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CHAPTER 9

Résumé and Prospect

IN this concluding chapter we assemble the principal findings developed earlier, and briefly appraise their significance for an understanding of the decades ahead. Our summary consists of five major parts.

In the first, we focus upon the major characteristics of the growth of the regulated industries. Here, we review the long-run behavior of capital formation. Then we embrace the trends of the two variables which, proximately, determine the secular path of investment—output and the capital-product ratio. Second, we follow with a summary of our exploration into the factors underlying these trends. Third, we recapitulate our findings on the form and nature of long cycles. Fourth, we review the secular patterns observed in the financing of the regulated industries, and summarize the explanation we developed for them. Finally, we essay a brief analysis of the outlook.

The Secular Pattern of Capital Formation

The productive facilities of the regulated industries, in the aggregate, experienced a substantial expansion over the period from 1870 to 1950. From about 270 million 1929 dollars per annum in the first decade of the period, net capital formation rose to more than one billion per year in the years just preceding World War I. In subsequent years the growth in facilities was extended, though the early vigor of the rise slackened somewhat. As a result, the accumulated stock of physical capital in the regulated industries rose from about 8 billion 1929 dollars in 1870 to nearly 30 billion around 1910 and to about 47 billion in 1950. Gross capital formation, supported by swiftly growing capital replacement requirements, advanced from less than one-half billion 1929 dollars per annum in the 1870's to more than five times this amount in the post-World War II period.

Great as the expansion was, it did not keep pace over the eighty-year span of study with that of the nation as a whole. The regulated industries accounted for about 15 per cent of the nation's gross capital formation in the 1870's, about 20 per cent in the years preceding World War I, and no more than 10 per cent in the period following World War II. The per capita value of plant and equipment in the regulated industries, measured in 1929 dollars, was 221 in 1870, 368 in 1930, and 321 in 1950. Here, and in the subsequent

discussion of this section, references to capital in all cases pertain to quantities measured in constant dollars. Furthermore, in the regulated industries plant and equipment are taken as the *total* stock of reproducible capital, the small amount of inventories typically held being neglected. Capital formation, accordingly, refers to accumulations of plant and equipment.

The main components of the regulated industries segregated for special study include steam railroads, electric light and power, telephones, street and electric railways, and local bus lines. This quintuplet in the 1880's, insofar as its elements were in operation, accounted for about 90 per cent, and in the 1940's still took as much as 70 per cent, of the gross flow of investment of all regulated industries. The progress of capital formation in the five components over the period from 1870 to 1950 exhibited a number of significant characteristics in common. This feature of their behavior invited the use of a model pattern both as a descriptive device, and as a framework for comparative analysis. The model has the following properties. The secular path of net capital formation rises at an increasing rate, passes through an inflection point, and then continues its advance at a diminishing rate until its peak is attained. Subsequently it declines, after a time reaching zero and ultimately turning negative. The stock of capital follows a similar secular course, at least up to contact with the zero line. Its inflection point, however, is coincident with the peak in net capital formation. Its own peak is achieved when net capital formation becomes zero. We omit, for conciseness, the subsequent stages of the pattern, through which only street railways of all our components progressed in any significant degree.

Indeed, the degree of progression along the model secular pattern varied widely among our components. Judged by this standard, the most youthful was telephones. In this industry none of the key stages of the model pattern had by 1950 been completed, either in the growth of its stock of capital or of its net capital formation. Both rose at absolute rates which expanded progressively throughout the eighty-year span of study. Net capital formation in telephones averaged 240 million 1929 dollars per annum in the 1940's, more than twice the rate of the 1920's. The stock of capital increased fivefold between 1900 and 1930, and in the next twenty years doubled again.

The most mature of the components was street railways—an industry whose life span in nearly its entirety is covered by the period studied. In this component the application of electricity stimulated a spectacular advance in net capital formation, which, however,

soon reached its peak in the middle of the first decade of the twentieth century. Net investment then turned downward swiftly, diminishing at an increasing rate until it reached zero around 1916. At that point the stock of capital was at its peak. Subsequent contraction brought it down to about 770 million 1929 dollars in 1950, compared to facilities with value of nearly four billion 35 years earlier.

Of the other components, steam railroads came closest to matching the maturity of the street railways—though it still remained a substantial distance away. In railroads the changeover from an increasing to a decreasing rate of growth in the stock of capital—the secular peak in net capital formation—occurred in the early 1880's; the crest in the stock of capital itself seems to have been reached in the early 1930's. But in the years between 1931 and 1950, the railroads did not progress very far along the following stage. In this period the constant dollar value of road and equipment declined from 24.1 to 22.6 billion, or by less than 10 per cent.

The remaining components—electric power, local bus lines, and the all other regulated industries group—were ranged between these extremes. They had all passed, though at widely different times, the first stage in the model pattern of development—that is, the point at which net capital formation changes over from an increasing to a decreasing rate of advance. But in electric power and the all other group the signs of maturity went no further. In both, the rate of growth in 1950 was still very brisk, and the upward trend in net capital formation showed no clear indication of a termination. Local bus lines, on the other hand, proceeded one stage further in the model: in the late 1930's it passed the point at which the secular path of net investment reached a peak. Of course the stock of capital continued to head upward in subsequent years, for investment in buses remained substantial; but the rise from a secular point of view proceeded by diminishing amounts.

In one respect there is agreement among *all* components in the secular trends in the stock of reproducible capital. In all cases, the *relative* rate of growth diminished, and from a very early date in the history of each. Taking changes over successive long cycles, the secular rate of advance in the regulated industries in the aggregate dropped from 3 per cent per annum to 1.6 per cent and finally to less than 0.1 per cent annually. In the railroads there was a drop from 2 per cent to less than 1 per cent and finally to a slightly negative annual change. Electric light and power dropped from an annual increase of nearly 20 per cent during the first cycle to about 5 per cent in the second and to less than 1 per cent in the third.

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Over the entire time span, in telephones there was a reduction from a rate of nearly 12 per cent to one of less than 3 per cent, and in electric railways from an 8 per cent per annum rise to an average annual decline of nearly 6 per cent. Local bus lines, during its brief history dropped from an average increase of nearly 40 per cent to one of less than 8 per cent. Only in the all other group was the decline anything but constantly progressive. In this case the rate of growth remained unchanged at slightly more than 3 per cent during the first two cycles, and then dropped to 0.5 per cent in the final swing. Though inevitable, ultimately, in any industry, the early incidence of the tendency toward a retarded rate of growth was attributed in the body of this report to special characteristics surrounding the genesis of the regulated segment.

