Volume Title: Capital in Transportation, Communications, and Public Utilities: Its Formation and Financing

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Volume Publisher: UMI

Volume ISBN: 0-870-14102-3

Volume URL: http://www.nber.org/books/ulme60-1

Publication Date: 1960

Chapter Title: The Evolution of Financial Structures

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Chapter URL: http://www.nber.org/chapters/c1496

Chapter pages in book: (p. 143 - 173)

CHAPTER 8

The Evolution of Financial Structures

PARALLELING the physical growth of the regulated industries over the span from 1870 to 1950 was the ever-present need for money capital. The huge aggregations of equipment and structures for the railroads, electric power, telephones, and the other components entailed a draft upon the nation's savings which was at all times very substantial. In the nation's organized financial markets, the relative weight of those requirements was even greater. For the establishment and subsequent growth of the great business units characteristic of this segment of the economy typically necessitated accumulations of capital far greater than those at the immediate command of their organizers and managers. The acquisition of funds from other sources was a literal prerequisite for their development.

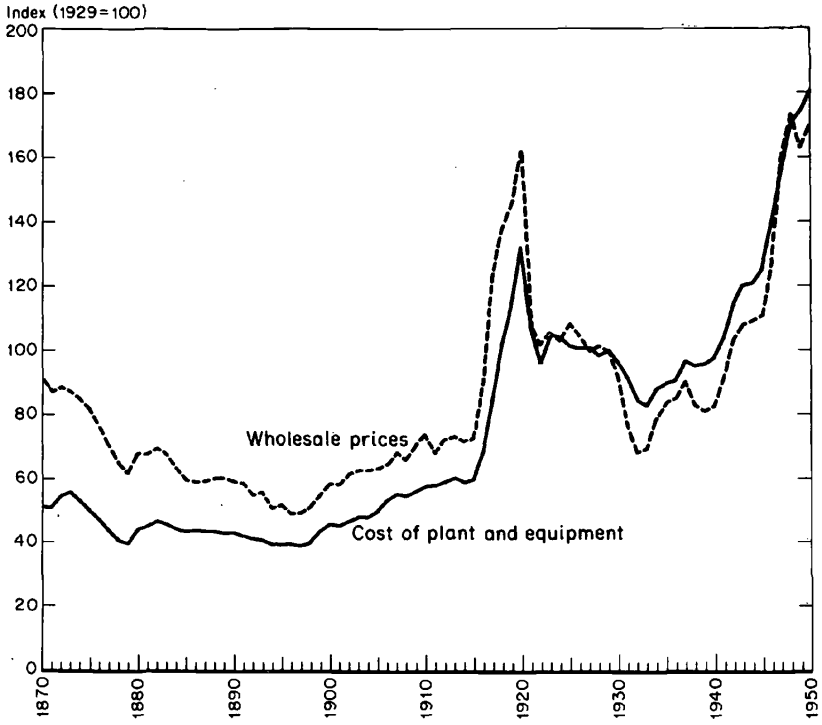
The particular manner in which such funds are acquired, however, necessarily changes over time, in response to the alterations in financial institutions, conventions, environmental factors, and the process of growth itself. It is to the broader pattern of such changes that we now proceed, with a view to discovering what, if any, persistent revisions have occurred in the means of financing the regulated industries over the eighty-year period studied. To focus attention upon the financial aspect of development, however, requires a different framework from that used in this volume so far. In previous analyses we have confined attention to the flow of real capital—to aggregates expressed in terms of constant dollars and considered representative, insofar as techniques of deflation permit, of physical quantities. Present purposes require centering upon the money flows themselves, unadjusted for price changes.

The Flow of Money Capital

A brief review of the general magnitude of these flows may provide a useful background for the financial analysis, for the trend of prices from 1870 to 1950 was sufficiently pronounced to make for significant differences between the flows of real and money capital. Broadly, the influence of prices was exercised in opposite directions in two periods. From the early 1870's through the late 1890's, the trend in the cost of plant and equipment was gently downward, as the solid line of Chart 23 shows. In this period, then, the sharp rise in real capital formation was slightly modified, or dampened, when translated into money terms. In the following years the opposite trend appeared and in much greater dimension. From the late 1890's to

CHART 23

Indexes of the Cost of Plant and Equipment of the Regulated Industries and the Wholesale Prices of All Commodities, 1870–1950

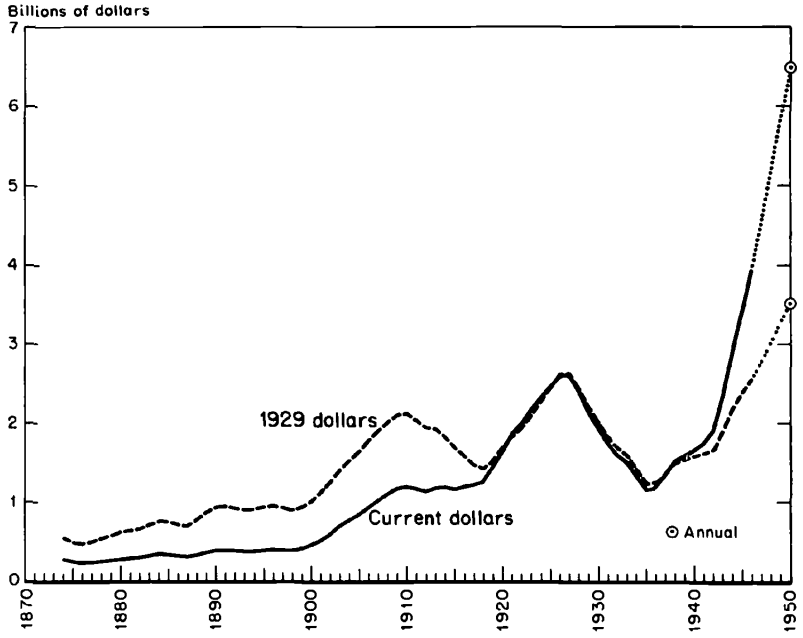


Source: Cost of utility plant and equipment, Appendix Table B-10; wholesale prices, Bureau of Labor Statistics.

the mid-1920's, the average price of capital goods increased two and one-half times. Between 1925 and 1950 there was a further rise of about 80 per cent. Over the period 1870–1950 as a whole, the chart shows, the advance in the cost of plant and equipment was considerably greater than that of the general level of wholesale prices. In the pre-1896 years, its decline was much more modest; its subsequent rise was more vigorous. In 1950 the cost of capital goods was fully three and one-half times as great as in 1870. Over the same period the general level of wholesale prices barely doubled. Hence the difference between the magnitude of the advance in the real, and in the money capital flows of the regulated industries reflected more than an alteration in the general price level; it mirrored, too, a revision in the *structure* of prices which rendered capital goods more costly in relation to others.

CHART 24

Gross Capital Formation, All Regulated Industries, 1874–1946
(nine-year moving averages)



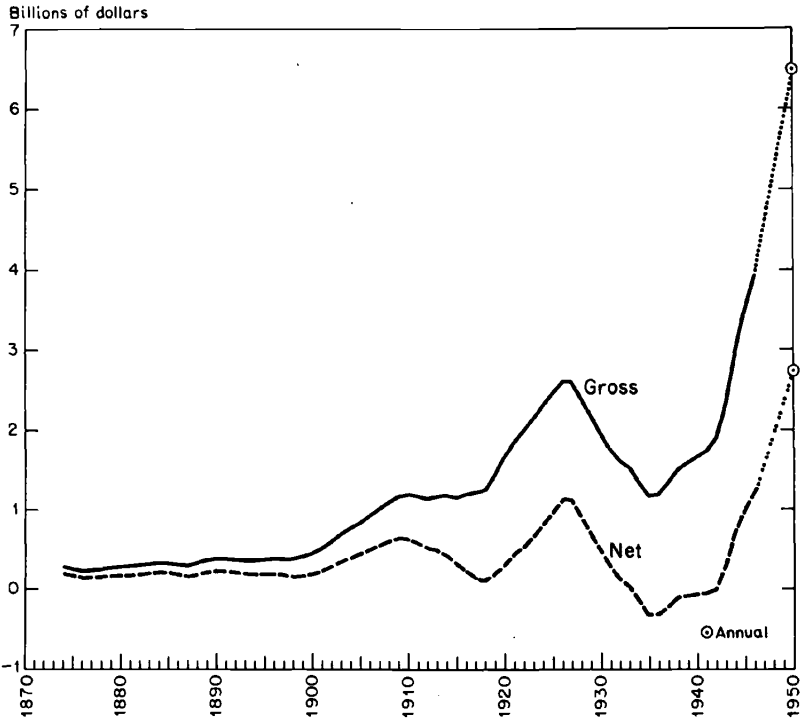
Source: Appendix Tables K-2, for 1929 dollars; K-6, for current dollars.

