.

The instability of investment rates is no less marked for individual industries. It would be possible for aggregate investment to fluctuate widely and at the same time for the industrial patterns of rate of investment to be stable: this would happen if the movements of general business dominated the investment of individual industries. But the industrial

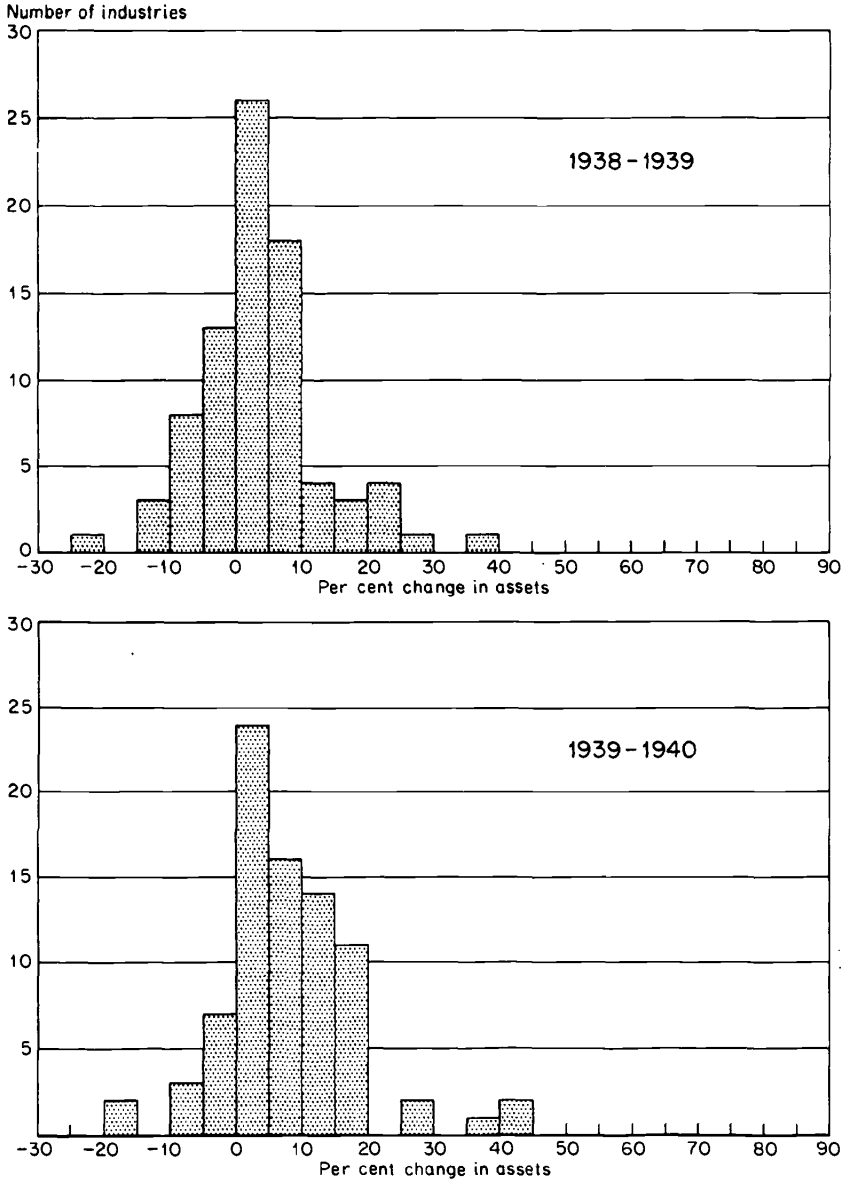
<sup>8</sup> In 1950, for example, industry assets ranged from \$40.6 million in millinery to \$15.8 billion in petroleum refining—a range of 1 to 390.

<sup>9</sup> There is a modest positive rank correlation between 1950 size of industry and 1947-54 percentage increase of assets, however ( $\rho = .23$ , with 99 industries). In the 1938-47 period, no such correlation is present ( $\rho = .02$  with 82 industries).

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CHART 2

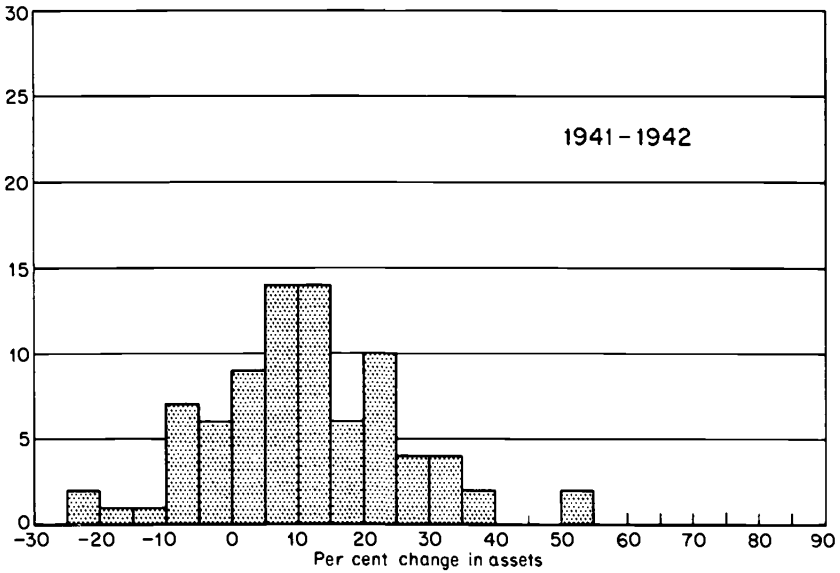
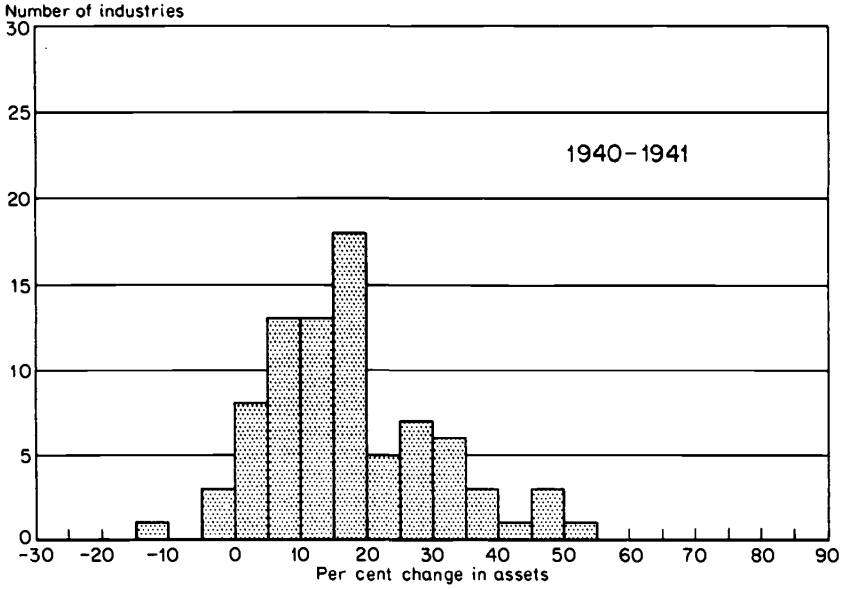
Frequency Distribution of Manufacturing Industries, by Annual Rate of Change of Capital, 1938-57