Barring a dramatic alteration in the average life of capital, the trend just described implies a necessary relationship over time between net capital formation and capital consumption. Unavoidably, the latter must match the former at a very early date, and then spring far ahead. Such was the case in the aggregate of the regulated industries and in each of the components. In the decade of the 1940's, when investment was extraordinarily high, capital consumption in the total of the regulated industries was three times as great as net capital formation; in the railroads it was twenty-five times, in local bus lines and the all other group three times, and in electric power two times as great as net capital formation. In telephones they were equal, but in tribute to the surge of investment in the last decade covered by our study, it was the first time since the 1890's that net capital formation had been so large in relation to capital consumption. Thus in all components in recent years (street railways remained in the process of contraction), large replacement requirements were the dominant element in the gross flow of capital. It is significant that an investment of nearly two billion 1929 dollars was required annually in the 1940's simply to keep the physical stock of capital of the regulated industries intact, and that more than one-fourth of the two billion was accounted for by railroads.

As suggested, the trend in the gross flow of capital presents a relatively buoyant picture. Even in the railroads, the sharp downward movement evident in net investment is almost obliterated in gross capital formation. In all other components except street railways, the trend of gross investment was distinctly upward. In the aggregate of the regulated industries, it leaped from less than 500 million 1929 dollars per annum in the 1870's to 2.6 billion in the 1920's and to more than 3.0 billion per annum in the years immediately following World War II. In the latter period it represented

from 25 to 30 per cent of the national total of gross capital expenditures on plant and equipment by all nonagricultural industry.

Secular Trends in Production

The model pattern of growth employed in the analysis of capital formation may also be applied to production. In this framework, output is analogous to the stock of capital, and changes in output are analogous to net capital formation. The trends in these two categories, in general, differ widely but systematically. In particular, the regulated industries appear considerably less mature when judged by the behavior of production rather than by that of capital formation. In the aggregate, output of the regulated industries rose by progressively increasing amounts throughout the 1880-1950 span for which records are available. So did the increments in output. Trends of the same kind prevailed in telephones, electric power, and the all other group. The latter two components, as well as the aggregate of the regulated industries, had been in an appreciably later stage of development when appraised from the standpoint of capital formation. At least they had each reached the point at which net capital formation (analogous to output increments) had ceased to rise by increasing amounts.

Railroads and local bus lines ranked on a par when judged by the production maturity standard, each having completed the first two stages of the model pattern. In both cases the secular trend of production in the 1940's remained upward, but its rise progressed at a diminishing rate. In the railroads, it will be recalled, the stock of capital had reached its peak in the early 1930's. Local bus lines—alone among the components, except for telephones—reached the same stage of growth in output and in capital formation. Street railways had a slightly more youthful look in the production framework, though output in 1950 was heading secularly downward, and had been tending in this direction for at least twenty-five years.

Thus the relative rank of the industries with respect to maturity is nearly the same when judged by the behavior of production as by that of capital formation. But in the former framework, the various components appear to be in significantly earlier stages of development, reflecting systematic changes in their respective capital coefficients. The most striking feature in the behavior of their production in the aggregate, however, was the vigor of its rise. Measured in 1929 dollars, it rose from a little more than one billion in the 1880's to nearly twelve billion in the 1920's and to nearly twenty-six billion in the 1940's. Of course, over almost the entire 1880-1950 period the *relative* rate of increase in output diminished—

in the aggregate and in each of the components. But as might be expected from the trend patterns already defined, the reductions were not quite as great as the corresponding ones in capital formation, and the rates of increase prevailing were generally higher.

Capital Coefficients

It is thus apparent that capital formation failed by a considerable margin to reflect the full vigor of the growth of output. The coefficients relating these variables were patently subject to constant change. In the analysis of this relationship, two concepts were distinguished: the average and marginal capital-product ratios.

The first may be defined as $\frac{C}{O}$, where C is the stock of reproducible capital and O is the volume of output, both measured in constant dollars. The marginal capital-product ratio may be defined as the ratio between the change in the stock of reproducible capital and the change in output, similarly measured—i.e. as $\frac{\Delta C}{\Delta O}$.

Over the seventy-year period for which records are available, the trends of average and marginal capital-product ratios in the regulated industries are marked by abrupt decline. The average ratio in the aggregate dropped from about 12 in the 1880's to 6.5 at the turn of the century, to 3.5 in the 1920's, and to 1.7 in 1950. In railroads the reduction was also continuous—and at a diminishing rate—throughout the period of study, after allowance for cyclical variations, dropping over the span from 16 in the 1880's to 3 in 1950. In the other components the reductions were more irregular, totally apart from those fluctuations common to them all, which stem from cyclical revisions in the level of business activity. In telephones and electric power, the first decade of operation was characterized by a rise in the ratio. So were the earlier years in street railways in which electrification was accomplished. Significant interruptions in the long-run decline occurred in addition in electric power in the first twelve years of the twentieth century, and in telephones in the late 1920's and 1930's. Nevertheless, the over-all reductions were extensive: from the 1890's to 1950, the ratio dropped from 15 to 2 in electric power, from 5 to somewhat less than 2 in telephones, from 6 to 2 in street railways, and from 10 to 1 in the all other group. Moreover, the trends in general exhibited the common characteristic of gradually losing momentum. In the aggregate, in railroads, and for most of the period in electric power, they were described with considerable accuracy by the downward branch of a Gompertz curve.

Only in local bus lines is there a material departure from the

general pattern, though it must be borne in mind that the history of the industry is very brief. In this component the ratio rose from about 0.5 in the mid-1920's to 1.7 in 1950. Part of this advance was due to short-run factors relating to the war and its aftermath; but part was also due to distinctive characteristics of this component.

The trend of the *marginal* capital-product ratio was also downward in every industry group except local bus lines. Measuring changes from peak to peak in the first long cycle and from peak to peak in the last of the long swings in the 1880-1950 span, the ratio declined from 9 to 0.4 in the aggregate of all regulated industries, from 10 to -0.2 in railroads, from 17 to 0.6 in electric power, from 5 to 2 in telephones, from 6 to 4 in street railways, and from 11 to 0.4 in the all other group. The negative ratio during the last cycle in the railroads indicates that during the years 1927 through 1950 output increased while the stock of capital was being contracted. Thus, with a minor exception, advances in output over the period were accompanied by progressively smaller amounts of capital formation—in each of the regulated industries as well as in the aggregate. And the dimension of this change in the long-run relationship between demand for final product and investment was very substantial.