The effect is shown in Chart 24, which compares gross capital formation measured in current and in 1929 dollars. The general upward trend is very much more pronounced in the former. The gross flow of funds averaged between 200 and 300 million current dollars annually in the 1870's and 1880's. By the pre-World War I period, it exceeded one billion current dollars per annum, reached 2.6 billion in the 1920's and about 4.0 billion yearly in the 1940's. It will be recalled that this flow represents the expenditures of the regulated industries for plant and equipment; inventory accumulation, which is small in this segment of the economy, is omitted. Comparison may therefore be made with the gross expenditures of nonagricultural industry on plant and equipment as measured by the Department of Commerce. In 1950, when the gross flow of funds in the regulated industries amounted to 6.5 billion dollars, it represented 31 per cent of the national total. Since it is these expenditures which require long-term financing, the importance of the regulated industries in capital markets is patent.

CHART 25

Gross and Net Capital Formation, All Regulated Industries, Current Dollars, 1874–1946

(nine-year moving averages)



Source: Appendix Tables K-6, for gross capital formation; K-8, for net capital formation.

In Chart 25, the gross and the net flow of funds from the regulated industries are compared. The figures for these and related series are given in Table 45. Although in real terms, the pace of the advance in net capital formation in this segment of the economy was retarded after World War I, the secular trend of the net money flow continued upward throughout the period of record. But the rise is by no means as pronounced as in the gross flow. Indeed the difference between the two expands progressively and swiftly. This difference is of considerable importance, for it represents capital consumption measured in current prices—i.e. at *replacement* cost.

It was pointed out earlier that the normal process of growth ensures that capital consumption must ultimately equal and then exceed the magnitude of net capital formation.[1] This is true, whether

[1] See page 15.

TABLE 45

All Regulated Industries: Value of Plant and Equipment, Capital Formation, and Capital Consumption, Current Dollars, Nine-Year Moving Averages

(in millions)

Central Year of Nine-Year Average	*Value of Plant and Equipment*	*Gross Capital Formation*	*Net Capital Formation*	*Capital Consumption*
1876	5,218	224	134	90
1880	5,423	275	176	100
1886	6,503	314	183	131
1890	7,010	386	234	152
1896	7,861	390	186	204
1900	9,027	449	182	267
1906	12,695	927	505	423
1910	16,447	1,185	633	554
1916	25,474	1,193	210	988
1920	34,083	1,678	344	1,339
1926	39,614	2,614	1,125	1,496
1930	40,670	1,937	460	1,484
1936	38,790	1,178	−328	1,510
1940	41,984	1,663	−70	1,735
1946	57,512	3,942	1,264	2,678
1950[a]	78,453	6,488	2,736	3,752

[a] For 1950 only.

Source: Appendix Tables K–5, 6, 7, 8.

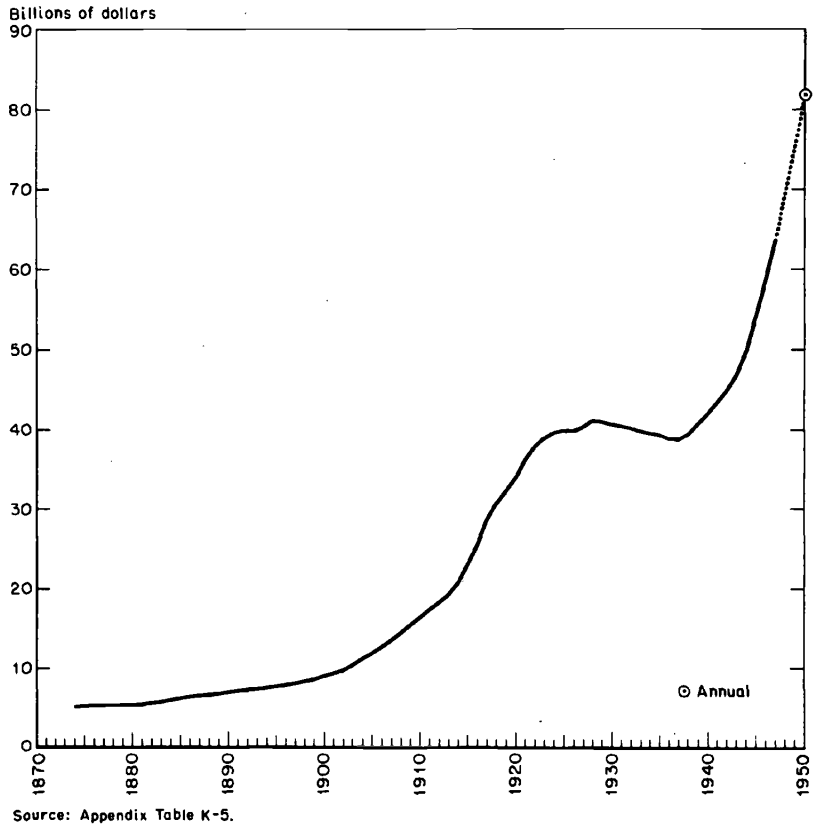
the flows are measured in real or in money (current dollars) terms. In the regulated industries a period of rough equality in these money flows came just before the turn of the century. After that capital consumption drew far ahead; even in 1950 when net capital formation reached a peak of 2.7 billion dollars, capital consumption was greater by about one billion.

The close connection between the real stock of capital and real net capital formation (the latter representing merely the change in the former) of course ceases to hold when these quantities are expressed in current dollars. For a price change will alter the money value of plant and equipment, either upward or downward, even in the absence of net capital expenditures. The trend of one cannot be derived from the other, as would be the case if the influence of prices were eliminated. In the light of the sharp general upward trend of prices, compounded as it was with the brisk flow of net capital expenditures, it is apparent that the growth of the money value of the plant and equipment of the regulated industries must have been enormous. The pace of the advance is depicted in Chart

CHART 26

Value of Plant and Equipment, All Regulated Industries, Current Dollars, 1874–1947

(nine-year moving averages)



Source: Appendix Table K-5.

26. From somewhat more than five billion dollars in the 1870's, the money value of plant and equipment rose to about 10 billion just after the turn of the century, and then catapulted to 40 billion in the 1920's and—with the second postwar inflation—to nearly 80 billion at the beginning of 1950. The spectacular behavior of the money value of capital, however, should not be permitted to obscure the underlying trends of the physical quantities described in the previous chapters. For the *relationships* among these money flows, since the influence of prices is common to them all, are much the same as those which prevail among the real aggregates, despite the one important difference already pointed out. In this sense, even for

financial analysis, as we shall see in the following sections, these "real" trends are of paramount importance.

The Statistical Setting

A study of the financing of capital formation—in an industry or in the nation as a whole—requires a comprehensive view of the entire complex of the economic unit's financial transactions. For there is no way of tracing the route of a *particular dollar* obtained from some given source to any of the alternative uses to which it might be put; nor, since dollars are interchangeable, would there be any sensible purpose to such an undertaking. Hence, the sources and uses of capital funds must be analyzed in their entirety. For present purposes, since our principal interest is in secular development, we should require a *sequence* of such analyses, covering successive time intervals over as much of the 1870–1950 period as possible. We would in this way acquire a statistical portrait of the evolution of financial structures, and an opportunity to determine the dominant tendencies characteristic of it. Compilations framed with this end in view are presented for four of the principal components of the regulated industries—railroads, electric light and power, telephones, and street and electric railways; it was not possible to assemble appropriate materials for all regulated industries in the aggregate. The relevant data are given in Tables 46 through 49.

