CHAPTER THIRTEEN

BUSINESS-CYCLE FLUCTUATIONS

INTRODUCTION

THIS chapter deals with the theory of the business cycle. In our explanation of the phenomenon of business cycles we shall have to bear in mind that this phenomenon occurs in quite divergent forms in different countries and in different periods. We shall discuss these differences in some detail.[1] In view of these differences any generalizations concerning the business cycle have to be made, and to be used, with considerable caution. For the moment, however, we shall concentrate on those characteristics that are common to the great majority of business cycles, without implying that they occur necessarily in every cycle.

As we have mentioned, the separation between a trend movement and a cyclical movement, although to some extent artificial, offers considerable advantages in the analysis. In this chapter we are dealing, therefore, with the explanation of the cyclical component by itself.

Before entering into the discussion of actual business-cycle theories, we must mention three fundamental questions, even though full answers to these questions can be given only at a later stage.

1. Should the succession of prosperity and depression be considered as a real cyclical movement in which one phase necessarily follows the other as part of an integral process? Or should this succession be considered as the result of a random series of disturbances which lead sometimes to upward, sometimes to downward, movements, without any necessary link between

1. Pp. 227 ff., *infra*.

them? We shall see that recent investigations lead to a satisfactory theoretical synthesis of these two viewpoints.

2. Granted that there is a tendency for the economy to develop in cycles, should each cycle be considered as a separate identity, or does one cycle necessarily lead to the succeeding cycle? With respect to this question, too, it will be shown that neither viewpoint is exclusively acceptable.

3. Should an explanation of the cyclical movement consist of a separate analysis of the four phases of the cycle: the upward movement, the upper turning point, the downward movement, the lower turning point? Or should all four phases be explained simultaneously on the basis of one and the same set of economic relationships? Here again it will be shown that the explanations should be partly of the former, partly of the latter, type.

The general observation should be made at this stage that business cycles are so complicated in nature that they cannot satisfactorily be described in all their aspects by reference to one single principle or to one single feature of the economy. This same reason makes it particularly difficult to give an integrated picture of business cycles. It is difficult to decide with what aspect of the phenomenon or with what part of the economy to start. No single approach is the best one, and many different approaches lead to the same goal.

THE TWO MONEY STREAMS

As a starting point of our discussions we select a description of the economy which, by its general nature, is particularly suitable to facilitate a general understanding of the phenomenon on which we shall concentrate. We describe the economy as a circular flow of money streams consisting of two parts: (*a*) the formation of income and (*b*) the use of this income. This circular flow repeats itself without end, since the use of income creates at the same time new income which can be used in turn. The circular flow may be described by reference to two amounts per unit of time (year, quarter, or month): the total income of the population and the total expenditure representing the use of this income. These two amounts, it will be noted, do not include all payments. They exclude, in particular, payments that can-

not be considered as the use of income, such as entrepreneurs' outlay for raw materials, wages, etc. These latter payments are not given a separate place in our outline of the circular flow; the entrepreneur is rather considered as representing the ultimate consumer who buys his product. Through the intermediary of the entrepreneur, the consumer pays an income to the workers who produce this product. At a later stage of our discussion, however, we shall treat such successive payments separately.

For our purposes, national income may be described as the sum of the net incomes of individuals and institutions, including among the latter business enterprises, the government and its various agencies, nonprofit institutions, etc. Net income will be defined as the amount that can be consumed without impairing the capital of the individual or institution concerned. For practical purposes, net income may be considered to be equal to the remuneration of all types of labor, interest, rent, dividends, profits of unincorporated business, and undistributed profits of corporations. This summary description does not attempt to resolve all points of doubt concerning the definition of national income. Any remaining problems, however, are not of particular consequence in connection with our study; the reader is referred to the existing literature on the subject.

In modern business-cycle theory it is usually found convenient to start from the concept of the two money streams. The problem of business cycles can then, in its simplest form, be formulated in this way: How can one explain the fluctuations which, according to our observation, occur in the magnitude of these two streams? A description of the entire economic process by reference to two global money amounts, which comprise many different elements, may appear objectionable in its simplicity. Yet, since the various elements usually show predominantly parallel movements, it would generally appear permissible to group them together in this way, at least as a first approximation. In one respect, however, a differentiation in total expenditure should be made from the start, namely, between expenditure for consumption and expenditure for investment, including in both types of expenditure both commodities and services. This distinction appears indicated since fluctuations in

these two flows of expenditure are determined by different causes.

Since every expenditure may be considered as a payment of income to the economic subject whose products one acquires, we may write this first equation for income formation:

$$\text{Consumption expenditure} + \text{Investment expenditure} = \text{Income}. \quad (1)$$

Since income has been defined "net," investment is also net in this equation, i.e., gross investment *minus* depreciation allowances.

All income is either spent on consumption or saved. Hence:

$$\text{Income} = \text{Consumption expenditure} + \text{Saving}. \quad (2)$$

It follows from equations (1) and (2) that

$$\text{Investment} = \text{Saving}. \quad (3)$$

This result appears paradoxical, if one thinks of saving and investment as two different variables, both dependent on the rate of interest which is assumed to equate these two variables by assuming the proper level. The equations given would, however, show that the two variables were identical.

This apparent paradox need not detain us. The concepts of saving and investment which enter into these two equations are such that they may both contain "unintended" components. Thus, if consumption depends not on current income but on income some time earlier,[2] current saving will be the somewhat arbitrary difference between current income and consumption expenditure corresponding to past income. Similarly, investment includes unintentional accumulations or decumulations of inventories. The statistical identity of total saving and total investment is therefore logically compatible with an equalization of intentional saving and intentional investment by means of the rate of interest. However, according to the views of the Keynes school (which would appear reasonable to us), the rate of interest would in practice have only a minor effect in equating these two variables, the primary, if not the only, adjusting factor being the level of total national income.

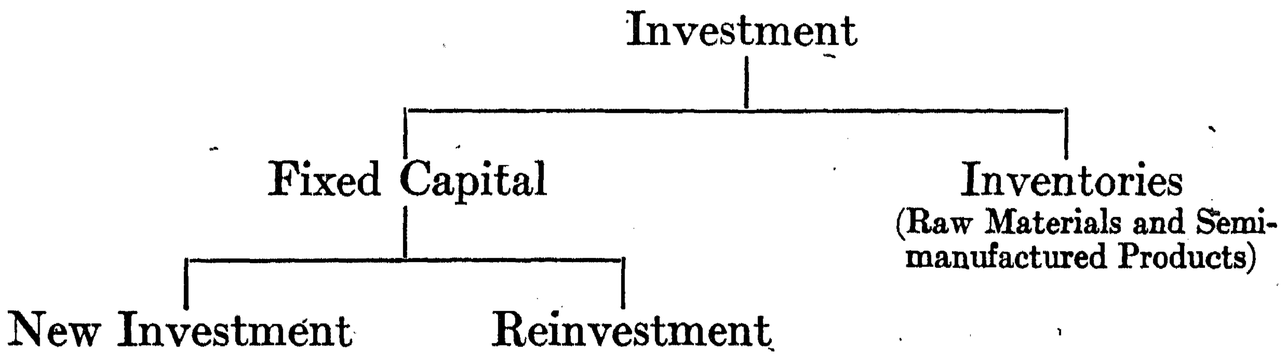
Our objective is the explanation of fluctuations in the total amount spent. This stream of money may be considered as the

2. Cf. p. 188, *infra*.

product of the total stock of money and the income velocity of money. Inasmuch as the velocity of money can, in normal periods, increase to a limited extent only, one may mention the fact that the possibility of an increase in the quantity of money during the boom is a condition for an expansion of the flow of money payments. A certain elasticity of the monetary system is necessary to permit cyclical fluctuations. This elasticity does not have to be very large, however, because, as has been shown clearly by Carl Snyder's investigations, the velocity of circulation increases also in periods of boom.

FLUCTUATIONS IN INVESTMENT

We shall start our attempt to give an explanation of fluctuations in total expenditure with a closer analysis of the causes of fluctuations in investment. The total amount spent on investment may be considered as the product of the volume of investment and the price of investment goods. We shall concern ourselves first with fluctuations in the volume of investment. In order to do this, we must immediately make a subdivision of investment. The accompanying division accords with the nature of investment and provides at the same time an opportunity to appraise the various investment theories.



New investment is considered investment leading to an increase in the stock of capital; reinvestment is all other investment. The latter may either replace specific capital goods, which have been used up or become obsolete, or compensate, by means of different capital goods, for the reduction of capital in other places in the productive apparatus of the economy.

A) New investment in fixed capital

First we shall treat new investment in fixed capital. The most interesting theories in this field consider the demand for new in-

vestment in fixed capital goods as a derived demand. The primary demand, they state, is for consumption goods or services, to be produced with these capital goods. The demand for these final commodities determines the demand for capital of the different sorts necessary for their production. Given the quantity of fixed capital available, the amount of necessary new investment follows.

This line of reasoning has been worked out further in the theory of the "acceleration principle," which has gained considerable currency in recent years. In accordance with this principle the demand for investment goods will be proportional to the increase in the demand for consumption goods over a certain period. This may most conveniently be shown by a simple example. Suppose that the production of shoes in a certain year is five million pairs, which require a thousand machines of a certain type. If in the two succeeding years six and six and a half million pairs are required, respectively, then twelve hundred machines will be needed in the first of these years and thirteen hundred in the next. New investment of two hundred machines will then be required in the first and of one hundred machines in the second year, that is, in proportion to the increases of one million and a half million, respectively, in the number of pairs of shoes produced.

This theory makes certain tacit assumptions which it is well to state explicitly:

1. There are no severe declines in the production of consumption goods, for such declines would require a proportional reduction in the quantities of fixed capital which is not possible. Negative new investment is possible but cannot exceed the quantity of machines that is eliminated each year on account of obsolescence or usage. If we put this percentage as 10 per cent of the total, then a decrease in the production of shoes by 20 per cent could not lead to a proportional reduction in new investment.

2. There should be no abrupt changes in the methods of production.

3. The means of production are used either always at full capacity or always at a constant percentage of full capacity. In other words, it is assumed that entrepreneurs are able to esti-

mate future production with such accuracy that they will always have either the capacity which corresponds to this production or a certain fixed percentage excess capacity. The principle implies perfect technical adjustment of new investment, according to very simple principles, to changes in the level of production, disregarding in particular the time period required for the production of means of production.

The acceleration principle has been expanded into a much more general principle by the interesting studies of Dr. Chait.[3] He considers not only durable goods but also goods of a shorter lifetime, such as raw materials, and not only processes in which one capital good is used for the production of one final product but also processes consisting of many more chains and ramifications. He, further, takes explicit account of the formation of inventories, which he assumes to change proportionate to turnover. He follows the acceleration principle in its assumption that there is immediate adjustment of the stocks of capital goods and raw materials to the requirements of demand; he also disregards the time involved in the production of capital goods, an omission to which we must make some objections. The results of the much more general problems with which he deals cannot be expressed without the use of mathematical formulas. We may, therefore, return to the simpler statement of the acceleration principle.

It would appear to us that in particular the third assumption of this principle is not in accordance with reality. On account of the relatively long period involved in the production of investment goods, it is impossible for entrepreneurs in advance to estimate accurately the level of production at the moment the goods will become available; as a result, productive capacity is not always adapted to the demand for production, nor is there a constant excess percentage. Statistical data, concerning the percentage of capacity used, indicate clearly that excess capacity fluctuates very greatly. Apparently, entrepreneurs do not succeed in anticipating exactly the future level of demand, as might indeed have been expected. New investments on the part of en-

3. B. A. Chait, *Les Fluctuations économiques et l'interdépendance des marchés* (Brussels, 1938).

trepreneurs should be considered rather as attempts to adapt capacity to demand than as measures of actual and precise adaptation.

Moreover, the question for most enterprises is not purely a technical one, one in which quantities only play a role. Prices and particularly profit expectations are of great importance. Most new investments are made for the purpose of making greater profits. Profit expectations will, therefore, be among the most important determinants of new investment. It should be noted that these are "expectations" containing a considerable amount of uncertainty. Modern Anglo-Saxon and Swedish economists have paid particular attention to this aspect of profits.

The adherents of the acceleration principle will not deny, of course, that profits are the purpose of investment, but they may point to the fact that one of the conditions for making profits is the sale of products. This, however, is not the only element in profits. The price of the products and the cost of production are also of importance. All these elements enter here in precisely the same way in which they enter into the calculation of profits. It is, therefore, much simpler to say that profits are the determinant of investment.

But how are profit expectations determined? They may be affected by extra-economic exogenous factors, such as new technical possibilities or measures of economic policy. For these reasons, some economists consider profit expectations as an entirely exogenous factor which determines investment and thereby indirectly the entire business-cycle position. But this separation of profit expectations from the entrepreneurs' experience appears to us to be exaggerated. To a very large extent, profit expectations will be based on current facts, in particular on the actual magnitude of profits. This may be observed in many sectors of the economy. In determining the acreage to be planted with a certain crop, farmers are guided usually by the last known prices, sometimes to some extent also by the prices of earlier years. Share prices are determined to a large extent by the latest dividend. There is always a strong and well-under-

standable tendency to extrapolate the recent past and current events into the future.

There is, therefore, very much to be said for the proposition that the volume of investment depends to a considerable extent on the level of profits at the time when investment plans are made.

There is a second reason why investment depends on profits. The larger the profits, the larger the possibility toward self-financing. Since each entrepreneur prefers to invest in his own enterprise and many enterprises do not have easy access to the capital market or even to bank credit, the level of profits is an important limitation of investment. Large profits may even be the cause of investments that in themselves would be hardly justified, or not at all. The inflation period in Germany in 1923 gave clear examples of this.