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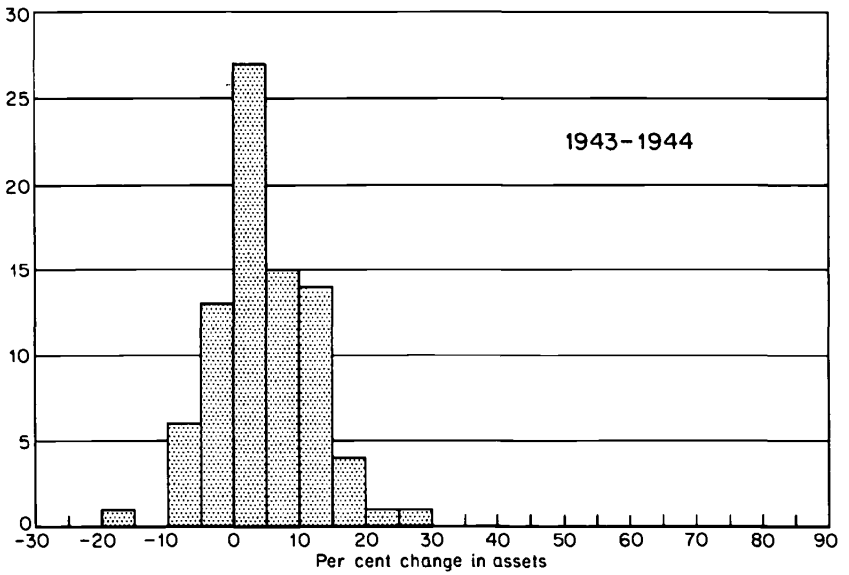
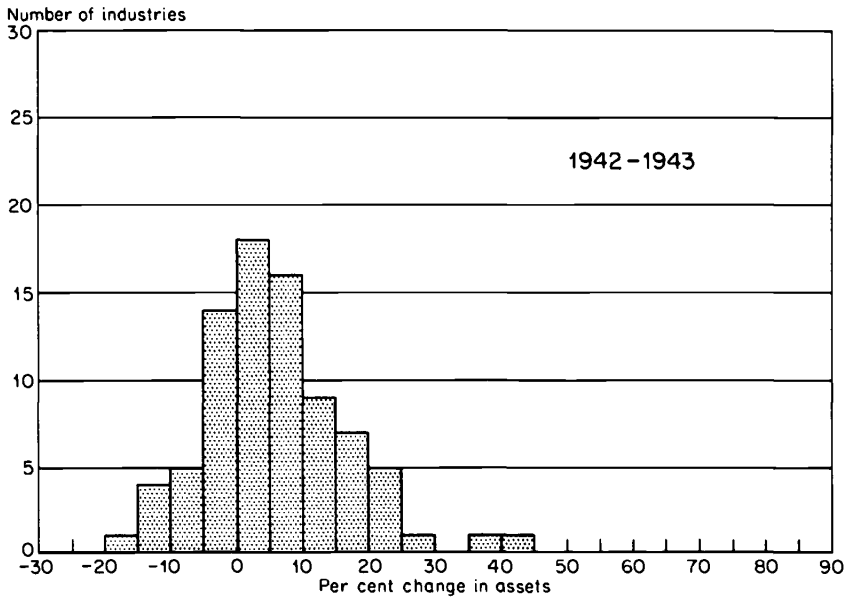
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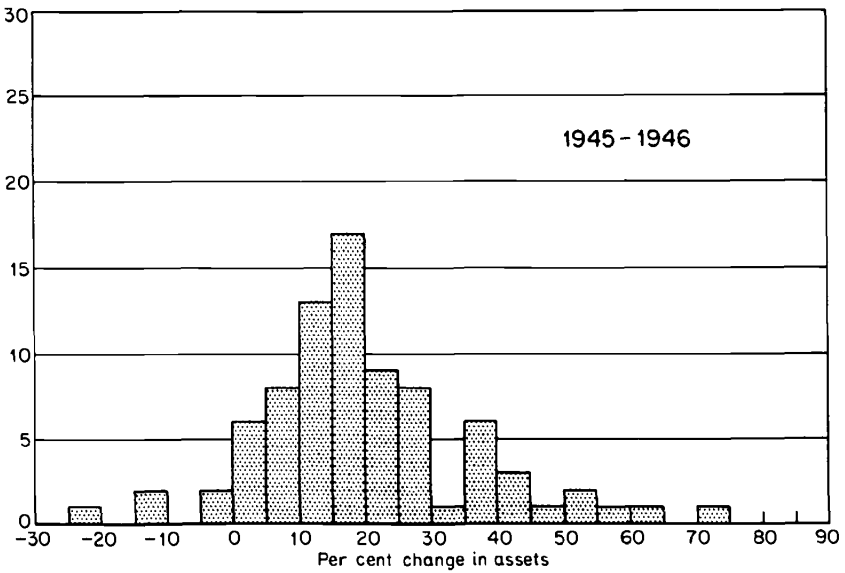
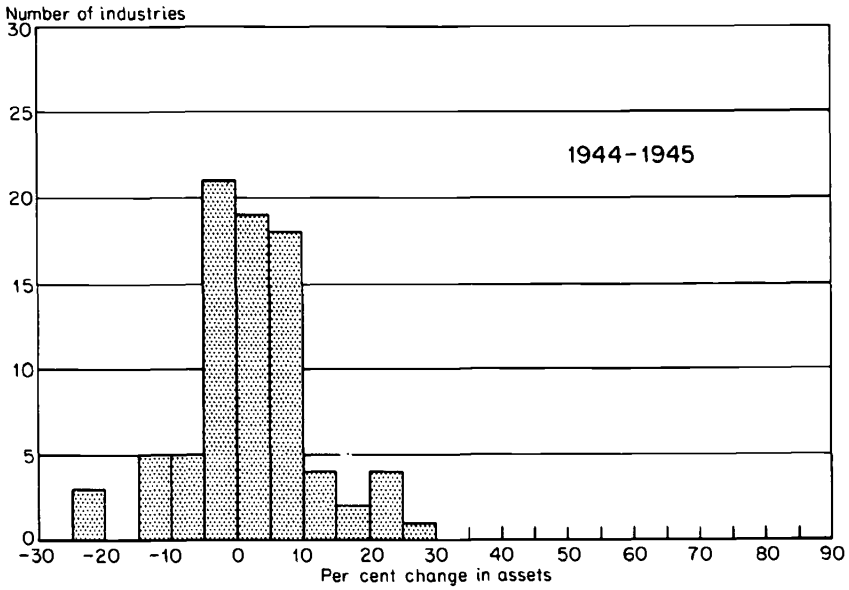
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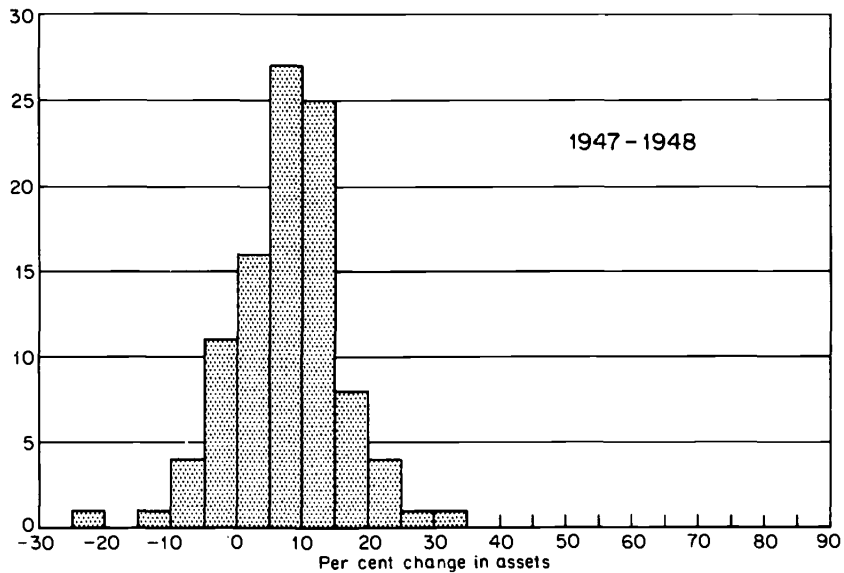
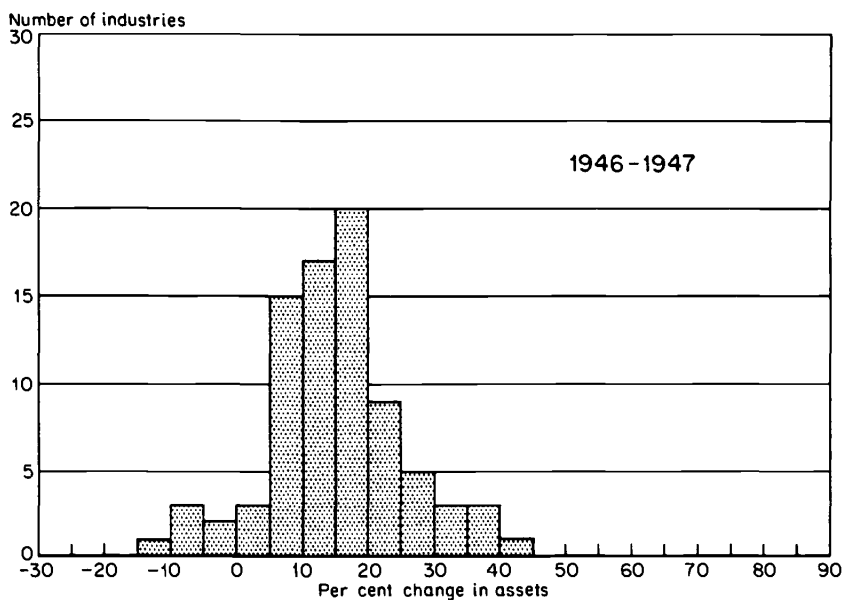
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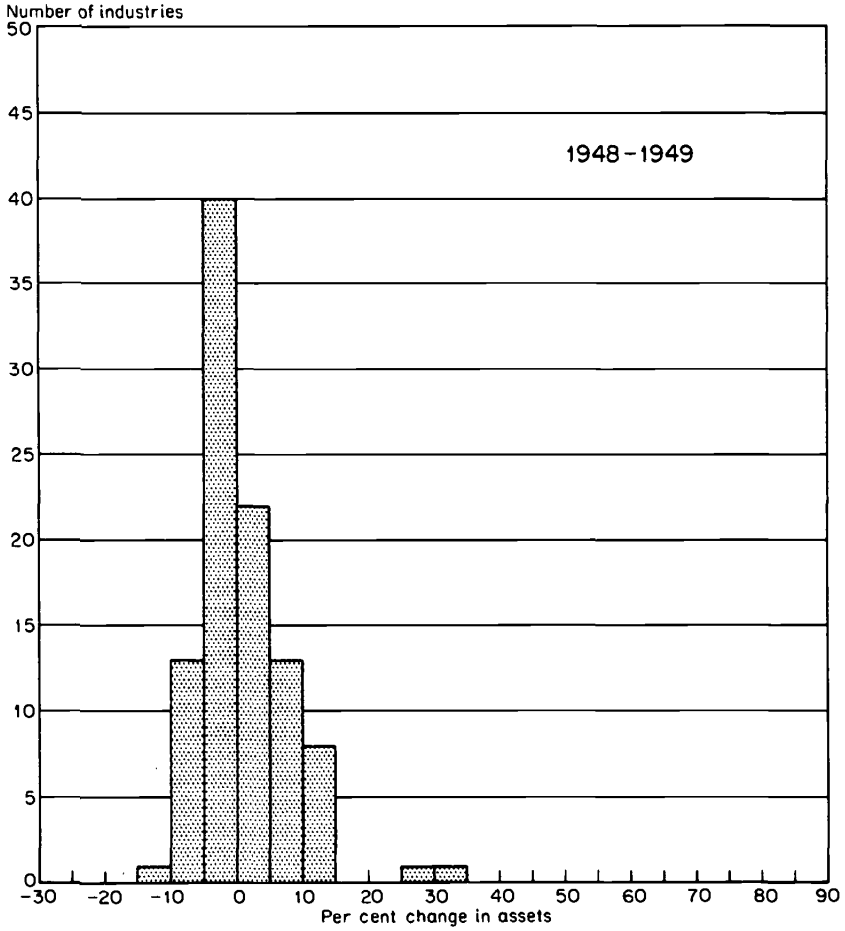
THE FLOW OF INVESTMENT

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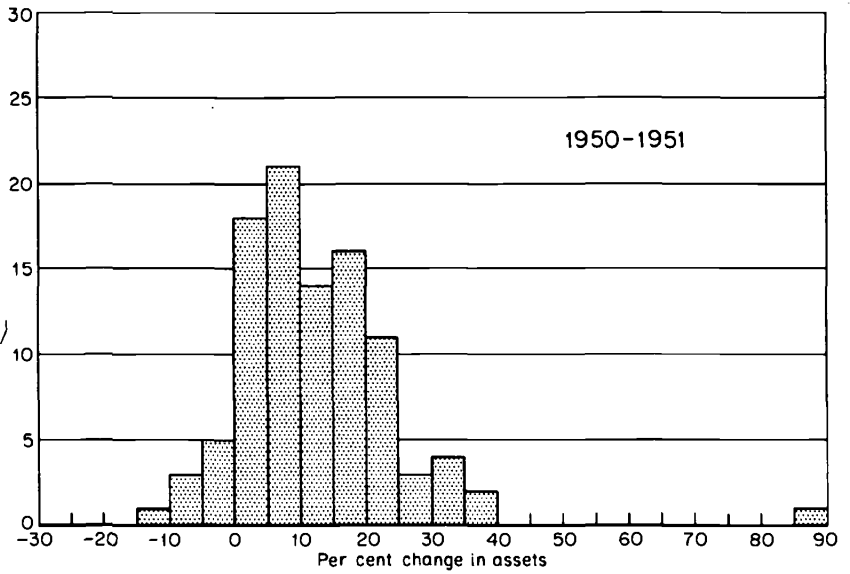
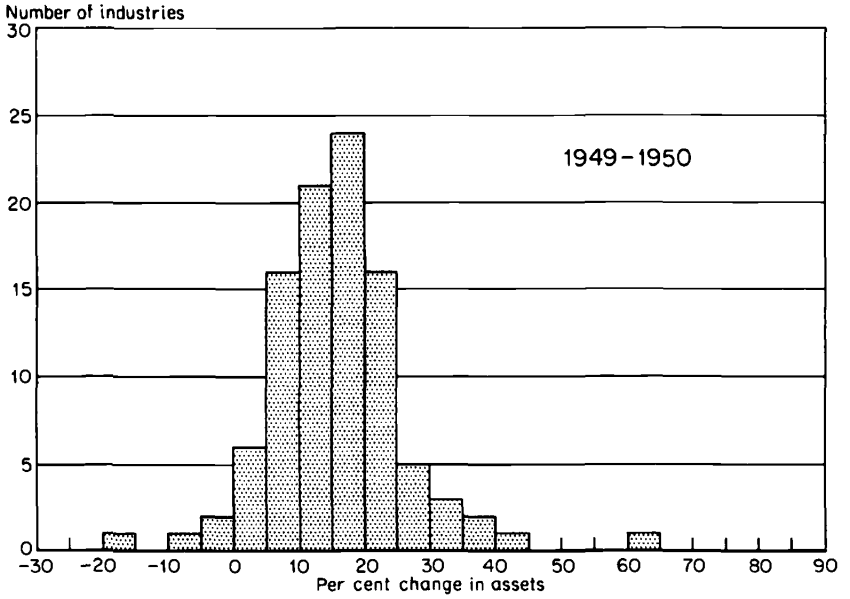
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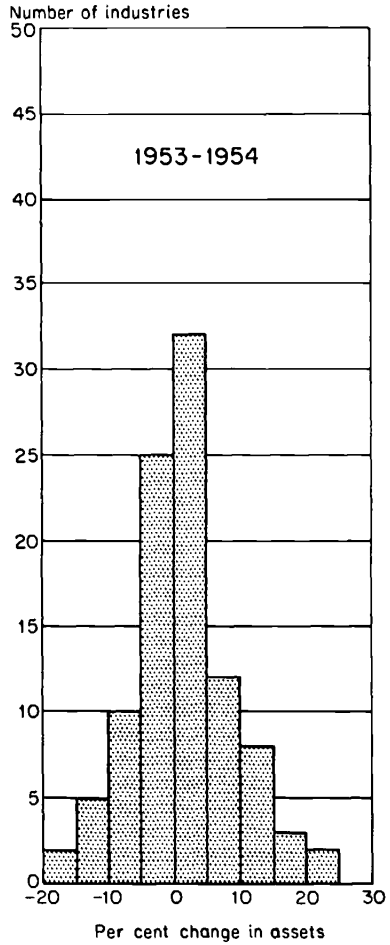
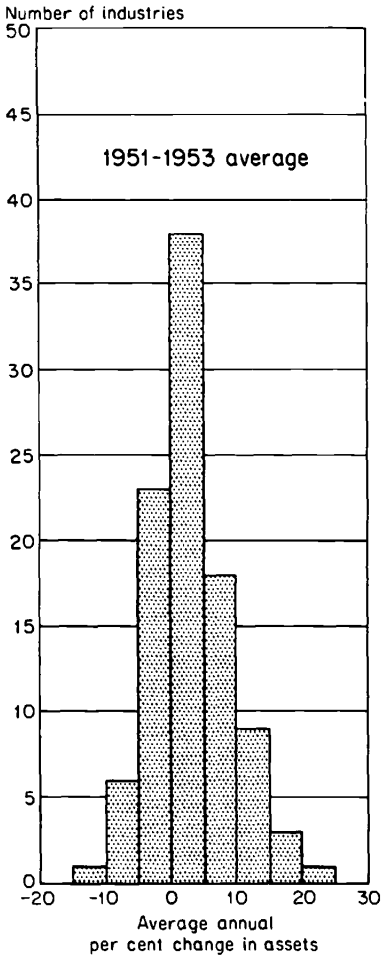
THE FLOW OF INVESTMENT