These tables provide information on all of the uses to which capital funds were put, and on all of the sources of these funds, during designated periods. Except for statistical errors, of course, the totals of sources and uses must balance. In the compilation at hand, however, only percentage distributions are given, although data on capital formation included at the bottom of the tables provide a guide to the *absolute* dimensions of the capital flow under review. This procedure was adopted for two reasons: (1) assuming that the time periods selected are reasonably representative, principal interest in our analysis actually centers in the proportions involved, rather than in the absolute magnitude of each of the items in the tables; (2) since the lengths of the intervals studied vary, and since the proportions of the industries covered also shift over time, comparison of the raw data underlying the tables would have been misleading. Nevertheless some of the characteristics of the basic data (given in Appendix J) may be noted before proceeding, in order to make the limitations of our tabulations clear.

In the earlier years the sources and uses of funds were approximated primarily by calculating the differences in corresponding balance sheet items from the beginning to the end of each of the

TABLE 46. Sources and Uses of Funds, Steam Railroads, 1880–1949: Percentage Distributions

	July 1, 1880 to June 30, 1890	*July 1, 1893 to June 30, 1907*	*July 1, 1907 to Dec. 31, 1916*	*July 1, 1914 to Dec. 31, 1920*	*Jan. 1, 1921 to Dec. 31, 1930*	*Jan. 1, 1931 to Dec. 31, 1940*	*Jan. 1, 1941 to Dec. 31, 1949*
Uses							
1. Gross capital expenditures[a]	85.9	74.0	108.8	78.6	120.3	121.6	80.4
(a) Road and equipment[a]	N	N	N	74.4	121.0	117.0	79.6
(b) Miscellaneous physical property[a]	9.9	N	4.6	4.2	−0.8	4.7	0.8
2. Current assets	4.1	17.0	2.6	8.1	−15.2	−3.7	18.8
(a) Inventories	0.6	2.7	2.3	14.8	−5.0	−4.0	4.5
(b) Receivables				5.8	−7.5	−2.6	1.9
(c) Cash and deposits	3.5	14.3	0.3	−0.8	2.3	4.2	10.1
(d) Other current assets				−11.7	−5.1	−1.3	2.3
3. Long-term securities, other than those in affiliated companies	N	N	N	−13.3	2.7	−12.2	1.5
4. Other assets	0	9.0	−16.1	26.6	−7.8	−5.8	−0.8
5. Total uses	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Sources							
6. Retained profits	2.4	9.5	29.7	34.9	50.8	13.9	47.3
7. Depreciation charges			13.2	17.8	44.0	83.5	54.3
8. Current liabilities	7.3	11.9	2.3	21.5	−12.9	−20.3	9.2
(a) Tax liability	N	N	N	N	N	−0.2	4.1
(b) Other current liabilities	N	N	N	N	N	−20.1	5.1
9. Net new issues	90.3	73.7	63.2	3.3	25.8	14.3	−6.6
(a) Stocks	43.0	47.5	35.0	−3.0	14.8	11.9	−7.1
Common	N	N	N	−2.0	11.9	5.7	−5.8
Preferred	N	N	N	−1.0	2.9	6.2	−1.3
(b) Bonds	54.9	63.8	60.1	36.5	37.1	−22.6	−11.4
(c) (Less) investments in affiliated companies	−7.5	−37.6	−32.0	−30.2	−26.0	25.1	11.9
10. Other	0	4.8	−8.3	22.5	−7.8	8.6	−4.2
11. Total sources	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Gross capital formation							
Millions of current dollars	2,687	2,978	5,280	3,021	8,088	2,874	7,020
Millions of 1929 dollars	6,069	6,382	8,945	3,365	7,961	3,246	5,067

Detail may not add to 100 because of rounding. N = Not shown separately. [a] Includes land.

TABLE 47

Sources and Uses of Funds, Electric Light and Power, 1881–1950: Percentage Distributions

	Jan. 1, 1881 to Dec. 31, 1912	*Jan. 1, 1913 to Dec. 31, 1922*	*Jan. 1, 1928 to Dec. 31, 1937*	*Jan. 1, 1938 to Dec. 31, 1950*
Uses				
1. Gross expenditure on plant and equipment[a]	89.1	78.2	87.4	94.5
2. Current assets	5.9	10.2	−0.2	8.7
(a) Inventories	N	N	N	3.2
(b) Receivables	N	N	N	1.2
(c) Cash and deposits	N	N	N	4.3
(d) Other current assets	N	N	N	[b]
3. Long-term securities, other than those in affiliated companies	3.3	3.1	16.4	−0.3
4. Other assets	1.7	8.5	−3.6	−2.9
5. Total uses	100.0	100.0	100.0	100.0
Sources				
6. Retained profits	4.9	5.3	7.3	12.8
7. Depreciation charges	2.7	10.2	16.3	37.5
8. Current liabilities	8.5	7.0	0.9	6.4
(a) Bills and accounts payable	2.7	6.8	N	2.1
(b) Tax liability	5.8	0.1	N	4.1
(c) Other short-term debt			N	0.2
9. Net new issues	82.7	76.6	75.0	44.2
(a) Stocks	49.5	37.1	36.4	18.0
Common	42.0	24.4	N	N
Preferred	7.5	12.7	N	N
(b) Bonds	38.5	49.8	38.6	24.8
(c) (Less) investments in affiliated companies	−5.4	−10.3	N	1.4
10. Other	1.1	1.0	0.5	−1.0
11. Total sources	100.0	100.0	100.0	100.0
Gross capital formation				
Millions of current dollars	1,771	2,067	4,027	10,746
Millions of 1929 dollars	3,856	2,643	4,124	6,752

Detail may not add to 100 because of rounding.
N = Not shown separately.
[a] Includes land.
[b] Less than one-tenth of 1 per cent.

intervals studied. This was the method employed for railroads prior to 1914, for electric power prior to 1937, for telephones prior to 1913, and for street railways throughout the period for which data are presented. It can obviously provide only rough approximations of the magnitudes we seek, and its use affords another reason for confining our tabulations to percentage distributions. The most important source of distortion springing from the procedure followed in the earlier years is to be found in revisions in property valuations

TABLE 48

Sources and Uses of Funds, Telephones, 1877–1950: Percentage Distributions

	Jan. 1, 1891 to Dec. 31, 1902	*Jan. 1, 1903 to Dec. 31, 1912*	*Jan. 1, 1913 to Dec. 31, 1920*	*Jan. 1, 1921 to Dec. 31, 1930*	*Jan. 1, 1931 to Dec. 31, 1940*	*Jan. 1, 1941 to Dec. 31, 1950*
Uses						
1. Gross expenditure on plant and equipment[a]	84.6	86.5	93.7	87.2	113.8	92.7
2. Current assets	13.3	5.5	N	N	N	N
(a) Inventories	2.4	N	2.6	1.4	−3.0	0.8
(b) Receivables	10.9	N	3.1	2.1	−10.0	3.7
(c) Cash and other current assets		N				
3. Long-term securities, other than those in affiliated companies	2.0	6.4	0.6	9.3	−1.9	2.2
4. Other	0.1	1.7	0	0	1.7	0.6
5. Total uses	100.0	100.0	100.0	100.0	100.0	100.0
Sources						
6. Retained profits	−2.2	4.9	10.9	11.2	−7.4	2.1
7. Depreciation charges	8.5	14.7	47.4	31.9	107.2	38.4
8. Current liabilities	10.9	5.4	2.0	3.0	3.7	8.6
(a) Tax liability	N	N	3.8	2.3	2.5	3.1
(b) Other current liabilities	N	N	−1.8	0.7	1.2	5.5
9. Net new issues	82.6	74.8	39.6	53.9	−3.1	50.7
(a) Stocks	64.1	80.1	6.6	38.8	−7.1	8.5
(b) Bonds	18.5		36.2	19.2	4.8	45.5
(c) (Less) investment in affiliated companies	N	−5.3	−3.1	−4.2	−0.8	−3.2
10. Other	0.2	0.2	0.1	0	−0.4	·0.2
11. Total uses	100.0	100.0	100.0	100.0	100.0	100.0
Gross capital formation						
Millions of current dollars	382	905	948	3,708	2,092	7,083
Millions of 1929 dollars	841	1,614	1,152	3,439	2,102	5,007

Details may not add to 100 because of rounding. N = Not shown separately. [a] Includes land.