Certain industries, however, will be in a position to make new investment by use of bank credit or capital derived from the capital market. The investment decisions of these industries will be determined in part by the rate of interest at which these resources can be procured. For bank credit, this will be the rate of interest for short-term credit, particularly the rate for advances to customers. This rate fluctuates, usually in accordance with the discount rate of the central bank. Since these credits will, however, require to be consolidated at some time in the future, the rate of interest in the capital market should also be of importance. Most enterprises will try to attract capital by the issue of shares; the corresponding rate of interest is the yield on shares. This yield is equal to the ratio between the dividend and the market price of the share. An annual dividend of $3.75 on a share quoted at 50 would represent a yield of $7\frac{1}{2}$ per cent. It will be found in practice that the share yield neither is equal to the yield of first-class bonds (which is usually considered as the typical representative rate of interest in the capital market) nor does it show parallel movements. Since dividends are largely determined by profits, and share prices in turn by dividends, the yield of shares will also depend to a considerable extent on the level of profits. Part of the influence of the rate of interest on

investment would, therefore, again be the influence of profits on investments.

Share prices, however, depend also to some extent on the bond yield; in this way, there is an indirect influence of the latter.

To the extent, further, that investment is financed by the issue of bonds in the capital market—a form of financing of particular importance for railroads and public utilities—the rate of interest in the conventional sense of the word would also influence the volume of investment. Generally speaking, even in the other cases quoted, a proper calculation of the use of capital will have to be performed on the basis of this rate of interest instead of on the basis of the other rates. It may be questioned, however, how many enterprises are in fact guided by such a proper method of calculation.

The consideration that the gross rate of profit should be reduced by the interest to be paid on credit or capital obtained has induced economists of the Swedish school in particular to argue that the volume of investment would be determined by the difference between what they call the "natural rate of interest" and the market rate of interest. Sometimes the natural rate of interest has been identified with the rate of profit. In that case, the line of argument would seem to be realistic from a practical point of view and quite in accordance with the theory given here.

Usually, however, the concept of a natural rate of interest has been defined in a much more abstract way. It has been defined, for instance, as the rate of interest that would prevail if the supply in the capital market consisted exclusively of savings and did not include credit creation by the banking system. The word "natural" is then used to indicate that the creation of credit by the banks would be an "unnatural" disturbance of that economic equilibrium which would have been established in an economy without money. The creation of credit in the market depresses the rate of interest below its natural level, and in this way a larger amount of investment is induced that would have taken place in the equilibrium situation.

We have given some reasons for believing that not each de-

cision to invest is reached by a comparison of the rate of profit as a positive item and the market rate of interest (either the discount rate or the bond yield) as a negative element. We would expect, therefore, that the positive coefficient of the rate of profit would be larger than the negative coefficient of the market rate of interest. In other words, an increase of profits by 1 per cent will increase the volume of investment more than a decrease by 1 per cent of the market rate of interest. And even if we were to accept the theory of the Swedish school that the volume of investment is determined by the difference between the natural rate of interest (to be defined, for simplicity, in the realistic sense, that is to say, as the rate of profit) and the market rate of interest, even then the influence of the fluctuations in the latter would be of secondary significance in the explanation of fluctuations in investment, because the rate of profit fluctuates much more strongly than the market rate of interest. It is doubtful whether the older Swedish writers had realized this point.

It will be clear from the preceding paragraphs that we do not consider the influence of the rate of interest on investment to be very great. There has been a considerable divergency of views on this subject; particular attention to the influence of the rate of interest may be noted among British economists. Some hold that investment in long-lived capital goods is particularly susceptible to fluctuations in the rate of interest; others, on the contrary, that this influence is felt particularly in investments in raw materials and semimanufactured products and first of all in inventories held by merchants. Sensitivity of investment in long-lived capital goods would be attributable to the large amounts of capital which are required. On the other hand, the fluctuations in profits connected with these investments are still greater. The sensitivity of investment by merchants is motivated by the argument that the amounts paid for interest may be of considerable importance compared to the small margins on which merchants operate. But here, too, fluctuations in profits are much greater. This will be readily plausible if one realizes that profits may become negative whereas the rate of interest will never fall below zero.

Recently, attempts have been made in two ways to determine empirically the actual influence of the rate of interest on investment. A group of economists at Oxford University has made an investigation with a large number of business leaders, requesting information on the basis of an extensive questionnaire, about the motives which guided them in their investment decisions. It appeared from this study that the influence of the rate of interest in the decisions was quite minor.[4]

Another attempt has been made in connection with the statistical testing of business-cycle theories, undertaken by the League of Nations Secretariat shortly before the war,[5] to find an answer to these questions by mathematical-statistical methods. The details of these studies cannot be explained here. Mention is made, however, of an attempt to approximate the fluctuations in investment in a number of countries, for the period 1870–1914 and 1919–32, by a formula including profits and various rates of interest, as well as a number of other variables which could be considered to be important. The results of these calculations showed in almost all cases that the fluctuations in the rate of interest had a very secondary significance in the explanation of fluctuations in investment. The influence appeared to be larger in the case of railroads, whose capital goods have a very long lifetime and whose financing of investment is often done by bond issues, than of investment in general. In the nineteenth century, railroad investments constituted an important part of total investment; after 1920 this is no longer the case. This indicates a structural change that is of importance in this connection.

It appeared also that the rate of interest was of some significance for investment in residential construction. This conclusion, however, was subject to some reservation, owing to the relatively inadequate statistical material available for this part of the investigation. Some students of this problem point to the

4. J. E. Meade and P. W. S. Andrews, "Summary of Replies to Questions on Effects of Interest Rates," *Oxford Economic Papers*, Vol. I (1938).

5. J. Tinbergen, *Statistical Testing of Business Cycle Theories*, Vol. I, *A Method and Its Application to Investment Activity*, and Vol. II, *Business Cycles in the United States, 1919–1932* (Geneva: League of Nations, 1938–39).

fact that in residential construction it is the preparedness to grant credit rather than the actual rate of interest which is of importance. We shall return later to this question in connection with the special waves in residential construction in the United States.[6] In the same studies a statistical verification was also attempted of the significance of the acceleration principle. It appeared that this principle is clearly applicable only to investment in railroads, with respect to which it had been formulated first by its discoverer, Professor J. M. Clark. It is not impossible that the predominance of this technical principle in the case of the railroads should be seen in connection with the conditions of exploitation of railroads. In most countries railroads have an obligation to provide transportation and can therefore sometimes be guided less completely by considerations of profitability.

Our main theme in the preceding paragraphs has been that the volume of investment is determined by profit expectations and that profit expectations are determined mainly by the level of profits at the time the investment plans are made. We have further mentioned the influence of the rate of interest. The latter, however, may also be seen as a correction on the profit figures. Usually, although this is not the most correct way of calculation, profits are computed on the basis of interest actually paid. Actual interest payments, at least for the economy as a whole, are based on credits taken in a large number of years in the past. The average rate of interest over a long series of years shows practically no fluctuations. To the extent that credit has to be attracted, new investment will be financed, however, at the current rate of interest. This rate may differ from the average rate. The difference may sometimes be large, sometimes small, sometimes positive, sometimes negative. There is some reason, therefore, to refrain from identifying profit expectations with the current rate of profit and to adjust the calculation of profit with respect to the rate of interest used.

The effect of prices of capital goods that are to be purchased may be interpreted in a similar fashion. In computing current profits, use is made of depreciation allowances based on the

6. P. 241, *infra*.

prices of capital goods of many years in the past. The average of these prices, again, will fluctuate very little from year to year. The profit expectations of new investments, however, will have to be based on prices of new capital goods. These prices fluctuate very strongly from year to year. It might therefore be expected that investment activity would show certain fluctuations from year to year which do not reflect fluctuations in profits as computed in the usual way but which are connected with fluctuations in the prices of capital goods.

The effect of the price of capital goods may also be interpreted in a different way, namely, as a normal price-demand relationship. The opinion has sometimes been held that this relationship is even very pronounced, that is to say, that the demand for capital goods would be very elastic with respect to price. The studies made by the League of Nations Secretariat have led, however, to the conclusion that these demand functions are not elastic.

Since fluctuations in national income run approximately parallel with fluctuations in profits (the latter forming the most fluctuating part of income), it may also be stated as a reasonable approximation that fluctuations in investment are largely determined by fluctuations in income.

The preceding paragraphs have referred in general to the volume of investment demanded. The expenditure on investment is obviously equal to the product of this volume and the price. The amount spent on investment will therefore depend on the same factors as those determining the volume, plus the price, which, however, is itself among these factors.

Profit expectations reflect, in an indirect way, the scarcity of productive capacity. It is conceivable that, apart from this indirect influence, there is a direct influence of this scarcity of capacity on the volume of net investment. Other things being equal, the larger the existing productive capacity, the smaller the demand for new investment; the smaller the existing productive capacity, the larger the demand for new investment. Thus, there may be grounds to consider available capacity as an additional factor determining investment. Since the fluctu-

ations in total capacity are, as a rule, rather weak, we shall disregard this factor in our simpler models.

The effect of the rate of interest, to which we referred in more detail before, may be considered as a brake restraining investment on the part of the credit system. It tends to prevent the expansion of the productive apparatus from becoming excessive, excessive as measured by standards of the capacity of the credit system. A more direct force operating in this direction is sometimes exercised by a certain rationing of credits applied in periods of credit tension. In economic terms this means that the law of demand and supply is temporarily put out of action: given all factors, that is to say, profits, prices, and the rate of interest, prospective borrowers would like to obtain a larger volume of credit than is actually supplied. There is not much information available whether the extent of credit-rationing has ever been considerable. There would seem to be some indication that its influence was rather modest in the boom year 1929; it is not impossible, however, that in some of the boom years before 1914 its influence was more considerable.

We have dealt so far with fluctuations in profits, in the rate of interest, and in prices of capital goods as determinants of investment. It would seem probable that other factors in addition had some influence. Among such, mention may be made of new inventions, which may lead to the creation of new enterprises or to the expansion of existing ones; it is probable that new inventions are of considerable importance, particularly for developing industries. The significance of these industries in the total volume of production should not be overestimated, however. The very industries that are in the experimental stage are normally of relatively small size. It may perhaps be assumed, further, that the occurrence of new inventions is distributed over time in a way that is not systematically connected with the business cycle. There may be some tendency toward a certain relation between the two, as the pressure toward research may be greater in a depression than in a boom; for this reason there may be a tendency to find more important results shortly after a depression than in any other phase of the business cycle. But chance will always play a large role in these matters. For these reasons,

new technical possibilities may thus be considered as random disturbances of the systematic pattern of business cycles, disturbances which may give impulses toward a more rapid recovery.

A point of very great importance for a full understanding of the mechanism of the business cycle is the question of the lag between the factors mentioned and investment expenditure. For a number of reasons, a certain time must elapse between a given increase in profits and the corresponding increase in the amount spent on new investment.

a) First, it takes a certain time before profit figures, even those of one's own enterprise, are actually known. It would seem that this period was greater before 1914 than thereafter and greater in England than in the United States.

b) A certain period must elapse before an increase in profit leads to the stimulation of investment plans—a psychological reaction period. Since fluctuations of profits have many irregular characteristics, it is not always possible to decide on the basis of an increase for one month whether the change should be expected to be lasting. This may require waiting a second and a third month.

c) A certain amount of time is involved in the elaboration of investment plans or the adaptation of existing plans to a new situation.

d) Finally, the actual production of the investment goods, or their installation, will require a certain amount of time.

For these various reasons there will be a time lag of at least some months before increased profits will be reflected in increased investment expenditures.

This lag will be very different for different industries and for different types of investment. The installation of machines that are on hand can happen in a very short time; the building of a factory will take half a year or a year; the building of new railroads—a very important component of total investment in the nineteenth century—may take a number of years. For purposes of the cyclical mechanism it is necessary to take some sort of weighted average of these lags. It would seem plausible that this average lag would be between one-half year and one year.