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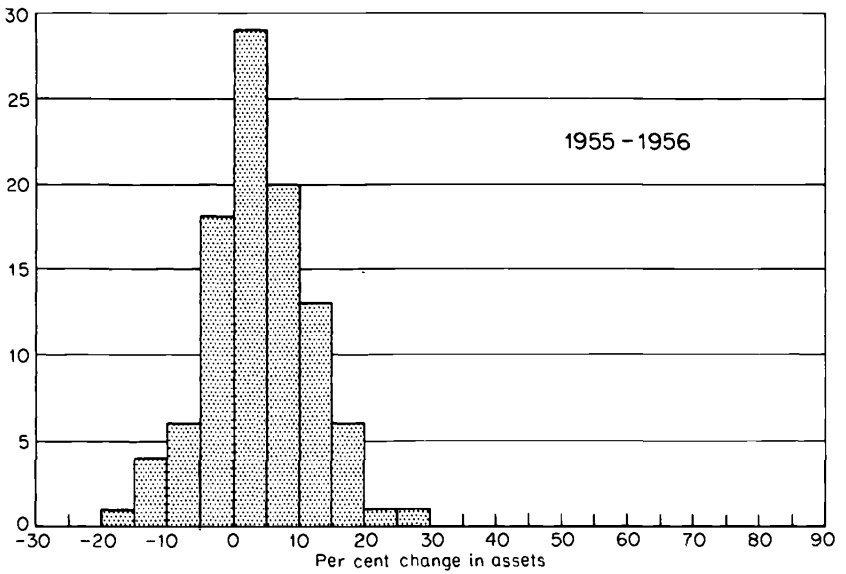
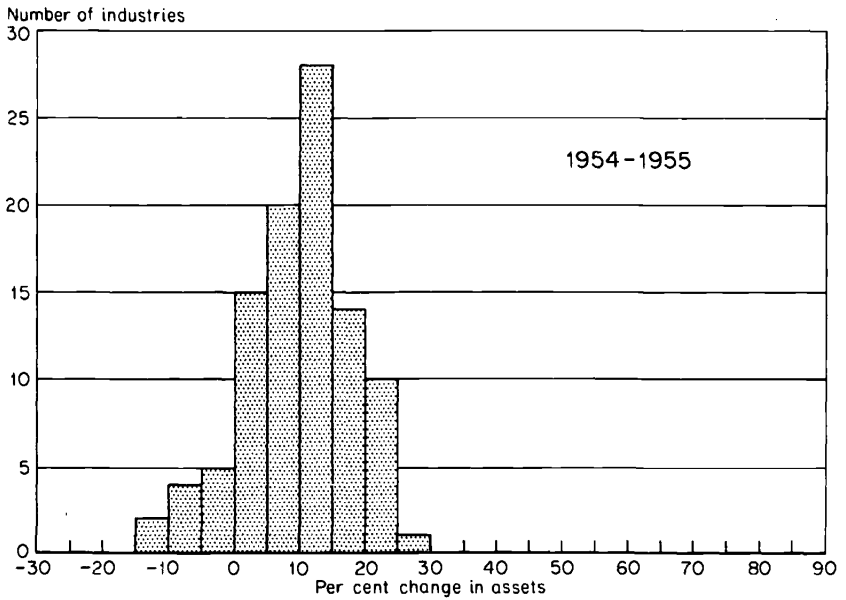
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THE FLOW OF INVESTMENT

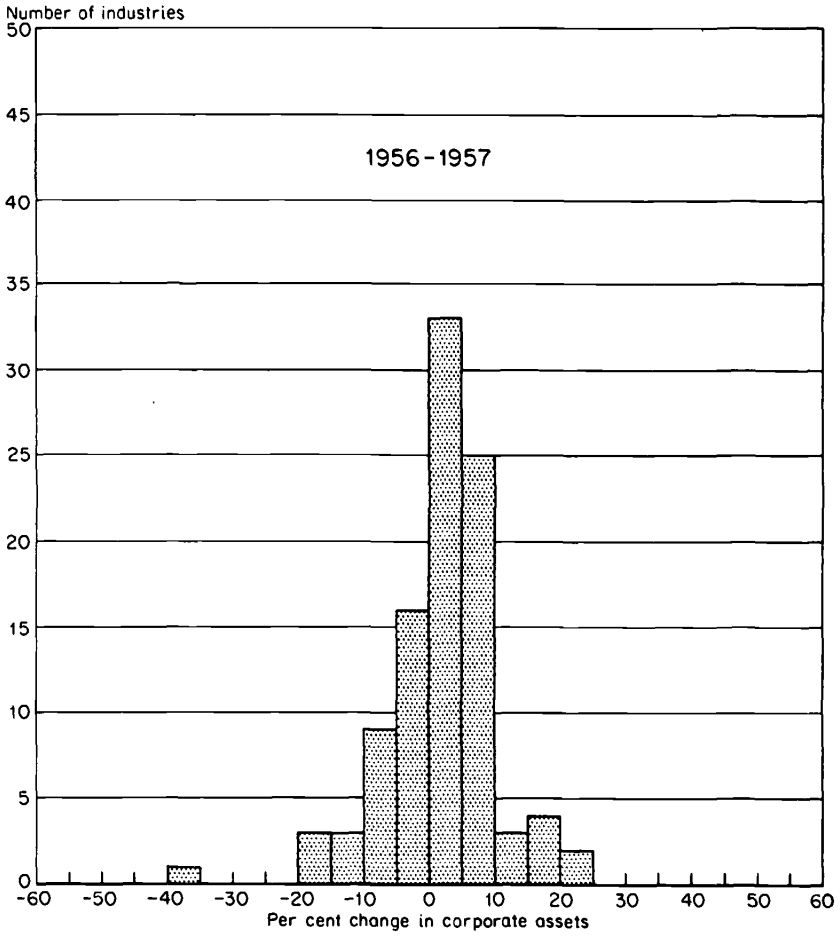
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CHART 2 (concluded)



Source: Tables A-14 to A-59.

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pattern is highly unstable (see Table 7); one is tempted to ask, not how strong the association is between successive annual rates of increase of capital, but whether there is any association. There is, in fact, a positive association in all but three years, but the correlations are nonsignificant in 13 out of 17 cases.

TABLE 7  
RANK CORRELATION OF PERCENTAGE INCREASE IN ASSETS AMONG  
MANUFACTURING INDUSTRIES, PAIRS OF YEARS, 1938-57

Period	Correlation Coefficient	Number of Industries
1938-39 with 1939-40	-.104	82
1939-40 with 1940-41	.311	82
1940-41 with 1941-42	.290	82
1941-42 with 1942-43	.118	82
1942-43 with 1943-44	.254	82
1943-44 with 1944-45	.205	82
1944-45 with 1945-46	.138	82
1945-46 with 1946-47	.025	82
1946-47 with 1947-48	.116	75
1947-48 with 1948-49	.105	99
1948-49 with 1949-50	.067	99
1949-50 with 1950-51	.092	99
1950-51 with 1951-53 <sup>a</sup>	.366	99
1951-53 <sup>a</sup> with 1953-54	-.158	99
1953-54 with 1954-55	-.017	99
1954-55 with 1955-56	.011	99
1955-56 with 1956-57 <sup>b</sup>	.153	99

<sup>a</sup> Two-year change.

<sup>b</sup> For 1956-57, percentage increase in corporate assets.

SOURCE: Tables A-14 to A-59.

One large source of variation in the industrial pattern of rates of investment is purely statistical. If we correlate

$$\log \text{capital}_t - \log \text{capital}_{t-1}$$

with

$$\log \text{capital}_{t-1} - \log \text{capital}_{t-2},$$

any error in the capital data for the intermediate year ( $t - 1$ ) works in opposite directions on the relative increases. It can be shown in fact that, even if the correlation between the precisely measured rates of capital increase were .75, the observed correlation could be as small as .125 if the variance of the errors in measuring capital in any year were half as large as the variance of the annual changes in capital.<sup>10</sup>

<sup>10</sup> Let  $(C_t + \delta_t)$  be the logarithm of the observed capital in an industry in year  $t$ , where  $C_t$  is the "true" figure and  $\delta_t$  is the error of measurement. The observed correlation between rates of increase in the two successive years will be:

$$r_o = \text{correlation of } (C_2 + \delta_2 - C_1 - \delta_1) \text{ with } (C_3 + \delta_3 - C_2 - \delta_2).$$

This effect of errors of measurement can be reduced by lengthening the periods over which changes in capital are measured, for then the error in measurement is unaffected but the true change is increased. Taking a longer time span, the industrial pattern of rates of increase in capital becomes more stable. For example, the correlation between rates of increase in capital from 1949 to 1951 with 1951 to 1953 is .422, whereas the maximum correlation of successive annual rates in that period was only .366 (and it was based upon one two-year change).<sup>11</sup>

The magnitude of the errors in measurement of capital in a given year relative to the magnitude of annual changes in capital is unknown, but it is surely substantial and possibly the measurement errors are of the same order of magnitude as the annual changes in an industry's capital stock.<sup>12</sup> Since we can form no independent estimate of measurement errors, we deal usually with periods longer than one year in the analysis of rates of change of capital.