TABLE 49

Sources and Uses of Funds, Street and Electric Railways: Percentage Distributions

	July 1, 1890 to June 30, 1902	*July 1, 1902 to Dec. 31, 1912*	*Jan. 1, 1913 to Dec. 31, 1922*
Uses			
1. Gross expenditure on road and equipment[a]	87.0	96.5	57.1
2. Current assets	2.0	4.7	8.9
(a) Inventories	0.4	N	N
(b) Receivables	0.7	N	N
(c) Cash and other current assets	0.9	N	N
3. Long-term securities, other than those in affiliated companies	5.0	−1.9	14.9
4. Other assets	6.0	0.7	19.0
5. Total uses	100.0	100.0	100.0
Sources			
6. Retained profits	1.4	2.2	−12.6
7. Depreciation charges		3.2	26.2
8. Current liabilities	4.8	12.8	13.4
(a) Bills and accounts payable	4.0	−0.6	6.2
(b) Interest, dividends, and taxes payable	0.7	1.6	19.6
(c) Other short-term debt		11.8	−12.4
9. Net new issues	88.2	84.0	66.9
(a) Stocks	49.6	44.2	−5.2
Common	N	N	−13.2
Preferred	N	N	8.0
(b) Bonds	38.6	54.1	81.1
(c) (Less) investments in affiliated companies	N	−14.3	−9.0
10. Other	5.7	−2.2	6.1
11. Total sources	100.0	100.0	100.0
Gross capital formation			
Millions of current dollars	1,134	1,410	1,087
Millions of 1929 dollars	2,663	2,643	1,292

Detail may not add to 100 because of rounding.
N = Not shown separately.
[a] Includes land.

—especially write-ups. They were particularly pronounced in the railroads before 1907 (when Interstate Commerce Commission regulations bearing on accounting procedures were strengthened) and in street railways before 1913. Their principal effect on our data is to inflate "expenditures on plant and equipment" on the uses side and "retained profits" and "net new issues" among the sources. Checks on the magnitude of distortion, given in Appendix J, suggest that in some of these earlier periods expenditures on plant and

equipment may have been overstated for the railroads and electric power by as much as 24 and 15 per cent respectively. Such checks were not available for telephones or street railways, though general information indicates that the magnitude of write-ups may have been about the same for the latter and considerably smaller for the former.

In the later years (railroads after 1914, electric power after 1937, and telephones after 1913) the tabulations rest on a quite different foundation, and the apparent degree of accuracy is accordingly much higher. Distortions arising from changes in value were largely eliminated, for in the compilations in these years estimated series on capital expenditures, retained profits, depreciation charges, and net new issues were directly incorporated. The sources side and the uses side, each of which was in the main independently estimated, are in every case approximately in balance.[2] Nevertheless, taking the period of study as a whole, it is apparent that the data of Tables 46 through 49 are to be employed primarily for the detection of major trends and for the observation of the broader proportionate relations among the components. Fine differences must clearly be ignored. The presentation of percentage distributions, rather than the original data, was designed in part to encourage such interpretation.

The fairly long intervals for which sources and uses have been compiled also operate in this direction. Generally, the periods are in the neighborhood of a decade, and vary at the extremes from six to fifteen years, barring the initial interval for electric power, which covers the industry from its beginnings to the point at which comprehensive accounting data first became available. This telescoping of time, of course, obscures short-term movements. A brief period of heavy bond flotations followed by one of equally heavy redemptions may appear, in summary, as simply "no change" in one of our intervals. But insofar as that fault permits focusing upon the longer-term trends, it is in fact an advantage. So, from this point of view, is the netting-out of changes within the broad industry aggregates employed. For example, it is of interest that western railroad lines have in recent years grown in relation to the eastern lines. The composite changes over time, however, are also of interest, and it is upon these that emphasis is placed in this study.

The Sources and Uses of Capital Funds

Throughout this volume, the capital formation of the regulated industries is measured exclusively in terms of expenditures on fixed capital—plant, road, and equipment. Inventory accumulation is

[2] See Appendix J.

ignored as of little consequence. The basis for this judgment appears in the data in the upper panels of Tables 46–49. Generally, inventory accumulation accounted for less than 3 per cent of all uses of capital funds against at least 75 per cent for expenditures on plant and equipment. Only during the relatively brief period of war and postwar inflation in the railroad component—from 1914 to 1920—did inventory accumulation appreciably exceed this maximum level; and in the next two decades there was an offsetting liquidation. Only in street railways from 1913 to 1922, when contraction in physical terms was already under way, did expenditures on road and equipment fall appreciably below their minimum level. In all periods for which data are available, and in all components, inventory accumulation accounted for less than 2 per cent of all uses of funds, compared with more than 90 per cent for expenditures on plant and equipment.

Indeed, in the pattern of capital uses generally there appears to have been a considerable degree of stability over time among the several components. Cash and deposits were built up rather steadily by amounts varying in the main between 2 and 10 per cent of all dispositions. Investment in long-term securities was of about the same size, except for heavy liquidation by the railroads after 1914. Inventory accumulation was progressive but small. By far the most important use at all times was expenditures on plant and equipment. No such stability is to be found in the sources side of the tables. Here there is evidence of significant trends that apparently persisted throughout the time span covered, and radically altered the pattern of financing.

The first and most important of these is the pronounced and progressive shift over time toward internal financing. In the railroads this trend is in evidence in its most extreme form. In the 1880's, railroads secured 98 per cent of capital needs from outside. As in the case of all regulated industries, very little use then or at any other time—with one brief exception—was made of short-term credit. Ninety per cent of all capital requirements were met through the issue and sale of stocks and bonds. Gradually in the subsequent periods, the relationship between internal and external sources shifted. By the decade just preceding the entrance of the United States into World War I, internal sources had already mounted to the level of more than 40 per cent of all financial requirements. About two-thirds of this came from retained profits, the rest from depreciation charges. Net new issues of long-term securities provided nearly all remaining funds. Substantial use of short-term credit was made only during the inflationary surge of the immediately following years—during World War I and the brief adjacent postwar period

—when inventories were also accumulated in considerable volume. But even in these years, the proportion of total capital requirements financed internally increased, reaching more than 50 per cent.

The next three decades witnessed the climax of this trend. Between 1921 and 1940, 95 per cent of the industry's funds were generated internally, either through retained profits or depreciation charges. To be sure, stocks and bonds were issued in this period—amounting to 26 per cent of all sources in the 1920's and 14 per cent in the 1930's—but this financing was offset almost entirely by the liquidation of current liabilities. In the final decade of the 1940's, *all* capital needs were satisfied from internal sources. Long-term obligations, on balance, were actually reduced, although some short-term debt was incurred. And it should be borne in mind—as shown by the last two lines in Table 46—that this was a decade of very substantial investment. It may be rejoined that it was also a decade of financial as well as world-wide social and physical turbulence: during the first half railroads redeemed securities and in the second half floated new issues, while in the western sector of the country the expansion of roads offset the contraction in the eastern states. Nevertheless, our data for the 1941–49 period show the net results of these countervailing movements; taking the industry as a whole, and allowing as always in this study for short-term fluctuations, they complement neatly a secular trend clearly and steadily in evidence throughout the preceding years.

The same trend, but in modified form, appears in the other components. In electric light and power between 1881 and 1912, less than 8 per cent of capital funds were generated internally; 83 per cent was obtained through long-term securities. Between 1913 and 1922, 15 per cent of all capital requirements were obtained internally, between 1928 and 1937 more than 23 per cent, and between 1938 and 1950 more than 50 per cent. By the latter period net new issues accounted for only 44 per cent. Internal financing by street railways accounted for not much more than 1 per cent of all requirements between 1890 and 1902, and then rose to 5 per cent between 1902 and 1912 and to 14 per cent between 1913 and 1922. Unlike the first two components, however, the growth of retained profits did not contribute to this trend. As might be expected in an industry in which net growth ceased—and was followed by a decline—depreciation charges accounted for the entire expansion in internal sources.