In the League of Nations study referred to, a lag of one-half year was found for the United States for the period from 1919 to 1933 and a lag of one year for the United Kingdom for the period from 1870 to 1914. It will be seen from Figure 45 that it is possible to explain a very large part of the fluctuations in the volume of investments in the United States for the period from 1919 to 1933 on the basis of fluctuations in profits, the price of capital goods, the rate of interest of short-term credits, and the

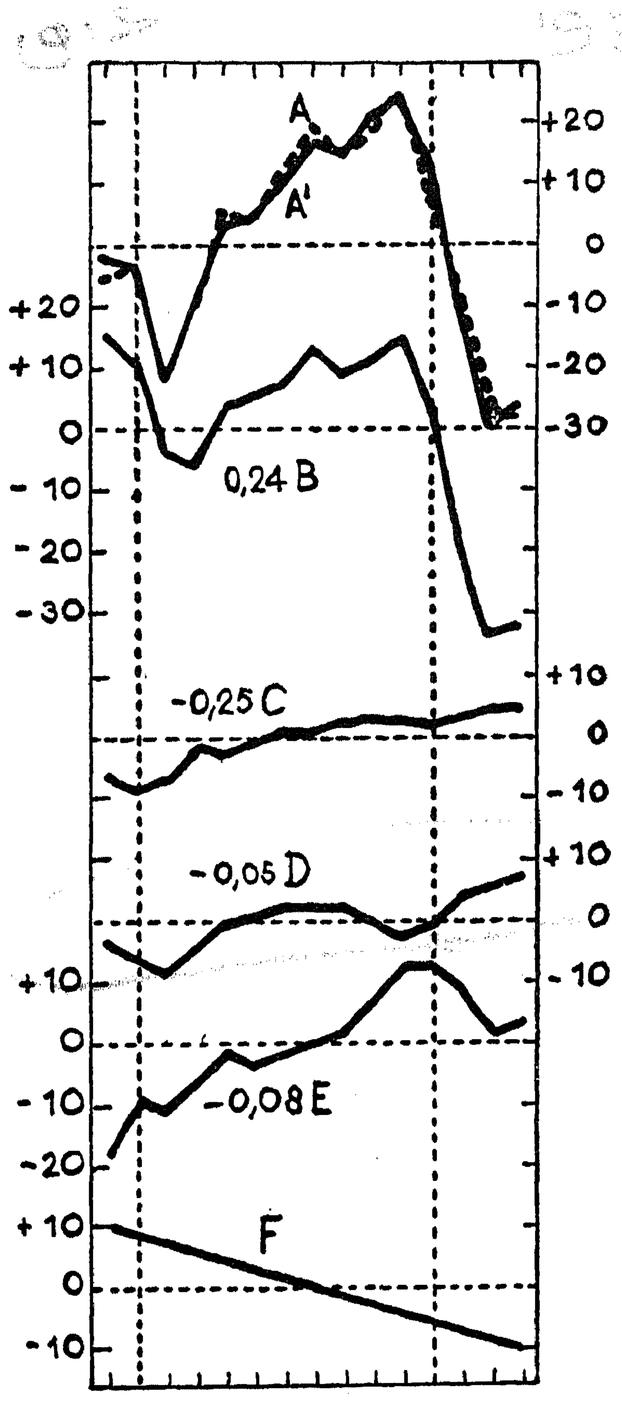


FIG. 45.—Explanation of fluctuations in *A:* investment in the United States, on the basis of *B:* profits of corporations, *C:* iron prices, *D:* the rate of interest for short-term credits, *E:* the yield of shares, and *F:* a trend component. The line $A' = 0.24\ B - 0.25\ C - 0.05\ D - 0.08\ E + F$ has been selected to approximate line *A* as well as possible. The variables *B*, *C*, *D*, and *E* all refer to a time one-half year earlier than series *A*.

share yield, all the latter series taken one-half year earlier. The sum of these series and the trend series, each of them multiplied with the appropriate coefficient indicating its influence, yields a total series which shows almost exactly the same fluctuations as the investment series itself. It is necessary, however, to add a smoothly declining series of figures (a negative trend) which represents the influence of the slowly changing factors (e.g., technical changes).

The significance of each of the factors mentioned in the explanation of fluctuations in investment is further illustrated in Figure 46. Along the horizontal axis of section I are plotted profits (series B) one-half year earlier and along the vertical axis the volume of investment after correction for the influence of the other explanatory variables (the price of capital goods, the rate of interest, share yield, and the trend component), in order to give the investment figures as *ceteris paribus*. This section of the diagram indicates the relationship between profits and the volume of investment. Similarly, section II reflects the influence of the price of capital goods on investment, section III the influence of the short-term rate of interest, and section IV the influence of the share yield. The significance of the influences shown by these various sections is qualified, of course, by the condition that by the statistical method employed the intensity of the influence of each of the variables on the total volume of investment is in fact accurately determined. One can rarely be absolutely certain about this, but there is a reasonable probability in the cases such as the present one, in which it is possible to explain the fluctuations in the determined variable with a very high degree of approximation.

B) Reinvestment in fixed capital

We shall now give some consideration to the factors that determine reinvestment in capital goods. These factors are to a large extent similar to those determining the volume of new investment. In a sense, the distinction between the two is artificial. If an old factory is replaced by a new one with a greater capacity and involving more capital, there is at the same time, and inseparably, new investment and reinvestment.

It is, however, also possible to mention certain factors which

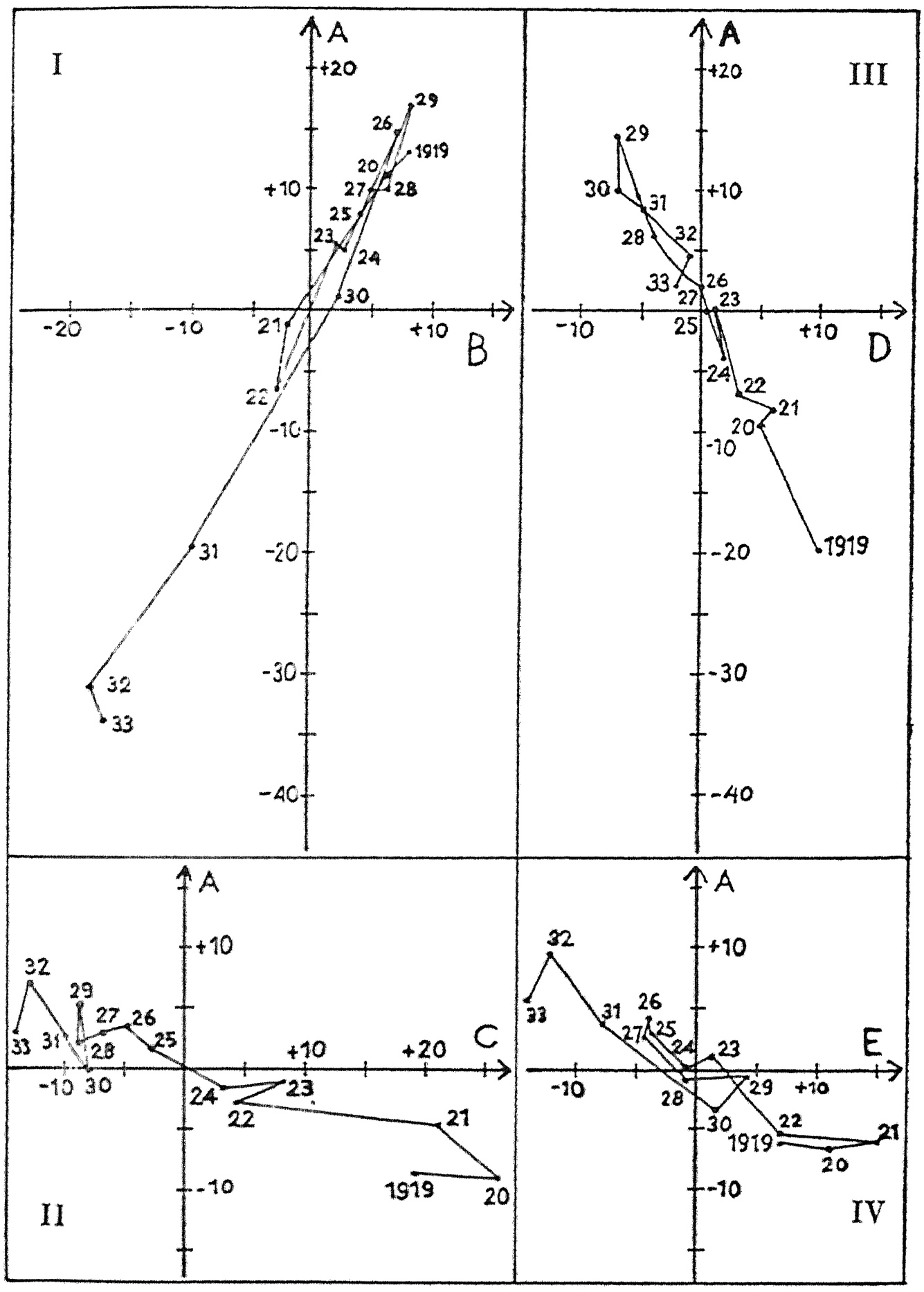


FIG. 46.—The influence on investment (A) of variables B, C, D, and E given in Figure 45. The four sections show the following:

Section	Along Horizontal Axis	Along Vertical Axis
I	B	A corrected for the influences of C, D, E, and F, i.e., $A+0.25\,C+0.05\,D+0.08\,E-F$
II	C	A corrected for the influences of B, D, E, and F, i.e., $A-0.24\,B+0.05\,D+0.08\,E-F$
III	D	A corrected for the influences of B, C, E, and F, i.e., $A-0.24\,B+0.25\,C+0.08\,E-F$
IV	E	A corrected for the influences of B, C, D, and F, i.e., $A-0.24\,B+0.25\,C+0.05\,D-F$

are of particular importance for reinvestment. These are especially of a technical nature. There is, namely, a compelling reason to reinvest if the technical lifetime of a given individual capital good has run out. In other words, the tendency to reinvest is the greater, the larger the proportion of the available stock of capital goods which has reached its technical age limit.

A very simple situation would occur if each individual capital good had an equal lifetime and if, further, each were replaced as soon as its lifetime had run out. In that case, the replacement demand of capital goods would be the exact replica of the production of investment goods one average lifetime earlier. This proposition has been called the "echo principle." Reality, however, is much more complicated.

a) The lifetime, in whatever way defined, is not the same for all capital goods. There are, first, differences in type: one type of capital good has a longer life than another type. There are further individual differences: one railroad car may last longer than another one from the very same series. The differences in type are very important: small machine tools may last only a few years, while bridges, sewer systems, buildings, may last many tens of years. Individual differences may also be important. For both reasons, therefore, a considerable spread should be expected.

b) There is a very important distinction between the technical lifetime (to the extent that this can be defined) and the economic lifetime of a capital good. This may also be stated in this way, that replacement does not always take place at the end of the technical lifetime but sometimes earlier and sometimes actually later, depending in particular on economic considerations. In favorable conditions there may be early replacement; in unfavorable conditions replacement may be postponed. The same thing may be expressed in another way (although the two expressions are not exactly the same): in a year of favorable economic circumstances, replacement will be larger than the number of capital goods whose technical lifetime has run out, and it will be the larger, the more favorable are economic conditions.

c) We have hinted already at the fact that the technical lifetime may not always be definable. Take, for example, a compli-

cated machine different parts of which may be replaced successively. In the end, the whole machine may have been renewed. But it is not easy to indicate any particular time at which replacement has taken place.

The simple echo principle just formulated would require to be replaced by a much more complicated system of reinvestment fluctuations, on account of the complications mentioned under (*a*). A number of different echoes are, as it were, superimposed, the result of which is a damped wave movement. This may readily be understood on the basis of a few numerical examples. Assume that there has been a pronounced peak in the production of capital goods in year 3, as indicated by the following figures:

Year	1	2	3	4	5
Production	0	0	100	0	0

Assume, now, that the frequency distribution of the lifetime of capital goods is as follows:

Lifetime in Years	Percentage of Capital Goods
3	20
4	50
5	20
6	10

It is easy to calculate the number of investment goods that will be replaced each year. The one hundred produced in year 3 will be replaced as follows:

Year	6	7	8	9
Replacement	20	50	20	10

Of the twenty that have been produced in year 6, replacement will be as follows:

Year	9	10	11	12
Replacement	4	10	4	2

Of the fifty produced in year 7, the replacement program will be as follows:

Year	10	11	12	13
Replacement	10	25	10	5

Proceeding in this way, the total replacement demand is found as follows:

Year	6	7	8	9	10	11	12
Replacement	20	50	20	14	20	33	22

It will be noted that the peak of one hundred is not reached again; successive peaks and troughs become flatter and flatter. The movement is damped as compared to the undamped movement assumed in the simple echo principle.

The complication mentioned in (*b*) has an opposite influence to the extent that the general economic position would determine to some extent the volume of reinvestment. The general economic condition has a tendency again to concentrate reinvestment in years of prosperity; replacement in depression years preceding that peak is postponed until the prosperity years, and replacement in depression years following that peak has to some extent already taken place in the prosperity years, in any case more than would have taken place if the boom had not occurred. It might occur, therefore, that in the example given the relatively low peak of fifty in year 7 might again be increased, even to one hundred.

If reinvestment amounts show a wavelike movement, then the amounts set aside for depreciation each year, which are much more regular, will not be equal to the expenditure on reinvestment. In depression years, depreciation allowances will to some extent be hoarded, and these reserves will be used in boom years when replacement exceeds depreciation.

C) Investment in inventories

We may now deal with the last category of investment, namely, the investment in inventories. These are also quite important in the cyclical mechanism; fluctuations in stocks of raw materials and semimanufactured products (working capital as distinguished from fixed capital) are quite considerable. The size of minimum inventories is determined by technical factors. But extra stocks in excess of these minimum inventories are often kept. On the part of the producers of agricultural commodities, these extra stocks may be considered as the result of unusually large crops; on the part of the processing industry, they should more properly be considered as speculative stocks. To the extent that there are excess stocks for products other than those of agriculture, e.g., mineral raw materials, the considerations on the part of the producers should normally also be considered as

speculative; in other words, the stocks have been produced in anticipation of increased demand or increased prices.