It may be noted that the average capital-product ratio in the regulated industries has in all periods greatly exceeded that prevailing in other segments of the economy, although in the light of the trends described above, the differences have diminished over time. In manufacturing in 1948 the capital-product ratio was 0.65, compared with 1.7 in the regulated industries. In mining the ratio was 1.3. Differences in the amount of capital *consumed* per dollar of output, however, are much smaller than the disparities would suggest. The average life of capital is appreciably longer in the regulated industries than in either of the other two segments.

Underlying Factors

As suggested above, the secular behavior of net capital formation may be illumined by an analysis of factors which appear to shape the long-run trends in output increments and in the marginal capital-product ratio. We proceed to a summary of these factors.

OUTPUT

In the early days of the regulated industries a rate of growth was established far greater than that of any possible long-run sustaining factors. This is recorded distinctly for each of our components. For example, in the 1890's, shortly after the beginnings of electric power, its output amounted to 31 cents per person in the United States,

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0.07 per cent of the gross national product, and 0.2 per cent of our rough measure of urban income. A decade later per capita output had increased five times, its proportion of the gross national product had quadrupled, and its proportion of urban income had tripled. Similar spectacular advances were made in the same period by the budding telephone industry and by street railways, which as a virtually new industry was in the process of electrification.

Here is a manifestation of what we have termed the vacuum effect. It is characterized by the rush of resources into a segment of the economy in which profit opportunities appear extraordinarily high. Its power is always great, though it must depend, ultimately, on the size, flexibility, and mobility of available resources, and on the relative magnitude of the demands made upon them. It is fed by the overthrow of the competitive opposition of older industries. It is nurtured also by an income elasticity of demand which in a new industry, destined for success, is almost certain for a time to exceed the critical level of unity. It is ensured, temporarily at least, by the fact that the earliest productive units established will fall far short of the capacity the market may at the time successfully absorb. This is a virtual technological necessity in a nation as large and as sprawling as the United States, and is only reinforced by the fact that caution and experiment are typical business characteristics. Moreover, far-reaching technological improvements are almost certain in an industry's earlier years, and add even further to its powers of expansion. In the face of a potential market which is obviously growing swiftly and is far above the level that existing facilities can exploit, innovators extend capacity as rapidly as possible. Reports of their successes attract imitators from an ever-wider range. Capital is risked with steadily mounting confidence. All these factors in concert push output forward at a rate far in excess of the growth of the nation's aggregate purchasing power, urbanization, or any other factor which in the long run could sustain it. This was true, in the earlier years, of all the components of the regulated industries.

So great was the power of the vacuum effect in the regulated industries that some ultimate decline in the relative rate of growth was inevitable in later years. However, the performance of the components studied varied greatly. In some, a number of "invigorating" factors served to support the pace of output at a relatively high level throughout the period of study. In others, "retarding" influences gained the upper hand. Among the invigorating factors were:

1. The development of new uses for the product. In this category

was the gradual extension in the uses of electricity to stoves, refrigerators, dishwashers, and a variety of other household and industrial appliances.

2. Virtual immunity from competition. For technical as well as institutional reasons, telephone service was so situated.

3. Technological innovations and mass production. These encouraged consumption by permitting price reductions relative to the general price level.

4. Propitious social changes making for favorable shifts in consumer tastes. One change was the swift pace of urbanization in the United States, with favorable impact on nearly all of the regulated industries.

All of the invigorating factors were especially influential in the development of the electric power and telephone industries. Owing to their effects, the early swift rise of output in the two components was extended so that throughout the 1880-1950 span production rose at an ever-increasing absolute rate. But even in these vigorously growing components, retarding influences were manifest, though always overshadowed. Contrariwise, in our other components the invigorating influences were weak and the retarding factors stronger, so that the pace of production was perceptibly dampened and—as we have seen—these industries moved farther along the model pattern of growth on the road to maturity. The retarding influences were:

1. Ultimately, the older related industries were completely crushed, or thrust into a smaller facet of their function, which for some reason remained impregnable. Future advances, then, could not be fed by business stripped from competitors.

2. Once mass distribution had been attained, the income elasticity of demand tended to decline. This stemmed, in part, from the complete routing of older competition and the achievement of at least temporary market saturation. Future advances, at best, were thus limited only to those arising from national growth

3. Younger industries producing related goods or services ultimately arose to offer competition.

4. The very power of the vacuum effect tended to induce some later reduction in the rate of growth of output. The longer it lasted, the greater grew the danger of overextension.

Production of all industries in their earliest years expanded far more rapidly than the gross national product or even urban income. In electric light and power and in telephones this condition persisted throughout the 1880-1950 span. Nevertheless, even in these vigorously growing components, retarding influences were at least

modestly in evidence. For electric utilities, there was the competition of public power. For telephones there was some indication of market saturation—i.e. a declining elasticity of demand, both with respect to price and income. Hence the differential in the rate of growth of the two industries, over their long-run sustaining factors, was gradually and quite significantly narrowed, although in both cases the rate continued slightly above that of urban income. For the special invigorating factors, so pronounced, had barely begun to peter out.

Railroads, street railways, and local bus lines lack the virtual immunity from competition characteristic of telephones. They also lack the technical resiliency which has enabled electric light and power to find a succession of new uses. Their older competitors—canals, horse-drawn vehicles, etc.—had long since been routed. The vacuum effect in these components subsided at an early date in the period of our study, and invigorating influences, tending to prolong swift growth, were weak. Thus, new competition proved swiftly crushing for street railways and slowly but firmly limited the growth of the railroads. For local bus lines, the chief retarding factor appears to have been a declining income elasticity of demand.

Accordingly, in 1950 production by street railways amounted to 0.2 per cent of the gross national product, less than one-sixth of the proportion prevailing just before World War I. For railroads the rate of increase in output dropped from one which far exceeded that of the gross national product before World War I to one which did little more than match the growth of population. In 1950 railroad output amounted to about fifty-six dollars per person, at 1929 prices, approximately the same as thirty years earlier. The rate of growth of production by local bus lines had also fallen significantly below that of the gross national product. Of course, during the period of the vacuum effect, growth in all three had been sufficiently great to exceed even that of the swiftly advancing *urban* income.