In telephones the trend toward internal financing was more uneven than in any of the other components. Between 1891 and 1920 the contribution of internal sources mounted briskly, rising from 6 to nearly 60 per cent, with both retained profits and depreciation

charges expanding. The succeeding decade, however, was one of unusually high investment and the rise in retained profits in this period was more than balanced by the *relative* decline in depreciation charges. Compared with the preceding war years, then, there was some reduction in the proportion of internal funds taken as a whole, though it remained greater than in all previous years. In the depressed 1930's, depreciation charges accounted for all capital requirements. In the decade of the 1940's, substantial expansion and some tendency toward a profit squeeze were coupled with the maintenance of the distinctive dividend policy of this component. Together, they contributed toward limiting the role of internal financing. The proportion of capital funds obtained through gross saving was somewhat below that of any of the intervals back to 1913, though still substantially above that of the intervals prior to 1913. Broadly, in this component, the trend toward internal financing was evident over the 1877–1950 span, though less distinct than in the other regulated industries.

The Anatomy of Internal Financing

In this section we explore the *reasons* underlying the secular advance in the rate of internal financing. We seek a *quantitative* explanation—that is, one which may be tested against, and weighed by, the data at our disposal. A first step toward this objective is to define the variables strategic for our problem.

Note, first, that we are dealing with a *ratio*—the proportion of all sources of capital represented by retained earnings and depreciation charges. In the appendix to this chapter we derive a formula which relates the various measurable factors influencing this ratio's secular trend. Within the framework adopted, the variables identified are exhaustive—i.e. they embrace, directly or indirectly, *all* the factors which affect the rate of internal financing. We summarize these below. Following the summary, we test their actual importance in the determination of the trends observed in the regulated industries. As might be expected in a financial analysis, all variables dealt with are measured in *current* dollars. Our formula is as follows:

$$r = \frac{\text{gross retained earnings}}{\text{total uses of funds}} = \frac{ab + k}{\alpha + \beta},$$

where r is the rate of internal financing, a is the net rate of savings, b is the profit rate, k is the depreciation rate, α is the net rate of capital flow, and β is the rate of capital consumption. Our numerator, therefore, breaks down the totality of gross retained earnings into its main components. Our denominator does the same for the

total uses of funds. Since total uses are necessarily equal to the total sources of funds, our formula represents simply one way of expressing the rate of internal financing. The significance of the variables cited will become clearer in the further discussion of their definitions which follows.

DIRECTLY RELATED VARIABLES

Our formula isolates three variables, in the numerator, which vary *directly* with the rate of internal financing. The first of these is the net rate of savings (a), defined as the ratio of retained profits to total profits. Obviously, with *other things being equal,* an advance in the net savings rate would raise the rate of internal financing. The second factor is the profit rate (b), defined as the ratio of net profits to the value of total assets. If the profit rate advances while all other variables (including the net savings rate) remain unchanged, the rate of internal financing will also rise automatically. The final factor in this group is the depreciation rate (k), defined for our special purpose as the ratio of depreciation charges to the value of total assets. This, too, varies directly with the rate of internal financing, *ceteris paribus.*

INVERSELY RELATED VARIABLES

The formula isolates two variables in the denominator which vary *inversely* with the rate of internal financing. These are the net rate of capital flow (α) and the rate of capital consumption (β). The first is defined as the ratio of all capital uses, *net of capital consumption,* to the value of total assets. If numerator and denominator of this ratio were expressed in constant dollars, it would represent the rate of growth of an industry's assets (viewed as physical goods and command over physical goods). Measured in current dollars—as it is in our formulation—it roughly approximates this.[3] If the net rate of capital flow declines, other things being equal, the rate of internal financing must increase. Totally aside from the obvious algebra, this is understandable if we consider that the net flow of capital represents a *use* of funds. If total *uses* decline, while retained gross earnings remain unchanged, then the *rate* of internal financing automatically rises. The same consequence follows if the net rate of capital flow diminishes, while the other variables in our formulation remain unaltered.

The rate of capital consumption is defined as the ratio of capital consumption to the value of total assets. Since all our measurements are in current dollars, capital consumption covers the using up of

[3] See the appendix to this chapter.

capital (through wear, obsolescence, etc.) at replacement cost. The replacement of capital consumed, of course, also represents a *use* of funds. If the rate of capital consumption rose, while all the other variables remained unchanged, the rate of internal financing would decrease. Bear in mind that capital consumption is not the same as a depreciation charge. In the nineteenth century all industries experienced capital consumption, but in many of them—before the general spread of accounting practice—depreciation charges were zero.

We shall shortly investigate the behavior of the strategic ratios contained in this equation for the light they may cast upon the changing proportions of internal financing to the total sources of capital. But we pause first for a few additional remarks concerning the distinction our formula draws between capital consumption and depreciation charges.

In the earlier years of our study, especially, this distinction is crucial, though it is at all times important. For depreciation accounting was not widely adopted in industry at large nor in the regulated segment. Thus in the railroad component in 1880–90, though it is not shown separately in Table 46, zero is an excellent estimate of the volume of depreciation charges. The same estimate would not hold in other segments, but even here it is probable that there was some deficiency in usage. Insofar as there was, it was gradually eliminated by the pressure of regulating agencies, the courts, and finally the exigencies of the income tax. Depreciation accounting came more and more into use, and was applied to an ever wider range of the stock of capital. Other things being equal, this was a factor making for greater internal financing. But of course it cannot be contended that under such circumstances other things would actually have remained unchanged.

Thus, a reduction in the reported profit rate would result inevitably from the adoption of depreciation accounting in the early days of an industry in which capital was long-lived. Conceivably, gross saving could remain unchanged. On the other hand, however, there is some likelihood that a rise in depreciation charges would stimulate an advance in the rate of *net* retention. For there is an obvious motivation for maintaining dividends within some distance of the bounds of reported profits. Suppose, for example, that the retention rate had been zero before the adoption of depreciation accounting —and in some *firms* it probably was. Then the product ab in the above equation, as well as k, would have been zero. Our contention is that if the depreciation rate (k) had become positive under such circumstances it is unlikely that ab would have gone negative by a

corresponding amount, i.e. dividend payments would not in general have been maintained for very long at the price of a reduction in the value of total assets. Because of financial convention, therefore, the adoption of depreciation accounting may have had the effect of increasing the magnitude of gross savings and of the proportion of all capital uses financed internally. Whatever its extent—and some light is cast on this below—the influence of this factor had probably petered out by the time of World War I, or somewhat earlier. For depreciation accounting had by then been generally adopted.

We shall now apply our formula to a quantitative analysis of the factors underlying the growth of internal financing. The essential data required are given in Table 50. For this tabulation we have computed estimates of α and β during the initial time interval covered in the sources and uses tables for each of the components, and for the corresponding final interval. The over-all time span covered is, then, thirty years for street railways, sixty years for telephones, and seventy years for the others. Thus, for the railroads,

TABLE 50

Net Rate of Capital Flow and Rate of Capital Consumption, Selected Components

(*per cent*)

	First Period[a]	*Nine-Year Average Centered in 1926*	*Final Period*[b]
Net rate of capital flow[c]			
Steam railroads	3.2	1.4	0.2
Electric light and power	14.2	8.6	3.2
Telephones	17.5	10.6	9.3
Street and electric railways	12.1	...	−1.5
Rate of capital consumption[d]			
Steam railroads	1.8	2.0	2.3
Electric light and power	7.3	4.5	4.5
Telephones	10.9	11.5	7.2
Street and electric railways	4.3	...	4.5

[a] July 1, 1880 to June 30, 1890 for railroads, January 1, 1881 to December 31, 1912 for electric power, January 1, 1891 to December 31, 1902 for telephones and July 1, 1890 to June 30, 1902 for street railways.

[b] January 1, 1941 to December 31, 1949 for railroads, January 1, 1938 to December 31, 1950 for electric power, January 1, 1941 to December 31, 1950 for telephones and January 1, 1913 to December 31, 1922 for street railways.