We shall deal later with the particular factors operating in the case of agricultural products.[7] They are not systematically connected with cyclical fluctuations. There remains, then, the technical factor as the most important systematic factor determining investment in stocks. In the simplest cases this may be considered as a special case of the acceleration principle. There is a pronounced tendency to keep stocks, not only stocks of raw materials and semimanufactured products but also of finished products, in proportion to the volume of sales. This tendency would produce a reaction quite similar to that described by the

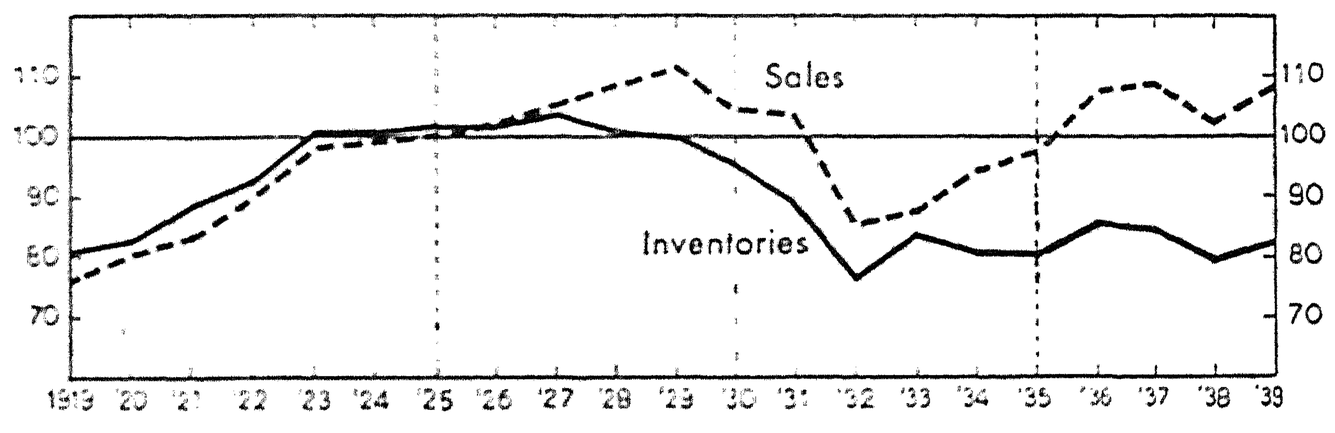


FIG. 47.—Fluctuations in stocks at the end of the year and sales during the year for department stores in the United States (index numbers, 1923–25 = 100).

acceleration principle. In some cases where there is no proportionality, there is nevertheless correlation in the sense that increases of stocks per unit of time (positive or negative) fluctuate proportionate to changes in the volume of production (see Fig. 47). The increase in stocks per unit of time accounts itself for part of the production, since part of production has to be used to increase stocks. This leads to the interesting mathematical construction that production depends in part on its own rate of increase a short time before. From this we shall derive certain important conclusions with respect to the movement of production.[8]

In more complicated cases the formulas developed by Chait provide a solution; but, since these formulas involve higher

7. Chap. xv, *infra*.

8. P. 199, *infra*.

mathematics, we must leave them out of consideration in this connection.

Various authors, in particular Hawtrey, have argued that changes in the rate of interest for short-term credits would have an important influence on investment in stocks. However, they have not made quite clear whether they intended that a high rate of interest would correspond to a low level of new investment in stocks or to a low level of stocks *in toto*. This case is typical of the precision of thought which is imposed by a mathematically exact way of expression and the danger of vagueness whenever less accurate modes of expression are used. But, as a matter of fact, it has never been possible to obtain any statistical verification of either of these two possible relationships between the rate of interest and stocks. Statistical investigations would make one believe that most satisfactory results in this field can be obtained by the acceleration principle. As was to be expected, however, disturbing factors are very important in addition to this principle.

FLUCTUATIONS IN CONSUMPTION

Next to investment expenditure, expenditure for consumption is the most important component in total national income. Expressed as a percentage of the average value of the series over a whole cycle, fluctuations in consumption are not so large as fluctuations in investment. But the average value of consumption is so much higher than that of investment that the amplitude of consumption expenditure in absolute terms is greater than that of investment expenditure. This fact, which has often been neglected, makes it very important to go into the factors determining fluctuations in consumption as a preliminary to a good understanding of the cyclical mechanism. It is Keynes's great merit to have drawn attention to this point.

The considerations that determine the part of income spent on consumption will determine at the same time the part of income saved.

We may concentrate first on the demand of an individual family for an individual consumption good. Here, the determining factors will be income, size of the family, and prices. This

applies not only to the quantity demanded but also to the amount spent, since the latter represents the product of the quantity demanded and the appropriate price. It would also apply to the total amount spent by the family under consideration for all consumption goods, because this amount may be obtained by the addition of the amounts spent on individual commodities. When we consider finally the total amount spent on consumption by all families together, we would expect to find first of all the influence of the incomes of all families, of the size of these families, and of the level of prices. The latter are in principle the same for all families, so that there are in this category no more determining factors than for one individual family. But in the categories of incomes and of the size of families there is a great increase in the number of determining factors.

Let us first consider the effect of total income on total consumption expenditure. Strictly speaking, it would appear as if, to know this effect, the size of each income would have to be known or, in other words, as if both national income and its distribution would have to be known. This, however, is not necessary in all circumstances, and the situation can be represented with a very good degree of approximation in a much simpler way. If families are grouped according to the size of their income, it appears from budget studies that a certain increase of income, for instance, by $100, will lead to approximately an equally large increase in consumption expenditure for groups with very differing incomes, namely, of approximately $80. It would follow that it does not matter much in which class a certain increase in income takes place and that changes in total income are the determining factor much more than the distribution of income or the distribution of changes in income. It is, therefore, legitimate to use the approximation that an increase in income of consumers affects consumption expenditure in a fixed relationship. In other words, the relation between total income and total consumption expenditure may be represented by a straight line, the slope of which is the reverse of the relationship just mentioned. This slope is therefore an important factor; following Keynes, it is usually indicated by the term "marginal propensity to consume."

From the theoretical point of view, there is also no objection to the assumption of a constant proportion between changes in income and changes in consumption; as shown by Allen and Bowley, this assumption is justified if one assumes that the utility surfaces are functions of the second degree, the simplest acceptable hypothesis for these functions. It is important, further, not to confuse the marginal propensity to consume with the average propensity to consume, the latter representing the ratio between total consumption expenditure and total income. For the country as a whole the average propensity to consume surpasses 0.8 because there is normally an excess of consumption over income (negative saving) at very low levels of income.

If the relationship between income and consumption expenditure for the individual family could not be represented by a straight line, information on total national income would not be sufficient to determine total consumption expenditure of all families; in that case, additional information on the distribution of income would be required. The distribution of incomes is a complicated concept. It is completely known only if we have the full frequency distribution. Less complete information may, however, sometimes be used as a substitute as is often done in statistics; e.g., the standard deviation or quartiles may be used. In the case of the income distribution, it is usual to employ other indices, in particular the number α of the law of distribution of Pareto. It may be assumed that Pareto's law describes accurately the distribution of incomes and that α acts as a measure for the inequality of incomes. The smaller α, the greater is the inequality.

As a first approximation, in cases where the individual consumption function is not linear, we try to explain total consumption of the population by total income and the index α. It appears, however, that in many cases the fluctuations in total income are almost parallel with those of α; therefore, it would appear, provisionally and on empirical grounds only, that fluctuations in income may be considered as representative of fluctuations in α and hence that fluctuations in consumption may again be explained by reference to fluctuations in income only.

Considerations similar to those applied to the influence of

changes of income apply to the effect of changes in the size of families. For large groups of the population, arranged according to the size of the family, it may be assumed approximately that consumption expenditure is a straight-line function of the size of the family, that is to say, that changes in expenditure reflecting changes in the size of families are proportional to the latter. If this is so, then only the average size of families is of importance for the total consumption expenditure, while the distribution of the population over the different size classes is irrelevant. Since, moreover, the average size of families changes only very slowly, its influence can be disregarded in the study of cyclical problems.

Both considerations—that of the influence of income and that of the influence of changes in the size of the family—apply to a population with a constant number of families. In addition, there are increases and decreases in the number of families, owing to marriages and divorces. The change in the structure of the population for these reasons has a separate influence on consumption expenditure. For a study of the cyclical problem, however, the significance of changes in the size of families as well as changes in the numbers of families is of very secondary importance, since both types of changes occur very regularly in the course of time and can be expected, therefore, to affect trend movements but not cyclical movements. Therefore, we shall not deal with them any further.

We shall now analyze the effect of changes in prices on consumption expenditure. Strictly speaking, a change in prices is known fully only if we know the price of every individual commodity. In order to obtain a general picture of the frequency distribution of prices, one will again often be satisfied by the indication of certain characteristic magnitudes of this distribution. First, one will have recourse to some sort of average and use an index number of prices to reflect the movement of prices. The calculation of such an index number may be adapted to the special purpose for which it is intended to be used by the choice of appropriate weights. In order to measure the effect of the movement of prices on the volume of consumption, one could use an index number that would be weighted somewhat differ-

ently from the conventional index number. It is probable that the effect of a change of prices of commodities with a very elastic demand will be greater, all other things being equal, than the effect of changes of prices of commodities with an inelastic demand. Strictly speaking, therefore, the index number that would be ideal to measure the effect of changes in prices on the expenditure on consumption would be a different one from that which would be ideal to measure the changes in the volume of consumption. In an actual study of fluctuations of consumption expenditure in total, these differences usually have to be disregarded, however, and the conventional index number of the cost of living will have to be considered as representative for the price level of consumption goods; it will be necessary to assume that fluctuations in this index number will determine changes in consumption expenditure which have been induced by changes in prices. This assumption is the more legitimate, the more parallel the changes in the prices of the various commodities are. Over the course of a business cycle there is usually a high degree of parallelism since the systematic causes of price changes are the same: changes in costs, on the one hand, and changes in demand, on the other hand.

With respect to the magnitude of the influence of changes in prices on changes in the quantity consumed, it may be stated that the elasticity of this total demand for consumption goods must be smaller than unity; persons with a very small income which is used entirely for consumption will have the same amount to spend as prices go up, which would indicate that for them the elasticity would be equal to unity. Those with a more comfortable income would tend to keep the quantity of consumption constant; this would correspond to zero elasticity. The average value will therefore be between zero and unity.

In summary, we may state that fluctuations in consumption expenditure depend, first of all, on changes in total income of consumers and changes in the index number of the cost of living. At a constant level of prices the ratio between the change in consumption and the change in income will be equal to the marginal propensity to consume. Fluctuations in prices are usually in the same direction as fluctuations in income. Their effect on

consumption will therefore on the whole be parallel to the effect of changes in income. Whenever the price level fluctuates approximately simultaneously with changes in income, the ratio between changes in consumption and changes in income will be larger than the marginal propensity to consume. We make, therefore, a distinction between the net marginal propensity to consume (assuming prices constant) and the gross marginal propensity to consume (incorporating changes in consumption due to changes in prices).

So far we have sought a relationship between the total value of consumption and the total income of consumers. For purposes of cyclical analysis it is advantageous, however, to consider total national income as the starting point. This figure includes, in addition to income of consumers, another component with strong fluctuations, namely, undistributed profits. On the whole, these will show fluctuations parallel to those of income of consumers, so that it would be legitimate to seek a relationship between consumption expenditure and total national income. If this is done, however, the figure found for the marginal propensity to consume will be smaller and that for the marginal propensity to save larger, since undistributed profits are saved *in toto*.

On the basis of Keynes's identity of saving and investment, then, the ratio of the amplitude of consumption expenditure and investment expenditure would be determined by the ratio between the gross marginal propensity to consume and the gross marginal propensity to save, both measured with respect to total national income. On the basis of statistical investigations by Mr. and Mrs. Stone, these two coefficients are to be put at 0.7 and 0.3, respectively, for most countries.[9]

Whether one considers consumption expenditure as determined either by income of consumers or (theoretically less accurate) by total national income, there is always another aspect in this relationship which deserves attention, that is, the time lag between a change in income and the corresponding change in consumption. As in the case of investment, this lag is of great

9. R. and W. M. Stone, "The Marginal Propensity To Consume and the Multiplier," *Review of Economic Studies*, VI (October, 1938), 1–24.

importance for the understanding of the cyclical mechanism. There are a number of causes explaining the existence of this lag:

a) First, there is for certain categories of income a certain lapse of time before income becomes available. Dividends and interest payments are the clearest example, in particular in Europe, where dividends earned during a certain year are paid out four to six months after the end of the year. In the United States, with quarterly dividend payments, this lag is obviously smaller.

b) A second cause of lag is the seasonal character of certain important expenditure items, especially of the higher income groups. Travel expenditure is concentrated in summer, expenditure for presents in December. An increase in income in the spring will therefore affect expenditure partly in the summer, partly only in the fall.

c) A third cause is the length of certain contracts which fix expenditure. A rent contract or an instalment-credit contract cannot be adjusted immediately to a lowered income. There will therefore be a tendency to adjust these types of expenditure to changing circumstances after a considerable period only.

d) A fourth cause for a lag may be found in the psychological inertia of most people. Only slowly do they fully realize their higher or, especially, lower income and adapt their expenditure to it.

Since the lag may be different for different expenditure items, different persons, and different groups of persons, it is essentially a distributed lag. It may also be different for upward and downward changes in income. As a first approximation, however, a good picture of reality can be obtained by assuming that there is one single lag between fluctuations in income and fluctuations in total consumption expenditure. Statistical investigation would make it plausible that for nonlabor income in England in the last decades of the nineteenth and the first decade of the twentieth centuries, the lag was approximately one year. For the United States in the period 1919–32 practically no lag is found. For the Netherlands in the same period a lag of about one-half year is found.