It may be noted that the growth of production in the all other group of regulated industries topped that of the gross national product and of urban income throughout the 1880–1950 span, reflecting the development of new industries. For all regulated industries in the aggregate, production rose from 7 per cent of the gross national product in 1890 to 12 per cent in 1910, to 14 per cent in 1930, and to 17 per cent in 1950, remembering that output is here measured as gross of the materials consumed. The pace of this advance was also greater than that of urban income up to the time of World War I; from that date onward the ratio of the output of all regulated industries to urban income was virtually steady.

CAPITAL-PRODUCT RATIOS

Underlying the trend of the capital-product ratio in the regulated industries was a definite sequence of events which was common to all components. The variations in capital-product ratio trends observed among the different segments are attributable to differences in the intensity and duration of the elements of this sequence. The general pattern may be described in terms of these stages.

Initially, there was a period of gestation in which preparatory investment was made on a wide scale, and many large indivisible units were started and only gradually brought to completion. This inaugural build-up was unusually large in the regulated industries, for a number of reasons including technological characteristics, the distant horizons envisaged by utility-builders, and the speculation which was rife at this stage in some of the components. Of course, actual output in this period was necessarily small, and the capital-product ratio rose.

But this introductory stage was, by nature, short-lived. It could last only so long as *new* plants were established at a faster pace than output rose in facilities that were brought to completion. The duration was less than a decade in the regulated industries for which relevant data are available. Furthermore, it should be recalled that in the *aggregate* of utilities this initial increase in the ratio for electric light and power, for telephones, and for electric railways was overshadowed by the sharp decline simultaneously in progress for the older industries—especially steam railroads and some of the older components included in the all other group. The capital-product ratio in the regulated industries as a whole accordingly moved downward throughout the 1880–1950 span. In manufacturing, the initial period of extensive expansion, characterized by the rise of a multitude of new firms and new industries, was accompanied and followed by the sweep of pervasive capital-demanding innovations which were the earmark of the industrial revolution. As a result the capital-product ratio remained on the rise until World War I or somewhat later.

The second stage of the pattern is a natural outgrowth of the first and followed swiftly in the regulated industries. Once many large installations were completed, output was free to expand with relatively little additional investment necessary. The capital-product ratio was therefore profoundly depressed.

In the third stage the drop in the capital-product ratio was perpetuated. Capital-saving inventions enhanced the efficiency of plant and equipment. These took the form, primarily, of piecemeal improvements in existing facilities. In some cases, the physical

capital stock was also put to more economical use. In addition, the growing relative importance of capital consumption, in the company of general technological advance, ensured that the stock of capital would be replaced at a progressively faster rate with units capable of greater productive service. Finally, the expansion of accrued depreciation served to depress the *net* stock of capital, as ordinarily measured, in relation to that actually in use. For all of the foregoing reasons the capital-product ratio continued downward even after the influences at work in the second stage had completely lost their force. It is certain that these factors were significant not only in the regulated industries, but—in whole or in part—in many other major segments of the economy; for, at least since the 1920's, the downward trend of the capital-product ratio was nationwide.

From the general pattern described there are, to be sure, deviations. Even after the first stage of the pattern had ended, capital-*using* innovations occurred in the regulated industries and resulted, for a time, in rising capital-product ratios. This was the case in the early 1900's in electric light and power, and in the mid-1920's in telephones. But such deviations in the seventy-year experience of our industries have proved temporary. The dominating, pervading factor among utilities in the long run, once the initial period of gestation had been surmounted, was the steady flow of capital-*saving* devices and the persevering drop in the capital-product ratio. Among our components, the only one in which this general trend did not hold was local bus lines. Here, special characteristics of the industry, together with the particular events of the World War II period and its aftermath, served to maintain a rising capital-product ratio throughout the industry's relatively brief history.

In general, the *extent* of the decline in the capital-product ratio was closely correlated among industries throughout the nation, including the regulated segment, with the initial standing of the ratio. The highest ratios declined the most. This development appears to be due to three factors: (1) Those components in which particularly high capital-product ratios were achieved were the very ones in which capital is characterized by a high degree of indivisibility. In such industries, the way is smoothly paved for a subsequent and particularly sharp reduction in capital-product ratios as output expands in later years. (2) The more diverse the physical stock of capital of an industry, the greater the chance that scientific advances will result in improving its efficiency. Insofar as diversity is correlated with the relative size of capital installations, this increases the *opportunity* for improving capital efficiency in capital-extensive industries. (3) There is no upper limit to the capital-product ratio,

though there is a lower limit at least at zero, and as a practical matter somewhat above zero. Accordingly, at their peak, capital-product ratios may be widely scattered. But as they decline, the presence of a lower limit tends to reduce their dispersion.

The influence of wage and interest rates upon the long-run trend of capital-product ratios in the regulated industries appears to have been secondary. Both rising and declining capital-product ratios were accompanied by advances in labor's productivity, with little, if any, significant difference in degree. Hence, the stimulus to economies in the use of labor provided by rising wage rates could—and did—find satisfactory outlets in *both* capital-saving and capital-using innovations. Progressive reductions in interest rates would (other things being equal) encourage investment in general, and would facilitate a rise in the capital-product ratio in particular *if such an advance were generated by other forces*. But on the other hand a decline in the cost of money capital would not in any way inhibit a *reduction* in the capital-product ratio if it were induced by technological or other conditions. Accordingly, neither the influence of wage rates nor of interest rates appeared to play a crucial role in determining the secular pattern of the capital-product ratio in the regulated industries.

CAPITAL FORMATION

The secular progress of capital formation is thus the result of the two streams of events already described: (1) those which determine the secular pattern of output and (2) those which determine the secular pattern of the capital-product ratio. In the early stage of development of the regulated industries, investment was generated in huge dimensions because of the combined operation of the vacuum effect upon output and the rise in the capital-product ratio characteristic of the gestation period. But after this period—and very soon after for most components—the situation altered materially. The effect of increases in demand for final product upon investment was significantly dampened by progressive reductions in the marginal capital-product ratio. Besides, numerous forces combined to retard the growth of output. In general, over the long run, there was a tendency for capital formation to follow the pattern of output, but it was in the main a less vigorous version because of the declining capital-product ratio. Though production in the aggregate of the regulated industries persistently outdistanced the gross national product throughout the period of record, investment, at least in the later years, barely maintained the much more leisurely pace of the growth of the population.