[c] Ratio of the average money capital flow, net of depreciation, to average value of assets in current dollars. Estimated by computing ratio of average net capital formation to average value of plant and equipment in current dollars.

[d] Ratio of average capital consumption to average value of assets in current dollars. Assets estimated by multiplying current dollar value of plant and equipment by 1.10.

the "first period" is July 1, 1880 through June 30, 1890, and the "final period" is January 1, 1941 through December 31, 1949. For convenience in appraising the long-term trends we have also provided figures for the nine years centered in 1926.

The upper panel of the table presents the estimates of the net rate of capital flow. These were computed by measuring the ratio of the average annual net capital formation during each of the periods to the annual average of the value of plant and equipment, with both numerator and denominator expressed in current dollars. Assuming that assets other than plant and equipment remained proportionately about the same in the long run, over the period of interest, this ratio would approximate the net rate of capital flow as defined above. Most important is the very substantial decline, reflecting the retardation in the rate of growth described in a previous chapter, in railroads, electric power, and street railways, and to a smaller extent, in telephones.

In the lower panel of the table are presented estimated rates of capital consumption. These were computed by measuring the ratio of the average annual capital consumption in current dollars in each period to the average annual value of plant and equipment, similarly figured, after inflating the latter by 10 per cent to allow for other assets. Since such data are most commonly reported in accounting statements in terms of original cost, it is worth emphasizing that our estimates of both capital consumption and the value of plant and equipment are in *current* dollars—as they must be to suit the requirements of the present analysis. Price corrections of a peculiarly difficult character were therefore a necessary element in their construction. It may be observed that over the period of analysis the rate of capital consumption rose in the railroads, remained about the same in street railways, and declined in electric power and in telephones. Even in the last two components, however, it is significant that the rate of capital consumption actually rose substantially *in relation to* the net rate of capital flow. For the drop in the latter was much greater than in the former. This means that in every case capital consumption represented an expanding proportion of all capital uses. Essentially, of course, this is a manifestation of the combined effects of the retarded rate of growth of output and the declining capital-product ratio, both of which are mirrored in the fall of the net rate of capital flow. As we shall see below, it is of much significance for financial analysis.

Some light on the factors underlying the long-run trend in the rate of internal financing may be obtained, initially, by appraising the situation which prevailed in the first period. The rates of internal

financing at that time are given for each of the components of the regulated industries in the first column of Table 51. These figures, of course, were taken from Tables 46–49 on sources and uses of funds. Employing the formula developed above, they may be represented symbolically as follows:

$$r_1 = \frac{a_1 b_1 + k_1}{\alpha_1 + \beta_1},$$

where the subscript 1 indicates the first period.[4]

Now with these actual rates we may compare hypothetical ones, computed on the assumption that depreciation and net savings were just sufficient, in combination, to cover the capital consumption requirements of this period. The hypothetical rate may be expressed by the equation:

$$r_1' = \frac{a_1' b_1 + k_1'}{\alpha_1 + \beta_1} = \frac{\beta_1}{\alpha_1 + \beta_1}$$

where the primes indicate hypothetical values. It should be noted that r_1' is nothing more than the ratio of capital consumption to total capital uses in the first period.[5]

The values of r_1' for each of the components are given in the second column of Table 51. In the first column are given the *actual* rates of internal financing in the first period. The differences between the two sets of figures are striking. It is evident that the rates of internal financing in these early years provided only a small fraction of the funds required for the consumption of capital—in the

[4] Since we know the values of r_1, α_1, and β, it is possible to compute the numerators of these ratios. Thus in the case of the railroads, we may write:

$$0.024 = \frac{a_1 b_1 + k_1}{0.032 + 0.016}.$$

Hence $a_1 b_1 + k_1 = 0.0012$. This is a reasonable answer on the assumption that a, the net savings rate, was about 10 per cent, that b, the profit rate, was about 1 per cent and that k, the rate of depreciation, was zero. This seems to have been approximately the case, remembering the manner in which these terms have been defined for purposes of this analysis—in particular, that the profit rate is the ratio of reported net income to the value of *all* assets measured in current dollars. For relevant data on profits and savings of the railroads in this period, see *Historical Statistics of the United States, 1789–1945* (Bureau of the Census, 1949), pp. 201 and 205, and W. H. S. Stevens and E. S. Hobbs, "Analysis of Steam Railway Dividends, 1890–1941" (Interstate Commerce Commission, mimeographed, November 1943), p. 22.

[5] Thus, from the definitions of the variables, we may write:

$$\frac{B}{\alpha + \beta} = \frac{\frac{C}{A}}{\frac{N}{A} + \frac{C}{A}} = \frac{C}{N + C}$$

where C is capital consumption, N is the net capital flow, and A is the value of total assets.

TABLE 51

Comparison of Actual and Hypothetical Rates of Internal Financing

	r_1	r_1'	r_2'	r_2''	r_2
Steam railroads	0.024	0.33	0.42	0.92	1.02
Electric light and power	0.076	0.33	0.24	0.58	0.50
Telephones	0.063	0.38	0.30	0.46	0.41
Street and electric railways	0.014	0.26	0.27	1.50	0.14

Source: Dates of first and final periods, given in footnotes to Table 50. Actual rates of internal financing, from Tables 46 through 49. Values of α and β, from Table 50.

Definitions of the rates are as follows:

r_1 = actual rate of internal financing in the first period.

$r_1' = \frac{\beta_1}{\alpha_1 + \beta_1}$, where α = net rate of capital flow and β = rate of capital consumption and subscript 1 indicates first period values.

$r_2' = \frac{\beta_2}{\alpha_1 + \beta_2}$, where subscript 2 indicates final period values.

$r_2'' = \frac{\beta_2}{\alpha_2 + \beta_2}$

r_2 = actual rate of internal financing in final period.

case of the steam railroads and street railways, considerably less than one-tenth, and for the others less than one-fourth.

The discrepancies, of course, reflect the absence of depreciation accounting referred to above. They also illuminate the extent to which business properties were being overvalued in the earlier years, for new assets were capitalized with little or no offset for wear and tear, aging, or obsolescence. This was clearly a situation which could not under any likely circumstances persist indefinitely. Sooner or later the financial practices in vogue would have been certain to affect the yield accruing to investors in these industries. As yields declined with the continued write-up of assets, the availability of additional external capital would have diminished or have been dissipated entirely.[6] Totally aside from this, the more extensive use of depreciation accounting was subsequently encouraged or enforced by the regulations of public administrative agencies as well as by the nature of corporate interests under the income tax laws. Thus, in one sense, the substantial excess of capital consumption over the gross retention of funds in the first period was itself a factor which induced a sharp rise in internal financing in later years. Even if

[6] Of course partial and temporary correctives occurred in the latter decades of the nineteenth century during major business cycle crises and depressions, many of which had strong financial overtones. During such periods assets were written down, though the long-term trend remained upward. The views concerning business cycles expressed by Thorstein Veblen in *The Theory of Business Enterprise* (Scribner, 1935) are based largely on the observation of such phenomena.

there had been no change in the rate of growth, a rise in internal financing would have been necessary on the grounds outlined. This is shown by the figures in the third column of Table 51. Here, we have computed values of r in accord with the following equation:

$$r'_2 = \frac{\beta_2}{\alpha_1 + \beta_2}$$

where the subscript 2 represents the final period. In particular, r'_2 represents the rate of internal financing which *would* have existed in the final period if (1) the net rate of capital flow had remained as it was in the first period, and (2) internal financing had been just sufficient to meet the prevailing rate of capital consumption. For comparison, the actual rate of internal financing in the final period is shown in the last column of the table.

Thus, a substantial increase in internal financing over the seventy-year span of our study would have been necessary even if the rate of growth in the regulated industries had not been dampened. The need to cover replacement alone would have pushed the value of r up from 2 to 42 per cent in the railroads, from less than 8 to 24 per cent in electric power, from 6 to 30 per cent in telephones and from one to 27 per cent in street railways. Comparison with the last column of the table shows that in the first three components these hypothetical advances account for from one-third to two-thirds of the actual increase in internal financing over the period of study. In street railways the hypothetical rate of internal financing is even greater than the actual rate in the final period.