INCREASES IN ASSETS AND COMPANIES

The average assets of manufacturing industries grew by 60.3 per cent from 1948 to 1956, but assets of corporations of average size in each industry

The true correlation if there were no errors would be:

$$r_t = \text{correlation of } (C_3 - C_1) \text{ with } (C_3 - C_2).$$

By definition,

$$r_0 = \frac{\Sigma(C_3 + \delta_3 - C_2 - \delta_2)(C_3 + \delta_3 - C_1 - \delta_1)}{N\sigma_{c_3 + \delta_3 - c_2 - \delta_2} \sigma_{c_3 + \delta_3 - c_1 - \delta_1}}.$$

If the errors are not correlated with the  $C$ 's or with one another,

$$\begin{aligned} \sigma_{c_3 + \delta_3 - c_2 - \delta_2}^2 &= \sigma_{c_3}^2 - c_2 + \sigma_{\delta_3}^2 - \delta_2 \\ &= \sigma_c^2 + 2\sigma_{\delta}^2, \text{ say.} \end{aligned}$$

Substituting in the definition,

$$\begin{aligned} r_0 &= \frac{\Sigma[(C_3 - C_2) + [\delta_3 - \delta_2]][(C_3 - C_1) + [\delta_3 - \delta_1]]}{N(\sigma_c^2 + 2\sigma_{\delta}^2)} \\ &= \frac{\Sigma(C_3 - C_2)(C_3 - C_1) - \Sigma\delta^2}{N(\sigma_c^2 + 2\sigma_{\delta}^2)}. \end{aligned}$$

Using the definition of  $r_t$ ,

$$\begin{aligned} r_0 &= \frac{r_t \sigma_c^2 - \sigma_{\delta}^2}{\sigma_c^2 + 2\sigma_{\delta}^2} \\ &= \frac{r_t - \lambda}{1 + 2\lambda}, \quad \text{if } \lambda = \frac{\sigma_{\delta}^2}{\sigma_c^2}. \end{aligned}$$

<sup>11</sup> The correlation coefficient between relative changes in assets from 1947 to 1950 with those from 1950 to 1954 was .361.

<sup>12</sup> On the other hand, an error is likely to be correlated with the change in capital, and errors in successive years are surely also correlated, so the formula in footnote 10 is only a very rough approximation.

THE FLOW OF INVESTMENT

TABLE 8  
INDUSTRIES WITH LARGEST RELATIVE INCREASE AND DECREASE IN NUMBER OF CORPORATIONS, 1948-56

Increase	Per Cent Change		Decrease	Per Cent Change	
	Number of Corporations	Industry Assets		Number of Corporations	Industry Assets
Aircraft and parts	194.7	394.8	Hats	-46.5	0.3
Fabricated structural steel	90.7	115.3	Tin cans	-44.1	106.3
Communications	90.4	167.3	Tires and tubes	-43.4	77.9
Costume jewelry	82.7	218.7	Cigars	-42.1	5.1
Metalworking machinery	77.0	104.6	Distilled beverages	-41.4	19.6
Electric generating equipment	68.4	113.0	Malt	-34.3	28.8
Miscellaneous petroleum products	65.2	3.3	Broad-woven wool	-34.1	-30.1
Metal stamping	64.9	81.4	Engines and turbines	-33.3	75.7
Professional and scientific instruments	62.2	200.3	Railroad equipment	-33.0	27.8
Insulated wire	59.5	116.2	Cereals	-30.6	91.3
Fabricated plastics	55.8	177.3	Sugar	-27.2	19.8
Fertilizers	54.0	89.8	Confectionery	-26.2	19.8
Commercial printing	53.3	103.4	Broad-woven cotton	-26.0	16.6
Miscellaneous machinery	47.9	85.1	Miscellaneous food and kindred	-22.0	52.9
Nonferrous foundries	47.0	47.7	Cut stone	-21.0	25.7

SOURCE: *Statistics of Income, Corporation Income Tax Returns, for 1948 and 1956 (Internal Revenue Service)*; and Tables A-36 to A-59, below.

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increased 65.3 per cent, showing the average number of corporations to have declined slightly.<sup>13</sup> Of course one expects average company size to rise (in current dollars of assets) in a period of rising prices, but deflated assets rose by more than one-third over this eight-year period.

TABLE 9  
RELATIVE INCREASE IN ASSETS OF INDUSTRIES AND AVERAGE CORPORATE ASSETS, 1948-56

Decile of Relative Growth of Industry (1)	Number of Industries (2)	Average Increase in Assets $\left(\log \frac{\text{assets, 1956}}{\text{assets, 1948}}\right)$ (3)	Average Increase in Corporation Size $\left(\log \frac{\text{average size, 1956}}{\text{average size, 1948}}\right)$ (4)	(4) as Per Cent of (3) (5)	Average Assets per Corporation, 1956 (\$ millions) (6)
I (slowest)	9	-.03344	.01807	—	1.1
II	10	.07675	.15753	205.3	3.4
III	10	.10576	.13360	126.3	5.3
IV	10	.14472	.16414	113.4	1.1
V	10	.18458	.15854	85.9	1.0
VI	10	.21842	.17769	81.4	8.3
VII	10	.25653	.24912	97.1	10.6
VIII	10	.29841	.22542	75.5	12.3
IX	10	.32661	.26364	80.7	8.2
X (fastest)	10	.44697	.28846	64.5	4.2
All manufacturing industries	99	.20491	.21853	106.6	5.6

SOURCE: Same as for Table 8.

The stability in the total number of corporate tax returns during a period of rapid growth of manufactures occurred because industries in which most corporations are found (food, textiles, and apparel) grew much less rapidly than the remainder of manufacturing industries did. The near-zero value of the (unweighted) average percentage change in the number of firms per industry, on the other hand, indicates that the phenomenon of stability in numbers was widespread. In fact, 48 of the 99 industries had a decline in the number of corporations.

The largest decreases in number of corporations occurred in a declining industry (broad-woven wool) and others which grew substantially (tin cans, cereals, engines and turbines, etc.), as Table 8 shows. But the industries with large increases in firms were those having unusually rapid

<sup>13</sup> The year 1948 is chosen as base because the 1947 number of tax returns cannot be estimated reliably on a basis comparable with the later years. These are unweighted averages of the industries. The number of returns in all manufacturing industries rose 4.6 per cent over the period.

growth—a relationship that was quite general. We may partition the relative increase of assets by the formula:

$$\log \frac{A_2}{A_1} = \log \frac{S_2}{S_1} + \log \frac{N_2}{N_1}$$

where  $A$  is industry corporate assets,  $S$  is average assets per corporation, and  $N$  is number of corporations, and the subscripts refer to dates. Then the share of industry increase ( $\log A_2/A_1$ ) that is “accounted for” by increase of firm sizes ( $\log S_2/S_1$ ) can be tabulated by deciles, as in Table 9.

The more rapidly an industry grew, the smaller the share accounted for by increased firm size and the larger the share accounted for by increased number of corporations. This is of course an eminently reasonable finding: that firms tend to leave slowly growing industries (often declining industries) and enter the most rapidly growing industries. Moreover, the rapidly growing industries had, on balance, larger average corporations (measured by assets in 1956) than the slowly growing industries had, but the relationship was very loose.

## 2. Rates of Return

The average rate of return on total assets was 7.2 per cent for the period 1938–56 (Table 10).<sup>14</sup> Aside from the only severe depression year, 1938, the average rate fluctuated between 5.4 and 10.4 per cent (after taxes), and averaged 7.5 per cent excluding that initial year. The rate of return when both income and asset data are converted to 1947 prices averaged 7.2 per cent, identical with the average of book-value rates. But if the process of deflation had no effect upon the average rate over the nineteen-year period, it had a noticeable influence upon its trend. The deflated rate fell below the book-value rate from 1939 to 1949, with peak differences in 1943 and 1947; from 1950 to 1957 the deflated rate exceeded the book-value rate by a steadily increasing amount. The effect of the adjustment for price changes is much smaller than its effect on capital, since a roughly parallel deflation of income is also made. The adjustment for accelerated depreciation (discussed in Appendix A) may have had as large an effect as that for inflation: calculations under admittedly extreme assumptions suggest that, in the absence of such depreciation, the rate of return would have been appreciably higher from 1942 through 1945, then lower through 1951, and higher again after 1951.

<sup>14</sup> The rates of return are calculated as total capital returns (excluding dividends received from other corporations) as a percentage of total assets (excluding investments in other companies) and therefore differ from the rates of return on stockholder's equity or net worth.

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TABLE 10  
PERCENTAGE RATE OF RETURN IN MANUFACTURING INDUSTRIES, 1938-57

Year	Average Rate of Return (weighted)	Average Rate in 1947 Prices (weighted)
1938	2.62	2.63
1939	6.00	5.77
1940	7.12	6.95
1941	8.56	8.36
1942	7.30	6.95
1943	7.30	6.80
1944	6.59	6.20
1945	5.43	5.26
1946	8.13	7.65
1947	10.34	9.84
1947 <sup>a</sup>	10.38	9.85
1948	10.43	10.05
1949	7.93	7.92
1950	9.97	9.99
1951	7.34	7.78
1952	5.96	6.46
1953	6.05	6.54
1954	5.68	6.26
1955	7.47	7.97
1956	6.85	7.71
1957	6.29	7.40

<sup>a</sup> Comparable to subsequent years.

NOTE: Calculations are based upon two-digit industries. For a description of the computations, see Appendix A, p. 118.

The rate of return on capital, unlike the annual relative changes in the stock of capital, has been comparatively insensitive to business conditions. In our period there were four peak years (1944, 1948, 1953, and 1957) and four trough years (1938, 1946, 1949, and 1954), and in the peak years the rate of return averaged 7.34 per cent (see Table 10), whereas in the trough years it averaged 6.09 per cent.<sup>15</sup> The average rose more than a negligible amount in six of fifteen years of expansion, and fell in three of four years of contraction, so conformity to business conditions was closer in business declines. One gets the impression that changes in corporate income taxation were as important as business fluctuations in explaining fluctuations in rates of return.

The movements of the rate of return broadly paralleled those of the rate of investment. In both series the peak was reached in the immediate postwar period (1946-47), with lesser peaks coming early in World War II (1941) and the Korean War (1950). The rank correlation between annual

<sup>15</sup> Indeed, excluding 1938, the prewar trough, the latter average is 7.25 per cent.

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rates of investment and the current annual rates of return in all manufactures was .67 for the eighteen-year period 1939 to 1956.<sup>16</sup>

What use was made of higher rates of return to obtain the vast expansion of the munitions industries during the war? The facts are given in the tabulation below.

<i>Year</i>	<i>Average Rate of Return (per cent)</i>	
	All Industries	Munitions <sup>a</sup>
1941	8.56	8.52
1942	7.30	7.39
1943	7.30	7.20
1944	6.59	6.65
1945	5.43	5.11
1946	8.13	-2.65

<sup>a</sup> Ships, aircraft, firearms, ammunition, tanks, sighting and firing equipment, munitions, n.e.c.