Long Cycles

The capital formation of the regulated industries is characterized by pronounced long cycles—a fact which at every point materially complicated the task of defining long-term trends. The cycles lasted on the average about twenty years. Their amplitude was considerable—averaging in expansions about 70 per cent, and in contractions about 40 per cent of the average annual investment during the cycles as a whole. A chronological as well as a cross section (by industry) analysis of these fluctuations yielded the following pattern. In the earlier days of a regulated industry long cycles were barely evident in the progress of investment, if they appeared at all. Later, the broad vigorous expansion was interrupted by modest contractions. Gradually, the contractions deepened while expansions tended to grow weaker. It was through this process of cyclical behavior that the sharp upward slope of the secular growth trend slowly diminished, and ultimately yielded to descension.

Chronologically, however, the tendency for expansions to weaken over time was offset in part by certain other economy-wide alterations in the environment, so that the magnitude of cycles taken as a whole increased progressively over the 1870–1950 span. In the post-World War I period, the swings in the regulated industries were paralleled by corresponding movements in the general level of business activity as measured by the gross national product. In these years, cycles in the two series were reinforcing. Prior to World War I long cycles in the gross national product appear primarily as swings in the secular *rate* of growth, and are not pronounced in the absolute figures. Furthermore, insofar as they do appear, their timing is not the same as in the regulated industries.

Though unmistakable in capital formation, long cycles are not pronounced in the output or in the annual output increments of the regulated industries. However, similar fluctuations—with almost precisely the same timing—are found in residential construction and in annual population increments.

Analysis of the duration of long cycles, together with the average life of capital and the variations about this average, suggests that they cannot be attributed to the periodic reinvestment impulses investigated by Johan Einarsen. The transport-building cycle hypothesis of Walter Isard was also rejected on the grounds that (1) it was impossible to tie each long cycle to a specific transportation innovation as the theory requires, and (2) a hypothesized relationship was lacking between the timing of cycles in the regulated industries and in the general level of business activity. It was suggested that further work along two lines in this area might prove

fruitful. One would be to explore the connection between swings in population increments, the gross national product, and investment in the regulated industries and in housing, as proposed by Kuznets. The other would concern certain tendencies toward long swings inherent in the characteristics of the regulated industries and residential construction, and the nature of the impact of major business cycles upon investment in this setting. In line with the latter hypothesis, long swings in the investment of the regulated industries would be interpreted as a manifestation of the interaction between this segment and business activity in the economy as a whole, conditioned by institutional properties peculiar to the segment. Among these properties are the high durability and great indivisibility of the capital used, the tendency to "bunch" orders of even the more divisible capital units, the cumbersome nature of capital budgeting and financing practices, and the considerable length of the average capital construction period. All these factors inhibit swift reversals in the direction of investment.

Finance

The physical growth of the regulated industries over the span from 1870 to 1950 was coupled with an expanding need for money capital. The rise in the flow of money capital was further supported, however, by the secular upward drift in the price level over the eighty-year span, and by the advances in the *relative* prices of capital goods. In current prices, the gross capital expenditures of the regulated industries amounted to between 200 and 300 million dollars per year in the 1870's and 1880's; by 1950 they aggregated 6.4 billion dollars. The value in current dollars of their stock of plant and equipment approached 80 billion at the beginning of 1950, against about 5 billion in the 1870's. In the financing of the huge capital requirements implied by these figures, two outstanding changes occurred over the eighty years for which data were assembled. First, there was a gradual, steady, and pronounced shift from external to internal financing. Second, there was a shift in the *form* of external financing from stocks to bonds.

Over the period of record, which differed somewhat among the several components, the proportion of internal sources to total sources of funds rose from 2 to 100 per cent for the railroads, from 8 to 50 per cent for electric power, from 6 to 41 per cent for telephones, and from 1 to 14 per cent for street railways. These changes were analyzed in terms of the equation:

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

where r is the proportion of all sources of capital provided by retained profits and depreciation, a is the ratio of net savings to profits, b is the ratio of profits to total assets in current prices, k is the ratio of depreciation charges to total assets, in current prices, α is the ratio of net capital flow to total assets in current prices, and β is the ratio of capital consumption at replacement cost to total assets in current prices.

Other things equal, the formula shows that the rate of internal financing (r) 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). Experimentally, it was possible to test the influence of some of these factors separately.

It was found that the rise in the rate of internal financing in the regulated industries was attributable in the main to two factors: (1) The need for correcting the initial deficiencies in capital consumption allowances which existed in the earlier years of our period of study. Depreciation charges in the latter decades of the nineteenth century were by a substantial margin inadequate to provide for the prevailing rate of capital consumption. (2) The expanding importance of capital consumption relative to *all* uses of capital over the period of study, springing from the retarded rate of growth of total assets. The latter trend mirrored, primarily, the retarded rate of growth of output together with the declining capital-product ratio.

Thus, alluding to our first factor, even if the regulated industries' rate of growth had been unchanged over the seventy years studied, a substantial increase in the rate of internal financing would have been necessary to cover replacement. This factor alone would have been sufficient to boost the gross retention rate from 2 to 42 per cent in 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. When the second factor—retarded rate of growth over the period—is taken into account, a possible explanation is provided for the *entirety* of the observed rise in the rate of internal financing. Thus, it was found that the influence of the decline in the net rate of capital flow was sufficient to induce a further boost in the gross retention rate of 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. In the first three components the aggregate "hypothetical" advance in the retention rate was roughly the same as had actually occurred over the period 1880–1950. In street railways the hypothetical advance was much greater than the actual one, indicating that in the later years in this

component internally generated funds were insufficient to meet capital consumption requirements. This situation was symptomatic of both the financial difficulties which many street railways were then encountering and of the fact that this component was in the process of contraction.

The shift in the *form* of external financing, from stocks to bonds, was also pronounced and pervasive. The use of long-term debt is—and always has been—far greater in the regulated industries than in the other segments of the economy. It is encouraged by the form of public regulation as well as by certain other characteristics of these components. Its extension over time probably reflected in part the growth of public regulation in addition to the shift toward internal financing which boosted the value of existing equity claims. The trend was further promoted by certain economy-wide influences such as the adoption and subsequent rise in the corporation income tax. But the importance of special factors is attested by the much more pronounced trend evident in the regulated industries. The proportion of external funds secured through bonds in the railroads rose from 56 per cent in the 1880's to 70 per cent in the 1920's, after which external sources in general sank to negligible dimensions. In electric power the rise was from 43 per cent in the years before 1912 to 58 per cent in the 1940's. In telephones bonds accounted for 22 per cent of net new issues in the 1890's and for 85 per cent in the 1940's. In the brief span of the expansion of street railways, bonds advanced from 44 to 100 per cent of the external sources of long-term capital. Reflecting these trends, the relative importance of bonds in the capital structure by the 1940's was three times greater in the regulated industries than in all other nonfinancial corporations.