Employing the same general method, we may now evaluate the effect of the retarded net rate of capital flow. To do this, we compute a second hypothetical rate of internal financing for the final period, defined by the equation:

$$r''_2 = \frac{\beta_2}{\alpha_2 + \beta_2}$$

It is the rate which would provide internal funds just sufficient for capital consumption, *given the net rate of capital flow actually then in progress*. Thus, r''_2 differs from r'_2 only in the net rate of capital flow assumed.

The difference in the figures in the third and fourth columns of Table 51, therefore, may be said to reflect the impact of this single factor in isolation. The retardation in the net rate of capital flow over the seventy years was sufficient alone to have raised the rate of internal financing from 42 to 92 per cent in railroads, from 24 to 58 per cent in electric power, from 30 to 46 per cent in telephones,

and from 27 to 150 per cent in street railways. Moreover, comparison between the fourth and fifth columns of the table shows that this hypothetical rate was in every case, save street railways, very close to the actual rate of internal financing in the final period. This means, essentially, that the sharp rise in internal financing over the period of study may be accounted for primarily in terms of two factors: (1) the need for correcting the initial deficiencies in capital consumption allowances which existed in the first period, and (2) the expanding relative importance of capital consumption in all uses of capital, springing from the retarded rate of growth of total assets. For both of these factors—and these alone—are reflected in our computations of r_2''.

Given the rough nature of our data, we may judge that the figures in the fourth and fifth columns of Table 51 are in approximate equality for steam railroads, electric power, and telephones. Obviously, this is not so for street railways. The great excess of the required rate of internal financing (r_2'') over the actual rate in this case is of considerable significance. It is in fact a symptom of the disaster which, before the end of the final period of analysis, had already overtaken this component. (The final period for street railways—from the beginning of 1913 to the end of 1922—is much earlier than for other components.) Overexpansion and the general failure to adopt sound methods of finance had in the 1920's brought many lines to insolvency. Income, in the aggregate, was insufficient to meet capital replacement. As the competition of the automobile intensified, this industry contracted swiftly. The final period of our financial analysis was a time of transition, in which the contraction process in street railways was begun.

For the other components, the experiments above appear to provide a sufficient—though, of course, not necessary—explanation for the observed rise in internal financing. Nevertheless, we may inquire concerning the possible role of other influences. One interpretation of our analysis so far would suggest the conclusion that the rates of net savings (a) and depreciation (k) had been raised in keeping with the long-run advance in the relative importance of capital consumption, together with the need for correcting the initial deficiency in retention that was characteristic of the earlier years. Another possibility is that the rates of retention—a and k—remained the same, but that the profit rate (b) increased by an amount sufficient to accomplish the same end. Available data, however, do not support the latter thesis. There is some evidence that the profit rate (in the sense in which it has been defined in this section) remained about the same in the long run in the street railways which

avoided insolvency, declined slightly in telephones and electric power,[7] and increased in the railroad component,[8] over the roughly seventy-year span. But cyclical fluctuations aside, none of these trends appears to have been pronounced. The substantial rise in internal financing in railroads, electric power, and telephones must have been accomplished, in the main, through boosts in the *rates* of retention.

Probing further, we may inquire concerning the influence of prices. The price level—as such—does not appear in our formula. No mention has been made of it as a factor tending to boost the rate of internal financing. And yet prices in general, and capital goods prices in particular, moved securely upward from the 1890's onward, cyclical movements aside. Depreciation charges must have fallen far short of capital consumption figured at reproduction cost through most of this period. For in all of our components the original cost of property was employed as the entire, or the principal base upon which such costs were levied. Was not the price level, then, an important factor stimulating the advance in internal financing—and one which we have thus far overlooked?

Our answer to this question must be negative. An advance in prices affects capital goods purchased for expansion as well as those purchased for replacement. Indeed it is unlikely that any element of capital costs would remain entirely unaffected. Hence, an inflation does not necessarily increase capital replacement requirements *relative to other uses*. To be sure, when prices rise, business concerns are compelled to boost their *accounting* rates of depreciation (levied on original costs) or the proportion of reported profits retained, or both, if replacement costs are to be met. But this would not increase the rate of internal financing; indeed, it would only keep it from falling. Reference to the definitions underlying our formula should clarify this:

$$r = \frac{ab + k}{\alpha + \beta} = \frac{\frac{RP}{PA} + \frac{D}{A}}{\frac{N}{A} + \frac{C}{A}}$$

where R = retained profits, P = total net profits, D = depreciation charges, N = net capital flow, C = capital consumption, and A = value of assets.

[7] Eli Winston Clemens, *Economics and Public Utilities* (Appleton-Century-Crofts, 1950), pp. 233–234.

[8] Stevens and Hobbs, *op. cit.*, p. 22.

A rise in prices would boost N, A, and C in the same proportion, so that the denominator of r would not be changed. If profits rose in proportion to prices, then so long as the net savings rate $\left(\frac{R}{P}\right)$ was maintained, the first term in the numerator (ab) would remain unchanged. If profits did not increase so rapidly, $\frac{R}{P}$ would need to be advanced in order to keep ab the same. Concerning the second term in the numerator, the results are fairly certain. Since D depends on the accounting rates of depreciation figured on a base of original costs, it would remain unchanged in inflation, or would rise only with a substantial lag. Hence, in order to maintain k unchanged, an advance in D would be necessary. In short, inflation requires a rise in *accounting* depreciation rates (affecting k through D) and perhaps a rise in the net rate of savings (a) simply to *maintain* the prevailing gross rate of internal financing (r). Since r advances substantially over the period of study, in the face of progressive inflation, it is apparent that k or a, or both, must have been boosted by very large amounts.

Finally, we may recall that our analysis of Tables 46 through 49 showed, in general, that *both* a and k were boosted over the period studied. Yet, one may ask why the net rate of savings (a) should share at all in an advance which is designed to provide internal funds primarily for capital replacement? Why should not k alone be expanded sufficiently for this purpose? One possible answer may be found in the numerous institutional obstacles to swift and extensive increases in accounting rates. In the face of these, especially in periods of broad price advance, the deficiency in the amount of internal funds generated was apparently more easily taken up, at least in part, by increases in a.

One of the characteristics of the regulated industries disclosed in the previous chapters casts a further light on the phenomena under review. We find that the rise in internal financing did little more—at most—than parallel the rise in the aggregate cost of replacing capital consumed, relative to all capital requirements. It would be wrong, nevertheless, to conclude that internal sources did not contribute to a net advance in productive power. For we have seen that a sharp and steady rise in the productivity of physical capital was an outstanding characteristic in this segment of the economy almost throughout the period of study. New plant and equipment was nearly always materially more efficient than the old facilities they replaced. Hence, retained earnings accomplished something more than the limited objective of keeping the physical capital

stock intact. In some part they have also contributed to the expansion of productive capacity.

Long-Term Debt and Equity

Brief reference may be made to one other significant alteration in the pattern of financing of the regulated industries over the spans covered by our sources and uses tabulations. This is the shift from equity to debt financing evident in each of our components. Of course we refer to a shift in the *proportions* of these methods of raising capital. Financing through the issue of long-term obligations was substantial in the regulated industries from their very beginnings. Of our components, only in telephones in its earliest days was less than a third of all capital funds obtained through the incurrence of long-term debt. For in the segment of the economy in which our interest centers, the conditions are inherently propitious for such obligations. The shouldering of a substantial burden of fixed charges is indeed possible *only* in situations in which both borrowers and lenders may share a reasonable degree of confidence in their safety. The size and quasi-monopoly positions of the firm in the regulated segment provide the necessary qualifications. For they yield the promise of the magnitude and steadiness in the gross income flow which alone can render substantial long-term debt financing feasible.[9]

Such considerations suggest a persistent difference between the regulated industries and the remainder of the economy. Available data bear this out. At the end of 1946 in the regulated industries, in the aggregate, the total value of bonds and mortgages outstanding was 21.5 billion dollars and of stocks, 23.9 billion. For all nonfinancial corporations exclusive of utilities, the value of bonds and mortgages outstanding was 12.2 billion dollars and of stocks, 43.4 billion. Thus the ratio of fixed debt to stocks was 90 per cent in the regulated industries and less than 30 per cent in the others. Nor is this discrepancy to be accounted for only by differences in the size of firm. In nonfinancial corporations, exclusive of the regulated industries, with assets of 100 million dollars or more, the total of bonds and mortgages outstanding at the end of 1946 was 4.4 billion dollars against 14.3 billion in stocks.[10] The ratio of the former to the latter is little more than 30 per cent. One must conclude that distinctive circumstances in the regulated industries, aside from mere

[9] Cf. Simon Kuznets, "Factors in the Demand for Capital Funds" (Work Memorandum No. 43, National Bureau of Economic Research, mimeographed, May 1952), p. 21.