Among the many limitations of our data, one is especially important at this point: the rates of return are calculated upon end-of-year assets rather than average (or possibly mid-year) assets. When the rate of growth of assets was very high—and in the munitions industries it was reported as 356 per cent in 1942—the rate of return is seriously underestimated. The previous year-end assets are not strictly comparable to the current year-end assets because of the shifting of companies but, taking the data at face value, the rates of return may be recalculated on a mid-year asset basis. On the assumption that the increase of assets was linear, the adjusted rates of return will be as shown below.<sup>17</sup>

<i>Year</i>	<i>Rate of Return in Munitions Industries on Midyear Assets (per cent)</i>
1941	11.67
1942	12.12
1943	9.65
1944	6.18
1945	4.39

The effects of the adjustment are very marked: the rate of return is much higher in the earlier years, and somewhat lower in 1944 and 1945. If

<sup>16</sup> There is little evidence, in these aggregative data, of any relationship between the rate of investment and the profit rate of the preceding year ( $\rho = .33$  for 1939 to 1954).

<sup>17</sup> That is, let  $A_0$  and  $A_1$  be assets at the beginning and end of year respectively, and  $R$  income. Then we can calculate  $R/\frac{1}{2}(A_0 + A_1)$ . A constant geometric rate of increase of assets would perhaps be more plausible.

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proper allowance could be made for accelerated depreciation, the rate would be appreciably higher in the two latter years. Our data therefore do not deny that extensive use was made of profit incentives in the mobilization of resources during the war.

DISPERSION OF RATES OF RETURN

The unweighted average rate of return of individual industries followed a course closely similar to that of all manufacturing, but was generally higher during the war period and lower in the postwar period (Table 11).<sup>18</sup>

TABLE 11  
DISPERSION OF RATES OF RETURN IN MANUFACTURING INDUSTRIES, 1938-57

Year	Number of Industries	Average Rate (per cent)	Standard Deviation	Quartile (per cent)	
				Q <sub>1</sub>	Q <sub>3</sub>
1938	82	2.72	3.31	0.50	4.25
1939	82	6.21	3.16	4.11	7.69
1940	82	6.80	2.96	4.75	8.21
1941	82	8.49	2.37	6.86	9.85
1942	82	7.56	1.91	6.13	8.68
1943	82	7.40	2.02	6.19	8.56
1944	82	6.95	1.97	5.73	8.18
1945	82	6.18	1.99	5.03	7.50
1946	82	10.29	4.31	7.38	13.25
1947	82	10.93	3.01	8.92	12.68
1947	99	10.29	4.26	8.15	12.54
1948	99	9.40	3.22	6.97	11.89
1949	99	6.93	3.01	4.97	8.69
1950	99	9.07	2.58	7.44	10.81
1951	99	6.37	2.43	5.19	8.23
1953	99	5.16	2.12	4.05	6.61
1954	99	4.86	2.33	3.41	6.45
1955	99	6.34	2.40	4.85	8.81
1956	99	6.17	2.18	4.67	7.75
1957	99	5.41	2.49	3.79	6.94

NOTE: Calculations are based on three-digit industries. The average, unlike that of Table 10, excludes certain industries (munitions, and industries that could not be adjusted for reclassification of large companies).

SOURCE: Tables A-14 to A-59.

Aside from the initial depression year the rates never averaged below 4.9 per cent, and in all but five years fell between 6 and 10 per cent.

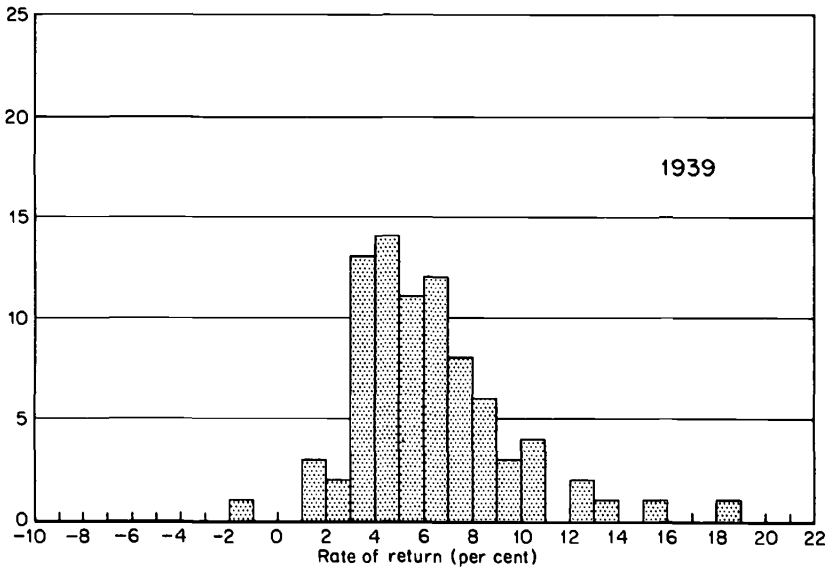
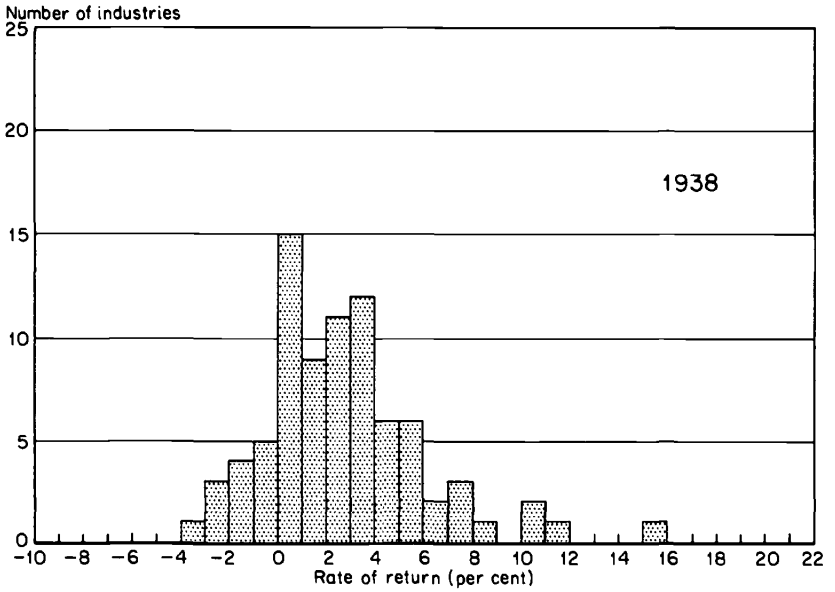
But the dispersion of industry rates was very great; the annual distributions are displayed in the panels of Chart 3. The dispersion was least in 1942-45, under the impact of very heavy corporate taxes but, these

<sup>18</sup> The averages are restricted to the "basic" set of industries, excluding munitions and industries excessively affected by reclassification of firms, described on p. 111.

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CHART 3

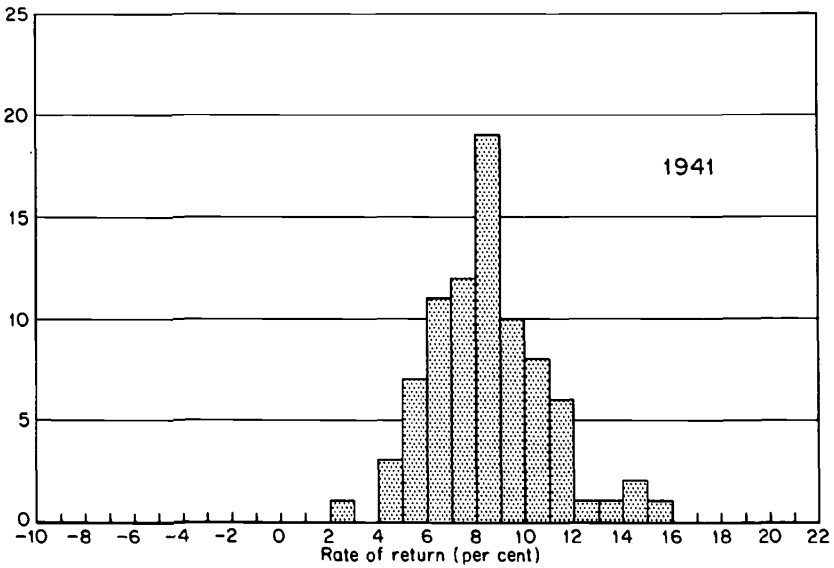
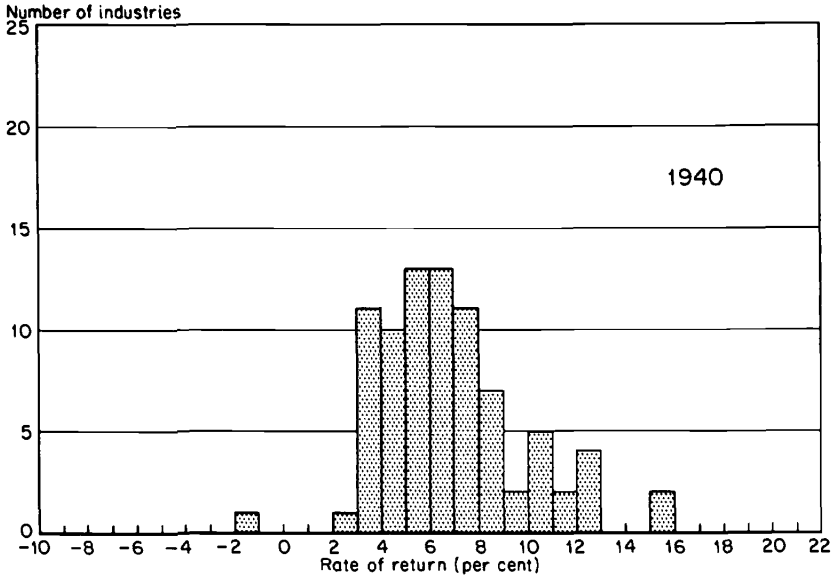
Frequency Distribution of Manufacturing Industries,  
by Annual Rate of Return, 1938-57



(continued)

