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Volume Author/Editor: Melville J. Ulmer

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Chapter Author: Simon Kuznets

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FOREWORD

by Simon Kuznets

I

THIS is the fourth in a series of monographs resulting from an inquiry initiated by the National Bureau of Economic Research in 1950, with the financial assistance of the Life Insurance Association of America.[1] The inquiry examines long-term trends in capital formation and financing in the United States, and is organized primarily about the principal capital-using sectors of the economy—agriculture, mining, manufacturing, the public utilities, residential real estate, and governments. The analysis for each sector summarizes the major trends in real capital formation from 1870 (or the earliest year for which data are available), and in financing from 1900, or somewhat earlier. In each, an effort is also made to discover the factors determining these trends, and, so far as possible, to suggest the significance of these factors for the future. In addition to the sector studies, the inquiry comprises two others. One deals with trends in external financing channeled through intermediate financial institutions and attempts to link the major types of institutions with the various groups of capital users. The second integrates the results of all the other studies, within a framework provided by country-wide estimates of national product and relevant components, and of country-wide estimates of assets and debts.

Some of the findings have been presented in part or in preliminary form in a series of Occasional and Technical Papers.[2] This monograph, like those to follow, presents the full results of a specific study together with supporting data. The three others, near completion, deal with trends in capital formation and financing in mining and manufacturing, and in governments, respectively; and

[1] The first three monographs are: *Capital Formation in Residential Real Estate: Trends and Prospects*, by Leo Grebler, David M. Blank, and Louis Winnick (1956); *Capital in Agriculture: Its Formation and Financing since 1870*, by Alvin S. Tostlebe (1957), and *Financial Intermediaries in the American Economy since 1900*, by Raymond W. Goldsmith (1958), all published for the National Bureau of Economic Research by Princeton University Press.

[2] Leo Grebler, *The Role of Federal Credit Aids in Residential Construction*, Occasional Paper 39 (1953); Daniel Creamer, *Capital and Output Trends in Manufacturing Industries, 1880–1948*, Occasional Paper 41 (1954); Raymond W. Goldsmith, *The Share of Financial Intermediaries in National Wealth and National Assets, 1900–1949*, Occasional Paper 42 (1954); Melville J. Ulmer, *Trends and Cycles in Capital Formation by United States Railroads, 1870–1950*, Occasional Paper 43 (1954); Alvin S. Tostlebe, *The Growth of Physical Capital in Agriculture, 1870–1950*, Occasional Paper 44 (1954); Israel Borenstein, *Capital and Output Trends in Mining Industries, 1870–1948*, Occasional Paper 45 (1954); David M. Blank, *The Volume of Residential Construction, 1889–1950*, Technical Paper 9 (1954); all published by the National Bureau of Economic Research.

with a summary presentation and analysis of trends in capital formation and financing for the country as a whole.

II

The regulated industries, whose long-term record is analyzed in Dr. Ulmer's monograph, have a number of distinctive characteristics. At the risk of repeating the obvious, it may be useful to list them briefly.

First, most regulated industries are products of modern technology —of new ways of providing energy for industrial and household uses, of harnessing energy to the transportation of goods and persons and to the communication of messages, written and oral. Many of these industries could not have existed a hundred or a hundred and fifty years ago because neither the practical inventions, nor even the theoretical discoveries underlying their operation, were known.

Second, because of the large volume of concentrated power involved in the modern technology of regulated industries, they require—for *minimal* operation—huge investments of durable capital: in roadbeds or roadways, terminal stations and airfields, power equipment, transmission lines, control stations, etc. For optimum *economical* operation such durable capital investment must be even larger relative to current rates of output—to exploit the internal economies of large-scale production and to provide for the secular rise in demand.

Third, since so many of the regulated industries are concerned with transportation and communication, the efficiency of their output depends upon a rapid integration of local and regional units into a country-wide—and sometimes international—network. A single railroad is far less effective economically than one which is part of a country-wide system; and the same can be said of a single truck company, air transport company, or telephone firm, unless, of course, each is already so large as to be able to provide effective integrated service throughout the country. Hence, once such a transportation or communication industry emerges, it is under great pressure to extend its network—and thus its capital investment—to cover the country; and perhaps link up with similar industries in other countries.

Fourth, the large size of durable capital investment relative to current output makes for a high ratio of fixed to variable costs—and leads to the classical case where, in the long run, competition within the industry ends in monopoly by killing off all competitors but one. By their very structure as producers, many regulated industries are naturally monopolistic.

Fifth, since the industries in the group are in the business of supplying power and other necessities (like water), or of providing transportation and communication services, the products constitute a basic framework for much of economic and social life. All of us need the products; and their availability, once established, permits changes in the pattern of life designed to take advantage of them (e.g. of new transportation facilities). The consequence is that the withdrawal of the products of regulated industries, an interruption in their supply, would create severe and widely ramifying difficulties throughout the country's economy. In other words, regulated industries are suppliers of goods that can be viewed practically as basic necessities.