The Outlook

Despite the economic, political, and social turbulence of the eighty years from 1870 to 1950, the continuity of development in the regulated industries over this period is impressive. Our analysis disclosed the evolution of economic patterns of several kinds, embodying the intricate sequences of secular growth. The patterns themselves may be viewed as chains, in which the links from beginning to end are related events over successive units of time. In our segment of study, no breaks are revealed in these chains—no sudden discontinuities in which the events of one period of time are divorced from all perceptible relationship with those which have gone before, or those which come later. It is from this point of view that something may be said of the secular growth of the regulated industries

in the years ahead. For knowledge of the factors which have shaped development in the 1870–1950 period must necessarily illumine long-run prospects.

We shall now focus briefly on the outlook through 1975. No specific forecast will be attempted. The problems involved in such an undertaking would extend well beyond the boundaries established for this study. The discussion will be confined to reflections, primarily qualitative, concerning the identity, power, and direction of the principal forces likely to shape the growth of the regulated industries over the twenty years ahead. A reasonably concise discussion necessitates the assumption that over the years through 1975 there will be no major wars.

One lesson from the past is that the *simplest* projections of the future are nearly certain to be seriously defective. To suggest, for example, that investment in the regulated industries will proceed in the future at the same percentage rate as that which prevailed in some period of the past would ignore the role of long cycles, the connection between demand for final product and capital formation, the susceptibility of the capital-product ratio to change, and the shifting role of other factors such as technology and competition in different stages of development. By the same token, some other popular and somewhat more sophisticated approaches are ruled out. Thus, to project output of the regulated industries at some constant ratio to the gross national product or to population would violate the pattern of the past in which such relationships have been subject to constant modification. And to derive investment from this projection by applying the currently prevailing capital-product ratio would ignore the virtual certainty that this ratio in the future will differ materially. In accord with the logic of our own historical analysis, an effort to illumine the future of investment must be directed, initially, to the factors underlying demand for final product.

Fundamental, of course, is the future growth of the nation as a whole. But even if some plausible assumptions are made concerning the growth of the population and its income, an analysis of the probable role of the regulated industries must grapple with a host of specific circumstances conditioning their relative behavior. The particular influences—summarized in the vacuum effect—which generated the spectacular advance in the years prior to World War I have obviously disappeared for all major components. Hence, a conflict of invigorating and retarding factors remains to be appraised. Virtually by definition, the latter are in ascension and the former in decline in established industries. Diminishing rates of

growth in production are universal among our components. And in some, reductions are in progress relative to the nation's growth. But differences in degree of retardation are enormous.

Output in the street railway component has for some time tended downward absolutely, and no element of importance in past development can be employed for supporting a reversal of this trend. No grounds exist for supposing that the competition of the other means of transportation will abate. Nor is there any likelihood that the range of innovation possible within the framework of street railways can overcome the fundamental advantages of competitors. The general pattern of growth described earlier, however, suggests one alteration in the pace of the decline of this component. The absolute reductions in output from year to year should diminish. This would continue a tendency noticeable in the immediate past. It reflects simply the fact that the industry is reduced gradually to a smaller number of remaining strongholds in which street railways enjoy some particularly favorable adaptation, or in which bus lines and passenger cars face unusual obstacles which are but slowly surmounted. The industry's progress to ultimate extinction thus becomes more and more reluctant.

In much diminished degree, railroads also face progressive encroachment from competitors. But output in this component remained secularly upward throughout the period of study. Will this pace be maintained over the next twenty years? Here we encounter not only the fundamental advantages of competitors, but certain basic advantages retained by the component itself. The rate of expansion in the output of the railroads had been reduced to well below the pace of the gross national product to approximately—since World War I—the rate of growth of the population. The inherent advantages of trucks and air transportation herald further inroads. None of those factors which we have termed invigorating is likely in the case of the railroads to spur an accelerated extension of activity. On the other hand, some facets of remaining business—e.g. long hauls for bulky and heavy commodities—are more nearly impregnable than others. It would not conflict with past patterns of growth to suppose that the output of the railroads will continue upward over the next twenty years, nor to suppose that the pace of its advance will become subject to further retardation. Indeed, an extension in this segment of the trend toward retardation in the rate of growth poses the possibility of a decline before 1975 in railroad output per capita. This would not preclude future substantial increases in the absolute volume of railroad output, for they will depend in part upon the trend in population itself.

Continued growth, though at a materially slower pace, seems also in prospect for local bus lines. For the most important invigorating factor present in the early days of this industry had by 1950 been sharply reduced in importance. This was the presence of numerous cities in which streetcars had not yet been replaced by buses. By the 1950's, the opposition had been almost completely crushed. Also, on the retarding side, it appeared that with higher incomes American families were depending in greater degree upon the private passenger car for local transportation. The pace in the advance in local bus lines had begun to fall behind that of the gross national product. It still remained above that of the growth of population. Perhaps it will converge with the latter, or possibly dip somewhat lower in the score of years ahead, under the pressure of an income elasticity of demand materially less than unity. This is the prospect indicated, if we assume that the direction of the forces now influencing demand in this component are by nature irreversible. Perhaps the most important possibility of reversibility lies in the competitive relation between the bus and the private passenger automobile. If traffic conditions worsen, and the use of private cars is limited further, the bus will be the chief benefactor. (See note 10, page 92.)

This leaves the three most vigorously growing components—electric power, telephones, and the all other group. In all three cases the pace of growth was geared more closely to that of urbanization than to the somewhat slower rate of expansion of the gross national product. Nevertheless, the differential had narrowed progressively. In telephones the principal retarding influence was apparently gradual market saturation. Increases in national income lent a progressively weaker stimulus to output as an ever larger proportion had acquired access to, and used, communication facilities. Continuance of past trends for this component would suggest a reduction in the rate of growth over the period ahead to a level not much above that of the population.

Evidence of retardation was less pronounced in electric power. A rise more rapid than that of population appears assured for some time to come by the wide expansion in household uses gradually extending throughout the country. Industrial uses might also be somewhat further extended if it becomes technically possible to reduce costs through the application of atomic energy. Yet it would appear that the size of the electric power industry must depend more and more upon the growth of the nation itself. The special invigorating influences of its earlier days—such as the vacuum effect, the crushing of competition, radical innovations of the basic technological framework—have either passed entirely or have been

materially diminished in degree. The expansion of public power, while limited, is a retarding factor which must not be overlooked. A growth rate much in excess of that of the gross national product, therefore, could persist only if some important *new* uses for electric power were developed. In the absence of these, in the decades ahead, the output of electric power should continue to converge toward that of the gross national product; in so doing, of course, it would continue a trend long in progress.