AND THE PATTERN OF RATES OF RETURN

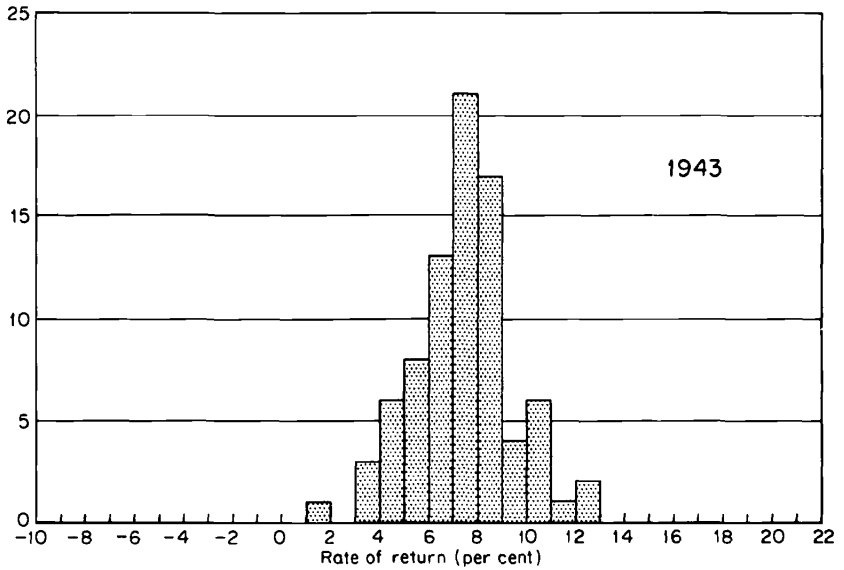
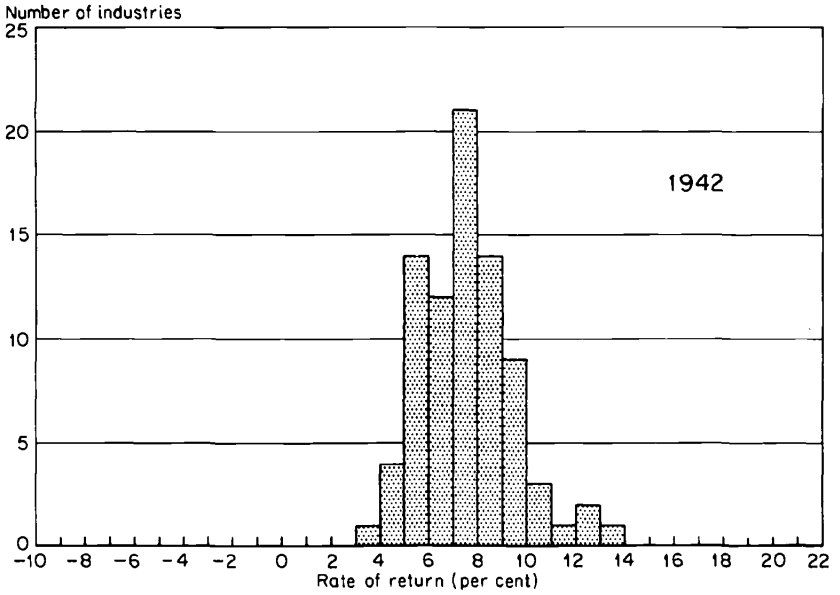
CHART 3 (continued)



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THE FLOW OF INVESTMENT

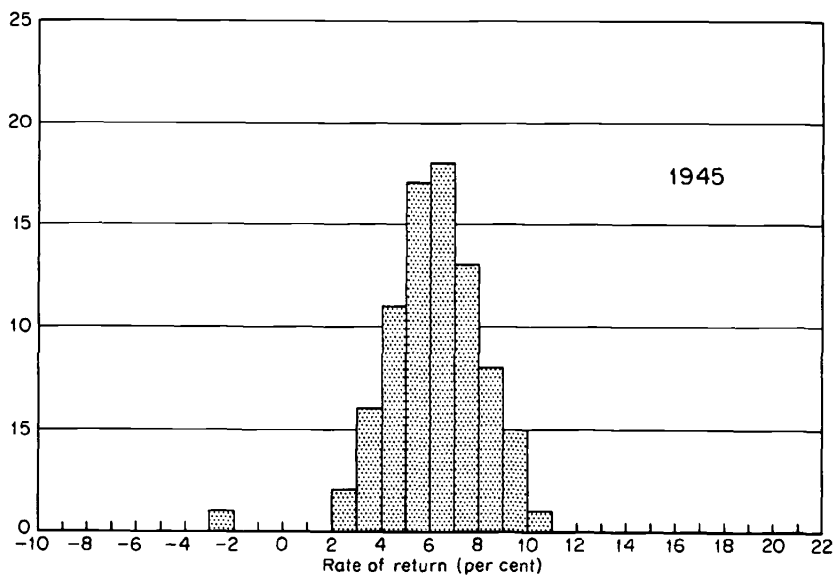
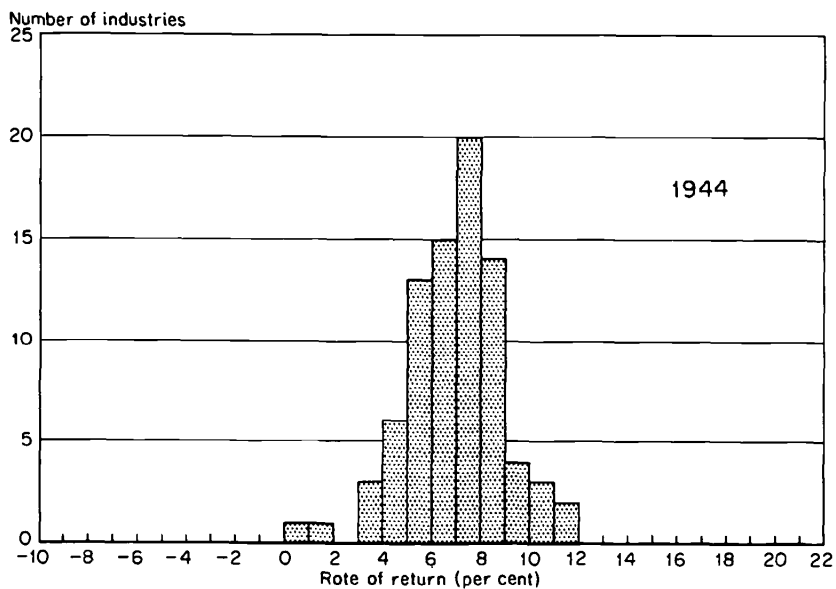
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AND THE PATTERN OF RATES OF RETURN

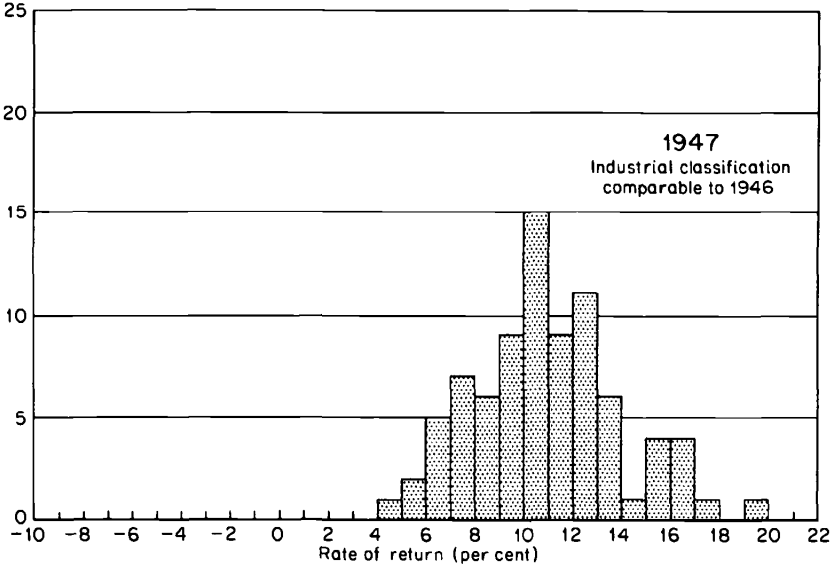
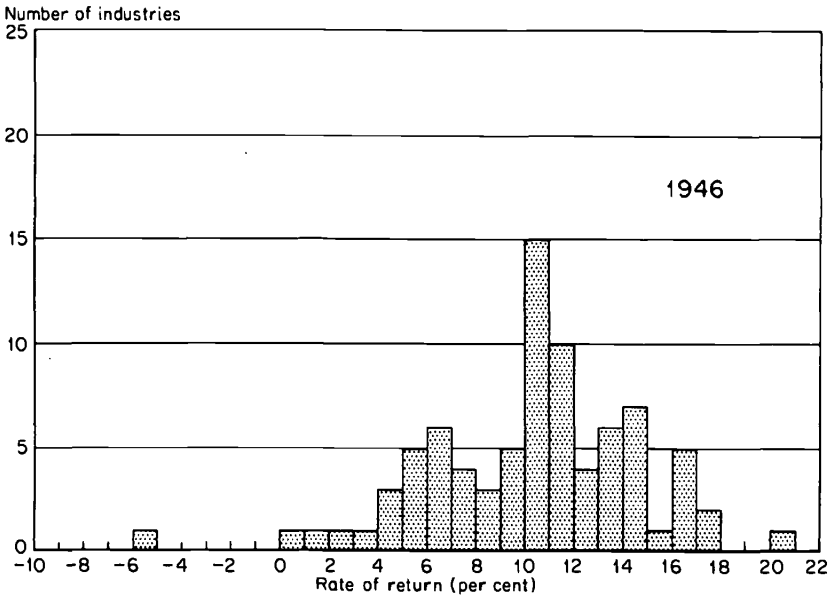
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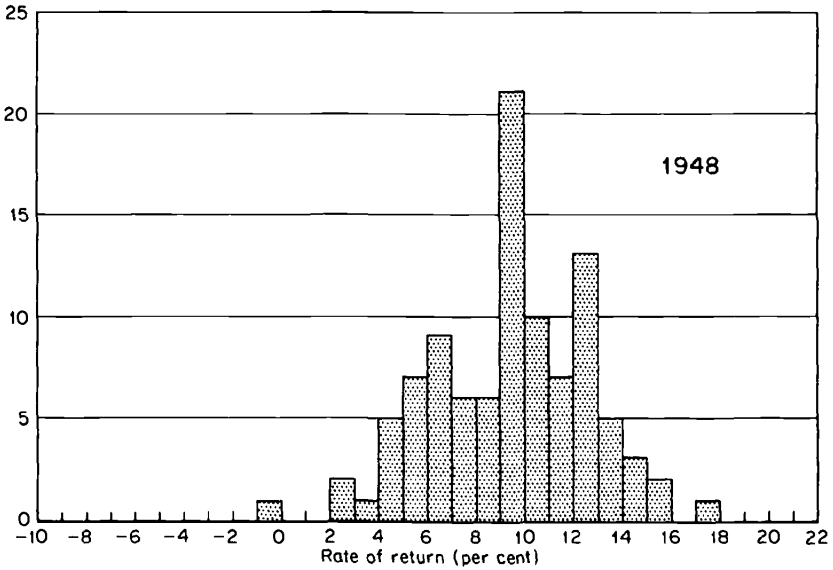
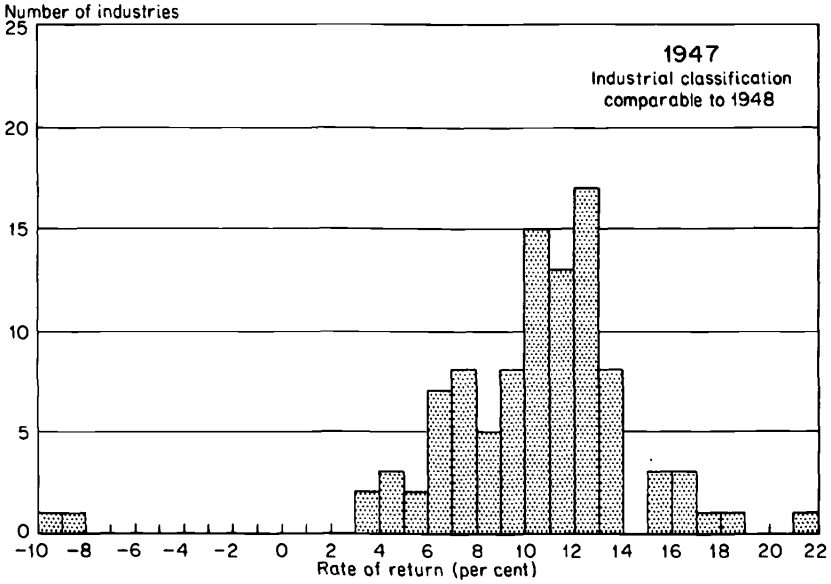
THE FLOW OF INVESTMENT