Since both investment expenditure and consumption expenditure show a certain lag with respect to income, it might be expected that fluctuations in investment and in consumption are practically simultaneous. This is confirmed by a direct comparison of the respective time series (compare Fig. 48). There are certain periods in which investment fluctuates slightly earlier. It has sometimes been held that this was generally the case; but there are also cycles in which consumption leads slightly; there are many cycles in which no lag in either direction can be distinguished. It would seem doubtful, therefore, whether toward the end of the boom

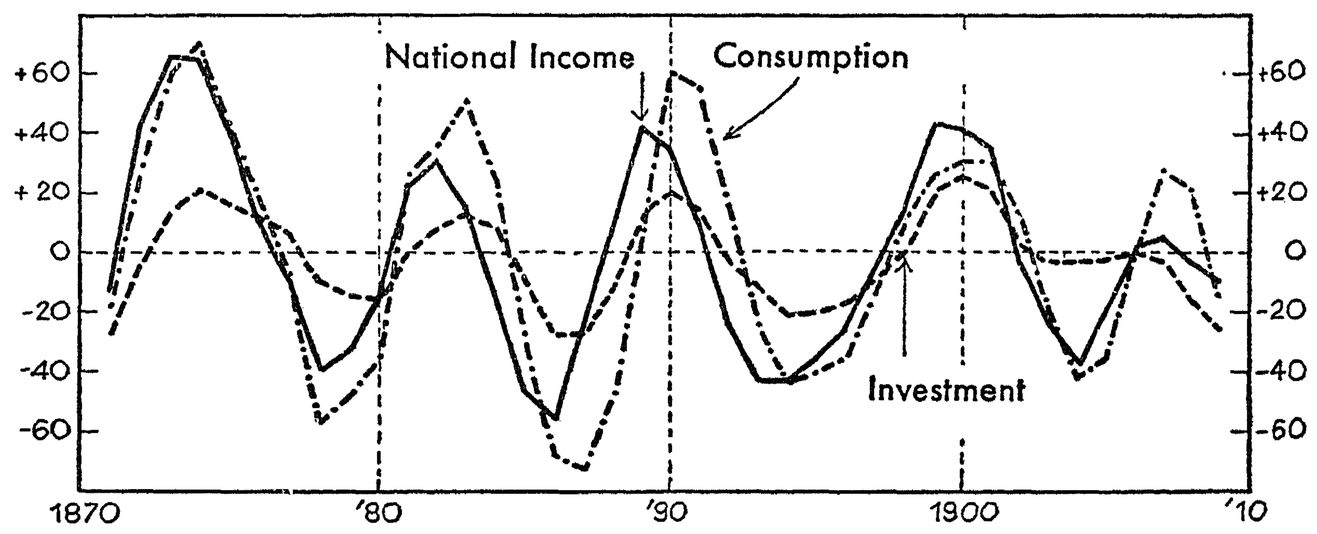


FIG. 48.—Fluctuations in investment, consumption, and national income in the United Kingdom. (Deviations from nine-year moving averages, millions of pounds of 1907 purchasing power.) Note that the fluctuations in the three series are practically simultaneous.

there is an expansion of the production of consumption goods at the expense of the production of investment goods, as held by certain cycle theories. Normally it would seem that both categories of production expand simultaneously.

A clear example of what the theories referred to consider as normal occurred in the period of extreme inflation in Germany in 1923. There was full employment of all factors of production, owing to hyperinflation, and investment goods industries and consumption goods industries actually competed for labor; it was impossible for both to expand at the same time. Such a complete employment of all labor occurred also occasionally in boom years before 1914, especially in Germany; in other major

countries it rarely occurred after 1920. The German inflation period of 1923 can therefore hardly be considered as an example of normal cyclical relationships. It indicates rather the pathological excesses of hyperinflation.

A few, normally secondary, factors affecting consumption expenditure may be mentioned. Most important among them are changes in prices, as distinguished from the level of prices. It is necessary to make a sharp distinction between these two concepts. In the preceding paragraphs we have dealt with the influence of the level of prices on the level of consumption or, what comes to the same, with the influence of changes in prices on changes in consumption. However, there is in addition to this an effect of changes in prices on the level of consumption. An upward movement of prices may lead to increased purchases made in anticipation of a further rise in prices. Similarly, falling prices may lead to a buyers' strike in anticipation of a further fall. The effect of price expectations may play a major role with respect to purchases by dealers, especially in the short run and more generally in abnormal periods either of scarcity or of a precipitous price fall. But statistical investigations have not succeeded in establishing any important effect of price changes in normal business cycles.

A second factor, the rate of interest, is sometimes mentioned, in particular because it would affect savings and thereby indirectly consumption. Economic theory is uncertain, however, as to the direction of the effect of the rate of interest. On the one hand, it is argued that a lower rate of interest will reduce the attractiveness of saving since the price paid for saving is reduced. On the other hand, it is pointed out that the purpose of saving is often to obtain a given income in the future and that in order to achieve this income a larger capital will have to be saved at a lower rate of interest.

Statistical evidence would lead to the conclusion that changes in the rate of interest exercise little effect on the volume of consumption and of saving. It may be shown that the rate of interest granted by individual institutions may affect the amount of savings made in those institutions; but this reflects primarily shifts between different forms of saving which, as one might ex-

pect, react more to interest differentials than the total amount of saving can react to the average rate of interest.

Finally, the availability of new products will have some influence on the demand for commodities in general and on the demand for commodities immediately competing in particular. In general, the possibility of satisfying a specific demand which could not be satisfied before will lead to an increase in demand. Initially, only a few people will be prepared to spend on the new experiment. As experience spreads, more layers of the population will gradually become interested. A large stream of buyers follows suit, while a few conservatives require a still longer period to make up their minds. In the case of articles which are not durable and which, when once consumed, must be purchased at regular intervals, the sale of the new product will show a growth curve. This has interesting consequences for the adaptation of production to demand. Initially, the rate of increase will be more and more rapid, which may produce a tendency to expand productive capacity more and more. Hence it will be easy to overshoot the mark, since it is extremely difficult to estimate the pattern of the growth curve and in particular its maximum height on the basis of its initial phase only. There is then a great possibility of overproduction of new products. The business-cycle theories of "generalized partial overproduction" pay particular attention to this problem and then indicate, further, how such a partial overproduction will propagate through the entire economy. We do not want to enter upon a discussion of these theories at this stage, since, as we have mentioned, new commodities have only a relatively minor significance in the total demand for all commodities.

FLUCTUATIONS IN INCOME

We have considered above[10] the circulation process in its two component parts, the use of income and the formation of income. In the two preceding sections we analyzed the factors which determine fluctuations in expenditure. We will take up now the formation of income, that is, the factors which determine the fluctuations in the magnitude of the national income.

10. P. 160, *supra*.

As a starting point in the definition of national income we take the total value of the sale of finished goods and services for consumption and investment (including those sold abroad as exports). Looked at from the other side, the same magnitude represents the total expenditure on investment and consumption goods and services. Both concepts, however, are gross rather than net, and for that reason they are in some aspects in excess of total national income.

Part of the receipts from sales, though not representing income of the firm which receives them, is passed on by it as income to others. This applies to wages passed on to the employees, dividends passed on to the shareholders, interest passed on to the bondholders, etc. Similarly, payments made by the firm to other firms for raw materials and semimanufactured products within the country under consideration represent income passed on. Payments to foreigners, however, for imported materials, are not part of the national income of the country and must therefore be deducted from the value of total sales if we are to arrive at the net figure of national income.

The amounts received from sales which correspond to depreciation allowances do not represent income at any stage of the process of production and should therefore not be included in a figure for net national income. For purposes of cyclical analysis, depreciation is of secondary importance, since the amounts involved fluctuate only very little from year to year. The amount of depreciation is normally based on the value of the total stock of capital goods installed. On account of the long lifetime of capital goods, the physical stock shows very gradual changes. Since the price of capital goods used for purposes of depreciation is usually the original purchase price, the fluctuations in the value of the stock of capital reflect the prices of a great many years in the past and, therefore, will also be quite small. Only depreciation on account of special losses may occasionally, for particular industries, give a sharp dent to the depreciation curve; but for business as a whole writeoffs of this nature are usually of minor importance, except in years of very sharp and severe depression.

If we follow the conventional way in which income is com-

puted, another income element still has to be taken into account. To assume equality between gross income and the total value of gross expenditure on final consumption and investment goods implies the assumption that the final producers charge the same amounts for the raw materials and semimanufactured products contained in these goods that they are currently paying for them. Only on this assumption would the costs paid by final producers equal the receipts of the producer of the raw materials and would these two amounts cancel out for all enterprises taken together. This assumption is fully justified only if all raw materials either are used immediately or, if used later, are charged as cost at the price ruling at the time when they are used. Normally, however, the existence of inventories of raw materials makes for a considerable lag between purchase and use; and also, normally, costs are charged on the basis of purchase price rather than of replacement price. Thus, the prices calculated reflect actual purchase prices at an earlier time, say, three months earlier. If, during this period, prices have risen, the amount calculated as costs is smaller than the receipts for the sale of raw materials by the enterprises producing them during the same period. An amount of extra profit is contained in the total value of consumption and investment goods to final users. The amount of this income equals the average volume of all stocks in the hands of producers during the period under consideration times the increase in price. Thus, if income is calculated for a calendar year and stocks represent one quarter's consumption of raw materials, these extra profits are equal to the average stock during the year times the price increase between the last quarter of the previous year and the last quarter of the current year. Similarly, losses of the same character occur in times of falling prices. Such profits and losses are in nature, even if not in intention, speculative. Their pattern over time is determined by changes in the price level. They show therefore a lead[11] with respect to prices themselves and usually also with respect to such other cyclical developments as the volume of production.

11. Cf. p. 19, *supra*.

In very much the same way, income is created by the increase in prices of shares, since stock-exchange profits and losses are often treated as if they were fluctuations in income both by many business firms holding shares and by speculators. Other investors, however, whose primary interest is the regular income from investment, may not consider changes in the value of their holdings as income. In disregarding paper profits and losses, these latter investors act in accordance with modern theoretical conceptions as to what constitutes income. But for the purpose of explaining business-cycle fluctuations we are not primarily interested in what income "is" or "should be." We have to concentrate on the concept of income as seen by those who receive the income. It is income according to this concept which determines their decisions with respect to consumption, and these decisions are one of the important chains in the cyclical mechanism.

As a final adjustment in passing from gross sales to national income, we still have to take account of the lag between gross receipts at the final stage of production and the income earned at earlier stages of the same production.

It will be shown later that the movement in prices of commodities and shares can be explained to a large extent by reference to fluctuations in income. In the case of commodity prices this is due mainly to the fact that changes in demand factors are the most important systematic causes of price movements, and income is the most important demand factor. Share prices are determined primarily by dividends and expected dividends, the movement of which is very nearly parallel to that of national income, because profits, from which dividends are derived, constitute the most fluctuating element in national income.

The movement of the price level is thus approximately parallel to that of national income, though with a short lag. The rise of the price level from one quarter to the next is therefore also parallel with the increase in national income, but again with a short lag. If we take this lag as three months, then the increase of the price level from the third to the fourth quarter would be determined by the increase of national income from the second quarter to the third quarter. Changes in share prices are deter-

mined similarly by changes in national income, again sometimes with a certain lag which need not be constant.

On the basis of the two relations developed, we come to the important conclusion that that part of income (as seen by consumers) which represents speculative income is determined by the rate of increase in national income some short time earlier.

THE MAIN ELEMENTS OF THE CYCLICAL PROCESS

We have made clear in the preceding pages (1) that fluctuations in investment and in consumption expenditure may be attributed largely to fluctuations in national income a short time previously and (2) that fluctuations in national income can be explained largely by (*a*) fluctuations in total expenditure for consumption and investment and (*b*) the increase of income itself taken over a slightly earlier period. In our example at the end of the preceding paragraph we assumed that the level of income due to factor (*b*) in the fourth quarter of a year was determined by the rate of increase of income between the second and the third quarters of the same year. We shall further assume that the lag between changes in income and the corresponding changes in expenditure on consumption and investment is also one quarter. The essence of the argument which is to follow is independent of the magnitude of these lags; but it is convenient at this stage to make specific assumptions concerning their magnitude.

We assume further that the relations to which we have made reference hold exactly and not only as approximations. We may then state that we have a system of relations, or a "mechanism," the properties of which we want to study.

It might appear that the two statements—that investment expenditure and consumption expenditure depend on income and that income depends on total expenditure—constitute circular reasoning. However, this is not the case. Circular reasoning occurs only when one and the same relation is first used to explain A on the basis of B and then to explain B on the basis of A. To give an example, we take the relationship that the price is equal to cost plus profit. If, now, in order to determine

profit one uses once more the same relation, viz., that profits are equal to the difference between the price and costs, then there is circular reasoning and price and profit are not determined. Our mechanism, however, is different in two respects. In the first place, the two relations used are not the same. For this reason alone there is no circular reasoning. If, to go back to our example, we would state that profit were 10 per cent of costs, this relation, together with the first one, would indicate that the price was 110 per cent of costs; both variables would then be determined. The second reason why our mechanism does not constitute circular reasoning is that the magnitudes occurring in them do not refer to the same time period. Expenditure in period 2 depends on income in period 1, while income in period 1 depends on expenditure in period 1.

If we indicate income by Y and expenditure by E and the period to which they refer by a subscript, then we may say that E_2 enters in the first relation and E_1 in the second relation. The first relation indicates how E_2 is determined by Y_1, while the second indicates how Y_1 is determined by E_1. Therefore the two relations together specify how E_2 is determined by E_1. The quantities E_1 and E_2 need not have the same value. The relations do not determine one constant value for the variable E but a series of successive different values. The mechanism in our previous example does not permit of more than one solution. It refers to a stationary position. But the mechanism connecting Y and E can refer to variable positions. It relates magnitudes of different time units and is therefore dynamic in the sense in which we have defined dynamic relations.