With respect to the prospects of the heterogeneous all other group, of course, less can be said of specific character. Experience would suggest, however, that if any new industry were developed in the immediate future to become part of this group, it would require considerably more than twenty years to assume substantial importance among the regulated industries in the aggregate—particularly since no such industry is now on the horizon. The declining rate of growth of the group as it stands has evidenced the passing of the vacuum effect in some of the leading elements such as trucking and air transportation. But the persistent vigor of these and some of the other industries included, such as gas utilities, has limited the decline in the group's rate of growth narrowly. Even in the course of the most recent years this component's expansion has outdistanced that of the economy as a whole by a considerable amount. A continuation of the modest decline in its rate of growth over the next twenty years would leave it still somewhat above the pace maintained by the gross national product over the last several decades.

Thus the general pattern of development, as shaped in the past, suggests for the next twenty years, taken as a whole, a brisk and continued expansion in output for the regulated industries in the aggregate. The limits of the rise, prospectively, are set by the pace of the growth of the nation. Barring some presently unforeseeable change, it is difficult to conceive, against the background of the past, of a future advance in the total output of the regulated industries much smaller than that of the population, or much greater than that of the gross national product. This at least is the promise implied by the patterns of the past, after allowance for the secular changes in progress or in view. Though brisk, a rise within these limits would imply a materially slower pace, relative to the nation's growth, than that which had prevailed secularly at any time previously. This slackening in the advance of the regulated industries mirrors the waning of invigorating factors and the rise of the forces of retardation which have been the faithful concomitants of maturity in the past.

In appraising the outlook for investment, however, the growth in demand for final product is no more important than the technical

relationship likely to hold between product and capital. Will the decline in the capital-product ratio—in progress for so long in the regulated industries—continue in the years ahead? If so, will its reduction proceed at a rate which matches, or materially exceeds, or falls short of, that of the past? Such questions become susceptible to at least general answers in the present context only if it is understood that reference, as throughout this discussion, is to secular movements. For both the average and the marginal capital-product ratios fluctuate widely over short periods of time in response to cyclical and other short-range factors.

The decline in the capital-product ratio in progress in more recent years in all of the regulated industries segregated in this analysis, except local bus lines, has been attributable to capital-saving innovations. In a larger sense, it represents a concluding chapter in a technological pattern, a phase of scattered improvements within an over-all framework which, itself, has embodied the most advanced basic scientific achievements currently available. Only a technological *revolution*—a fundamental change in the framework itself—can seriously disturb this pattern, and launch a prolonged *advance* in the capital-product ratio. Such a revolution would be tantamount to the rise of a new industry in the place of the old. There is no evidence of so radical a change in the offing in the regulated industry segment.

Even substantial interruptions (aside, of course, from cyclical changes) to the reduction of the capital-product ratio have been uncommon. The incorporation of atomic energy in the generation of electricity could conceivably occasion in the electric power component a material deviation of this kind from the longer-term trend. But this would reflect a mere period of build-up—during which capital is created and not yet brought into use. Such periods are by nature short-lived, as we have seen. The use of atomic energy in this setting, since it would leave the basic structure of the electric power industry intact, does not promise to be capital-demanding from a long-run standpoint. This at least is the prospect suggested by plans now taking shape in the industry. In a situation in which technological applications are still so amorphous, however, well-grounded predictions over any extended period of the future are not possible. Nothing in the nature of atomic energy rules out the development of capital-demanding uses, and it may well be that some will materialize within the next twenty years in connection with one or more of the industries under review.

Nevertheless, in the light of prospects now in view, something may be said in support of a continued stream of capital-saving innovations in the years ahead, in extension of the trend under way for so long

in the regulated industries. We might expect, of course, that the pace of the decline in the capital-product ratio in the future will be less pronounced than in the past. For we have observed the close correlation between the level of the ratio and the extent of its subsequent decline; we have noted the factors underlying this phenomenon; and we have witnessed the retardation of its descent in recent years. But the continuance of its decline, albeit at a diminished rate, is more likely than a rise in the same sense that technological revolutions are less frequent—and more dramatically foreshadowed—than a multiplicity of minor technical refinements. There are no distinct and present signs of imminent revolutions of this kind.

Not that the capital-saving innovations are necessarily undramatic. The widely heralded “automation” of industrial processes consists primarily of capital-saving devices. Thus, the construction of electronic railroad classification yards, which at present writing is mainly in the planning stage, promises immense economies in the use of freight cars. As has been true historically of most capital-saving devices, the innovation will likewise reduce manpower requirements. Generalized, this trend promises that the impact upon investment of future advances in the demand for final product are likely to be substantially modified by the changing technical relations between capital and output. The general patterns previously described illumine the probable dimensions of this effect. Net capital formation in the regulated industries in the aggregate had in recent years fallen appreciably below the pace of the advance of the total population; i.e. the per capita value of plant and equipment dropped materially. Owing to the retardation in the growth of output, as well as the diminishing capital-product ratio, this decline may proceed in the future. In absolute terms also, the advance in net capital formation had lost much of its earlier vigor; the secular *rate of increase* has clearly dropped since about 1910, and the trend in the volume of net investment itself appears to have been nearly horizontal since that date. The general conclusions reached above all point to an intensification of these signs of secular weakness—barring, of course, a radical upward shift in the pace of the long-term growth of the economy as a whole. Mention must be made, too, of a second fundamental qualification implicit in our analysis. Technological developments may of course arise at any time, and may be of sufficient import to alter significantly the capital-product ratio, the rate of obsolescence on existing capital, or the output prospects of the regulated industries. Such changes could operate toward lifting the pace of investment very substantially, and for an extended period of time. Nor is there any way of predicting technological

innovations. Their most likely center, as suggested above, is in the application of atomic energy, and the possibility that particular uses not now on the horizon may materialize as practical realities.