CHART 3 (continued)



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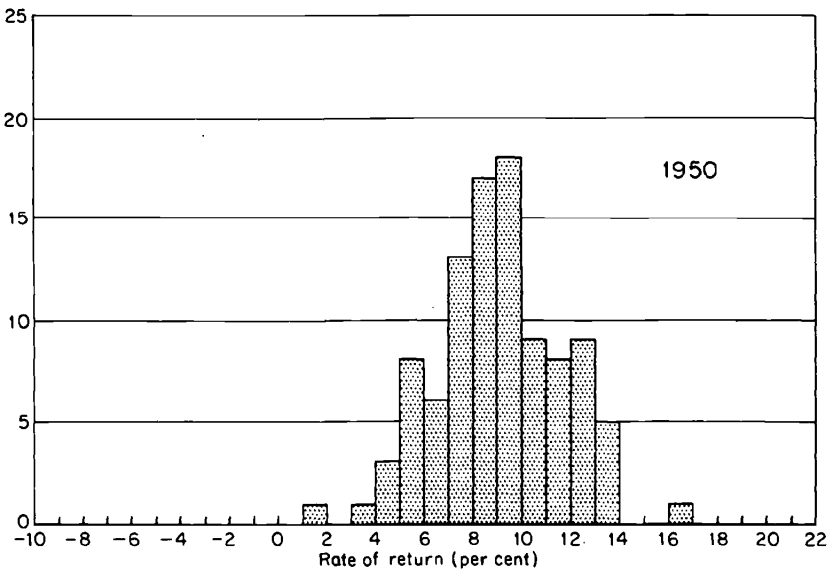
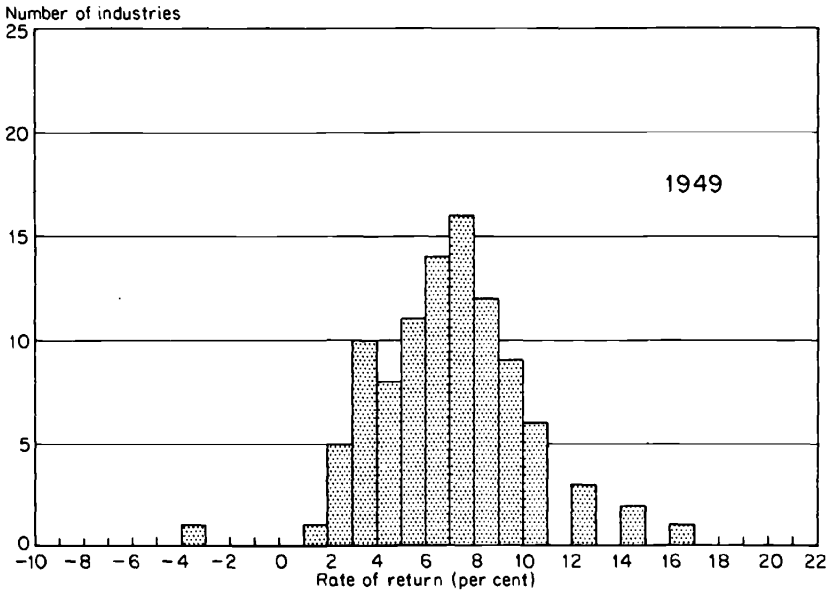
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THE FLOW OF INVESTMENT

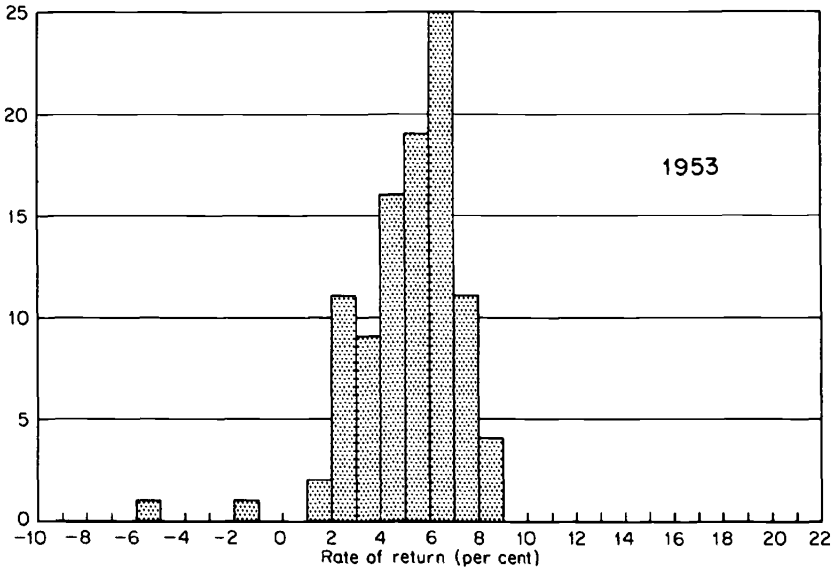
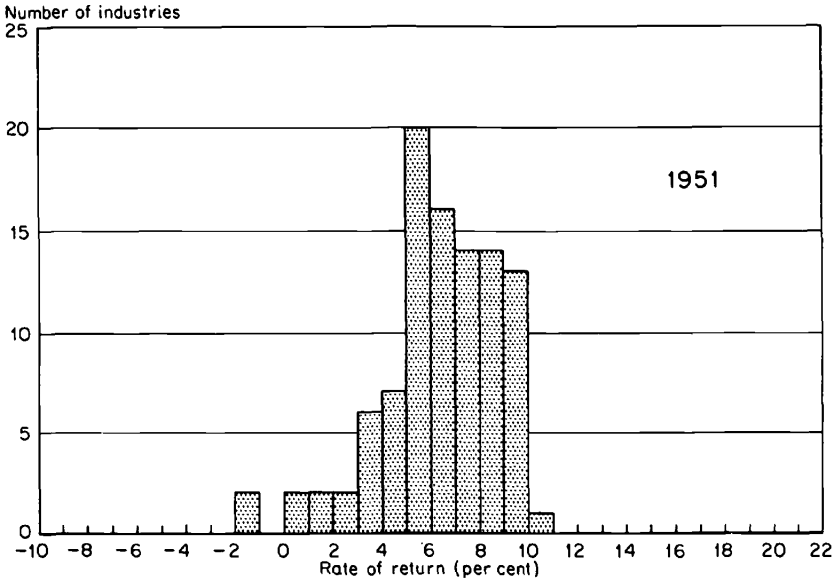
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AND THE PATTERN OF RATES OF RETURN

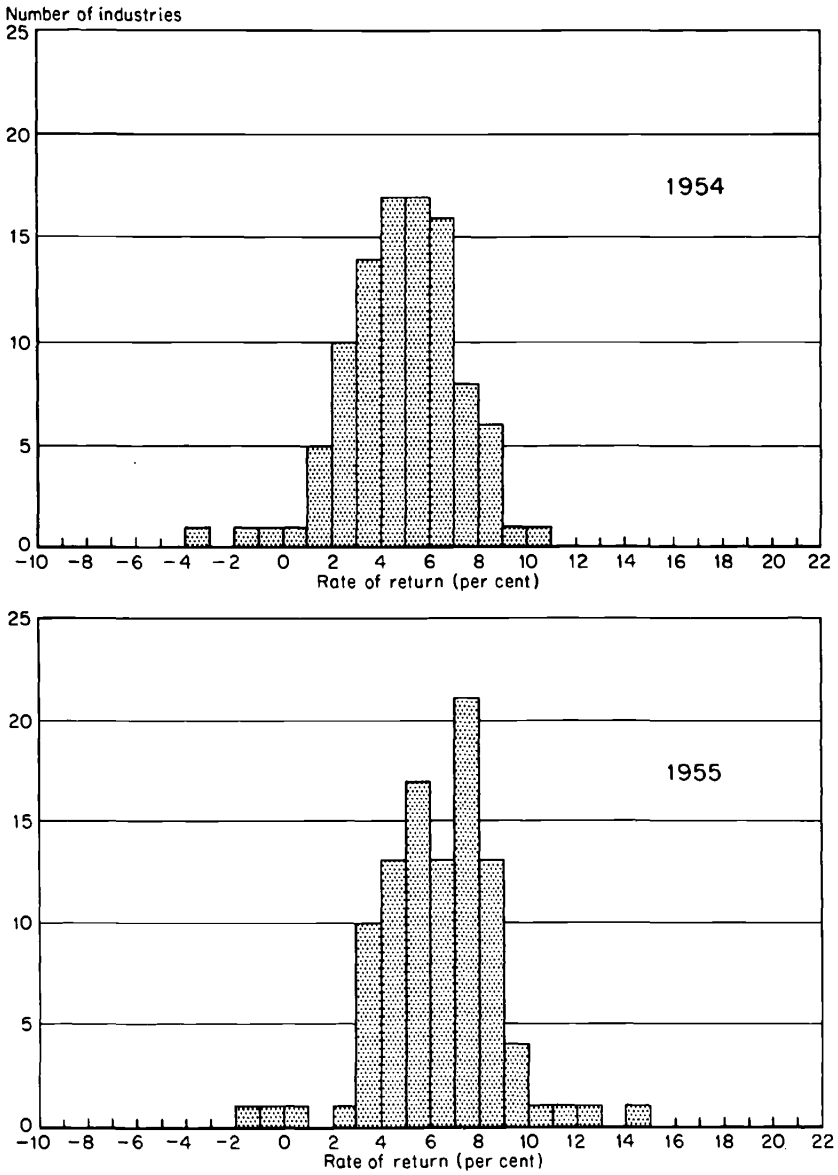
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THE FLOW OF INVESTMENT

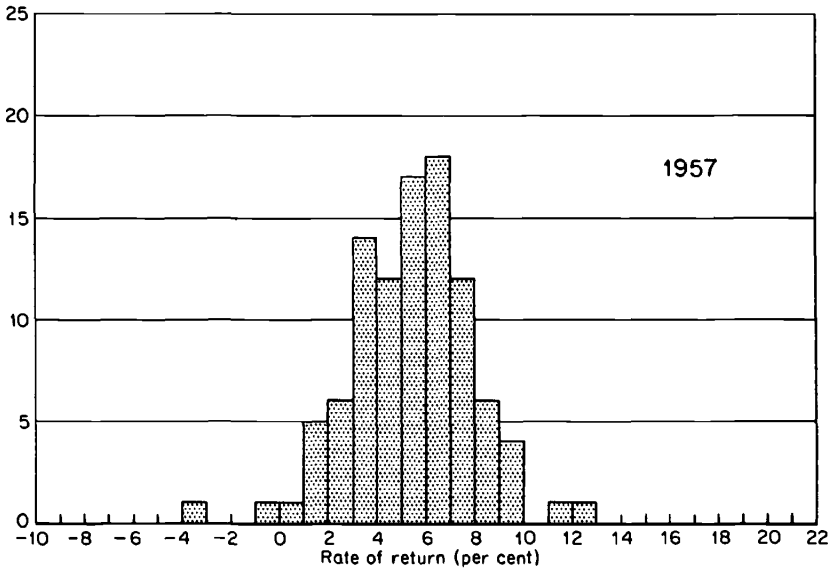
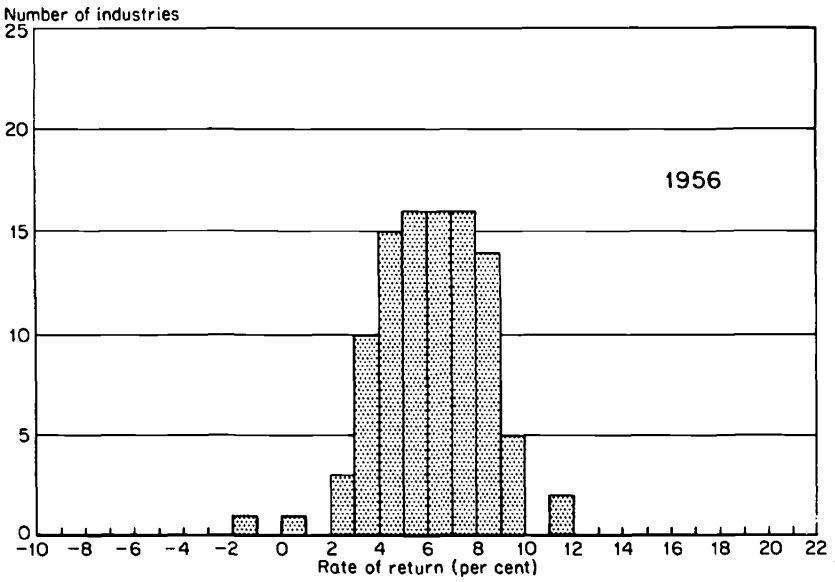
CHART 3 (continued)



(continued)

AND THE PATTERN OF RATES OF RETURN

CHART 3 (concluded)



Source: Tables A-14 to A-59.