Since these relations are valid not only for periods 1 and 2 but also for all successive periods, they may also be used to determine E_3 on the basis of E_2, E_4 on the basis of E_3, etc. In other words, the fluctuations of E over time can be determined by it provided that we know one initial value, E_1.

The same applies to the values of Y, since the second relation determines, on the basis of any value of E, the simultaneous value of Y. Therefore, if one knows the sequence of figures representing E, one can determine the sequence of figures representing Y. But it is also possible to determine the sequence of Y

values directly. The second relation determines Y_1 on the basis of E_1. The first relation, if applied to periods 0 and 1, determines the value of E_1 on the basis of Y_0. Together, therefore, they determine the relationship between Y_0 and Y_1. If we repeat this process, we can find Y_2 on the basis of Y_1, subsequently Y_3 on the basis of Y_2, etc. Here too, therefore, a sequence of figures can be obtained provided that we have one initial value, Y_0.

It is important to illustrate these processes by some numerical examples. We shall treat a number of them in succession and shall try to draw some lessons from the differences which occur between these various examples.

EXAMPLE I

In this example we assume that expenditure and income have an equilibrium value of 100. If, by some random cause which interrupts the relationship between the two variables in one time period, income is higher or lower than this equilibrium value, expenditure in the succeeding quarter will also be higher or lower and, we assume, 1.1 times as much as the deviation shown by income. Thus if income will be at 120, expenditure in the succeeding quarter will be at 122. One may assume that this relationship indicates a case of excessive optimism on the part of consumers. Assume, now, that, in fact, income in a certain quarter has been brought to the level of 120 by some external cause, for instance, an excessively large crop, and that according to our assumption expenditure will be 122 in the next quarter. We further assume that income is equal to expenditure in the same quarter. Income in the second quarter will then amount to 122. It follows, then, that expenditure in the third quarter will be 124.2. Thus, computing from one quarter to the next one, we find:

Quarter	1	2	3	4	5
Expenditure		122	124.2	126.6	129.2
Income	120	122	124.2	126.6	129.2

The deviations which income and expenditure form from the equilibrium value of 100 form together the terms of a geometric

series: each successive deviation is 1.1 times as large as the preceding one. The increase will go further and further, in an upward cumulative process.

If, on the other hand, we had taken as our starting point a value below the equilibrium value, for instance, 80, a downward cumulative process would have developed in an analogous way.

EXAMPLE II

We change Example I in one respect only, namely, by substituting 0.9 for the factor 1.1. In other words, "excessive" income will lead again to "excessive" expenditure, but the level of expenditure will be only 0.9 times in excess of the deviation of income from normal. Along the same lines we then compute the following sequence of figures:

Quarter	1	2	3	4	5
Expenditure		118	116.2	114.6	113.2
Income	120	118	116.2	114.6	113.2

There is now again a geometric series, but the ratio between two successive deviations from the equilibrium position is now 0.9, so that the equilibrium position is again gradually approached. There is now a process of adaptation to the initial equilibrium position. If we had started from a downward deviation, for instance, an income of 80, the process of adaptation would have been upward.

For convenience we shall in subsequent examples indicate only the deviations from the equilibrium position; in these terms the last example will appear as follows:

Quarter	1	2	3	4	5
Expenditure (deviations)		18	16.2	14.6	13.2
Income (deviations)	20	18	16.2	14.6	13.2

EXAMPLE III

We shall now reintroduce a complication which we had left out of account temporarily, namely, the assumption that income is not equal to expenditure in the same quarter but contains, as a further item, speculative income equal to the increase in income of the preceding quarter over the quarter before the preceding one. We start again from an equilibrium income in quarter 0 of 100 (deviation = 0), which by a random cause is brought to 120 in quarter 1 (deviation = 20). Hence, expenditure in the second quarter measured as a deviation from normal will equal $0.9 \times 20 = 18$. Income in the second quarter is now not equal to 18 but to $18 + 20$, the latter figure representing the increase of income in the first quarter over income in quarter 0. Hence income is 38 above normal. This will lead in the third quarter to expenditure at 34 above normal (rounded to integral numbers). Hence, income in the third quarter will be equal to 34 plus the increase between the first and the second quarters, namely, 18. The further process of computation will become clear from the following figures:

Quarter	0	1	2	3	4	5	6	7	8	9	10
Expenditure (deviation)	0	18	34	47	55	58	55	47	34	18	
Income (deviation)	0	20	38	52	61	64	61	52	38	20	0
Increase in income	20	18	14	9	3	−3	−9	−14	−18	−20	

Quarter	11	12	13	14	15	16	17	18	19	20	21
Expenditure (deviation)	0	−18	−34	−47	−55	−58	−55	−47	−34	−18	0
Income (deviation)	−20	−38	−52	−61	−64	−61	−52	−38	−20	0	20
Increase in income	−20	−18	−14	−9	−3	3	9	14	18	20	20

We had to continue this computation somewhat further because the further course of events is not so easily seen in this example as in the preceding ones, where the sequence of figures turned out to have simple properties. The development of the figures in the later part of the period shown is of particular interest. Initially, that is, up to the fifth quarter inclusive, there is an upward cumulative process: incomes increase more and more. However, the rate of increase slows down. By the sixth quarter income has decrease compared to the fifth quarter.[12] Although total expenditure is still higher than in the preceding quarter (58 as against 55), speculative incomes are so small that the total computed income is lower now than in the preceding quarter. This is the sign of the reversal. Up to the fifteenth quarter there is now a downward cumulative process which initially proceeds at increasing speed, then at a decreasing speed. After the fifteenth quarter there is again a cumulative increase which initially is also at increasing speed. In the twenty-first quarter the position is exactly the same as in quarter 1. From here on out the movement will repeat itself; it is purely periodic.

The most interesting aspect of this example is that it proves that constant relationships can produce a fluctuating process. Apart from the initial disturbance of the equilibrium, expenditure depends continuously in the same way on income and income depends continuously in the same way on expenditure and the rate of increase in income. After a disruption of equilibrium by one single exogenous event these relationships produce a fluctuating movement. It will be noted that the movement here, as in the preceding example, is an endogenous movement: it occurs without any further change in the data. This, then, is an example of an endogenous fluctuation. The assumptions underlying our calculations, in other words the economic theory which has been used, explain both the development of a cumulative process and its turning points. It is difficult to put this explanation into words. It is particularly difficult to indicate "the cause of the turning point." In fact, the belief that there must be a cause for each turning point is erroneous. It is not so

12. If another choice had been made of the initial values, this turning point could have come at another point of time.

that each turning point has a cause of its own. This may be so when the turning point has been brought about by a new change in the data. Many theories introduce such a change in data, often as a *deus ex machina*, at the appropriate moment; it is then, however, difficult to prove that the turning point is a necessary one.

In our last example it would have been impossible, moreover, to explain the turning point on qualitative grounds. The fact that a turning point occurs depends on the numerical values which enter into the relationships. If the ratio 0.9 between the excess of expenditure and the excess of income were changed into 1.1, no cyclical movement would occur. The occurrence of fluctuations, therefore, depends on the numerical values of the coefficients used. These values also determine the period of the waves and their degree of damping or antidamping. The various problems which arise in this connection can be solved satisfactorily only by means of mathematical methods.

It may have become clear from our examples that the movements of an economic system are determined by two sets of data: (*a*) the initial position, in particular the disturbance of equilibrium which occurs at the beginning, and (*b*) the nature of the relations among the various economic variables. What exactly has to be known concerning the initial position depends on the particular structure of these relations. If they should contain values for the variables for more quarters than occur in our examples, then a larger number of initial values would have to be known to determine the movement. In our third example, two values of income were necessary; whereas, in Examples I and II, one value was sufficient. These initial disturbances of the equilibrium should be considered as the operation of temporary factors, such as, for instance, large or small crops. The properties of the relations, however, are not of a temporary but of a more permanent character. They may in fact be considered as reflecting the economic structure of the economy or the market concerned.

These examples should not be considered as anything more than, indeed, examples; at best they indicate a few of the most important characteristics of actual cyclical movements. To pre-

vent misunderstanding, we want to mention at this stage a number of other characteristics which need to be added to obtain a reasonably realistic picture. In the following paragraphs we shall expand these additional characteristics gradually, in order to come gradually closer to reality.

In the first place, one should realize that the disturbances are not limited to one: after the cyclical movement has run its course for a certain time, another disturbance is likely to occur; there may be many disturbances in one cycle; hence a cycle will not in reality show the smooth, regular pattern of our example.

The relations between the various economic variables will, moreover, be of a more complicated nature. More variables than the two we mentioned will occur in them. We have referred to some of them already in preceding paragraphs. Thus, we assumed in our examples that expenditure was determined by the level of income only. But we have seen, above,[13] that, in addition to income, the level of prices, too, has a certain influence on expenditure. It is true that with a reasonable degree of approximation one may assume that the fluctuations in prices are parallel to those in incomes, so that prices as a separate variable may be eliminated; but this remains always an approximation. There are many examples of other similar approximations which would disappear in a more exact and complete theory.

Furthermore, a larger number of time units will occur in our relations. In Example III the level of income in the third quarter depended in part on the levels in the second and the first quarters. In reality, however, influences of quarters further back will make themselves felt. Part of expenditure, for instance, that for investment in commodities which have a very long construction period, will depend on the level of income many more quarters earlier. Since income is determined by expenditure in the same quarter, it, too, will in part depend on incomes a number of years ago.

Much longer lags may play a role as a consequence of the echo principle;[14] according to that principle, reinvestments are in part determined by investments which occurred one lifetime ago.

13. Pp. 185 ff.

14. Cf. p. 179, *supra*.

Then again, there may be relations of a more complicated structure. We have given some indications of these in chapter i. If they are taken into account, a more complicated and less regular pattern of waves may emerge, even without the occurrence of new disturbances.

EXAMPLE IV

A relatively simple example of a more complicated relation (which incidentally does not lead to waves of a less regular pattern) may be derived from the theories of Kalecki.[15] The purpose of this example is also to show that it is not particularly necessary to introduce the phenomenon of speculative income to obtain a cyclical movement.

Kalecki's theory may be interpreted in this way, that, in contrast to our Example III, he assumes that expenditure does not depend on the level of income but on the ratio of income to capital. He bases this assumption on the following considerations:

a) Expenditures for investment will determine all other expenditure, since they determine the level of income of consumers.[16]

b) Investments are determined by the rate of profit, that is, the ratio of profit to capital, rather than by the absolute level of profits.

c) Since fluctuations in profits are parallel with those in national income (profits forming the most fluctuating part of national income), it may also be concluded as an approximation that investments are determined by the ratio between total national income and capital.

We have now introduced a new variable, capital. In order to establish a system of computation, we have to determine how capital depends on the other variables. Capital is formed by the accumulation of successive investments. Assuming a certain initial capital, we find the capital at the end of a quarter by adding the amount of investment during that quarter; capital at the

15. M. Kalecki, *Essays in the Theory of Economic Fluctuations* (London: Allen & Unwin, 1938).

16. Cf. p. 113, *supra*.

end of the second quarter, by adding again investment during the second quarter, etc. Investment itself is part of total expenditure and indeed a systematically determined part.

For illustrative purposes we will put these relationships in the following specific forms which form the basis of Example IV. The amount of investment, I, shown on line 1, is 225 times the profit rate z of the preceding quarter, if both are measured in deviations from their normal value. Total national income Y (line 2) is twice the amount of investment (again both measured as deviations from normal). The normal value of national income is taken as 100, so that the absolute value of national income ($\overline{\overline{Y}}$) is equal to 100 $+ Y$ (line 3). The normal value of investment is 10, so that the absolute value $\overline{\overline{I}}$ equals $10 + I$. Hence the value of capital, $\overline{\overline{K}}_t$, at the beginning of quarter t is equal to the value at the beginning of the preceding quarter ($\overline{\overline{K}}_{t-1}$) plus $10 + I_{t-1}$, the latter symbol indicating the amount of investment in the quarter $t - 1$ (line 4). The profit percentage $\overline{\overline{z}}$ (in absolute value) is equal to the ratio of $\overline{Y}$ to $\overline{K}$ (line 5). The deviation from normal can be obtained by deducting 20 per cent so that $z = \overline{\overline{z}} - 0.2$ (line 6).

The choice of these numerical values, although somewhat arbitrary, is realistic. For a value of national income of 100 the value of new investment will indeed be approximately 10. The normal relation between national income and national capital is about 1 to 5; hence the normal value of $\overline{\overline{z}}$ would be 0.2. Of the total income, roughly one-fourth may be income of entrepreneurs, and the corresponding relationship to capital is therefore 0.05. The fluctuations in z will be mainly attributable to variations in this 0.05. The choice of 225 in the first line indicates that an increase of this ratio of 5 per cent of capital by 1 per cent would lead to an additional investment of 2.25 at a normal level of 10; this is also a realistic assumption.

