1

The Problem

This study of railroad capital formation spans a period of eighty years, from 1870 to the middle of the twentieth century. The period begins forty years after the successful operation of the first steam railroad in the United States. By this date a transcontinental route had already been completed. The major technical difficulties, which for a time had jeopardized efficient operation, had been largely overcome. The land-grant era had drawn to a close, with dispositions aggregating nearly 160 million acres. In the main, subsequent development brought elaboration and improvement of a railroad network whose general pattern had already been determined.

Thus by 1870 railroads were no longer the lusty infant among American industries. They resembled more closely the vigorous adolescent — the pace of whose future growth was to be more fitful and more sensitive to environmental changes and, because of its greater size, readier still to affect the environment.

Yet, despite some characteristics of advancing age, the railroad industry at the close of the Civil War was, from a quantitative point of view, still far from maturity. The investment already made in road and equipment by 1870 was almost negligible compared to the additional investment forthcoming in later years. In 1950 the value of road and equipment was nine times what it had been eighty years before.

Although the relative share of railroads in total capital outlay dropped over the study period (Table 1), railroad development was nevertheless huge enough to account for a substantial proportion of the nation's total investment. During the years 1870 through 1890 gross capital expenditures by the railroads amounted on the average to from 15 to 20 per cent of those of the entire nation. It should be borne in mind that the latter aggregate includes public as well as

TABLE 1

Railroad Gross Capital Formation as Percentage of Total United States Gross Capital Formation, 1870-1949

Decade	*Per Cent*
1870-1879	20.4
1880-1889	15.6
1890-1899	7.5
1900-1909	7.8
1910-1919	7.3
1920-1929	5.3
1930-1939	3.5
1940-1949	2.1

Source: Figures on United States gross capital formation from Simon Kuznets, "Nine-Year Moving Averages of National Product and Components by Type of Use, 1873-1945" (National Bureau of Economic Research, July 1951, mimeographed). Since the Kuznets data were published in the form of nine-year averages, it was necessary to approximate the 1870-1879 decade by averaging the Kuznets's figures for 1874 and 1875, and similarly for other decades. For purposes of this comparison the railroad outlay figures were averaged in the same way. The series compared were in constant dollars. Railroad data from the author's forthcoming monograph on capital formation and financing by public utilities.

private construction, residential as well as industrial building, producer durables purchased by farms as well as by nonagricultural industries. Even so, the ratio given is a minimum estimate, for included in the national total is a substantial quantity of capital expenditures charged to current account, while the railroad figure is exclusive of this item. In subsequent years the drop in this proportion was considerable. By 1940-1949 it had fallen to 2 per cent, as Table 1 shows. The relative importance of the railroads even in these years, however, should by no means be viewed as insignificant. For the modern period it is possible to compare their gross capital expenditures with those of all private nonagricultural industry alone.[1] In 1940-1949 railroads accounted for 6 per cent of the total.

The economy-wide impact of railroad capital formation in the eight decades since 1870, then, can scarcely be exaggerated. This is particularly so in the light of the evidence introduced later on the nature of

[1] The series referred to is compiled by the U.S. Department of Commerce and published in the *Survey of Current Business*. It is exclusive of capital outlays charged to current account.

these flows: investment in road and equipment proceeded throughout this period in dramatic, towering waves, the extent of which has been surpassed by few economic series.

Objectives

Although railroads are among the most widely discussed segments of American economic activity, relatively little information has been available heretofore concerning the quantitative aspects of their investment. For the period from 1912 to date the Interstate Commerce Commission has provided figures on gross capital expenditures for the bulk of American carriers,[2] but, even for these years, data were lacking on capital consumption, net capital formation, and the total stock of real capital. For the period before 1912 no figures on capital expenditures of any kind appeared, and the chief indicator of railroad investment was changes in miles of road or track owned or operated.[3]

It is the purpose of this study to fill this gap in existing knowledge. Newly developed series on capital formation are presented, and an exploratory study of their behavior over the period 1870 to 1950 is undertaken. Data are also presented on the means by which investments were financed.

Underlying this project, however, is an interest in the long-term future of the railroads with particular reference to their capital requirements, and in the light which their experience may cast upon other segments of industry. Though no attempt has been made to develop a forecast in this report, this interest has dictated both the variety of statistical series constructed and the nature of the exploratory analyses to which they have been subjected. Thus attention is initially focused upon the long-term trends in the stock of capital, in capital formation,

[2] The American Railroad Association has published a similar series with somewhat different coverage for roughly the same period.

[3] Data on number of rolling stock owned by the railroads are available back to 1876, but these have been put to little use for a number of reasons. Before 1890 no breakdown was available between freight cars and passenger cars. Even when breakdowns are available, the problem of weighting is considerable, both with respect to different types of rolling stock as well as to rolling stock as against other categories of capital expenditures. Most important, however, is the fact that retirements are substantial for rolling stock, so that changes in number owned provide little indication of the number purchased in any period.

and in the ratio between the stock of capital and railroad output. Second, since railroad investment is marked by extended swings lasting at least fifteen years on the average, some characteristics of these long cycles are investigated. Finally, with a view toward illuminating the impact of real capital requirements upon money capital markets, the record is perused for the detection of long-term trends in methods of financing.

A brief description of the data employed is provided in Appendix A. It is essential at this point, however, to note one characteristic of our series. Because of the nature of the materials available, the same degree of reliability cannot be assigned to the investment data for years before 1910 as to those for the later years. In particular, it is possible that in the earlier period substantial errors may appear in the annual figures. There is, however, no evidence of any consistent bias, and tests suggest that five-year moving averages succeed in eliminating — i.e. smoothing — many of the errors in particular years before 1910, as indicated in the Appendix. Accordingly, for this earlier period the analysis will be confined in the main to characteristics that may be studied in moving averages of five years or more in length.