Sixth, it is, of course, this combination of monopolistic position and provision of necessities that results in the industries[1] being regulated—treated as public utilities[3]—in countries where nationalization can be avoided. Were the industries concerned with minor luxuries, such as artificial hair buns or fancy cigarette holders, few would care about the monopolistic power of the producers—where the latter happened to possess them. If the goods were necessities, but the industry naturally competitive (as with many agricultural and industrial products), reliance could be placed on the free competitive market and little special regulation would be required. A public utility must be regulated for the joint reason that, as the term implies, it is of wide and basic use, and yet its technology and economics bar the possibility of effective intra-industry competition.

Finally, even though the degree of monopoly is high *within* each regulated industry, in the long-term perspective one can observe a great deal of *inter-industry* competition. Surely the railroads have been affected in recent decades by the competition of motor trucks and of airplanes; electric power competes for certain types of household use with gas; there is even competition, limited though it may be, between the telephone and telegraph. Indeed, it may be suggested that the very origin of regulated industries in recent technical progress and the wide field which they cover raise the probability that, as time passes, competitive pressure on some already existing industries will be exercised by newly emerging methods of providing power, transportation, or communication services—methods so new as to provide a base for new industries. And one may add that as such new industries are born, and exercise

[3] Dr. Ulmer's definition of regulated industries embraces a group somewhat wider than public utilities, but sufficiently close to it to say that by far the predominant part of the group are privately owned public utilities. (Government-owned units are excluded by Dr. Ulmer from the analysis; but in many of the subsectors, government ownership in this country is insignificant.)

competitive pressure on those already existing, the new sectors—even though still undergoing internal competition—may promptly be subjected to special controls and thus be added to the regulated group.

III

The characteristics just listed go far to explain the long-term movements of output, capital formation, capital-output ratios, and sources of financing, which are so clearly portrayed and cogently analyzed in Dr. Ulmer's monograph. His main conclusions can be briefly stated.

(1) As each of the major industries with which Dr. Ulmer deals separately (steam railroads, electric light and power, telephones, street and electric railways, local bus lines) emerges, its output grows at high rates—far higher than those in country-wide output. As a result, its share in total national output also rises rapidly. The steam railroads, much of whose early growth preceded the period covered here, accounted for about 5 per cent of gross national product in 1886 (their share in the 1830's must have been nearly zero), and rose to almost 9 per cent by the early 1920's. Electric light and power, whose share was close to zero in the early 1890's, rose to over 4 per cent of gross national product in the 1950's; the share of telephones, from close to zero in the early 1890's to over 1.5 per cent in the 1950's; and that of street and electric railways, which emerged in the 1890's, to a peak of about 1.4 per cent in 1916.[4] But such rapid growth—greatly in excess even of the vigorous growth of national output—ceases, after some decades. The timing differs from one industry to another, depending upon its scope and its susceptibility to competitive pressure from new industries. From a peak level in the early 1920's of 9 per cent of gross national product, the share of steam railroads drops to 5 per cent by 1950; that of street and electric railways declines from 1.4 per cent in 1916 to 0.2 in 1950; and even for those industries that are still growing relatively vigorously, such as electric light and power and telephones, the rise in share of total output, rapid at first, slows down materially.

This pattern of a life cycle of growth of output in the regulated industries is clearly associated with their origin: their emergence as a product of a major technological change which, as Dr. Ulmer points out, fills the vacuum of a felt need, of a wide potential market. The improvements that follow soon upon the introduction of the new technology, and the pressure on transportation and communication to build quickly toward an integrated country-wide

[4] All of these figures are from Tables 22 and 23 in the monograph.

framework, provide the continuous stimulus to a high rate of growth in the early phases of the industry's history. Then, as the national network is completed, as the original need is gradually satisfied, and as competitive pressures arise because of new technological changes, the rate of growth diminishes; and in some cases absolute and relative declines may set in.

(2) The long-term trends in capital formation are similar to the trends in output in that high rates of growth prevail in the early phases and then retardation begins. Plant and equipment grew in the regulated industries at rates averaging over 30 per cent per decade for the period from 1870 to 1910; but at a rate averaging only about 10 per cent per decade for the period from 1910 to 1950 (see Table 5). Net additions to durable capital of public utilities accounted for well over a fifth of all additions to durable capital in 1880–90; probably appreciably less than that in the earlier decades; about a fifth for the period 1880–1912; but less than a tenth for the period 1912–48. In other words, capital formation in the regulated industries, like output, first grew more rapidly than that for the nation and then declined materially as a share of the national total. This finding—that the trend pattern of capital formation reproduces that of output but in a magnified fashion and within a shorter time span—was to be expected. For the capital plant had to be built in advance of prospective demand and output, and as the technology became stabilized and the turbulent growth of output itself slowed down, higher rates of utilization and capital-saving economies made it possible to reduce the rate of growth of capital investment even more than the rate of growth of output was reduced.