In order to determine the movement of the variables, it is necessary to assume certain initial values. For this purpose we select a value of 450 of capital at the beginning of the period under consideration and a value of 2 for investment in excess of normal. The computation for Example IV then proceeds in a way similar to that in the preceding example:

EXAMPLE IV

Line	Quarter	1	2	3	4	5	6	7	8	9	10	11	12	13
1.....	$I = 225\,z$	2	7.0	10.6	11.9	10.8	7.7	2.7	− 2.9	− 8.1	− 12.4	− 16.0	− 18.7	− 20.3
2.....	$Y = 2\,I$	4	14.0	21.2	23.8	21.6	15.4	5.4	− 5.8	− 16.2	− 24.8	− 32.0	− 37.4	− 40.6
3.....	$\bar{\bar{Y}} = 100 + Y$	104	114	121	124	122	115	105	94	84	75	68	63	59
4.....	$\bar{\bar{K}}_t = K_{t-1} + I_{t-1} + 10$	450	462	479	500	522	543	561	574	581	583	581	575	566
5.....	$\bar{\bar{z}} = \bar{\bar{Y}} / \bar{\bar{K}}$	0.231	0.247	0.253	0.248	0.234	0.212	0.187	0.164	0.145	0.129	0.117	0.110	0.104
6.....	$z = \bar{\bar{z}} - 0.2$	0.031	0.047	0.053	0.048	0.034	0.012	− 0.013	− 0.036	− 0.055	− 0.071	− 0.083	− 0.090	− 0.096

Line	14	15	16	17	18	19	20	21	22	23	24	25	26	27
1.....	− 21.6	− 21.8	− 21.8	− 21.4	− 20.3	− 18.9	− 17.1	− 14.6	− 11.9	− 9.2	− 6.3	− 4.1	− 2.0	− 0.7
2.....	− 43.2	− 43.6	− 43.6	− 42.8	− 40.6	− 37.8	− 34.2	− 29.2	− 23.8	− 18.4	− 12.6	− 8.2	− 4.0	− 1.4
3.....	57	56	56	57	59	62	66	71	76	82	87	92	96	99
4.....	556	544	532	520	509	499	490	483	478	476	477	481	487	495
5.....	0.103	0.103	0.105	0.110	0.116	0.124	0.135	0.147	0.159	0.172	0.182	0.191	0.197	0.200
6.....	− 0.097	− 0.097	− 0.095	− 0.090	− 0.084	− 0.076	− 0.065	− 0.053	− 0.041	− 0.028	− 0.018	− 0.009	− 0.003	0.000

Since the relationship between the variables is more complicated, the resulting movement is also more complicated than that in the preceding examples. The primary movement is again a wave movement. In addition, a trend occurs, the character of which does not interest us in this connection. We suggest to the reader a very close study of this example. It has a number of interesting characteristics, many more than can be discussed in this text. It will be noted in particular, as we have mentioned already, that a wave movement is obtained without the introduction of speculative income, as a result of the assumption that not profits but the rate of profit determines investment. The example indicates the proposition which can be proved easily that fluctuating endogenous movements can occur in many different ways. For purposes of business-cycle theory it is important to determine which of these ways is actually operating in reality.

EXPANSION OF CYCLICAL MODELS

In the preceding example we have introduced a number of simplifying assumptions in order to explain the broad outlines of the cyclical process. In particular, we have assumed that total expenditure (apart from incidental disturbances) depended only on the size of national income.

a) Prices

This assumption implies that no separate influence is attributed to price. The assumption is justified if either of the following conditions is satisfied: (1) the elasticity of demand for all commodities combined, as a function of the general price level is equal to 1; (2) prices themselves depend on income only. As a first rough approximation we may say that both conditions are approximately satisfied so that our method is in two ways justified as a first step. A more precise analysis, however, will have to take account of deviations of these assumptions from reality. This will require the conventional demand and supply analysis. The quantities demanded and prices, and hence also the values, depend on the joint operation of demand and supply factors. We will therefore have to proceed to an enumeration and treatment of these factors, bearing in mind that the size of

their effects depends on the magnitude of the elasticities of demand and of supply. The latter will normally be taken as data. In this connection we do not have to pay attention to all demand and supply factors but only to those that are of importance in the cyclical process. The demand factors have already been discussed in this respect when we analyzed fluctuations in investment and consumption; a brief recapitulation will suffice.

The most important demand factor remains income; in addition, the rate of interest, the lifetime of the stock of capital goods, the rate of increase in prices and of share prices, and possibly the income distribution are of importance as demand factors.

We may now turn to the supply factors. Goods and services are supplied from production or, as far as goods are concerned, from stock. Supply from production is by far the most important. Factors that determine production are (*a*) those which determine the cost curve—we may mention, as the most important, the prices of factors of production (the wage rate, the rate of interest, and the rate of rent) and (*b*) the quantities of the factors of productions which are required per unit of product. For practical purposes, the latter are given by the size of the capital, the productivity of labor, and, in the case of agriculture, the yield per acre. Some further, more incidental, factors may for the moment be left out of consideration.

How can we depict the changes in the mechanism which follow from the introduction of these variables? For this purpose we shall have to expand the calculations given in our examples by as many new lines as there are new variables. Thus, if some of the magnitudes concerned, such as expenditure, depended also on prices, this factor could be taken into account. A new relation would then have to be added to compute the level of prices for each period and, similarly, for the computation of each new variable. No new relation is necessary when new data are introduced; their course over time is known in advance and is therefore independent of the figures computed on the basis of the other relations.

Two steps are therefore necessary: the new relations have to be determined, and with their help the course of the variables

in the more complicated model has to be computed. In general, it is by no means simple to anticipate the results of this computation simply on the basis of the knowledge of an individual new relation. The required mathematical method of handling can be replaced by reasoning only in exceptional cases, when one deals with exceedingly simple economic structures.

The relation which we need in each case is to inform us about the direct causes of changes in the variable under consideration; the indirect causes have to be left out of this relation. Indirect causes of changes in a given variable are always at the same time direct causes of changes in another variable. If we attribute changes in expenditure partly to changes in the level of prices and the latter again partly to changes in yields, then the latter are an indirect cause of changes in expenditure but at the same time a direct cause of changes in the price level. When we know the direct causes of all variables, we know all the elements in the general structure of relations. By concentrating our attention on direct causes, we can be sure that each link occurs only once. These questions are demonstrated clearly by the systems of arrows shown in Examples I, II, and III. Each of these systems consists of an endless repetition in time of a certain basic pattern which reflects the structure of the relations in the model. Each arrow indicates a direct cause of change of the variable to which the arrow points. The basic model is completely described by the enumeration of all direct causes. This may imply that more than one arrow points to one variable. We have already seen in chapter i that the total change in one variable may be composed of changes due to more than one cause.

We will now first consider the direct causes of changes in the price level. It is a reasonable approximation to reality to postulate that prices are determined by suppliers on the basis of the quantities demanded and of the supply factors. It is true that this is not the usual description of a market in economic theory. It is more normal to postulate that the suppliers determine the quantity they are prepared to supply on the basis of prices and supply factors.[17] In a sense, we turn the supply relation around and interchange quantity and price. As long as we assume im-

17. Cf. p. 113, *supra*.

mediate adaptation of these two variables, this interchange does not make any difference. But if it is assumed that a certain time elapses before the quantity supplied responds to a change in the market price, it does make a difference. In this case, we deliberately choose the relation in the sense in which we have formulated it because we believe that it better reflects actual changes in the short run. In economic theory, however, the supply relation is customarily not used to indicate changes in the short run but rather to describe the adaptation in the long run.

We assume further—a good approximation in most cases—that total costs for each enterprise consist of fixed and proportional costs, that is to say, that the cost curve is a straight line until very near total capacity. The slope of this line, however, may be different for different enterprises.

We specify now as a supply relation that the price will be equal to the marginal cost of the best firm plus profits such that the marginal firm will just cover its marginal costs. We mean by the best firm the one with the lowest variable cost per unit of time. Of course, it would be shorter to state that the price is equal to the marginal cost of the marginal firm, but in this connection it should be borne in mind that the marginal firm is not a given firm: it changes with the volume of production. For this reason the former formulation is preferable. The best firm may not be the same for eternity, but changes in this respect are in any case much slower. The concept of the representative firm may also be used, provided that one does not consider this as the firm which is midway between the best one and the marginal firm, since a firm so defined would also change too much over the course of a cycle.

The marginal costs of the best firm will be primarily wage costs and raw-material costs. If we consider a vertical integration of the economy, as we shall do to prevent too many complications, all raw-material costs vanish and instead of them we have wage costs of the firms producing raw materials. The wage costs are the product of the wage rate and the quantity of labor per unit of product. The latter variable is the inverse of labor productivity.

The profit margin which we mentioned is, as it were, the mar-

gin that the market permits. It will be the larger, the greater the distance between the best firm and the marginal firm. This distance may be measured by the volume of production. The size of the profit margin per unit of product depends on the spread of costs among the various enterprises. If this spread is small, the margin will also be small and will change little when the volume of production changes. In that case we would say that the supply price would have little flexibility, or that supply is very elastic. This will usually be the case for industrial products as long as there is unused productive capacity. If the volume of production reaches the limit of capacity, a further increase of production can take place only when the price promises profitability of the necessary new investment. At that stage, price suddenly becomes much more flexible; the further increase of the quantity supplied is accompanied by a relatively much stronger increase in prices. In the graphic representation between quantity and price the slope of the supply curve would show a definite change at this point.

In these various relations there may be a certain lag between cause and effect, that is to say, between a change in wage, labor productivity, or volume of production and a change in price. In particular, the tendency to compute costs on the basis of actual past expenditure will lead in this direction. If this method of calculation is used, a lag will occur equal to the period for which raw materials or semifinished products are kept in stock.

b) Wages

The wage rate, itself a price, may in its turn be considered as determined by the quantity turned over in the labor market, that is to say, the volume of employment, and by a number of supply factors. The most important supply factor with respect to changes in the wage rate in the short run is the cost of living. An increase in the cost of living will on the part of workers lead to requests and active measures for an increase in wages, whereas a decrease in the cost of living will lead to attempts on the part of entrepreneurs to lower wages. There are, of course, a number of other factors which determine supply, such as increases in the population, changes in social views, changes in

educational facilities, etc. But these factors are as a rule the cause only of very gradual changes in the wage rate and are therefore not of importance in this connection.[18] We are, therefore, not far from reality when we consider that changes in the wage rate are determined by changes in the volume of employment and in the cost of living; the latter may be considered as the general level of prices of consumption goods. Changes in productivity of labor occur on the whole very regularly also; they are primarily trend changes and may therefore remain undiscussed in an explanation of cyclical movements. On closer analysis and particularly in individual industries, certain changes connected with the cycle may also be discerned. We may make a distinction here between changes that are more or less automatic and changes of a more spontaneous character. Automatic changes are the direct and automatic consequences of changes in the degree of capacity used. At a high level of utilization of capacity the efficiency of the total system of production is usually greatest, but, on the other hand, it is often necessary in these conditions to use workers who are less capable. The opposite occurs at a low degree of utilization of capacity.

As to spontaneous changes in labor productivity, these would be due to changes in the method of production, introduced by management as a result of its continuous attempt to improve the organization, to employ new methods, etc. These changes are likely to be pursued with the more intensity, the lower the activity of the firm. Sometimes these attempts will have more success than at other times. Abstracting from these differences in success which are of a more incidental character and assuming that the actual changes are also greatest in the periods of greatest adversity, it still does not follow that labor productivity itself would also be highest in depression periods. The increase in labor productivity is greatest in such times; hence labor productivity itself would be highest (as a deviation from its trend) approximately one-quarter of a cycle later. Since the process of spontaneous changes takes a certain time, the relative maximum of labor productivity is, according to statistical investigations, reached still later (approximately half a year),

18. Cf. p. 118, *supra*.

hence in total some two and a half years after the minimum of employment or of production has been passed. As we have mentioned, however, the influence of the cyclical movement on labor productivity is not very large for production as a whole, and we will pay no further attention to it in this connection. We may postulate, therefore, that the cyclical movements in employment and production are practically parallel; this is confirmed by statistical investigations.

If we try to summarize the preceding reflections, we arrive at the following conclusions, first of all for periods in which the full productive capacity is not used. The quantity of commodities demanded depends also on price, in addition to income. Price is determined by the wage rate and the volume of production; the wage rate itself by the price level and the volume of production. If all these relations for the variables mentioned referred to the same unit of time, one would have three variables with three unknowns, namely, the quantity demanded, the price, and the wage rate. By mathematical operation it would then be possible to express all in terms of income. In other words, the fluctuations in income would pull along the other variables; again, in other words, the three variables, quantity, price, and wage, would adapt themselves immediately to changes in income. In that case our original model would remain valid. The meaning of some of the numerical coefficients which we used, such as the marginal propensity to consume, would have become somewhat more complicated. These coefficients would then represent some sort of net result of the joint operation of a number of relations.

If, however, the various relations operate with a certain lag, the entire model becomes much more complicated. But if the lags are not great, the differences from an unlagged system would not be very great either, so that we might expect that the quantities produced, the level of prices, and the wage rates would follow approximately the fluctuations in income.

But this would hold only as long as production does not reach capacity. When it does and when we reach the region of bottlenecks, the general picture changes. At that stage, production can increase only slowly. There will now be a discrepancy between the movement of incomes and the movements of the

other variables. The quantity produced and the quantity traded will show a tendency to increase only slightly, while prices start to rise more rapidly. It is now not certain how their product—total expenditure—will move; this depends on the elasticity coefficients entering into the various relations. Speculative income will now show more rapid increases than before. Hence the general development may become different. As a rule, however, there will still be a turning point. The curve of the volume of production will now reach its maximum first, but this does not mean that it will also show a decline first; a practically horizontal part may be expected, and this in itself will not always be a reason for a turning point. Whether a turning point does or does not occur can be determined only on the basis of a precise calculation and not by reasoning alone.

c) *Fluctuations in crops*

Another deviation in the pattern of the examples that can be attributed to factors in the commodity sphere is provided by changes in crops, changes to which we have referred a number of times before. In a year of excessively large crops, prices will be lower and the quantities consumed higher than they would have been in a normal year, given the same income of the preceding quarter. Here again one cannot say a priori whether total expenditure and hence income in a subsequent period will be larger or smaller, and a special pattern of developments may well occur. In this case there is not a systematic deviation from the cyclical pattern, since fluctuations in crops may be considered largely as random movements. As we mentioned in our examples, they may, therefore, rather be considered as disturbances of equilibrium which from time to time impart an impulse to the cyclical mechanism.

