GROWTH, STABILITY, AND FINANCIAL INNOVATION IN THE AMERICAN ECONOMY, 1897-1914

The period 1897-1914 in American economic history contains many interesting economic phenomena which require explanation. Fortunately, a steadily increasing supply of data has been generated in the past decade which permits more precise descriptions of certain aspects of the period. The present dissertation is an attempt to explain the following conjuncture: a retardation in the rate of growth of aggregate output after 1907, a fall in the ratio of gross capital formation to gross national product after 1907, and a surge in external financing of gross property additions by firms in the manufacturing and transportation sectors before 1907 followed by a sharp shift after 1907 to internal financing. Five business cycles, measured trough to trough, also complicate matters. The merger movement of 1898-1902 and a flood of new products and processes must also be considered.

The hypothesis is advanced that at the beginning of the period financial innovation occurred that permitted a sudden increase in the supply of external financing for the business sector. The innovation is found in the development of a market for industrial securities and the key elements are the concomitant rise of trust companies, the splitting of equity issues by manufacturing firms into preferred and common stock, and the legal encouragement of the corporation. One effect of this innovation in financial techniques was the bunching of the merger movement in the years 1898-1902. But of most interest for purposes of analyzing the growth and stability of the economy in succeeding years is the effect of financial innovation upon the rate of capital formation in the economy.

To determine this, the first step taken was to examine individual industries, the most important of which was steam railroads. Of general interest to students of the period may be the new estimates of the annual rate of gross investment by steam railroads which were prepared for this study. These estimates were made to rectify the deficiencies in previous estimates made by Melville Ulmer. The new estimates perform very well in terms of predicting expenditure levels in the fiscal years 1912-1915 for which there are ICC reports of investment expenditures; and they perform well in terms of corresponding closely to the flows of equipment expenditures indicated by William Shaw's estimates of output of railroad equipment for domestic use. The new series shows that the peak in railroad expenditures during the period was reached in the year ending June 30, 1907 rather than in the calendar year 1910. It also shows that the cumulated flows of investment expenditures for the period 1899-1909 were some $1.5 billion higher than the Ulmer estimates indicate. This demonstrates that capital deepening in the form of new depots, tunnels, straightening curves, double tracking, and increasing rolling stock per mile of track was far more important in the period 1897-1907 than one would judge from the Ulmer estimates.

When these new estimates, deflated by a new cost index, were used to test the explanatory power of alternative hypotheses of the determinants of investment behavior by railroads in the period 1897-1914, it was found that a regression equation relating the level of gross investment each year to the previous year's level of output, level of the dividend pay-out ratio, and level of retained earnings, was clearly superior to the alternative models tested. This means that one cannot understand investment patterns in the railroad industry in this period without making reference to the capital markets. Investigators using the Ulmer estimates, however, have concluded that investment in the 1897-1914 period was independent of any thing except the level of output experienced and the amount of capital stock on hand. Thus, they missed both the significance of financial changes, and of a trend break in capital-output ratios in the railroad industry.

The effect of financial innovation in this period was to reduce the cost of equity financing during the first four or five years and, it is hypothesized, to cause a rise in rates of capital formation. But the longer-term reaction to the innovation was a rise in debt-equity ratios as firms in-

creased their rates of capital formation and increased their external liabilities, filling up the new "financial space" created by the innovation. With new, stable financial structures achieved by 1907, the supply of internal funds became the constraining factor governing investment behavior, it is argued. The behavior of the financial structure and investment expenditures of the steam railroad industry conforms well to these hypotheses.

It is impossible, however, to extend this industry-by-industry analysis much further although both the iron and steel industry and residential housing show patterns of investment behavior consistent with the hypothesis. The data in these two cases are less satisfactory than for steam railroads, however. To test the hypothesis further, it is necessary to turn to a more aggregative approach. Approaching the problem on this level, it is shown that the change in the liability structure of the business sector is paralleled by movements in the asset structure of financial intermediaries. Their portfolios change in composition through 1907 in favor of non-government securities and their short-term loans become riskier. Combined with this movement are (1) a fall in the reserve ratios of banks which is halted after 1907, and (2) a sharp retardation in the rate of growth of high-powered money after 1907.

The implication of this pattern of change in financial intermediation for the rate of growth of the capital stock and for the embodiment of technological progress in new capital equipment are then examined. The conclusion is that the changes in financial intermediation help to explain a wide variety of phenomena. One example is the apparent reduction in economies of scale in the production function for the manufacturing sector after 1907. Another is the relatively greater emphasis upon labor-saving technical change in this period than in later periods. More specific phenomena, which are of general historical interest such as the pace of electrification of industry and the rapid replacement of Bessemer steel by open hearth steel in relative importance, appear also to be affected by the pattern of financial developments.

These factors, determining the rate of growth of potential, or full employment, output are also shown to be relatively more important than the rate of growth of aggregate demand in determining the amount of retardation which takes place in the rate of growth of total output.

The characteristics of each of the five business cycles in terms of the relative amplitude and duration of each contraction and expansion are then largely explained by the change, or lack of change, in the financial sector which is taking place at the time in response to the financial innovation. Thus, the first two cycles lasting from 1897 to 1904 are mild and dominated by inventory cycles. The contraction of the second cycle is extended by the period of "undigested securities" in 1903 and 1904, the result of a temporary exhaustion of fresh supplies of external financing. The third cycle, 1904-1908, is an example of an expansion powered by private investment, privately financed. The contraction is dominated by a financial panic created after the downturn in investment flows generated demands for short-term, external financing by the business sector which the financial sector could not meet. When the last two cycles are superimposed upon a slower trend of growth, it is seen that the two expansions in the period 1908-14, in contrast to the previous expansions, are largely powered by agricultural prosperity. Also, rising short-term interest rates quickly terminate the expansions in this period while low interest rates do not stimulate rapid recovery from the contractions. This behavior prevails for the economy as a whole in spite of the rapid growth of the automobile and electrical equipment industries during the years 1908-1914.

The conclusion that is reached from these successive levels of hypothesis testing is that the concept of financial innovation provides an extremely useful tool for understanding the vagaries of the American economy in this one period of time. It appears to me a more useful tool than the emphasis which Joseph Schumpeter and Rendig Fels placed upon waves of technological innovations which created new sets of investment opportunities. It also appears to be more useful than the stress placed by W. Schluter and

Alvin Hansen upon inelastic supplies of short-term credit.

Larry Neal, University of Illinois