## THE FLOW OF INVESTMENT

years aside, the standard deviation always exceeded 2 per cent. The empirical significance of the famous theorem that the rates of return tend to equality under competition, and the relevance of our data to this theorem, are discussed in detail in the next chapter.

These dispersions refer, of course, to interindustry differences in rates of return, and each industry average represents the weighted average of the firms' rates of return, ranging from 30 (cereals) to 6,989 (women's apparel) individual returns in 1950. For another purpose, described in Chapter 3, estimates were made of the dispersion of rates of return among firms within an industry,<sup>19</sup> and they are much larger. The standard deviations (calculated from 22 two-digit industry classes) in 1954, for example, are shown in the tabulation below.

<i>Asset Class</i> ( \$000's)	<i>Standard Deviation</i> (per cent)		
	Minimum	Maximum	Median
0-50	18.6	37.0	23.4
50-100	11.4	48.4	15.8
100-250	10.2	20.2	14.4
250-500	8.6	22.1	12.0
500-1,000	7.8	17.9	12.3
1,000-5,000	7.5	18.7	11.4
5,000-10,000	6.1	16.3	10.0
10,000-50,000	6.6	14.2	9.3

Similar estimates for other years consistently shared both characteristics of these standard deviations: the absolute level was high, and it fell quite steadily as the size of the enterprise increased.

### THE INDUSTRIAL PATTERN OF RATES OF RETURN

The industrial pattern of annual rates of increase of capital was found to be unstable over time, in considerable (and perhaps dominant) part because of measurement errors. The industrial pattern of rates of return, on the contrary, is relatively stable from year to year (Table 12): in every pair of years the correlation coefficient is highly significant. Aside from the years of demobilization after World War II, the coefficients are, in fact, always above .6 and average more than .7.<sup>20</sup> In the next chapter

<sup>19</sup> See Chapter 3, footnote 14.

<sup>20</sup> The statistical sources of instability that obscure the pattern of investment rates have much less influence upon the rates of return. A reclassification of companies, for example, will have at most a minor effect on an industry's rate of return because income is reclassified with assets.

AND THE PATTERN OF RATES OF RETURN

TABLE 12  
CORRELATION BETWEEN RATES OF RETURN IN MANUFACTURING  
INDUSTRIES IN SUCCESSIVE YEARS, 1938-57

Pair of Years	Number of Industries	Correlation Coefficient
1938 and 1939	82	.769
1939 and 1940	82	.848
1940 and 1941	82	.803
1941 and 1942	82	.782
1942 and 1943	82	.730
1943 and 1944	82	.885
1944 and 1945	82	.776
1945 and 1946	82	.494
1946 and 1947	82	.468
1947 and 1948	99	.689
1948 and 1949	99	.626
1949 and 1950	99	.677
1950 and 1951	99	.775
1951 and 1953	99	.738
1953 and 1954	99	.828
1954 and 1955	99	.826
1955 and 1956	99	.808
1956 and 1957	99	.790

the stability of the industry pattern over longer periods of time is explored.

The pattern is in general more stable—the correlation coefficients are larger—the less the dispersion of rates of return (see Table 11). During the war years, the dispersion of rates fell to a very low level due to heavy taxation, and the correlations of successive years were high; conversely in 1945-47, the dispersion of rates reached a peak and the correlations a trough. There is apparently a strong tendency toward at least short-run persistence of interindustry differentials in rates of return, and only very heavy impacts on this structure, arising out of major and sudden shifts of resources, are able to weaken this tendency appreciably. The implications of this characteristic for investment behavior are discussed in Chapter 4.

3. *Investment and Returns in Book Values Versus Stable Prices*

Throughout this chapter we have quietly assumed that changes in asset value were to be interpreted as changes in the volume of capital resources disposed of by an industry. Yet the period was one of inflation—and of substantial magnitude—upon which were superimposed highly diverse movements of individual prices. How can we know whether the industrial pattern of movement of book values of assets reflects movement of resources rather than of asset prices?

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In order to give at least a partial answer to this question, deflated capital values have been calculated for the major industrial categories in each year.<sup>21</sup> Although corresponding price deflators for three-digit industries require assumptions that seem seriously unreasonable, the comparative behavior of "real" and book-value assets for the broader groups sheds considerable light on the effects of price movements.

A direct comparison of annual percentage increases in book-value and "real" assets yields very favorable results on the whole (Table 13). In

TABLE 13  
CORRELATION OF PERCENTAGE CHANGE IN ASSETS, IN BOOK VALUES  
AND 1947 PRICES, MANUFACTURING INDUSTRIES, 1938-57

Year and Period	Coefficient of Rank Correlation
1938-39	.901
1939-40	.944
1940-41	.962
1941-42	.949
1942-43	.937
1943-44	.964
1944-45	.998
1945-46	.935
1946-47	.797
1947-48	.870
1948-49	.928
1949-50	.921
1950-51	.927
1951-52	.996
1952-53	.877
1953-54	.815
1954-55	.962
1955-56	.956
1956-57 <sup>a</sup>	.940
1938-41	.979
1941-44	.965
1944-47	.945
1947-50	.989
1950-53	.950
1953-56	.963

NOTE: Based upon 20 two-digit industries through 1947, and 22 two-digit industries thereafter.

<sup>a</sup> For percentage changes in corporate assets only.

15 of 19 annual comparisons, the rank correlation exceeds .9 and in no year does it fall below .8. Moreover, if we compare movements over three-year periods, the correlations are all above .94. The deflation

<sup>21</sup> See Appendix A.

leaves the ranking of industrial categories by rates of increase of assets almost unchanged.

There is good reason to believe that a similar result would hold for minor industries if we could deflate the assets data. If we denote assets by  $A$ , and price indexes by  $P$ , the relative increase in book values from year 1 to year 2 is  $A_2/A_1$ , whereas the deflated relative increase is

$$\frac{A_2/P_2}{A_1/P_1} = \frac{A_2/A_1}{P_2/P_1}$$

If we let

$$a = \log A_2/A_1$$

$$b = \log P_2/P_1$$

then we wish to know the correlation between  $a$  and  $(a + b)$ . Let  $a'$  and  $b'$  be the deviations of  $a$  and  $b$  from their means. Then

$$r_{a(a+b)} = \frac{\Sigma a'(a' + b')}{\sqrt{\Sigma (a')^2 \Sigma (a' + b')^2}}$$

$$= \frac{N\sigma_a^2 + N\sigma_a\sigma_b r_{ab}}{N\sigma_a(\sigma_a^2 + \sigma_b^2 + 2\sigma_a\sigma_b r_{ab})^{1/2}}$$

$$= \frac{\sigma_a + \sigma_b r_{ab}}{(\sigma_a^2 + \sigma_b^2 + 2\sigma_a\sigma_b r_{ab})^{1/2}}$$

If  $r_{ab}$  is small—if the movements of book values and price deflators are not closely correlated—

$$r_{a(a+b)} = \frac{1}{\left(1 + \frac{\sigma_b^2}{\sigma_a^2}\right)^{1/2}}, \text{ approximately,}$$

that is, increases in book values will be closely correlated with movements in deflated values, providing the standard deviation of the rates of price increase among industries is much smaller than the standard deviation of the rates of increase of assets in book values, and the two are not highly correlated. These conditions appear to hold.

The correlations between percentage change in book-value assets and percentage change in price deflators are usually fairly small for the two-digit industrial groups; and they are possibly smaller among the three-digit industries.<sup>22</sup> The variance of the percentage increases in capital is

<sup>22</sup> The correlation coefficients for the two-digit groups are:

1938-41	.152
1941-44	.202
1944-47	-.057
1947-50	.619
1950-54	.255

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many times the variance of the price ratios for the two-digit groups.<sup>23</sup> We know the variance of the percentage rates of increase in the assets of minor industries is much larger than that of the major industrial groups. The price deflators are in good part (i.e., with respect to durable assets and working capital) based upon prices common to many industries, and in general one does not expect fairly broad price indexes appropriate to the deflation of assets of industries to display the diversity that rates of investment show.

TABLE 14  
COMPARISON OF RATE OF RETURN, IN BOOK VALUES AND 1947 PRICES,  
TWO-DIGIT INDUSTRIES, SELECTED YEARS, 1938-56

Year	Unweighted Average Rate of Return		Coefficient of Rank Correlation	Average Absolute Deviation Between Book-Value Rate and 1947 Rate (per cent)
	Book Values	1947 Prices (per cent)		
1938	2.87	2.88	.998	.20
1947	9.94	9.51	.968	.60
1954	5.50	6.04	.955	.53
1956	6.51	7.38	.963	.87

SOURCE: Tables A-14 to A-59.

These arguments apply much more weakly to comparisons of relative increases of assets at different times. A rise in book values of 1 per cent in 1933 would represent a larger increase in assets than a rise of 10 per cent in 1947 would (when the average price index rose 10.8 per cent). In our period, however, the movements of asset prices were sufficiently steady, so the general order of magnitude of the rates of increase of book values is fairly similar to those for deflated values; the rank coefficient of correlation for the two series in Table 3 is .895 for the period 1938-54.

The rates of return have been calculated in 1947 prices as well as in book values.<sup>24</sup> The agreement between the two, at the level of the major

The derivative of  $r_{a(a+b)}$  with respect to  $(r_{ab})$  has the sign of

$$\sigma_b / \sigma_a - r_{ab}.$$

Hence  $r_{a(a+b)}$  will be decreased if  $r_{ab}$  is positive and moderately large.

<sup>23</sup> The variances are:

	$\sigma_a^2$	$\sigma_b^2$
1938-41	240.8	10.0
1941-44	2,195.5	41.6
1944-47	2,423.1	45.8
1947-50	161.2	3.5
1950-54	518.8	19.9

<sup>24</sup> In addition, rates of return were calculated in current prices (see Appendix A).

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industrial groups, is in general very close (see the rank correlations in Table 14). The absolute levels of the two series are also fairly close, since we deflate income as well as assets: the absolute difference in rates in 1947 prices and book values averaged .38 percentage points during the period 1938-57.