[10] *Statistics of Income for 1946, Part 2* (Bureau of Internal Revenue), Tables 4 and 6. Quoted in Kuznets, *op. cit.*, pp. 22–23.

size of firm, invite the use of long-term debt financing. The relatively stable character of their incomes, springing from positions of monopoly as well as—in some cases—the nature of their products, is surely one of these. The conditions of public regulation, as explained later, is another.

We return to the trend over time in the proportion of long-term debt financing, as evidenced in the data of Tables 46 through 49. In the railroads in the 1880's, 55 per cent of all sources of capital were obtained through bonds against 43 per cent through stocks. Of the net new issues (gross of investment in affiliated companies) in this period, then, bonds represented about 56 per cent. This proportion rose steadily for railroads as long as external financing remained a significant factor. In the 1914–20 period, bonds and mortgages accounted for all the long-term funds obtained and in the succeeding decade of the 1920's, for more than 70 per cent. The experience of the 1930's disclosed the dangers of so heavy a burden of fixed charges in a component which was more volatile than the average regulated industry and was subject—to boot—to the intense competition of related services. Between 1930 and 1950 fixed obligations in substantial volume were redeemed by the railroads. But by this time internal financing provided virtually all the funds required, in the aggregate, and there was no need for equity financing. Note, however, that internal financing itself materially enhanced the value of *existing* equity claims in the railroads. As pointed out earlier, neither in this nor in any of the other components did short-term debt assume much significance, except for very brief periods.

In the other regulated industries for which we have compiled data the swing to long-term debt financing was also pronounced. In electric light and power in the 1881–1912 period, bonds represented 43 per cent of total net new issues (gross of investment in affiliated companies). The advance in succeeding decades brought the proportion to 58 per cent in the final period of the 1940's. In this segment, external financing remained of considerable importance throughout our period of study, despite the rise in the magnitude of internal sources. In telephones the rise in the proportion of bonds, similarly figured, was from 22 per cent in the 1891–1902 period to 85 per cent in the 1940's. Even in the brief span of our record for street railways, the proportion rose from 44 to 100 per cent. Thus it is seen that in all components there was a marked shift from major reliance on stocks in the securing of external funds to major—or *complete*—reliance on fixed indebtedness.

Of course, the significance of this trend must be viewed in context. Its impact upon financial structures is substantially modified by the

expansion of equity claims through internal financing. Nevertheless the trend remains important for financial markets in general as well as for the industries themselves and must be viewed, essentially, as a manifestation of a distinctive orientation in the regulated segment evident in their earliest records. The principal factor underlying the swing would appear to be the existence of regulation itself. For this was an influence which gathered force through the years as public controls were extended, reinforced, and generalized, and was superimposed on the other characteristics of these industries benign to the growth of long-term debt. Wherever public regulation establishes permitted returns on *total* investment, and wherever it includes interest payments in costs, it provides an inevitable bias in industry for debt financing. The rewards for "trading on the equity" in monopolistic industries, in which public regulation aims at a fair return on total investment, acquire in this way an extraordinary degree of security which cannot be approached in other sectors of the economy.

In addition, of course, other well-known characteristics contribute to the trend toward debt financing, but these are common to all corporate industry and are of much more recent origin. They are also less puissant as judged by the reaction of the corporate sector exclusive of the regulated industries. Perhaps the most significant of these are the rise in the corporate income tax and the growing importance in capital markets of institutional investors, restricted either by legal limitation or preference to the purchase of bonds, or both.

Appendix: The Derivation of the Equation for the Rate of Internal Financing

Holding prices constant, we may define all the uses (U) of capital as equal to capital consumption (C) plus the *net* growth in the value of assets ($\mathcal{N}$), or

$$U = C + \mathcal{N} \tag{1}$$

If each of these magnitudes is expressed in current values, rather than in constant dollars, the equation still holds, but then $\mathcal{N}$ must be defined as the net *flow of funds* during the period, since the *value* of assets would fluctuate also with prices. In either case, however, we may express $\mathcal{N}$ as a ratio to the value of assets (A), as in:

$$\frac{\mathcal{N}}{A} = \alpha \tag{2}$$

Equation (2) is equivalent to the rate of growth of assets, if correction is made for price changes. If A and $\mathcal{N}$ are expressed in terms

of current values, this is no longer true. Still, even in the latter case the long-run trend of α would roughly approximate the secular behavior of the net rate of growth, being materially distorted only if the price change is brisk and the finite intervals over which the growth rate is computed are substantial. For if values are measured in current dollars, both the numerator as well as the denominator are influenced by price fluctuations. Nevertheless, when measured in current dollars, we shall term α the net rate of capital flow, to distinguish it from the growth rate. And since for the consideration of financial relations this is most convenient, we shall deal throughout this appendix with actual money flows, uncorrected for price changes, and shall continue to measure total assets in terms of current dollars.

We shall measure C in terms of current dollars—i.e. at replacement cost. The rate of capital consumption may then be defined as:

$$\frac{C}{A} = \beta \tag{3}$$

And since

$$N = \alpha A, \text{ and}$$
$$C = \beta A,$$

we substitute in 1 to obtain:

$$U = \alpha A + \beta A \tag{4}$$

Now the sources (S) of money capital may be equated to retained profits (R) plus depreciation charges (D) plus all external sources of capital (E), as in:

$$S = R + D + E \tag{5}$$

The net savings rate may therefore be expressed by:

$$\frac{R}{P} = a \tag{6}$$

where P = net profits.

The profit rate may be expressed by:

$$\frac{P}{A} = b \tag{7}$$

and the depreciation rate by

$$\frac{D}{A} = k \tag{8}$$

It should be noted that D is not the same as C, defined above. The magnitude of D is the arbitrary result of the particular accounting convention used by industry. Conceivably, D could be zero, even though C—the actual capital consumption at replacement cost—were very large.

We may further write:

(9) $R = aP,$

(10) $P = bA,$ and

(11) $D = kA$

Substituting 10 in 9 we obtain:

(12) $R = abA$

Using these symbols we may express the rate of internal financing (r) by:

(13) $$r = \frac{R + D}{S},$$

the proportion of all sources of capital obtained from retained profits and depreciation. Substituting from 11 and 12 in the numerator of 13, we get:

(14) $$r = \frac{abA + kA}{S}$$

Since S and U must be equal we may substitute from 4 in the denominator of 14 to obtain:

$$r = \frac{abA + kA}{\alpha A + \beta A}$$

and canceling:

(15) $$r = \frac{ab + k}{\alpha + \beta}$$

Hence, we conclude that the rate of internal financing may be analyzed in terms of five ratios. It will vary *directly* with the net savings rate (a), with the profit rate (b), and with the depreciation rate (k). It will vary *inversely* with the net rate of capital flow (α) and the rate of capital consumption (β). All relationships hold with the usual *ceteris paribus* assumption. Nevertheless, the last phrase of these conclusions would come as a surprise unless it were recalled that we have distinguished between the rate of depreciation and that

of capital consumption. *If* they were at all times equal we would be justified in writing:

$$r = \frac{ab + \beta}{\alpha + \beta} \tag{16}$$

In equation 16 the rate of internal financing varies *directly* with capital consumption, so long as ab is less than α, i.e. so long as the gross retention of funds does not already account for the *entire* volume, or more, of capital requirements.[11] But the postulate underlying this formulation is unrealistic. We have confined attention, therefore, to equation 15.

[11] The value of r could be greater than unity, as it was in the railroads in the 1940's, if the flow of funds from external sources were negative.