(3) This relation between growth of output and of capital formation is reflected most clearly in the trends of the capital-output ratios. Among regulated industries the ratios of capital to output, which in most cases were much higher than for the country as a whole, have declined precipitously—if not from the very beginning, then from not long after the industry's birth. In steam railroads the ratio declined from about 16 in 1880 to less than 3 in the 1950's; in electric light and power, from 16 and more in the early 1890's to less than 2 in the 1950's; in telephones, from 4 or 5 in the 1890's to less than 2 in the 1950's; and in street and electric railways, from about 7 at the end of the 1890's to less than 3 in the 1950's (all of these figures from Charts 17 through 20 in the monograph). It is clear that the very large volume of durable capital investment, relative to current output, which was required in the regulated industries—particularly during the early phases of extensive growth and construction of the networks—provided the opportunity and

the incentive for reducing the capital-output ratio, so that the resulting reductions were greater, both absolutely and relatively, than in most other industries in the country.

(4) The rate of growth of gross capital formation fell markedly from the high levels of the early decades—partly because of the slowing down in the rate of growth of output, and even more because of rising rates of utilization of capacity and of capital-saving innovations. But this meant that the ratio of capital depreciation to current capital formation would, all other conditions being equal, grow; and as Dr. Ulmer demonstrates, growth in the ratio of depreciation to gross investment was a major factor contributing to striking long-term changes in the sources of financing. Whereas in the early decades financing was almost wholly from external sources and came largely from new issues of stocks and bonds, in the later decades internal financing—retained profits and especially depreciation charges—loomed much larger; in some industries, such as steam railroads, dominating the picture completely. True, other factors were involved; and we must always consider the effect of price changes, in scanning movements of capital formation in constant dollars to infer trends in sources of financing. But even some of these other factors—for example, changes in the future prospects of the industry which clearly affect its chances of securing external funds in long-term capital markets—are, like the growing ratio of capital depreciation to gross capital investment, aspects of the life cycle pattern of growth traceable to the distinctive characteristics of the regulated industries.

(5) Finally, attention must be called to the long swings that so clearly characterized capital formation in the regulated industries—particularly in steam railroads, whose record is the longest. The association between them and long swings in other important aspects of the economy is discussed in detail in Chapter 7 of the monograph. In the present context, it is important to stress that many of the regulated industries provide consumer goods and should, in general, be quite sensitive to population movements; and additions to the durable capital in them, like additions to residential housing, should be responsive to additions to population and to internal migration. Given the long swings in additions to population and in internal migration, it is this association that may be at the root of long swings in capital formation in the regulated industries.

Two comments should be added to this too-brief summary of Dr. Ulmer's findings. First, the trend patterns in output, capital formation, capital-output ratios, and sources of financing—as well

as the susceptibility to long swings—that are so clearly apparent in the regulated industries can be found also in many other sectors. New industries, emerging as a result of new technological changes, are likely to go through similar life cycles of output, capital formation, capital-output ratios, and sources of financing; and if they happen to be responsive to population changes, may also show long swings. But because of the distinctive characteristics of regulated industries, these trends and long-term movements stand out with special prominence, and possibly provide a clearer insight into the causal mechanisms that bring them about.

Second, regulated industries are a category that includes subsectors at different stages of growth, and hence at different phases of their life cycle pattern. Any attempt at projection of the future from the past must, as Dr. Ulmer clearly shows, take account of this diversity of behavior within the group; and particularly of the possibility that the scope of the group will be expanded in the future by the addition of new industries, now in their very early stages or still to be born. It is the difficulty of appraising the potentials of the future with respect not only to the industry already existing and with clearly observable trends, but as well to new industries in the making, that renders projection so hazardous. And the rapidity of change, the short period of two to three decades in which an industry could grow, in the past, to unprecedented importance, is a warning that should be given due weight in avoiding oversimplified projection from the record.

IV

The comments above can hardly do justice to the analytical framework and to the empirical foundation of Dr. Ulmer's monograph. The intention here is to provide a brief view of the findings, and to introduce the reader to an intriguing account of long-term movements in capital and output in an important and distinctive sector of our economy. Even a brief glance at the discussion will reveal the variety of analytical suggestions advanced to account for the findings; and skimming through the appendixes will indicate the time-consuming effort that has been made to organize the underlying statistical data. One can trust that the data, findings, and hypotheses will be quickly absorbed in the stream of current work and thinking on economic problems; and thereby contribute to more reasoned views of them and so, hopefully, to more intelligent solutions.