From a financial standpoint—and with the qualifications cited—our analysis suggests that the regulated industries will play a more modest role in capital markets in the twenty years ahead. Of course, there are probably exceptions within the group, such as air transportation. But the general conclusion appears to hold for the group as a whole as well as for all the currently more important components. The impact of the retarded rate of growth, and the declining capital-product ratio, on this segment's demand for outside capital has been reflected in the past by the trends in progress in methods of financing. Reference, in particular, is to the gradual shift toward the internal financing of capital requirements notable for all the components for which relevant data were available. Only a powerful upward shift in the prospective growth rate of this segment, or a capital-demanding innovation of huge dimensions—neither of which is predictable on the basis of current knowledge—would be sufficient to arrest this trend in the future. Furthermore, persistence of the trend toward internal financing may be expected to stimulate in turn a continuance of the shift from stocks to bonds in net new issues. For while internal financing increased the value of equity claims, it would also make financially feasible the assumption of a greater volume of debt. But of course the choice between stocks and bonds is influenced by other factors, including the attitude of the providers of capital. Consequently, the nature of the future shifts in this respect among the regulated industries must remain indefinite.

Assuming that on the basis of the secular patterns defined in earlier chapters of this book, a particular set of figures had been established as the most probable trend values of net and gross capital formation over the years through 1975, at least one further adjustment would remain necessary for most of the practical uses to which such projections might be put. This would involve the provision of some notions concerning the timing of the investment. For the secular trend is an abstraction, being divorced from long cycles as well as from other shorter-term fluctuations. And the long cycles are sufficiently large and extensive to command attention even when strictly long-range problems are in view. Judging from average experience in the past, it would be necessary to allow for a long cycle contraction approximately 40 per cent below the average of the projected secular trend values, and for an expansion about 70 per cent above. We would expect the expansion to last 50 per cent longer than the contraction, with the cycle as a whole covering

twenty years. We might further adjust the amplitude by allowing for a secular tendency for contractions to increase in intensity. But two considerations would remain, which in fact might transcend in importance the mechanical details already mentioned.

The first would concern the possibility of a discontinuity in historical experience. It is generally believed that recent advances in technical knowledge as well as political education have enabled society to modify business cycle fluctuations to a much greater degree than was possible in the past. If this is true, does it not also follow that *long* cycles in economic behavior will be materially modified? It would seem that gradual modification, though certainly not swift elimination, may indeed be expected. Long cycle contractions have been accompanied in the past by severe business depressions. If depressions of major magnitude are avoided, long cycle contractions will be less extended and less severe. For it has been characteristic of the latter that investment dropped to levels far below those justified by secular growth factors. The sharpness of this decline reflected the collapse of demand as well as of business expectations. If demand for final product were maintained, the decline in investment would be more modest. As a result, the succeeding long cycle expansion, in which investment typically outstrips secular growth factors, would also be more narrowly limited. In this way the severity of long swings would be gradually dampened, perhaps so effectively that their practical significance would diminish to negligible proportions.

It is even conceivable that the effect of long cycles on the aggregate income and output of the nation may be virtually eliminated with considerable promptness. Many believe that fiscal and monetary controls, at least in principle, could accomplish this. But it is not within the realm of the plausible that long swings in every segment of the economy would be suddenly stopped. For the past makes an imprint on the present and on the future which cannot be easily erased, even when the desire to do so is general and urgent. In particular, a prolonged expansion has been under way in the capital formation of the regulated industries as well as in that of residential building since the mid-1930's. It was extended well beyond its usual length by the effect of World War II and its aftermath. It was characterized, like all such expansions, by an investment flow which far exceeded the growth factors upon which it must depend in the longer run.¹ Thus, the physical stock of capital of all regulated

¹ For substantiation of this point in residential construction, see Leo Grebler, David M. Blank, and Louis Winnick, *Capital Formation in Residential Real Estate* (Princeton University Press for National Bureau of Economic Research, 1956), Chapter xviii.

industries rose from 41.2 billion 1929 dollars at the beginning of 1946 to 48.4 billion at the end of 1950—an annual rate of increase of 3.3 per cent. This was approximately double the rate of growth of population during the same period. Roughly the same relationship has been extended into the mid-1950's. Yet the secular pattern of growth, taking into account demand factors as well as the trend of the capital-product ratio, suggests a long-run rate of increase in the plant and equipment of the regulated industries which may be *less* than that of population. It is of course possible that the maintenance of steadier incomes for the population in the future than in the past could promote a somewhat higher rate of secular growth for the regulated industries than would otherwise prevail. But barring an unforeseeable change in tastes or in technology, the difference would at most be slight, since expansions have always compensated more or less fully for the investment deficits incurred in contractions. The growth rate of the regulated industries temporarily achieved in the post-World War II period, as we have seen, is very substantially above the long-term trend, and hence may sooner or later slacken. This brings us to the second of the two problems that would remain on the timing of future investment: *when* will the next contraction in capital formation begin?

The lack of a fully tested and generally accepted theory of long cycles restricts an answer to this question primarily to empirical considerations. Long cycle expansions in the past have averaged twelve years in length. The current expansion had by 1955 been under way for some twenty years—four of which were war years characterized by investment restriction. Assuming some minimum comparability with the past, it would appear more likely that the bulk of the future contraction will fall in the ten or fifteen years ending in 1970 than in the ten or fifteen years ending in 1980. This likelihood is consistent with the prospects for residential buildings; the population pressures for housing are expected to be weaker in the first of these periods than they were in the immediate past or are likely to be in succeeding years.² The close relationship between long cycles in residential building and in the regulated industries previously described is thus consistent with the outlook for the incidence of these swings in the immediate future. On the other hand, it must be emphasized that our knowledge of the causal factors underlying long cycles is sketchy, at best. There are no unassailable theoretical reasons for assigning any particular time pattern for the long cycles of the future. Nor is our experience with the past documented over a sufficiently extended period to accord

² Grebler, Blank, and Winnick, *op. cit.*, Chapter XIX.

any considerable degree of reliability to a purely empirical forecast. Hence, our first approach to the question of timing, though perhaps the only one available, is not calculated to inspire confidence. Until more is known concerning the factors underlying such phenomena, our inability to predict their incidence, even in the broadest terms, must be conceded. Moreover, it is worth reiterating, the power of these cycles, as well as their impact upon the economy as a whole, may well be mitigated in the future by counteractions on the part of government and business which were unknown or but tentatively employed in the years prior to World War II. If so, the tendency for contractions to increase in intensity would be halted and reversed, to the distinct benefit of the nation's economic stability and the welfare of its citizens. Obviously, the accumulation of knowledge concerning these fluctuations must be ranked as one of the important factors necessary for bringing this goal closer to realization.