In this connection, it may be useful for a moment to assume that all lags are reduced to zero, that is to say, that the adaptations which are involved in this mechanism occur so rapidly that there is always an immediate adaptation of all economic variables to changes in the data. Thus, expenditure will correspond to a change in incomes not after a certain lag but immediately; prices will be adjusted immediately to increases in costs, wages

to changes in the cost of living, etc.; and there will be no speculative incomes. All economic variables would then follow the pattern of fluctuations in the data, in this particular case the fluctuations in crops. What would then be their pattern? Since the natural time unit of these fluctuations is one year,[19] and random fluctuations have a quasi-period of three time units, there would then be quasi-periodic movements with a period of three years. One might in this way derive a cycle which shows a high degree of approximation to the short American cycle (the Kitchin), although not to that of the European cycle. It is worth noting in this connection that the reaction periods in the United States are relatively short. Hence the particular assumptions made in this paragraph may approximate reality in the United States much better than in Europe. This example, however, should be considered as an extreme approximation in which the disturbances would dominate completely the endogenous reactions of the system, which again might be more acceptable for the United States than for Europe. We may add to this the remark that, as we trust the reader will have realized from what has been said, it is inaccurate to consider the "agricultural" theories of the business cycle as an alternative to other theories. Rather, they complete these other theories by giving a further specification of the disturbances whereas most other theories concentrate on the reactions of the economy to these disturbances.

Apart from the question whether the adaptation of the economic variables to changes in crops occurs rapidly or slowly, another question of importance remains, namely, in which direction total expenditure will move in the case, for instance, of a positive deviation of yields, i.e., relatively large crops. In this respect, the agricultural theories of business cycles contradict each other. There need be no argument that in such a situation the degree of activity in agriculture and in the processing and transportation industries depending on it will be increased or that prices will be below normal. These facts, however, do not indicate anything about the direction into which money incomes and money expenditure will move, unless one has a cer-

19. Cf. p. 77, *supra*.

tain amount of information concerning the elasticities of demand for the different agricultural products. A solution of this problem on the basis of a statistical determination of these elasticities would be possible but has not yet been achieved. A further complication should still be mentioned. Since in reality the various reactions indicated take a certain amount of time and since, further, speculative influences based on the movement of prices from one year to the next play a role, not all reactions caused by one change in crops coincide, and the later reactions of one crop year become mixed with the early reactions of the next crop year.

d) Short-term rate of interest

Adjustments similar to those which should be made in our simple models given in Examples I–IV, in order to take account of the influence of the price level on the demand for goods and services, should be made to take account of the influence of the rate of interest on demand and hence on expenditure. This will mean that certain influences originating in what we may call "the financial sphere" will make themselves felt. We consider this sphere as consisting of the variables—prices and quantities —relating to the more liquid assets, in particular to money, claims, and evidences of ownership. In the last two categories we would include short-term claims such as drafts, current account advances, etc., and claims with a longer period to maturity, such as bonds and shares. Each of these relatively liquid assets yields a certain income to its owner, and hence a certain rate of interest corresponds to each of them. The various short-term rates of interest correspond to the short claims, the rate of interest in the capital market to bonds, and the yield on shares to stock certificates. Of total expenditure, especially that for investment will depend on one or more of these rates of interest.

By the same token, these rates of interest will have a certain effect on business-cycle fluctuations. Here again, however, we may observe that the effect of these factors is quite moderate, because the influence of the rate of interest on investment is not very great. The movements of the rate of interest in the capital market (i.e., the bond yield) show, moreover, hardly any cycli-

cal component, which fact reduces further the influence of the rate of interest in the cyclical movements.

Let us consider first the modifications that have to be applied to our models to take account of fluctuations in the short-term rate of interest. We have to follow the same procedure as in the treatment of prices: a new line should be introduced for each new variable that is added to the model. Of the formation of the short-term rate of interest, it may be said that it (like other prices) is determined in the short run by the suppliers of short-term credits, that is, mainly the banking organization, usually under the guidance of the central bank.

We consider for our purpose the banking system as a whole, as it were, the combined balance sheet of the central bank and the other banks. The main assets of the banking system are then gold and foreign-exchange holdings and credits (loans, advances, investments, security holdings), and the main liabilities constitute together the money supply (central bank notes and deposits in the other banks). What are the considerations which guide central banks in setting their rates of discount, rates we may consider as representative of the rate of interest for short-term credits?

Various legal or conventional reserve requirements make it necessary for the banking system to hold a minimum of gold cover for the total money supply. Most central banks are required to maintain gold to at least a certain percentage of their sight liabilities. This establishes a relation between gold holdings and currency circulation plus the balances of other banks with the central bank. The latter balances, in turn, may be fixed by minimum reserve requirements, as in the United States, or by conventional reserve ratios, as in the United Kingdom. It follows that the short-term rate of interest is determined primarily by the relative movements of (*a*) the gold stock and (*b*) the quantity of money.

In order to complete the business-cycle mechanism, we shall have to analyze again the direct causes of changes in these two variables.

With respect to the demand for money we may refer to the different motives for holding cash to which Keynes in particular

has drawn attention. The most important motive, which is predominant especially in normal times, is the transactions motive, reflecting the necessity to finance transactions. On that account the volume of money would fluctuate with the value of turnover, reflected in our models by the variable total expenditure. Larger expenditure would require a larger quantity of money and would hence lead to a tendency of the rate of interest to increase. There may, further, be the hoarding motive, when the use of money is considered to be not profitable or when an extra cash reserve is desired for unexpected events. To some extent this reflects a comparison of the rate of interest which could be made if the money were invested with the preference for holding liquid assets; hence the demand for money is, in part, dependent on the various rates of interest. Finally, demand may in part be determined by movements of prices, movements in share prices, and many incidental events, particularly political events. All these factors would apply both to the demand for money exercised by private persons and to that exercised by businesses.

The gold stock is an important determining factor with respect to the supply of money in countries adhering to the gold standard. Fluctuations in gold stocks for a single country are quite different from fluctuations for all countries combined. For all countries combined the gold stock shows a very smooth pattern, as annual gold production is only a very small proportion of the available stock. More abrupt changes are possible only to the extent that gold privately held or gold used in ornaments may find its way into the holdings of the central banks (as happens occasionally in countries like India). On the whole, these changes are not very intimately connected with the cycle.

Changes in the gold stocks of individual countries reflect mainly changes in the balance of payments positions of these countries. The balance of payments position of a country depends on many factors. To arrive at net changes in gold, one would have to take account of the balance on trade account, the balance on invisible items, and long-term and short-term capital movements. One of the important factors determining the trade balance is the difference in the economic position between the country under consideration and the countries with which it

trades; this balance need not therefore be closely correlated with the business cycle itself. Differences in the cyclical position that may be incidental in character determine this balance. In the course of the last fifty years, for instance, Germany has shown a considerable change in the pattern of fluctuations of her trade balance over the cycle. While before 1914 Germany's exports tended to increase during the depression, no such tendency was visible in the interwar period. Similar considerations apply to invisible items and to capital movements. Such movements in particular are often the result of incidental events, such as the creation of a large new enterprise, the opening-up of a new area, political and psychological factors, etc. As a result of all this, movements in the gold stock are much nearer to being random disturbances than a systematic factor subject to cyclical changes.

In summary, then, movements in the short-term rate of interest are determined primarily by total expenditures as a demand factor and the gold stock as a supply factor; in addition, speculative and other incidental demand factors may play a role. The introduction of the short-term rate of interest in our model, therefore, means primarily that fluctuations in the gold stock are given a role in the determination of the cyclical pattern. To the extent that the level of expenditure makes itself felt through the rate of interest, the expansion of our model simply means the introduction of a restraining factor. A high level of expenditure will, after a certain period, for instance, after one quarter, lead to an increase in the short-term rate of interest, and this will make expenditure in the next quarter slightly lower than it would otherwise have been. Hence, the factor 0.9 in Example III would become slightly lower.

It should perhaps be mentioned that some authors attribute a psychological significance of much greater consequence than the economic influence we have indicated to an increase of the discount rate of the central bank above a certain maximum, for instance, above 6 per cent. They would believe that the transgression of such a critical point would lead to a general restraint in expenditure.

e) Share yield and share prices

After the analysis of the effect of the short-term rate of interest on the cyclical pattern, we should now deal similarly with share prices. We mentioned before that the yield on shares may be considered as a rate of interest and as such will be a factor determining the level of investment. A high share yield will be reflected, *ceteris paribus*, in a low level of new investment. Since the share yield is the ratio of the percentage dividend and the share price, both these factors will require to be incorporated in our model. We will have to deal with share prices in any case, because we have seen[20] that share prices directly affect the volume of speculative income; an increase in share prices creates speculative profits which are usually treated as income.

There is a direct relationship between dividends and profits. For most countries a rather strict relationship can be observed —the higher the profit percentage, the higher the percentage of dividends. There is, however, no proportionality: the dividend rate fluctuates with less intensity, and it never becomes negative. We have treated before the relationship between the profit rate on the one hand, and total income and the cumulated series of investments, on the other hand.[21] As a first approximation we may state that the dividend rate shows fluctuations parallel with those of national income but somewhat lagged because dividends paid out usually correspond to profits some time earlier. In European countries this lag is greater than in the United States. We may estimate it for Europe at approximately ten months. The rate of profit in a certain calendar year centered around July 1 will determine the rate of dividend around May 1 of the next year. In the United States it is found that dividends depend not only on the rate of profit but also rather clearly on the level of surplus, the latter representing the cumulation of undistributed profits.

We now come to the formation of share prices. Different aspects of the market for shares may best be treated in a series of successive approximations. As a first approximation we assume that all buyers and sellers of shares are investors, that is to say,

20. Cf. p. 194, *supra*.

21. Cf. p. 203, *supra*.

they desire to hold shares only because of the income they yield. We assume further a stationary society so that both dividends and the long-term rate of interest remain constant. Under these assumptions, share prices will be proportional to the dividend rate and inversely proportional to the long-term rate of interest. They are in fact equal to the ratio of these two magnitudes. If the dividend rate is 8 per cent and the long-term rate of interest is 4 per cent, share quotations will be 200 per cent of par.

A first complication is introduced if the situation is no longer assumed to be stationary, but both dividends and the rate of interest change. The yields will then be determined by the expected dividends. If in a certain year an extremely high dividend has been paid, shareholders will not assume that this dividend will be maintained but rather that future dividends will be lower. Statistical observation indicates that on the average share prices follow approximately the following rules:

a) The dividend rate considered as normal is reflected in share prices according to the normal level as indicated in the preceding paragraph.

b) The dividend expectation deviates from that average by roughly half the actual distance between the current dividend rate and the average rate. In other words, shareholders expect that when the current dividend is higher than normal the average dividend in the future will also be higher than normal but only by half as much. Normal share prices occur at a dividend rate of approximately 4 per cent. This yield appears to be determined by experience over the past decades. When the actual dividend rate is 10 per cent, the expectation for the future appears to be about 7 per cent, and the share-price index will reflect this yield. Thus, if the long-term rate of interest is 4 per cent, the price will be 175 per cent of par, or 1.75 times as high as it would have been at a dividend rate of 4 per cent.

Hence fluctuations in the share level will be determined primarily by fluctuations in dividends, and these depend in their turn on fluctuations in profits. Profits reflect the business cycle somewhat earlier than wages, since the latter have a certain lag with respect to other series. Total national income, that is to

say, the sum of profits (including all nonlabor income) and wages, lags therefore somewhat with respect to profits. This explains why share prices lead somewhat with respect to national income and also with respect to general indices of activity and prices.

Obviously, prices for individual shares may deviate from the above rule. The dividend expectations for individual shares will be determined by certain known facts, such as plans of the corporation, tax plans of the government, etc. In abnormal times, further strong deviations may occur with respect to all shares, owing to general expectations with respect to the economy as a whole. We have referred earlier to the low relative level of share prices during the inflation in Germany.[22]

Share prices will deviate from the standard indicated above when there is a pronounced speculative boom on the stock exchange. We refer here to a situation in which the public at large participates in speculation. This will occur only in countries in which there is a general desire for speculation and even then only after share prices have been rising for a considerable time. A further necessary condition may be that there is a certain availability of savings for which no good investment opportunity is available. The United States is clearly the country in which these conditions are best satisfied. A certain tendency toward speculation may also be observed in England, France, and Belgium, rather less in the Netherlands; in Germany it appears to be very small. In the United States, savings were available in particular in 1928 and 1929, when incomes were very high and the amounts required for investment were smaller than those provided by savings. Thus, the speculative boom in 1928–29 could assume dimensions which had been entirely unknown before. The boom was reflected not only in increases in share prices but also in the prices paid for a New York Stock Exchange seat. Figure 49 shows both magnitudes, the latter since 1870.

When the public at large starts to participate on a large scale in stock-exchange speculation, a new factor in the formation of share prices is added. This large body of speculators will be

22. Cf. p. 44, *supra*.

guided by stock-exchange profits made some time earlier. That is to say, the increase of share prices itself, for instance, from the first to the second quarter, will become a factor in the determination of the demand for shares in the third quarter and thereby of the share price in that quarter. This will introduce a new characteristic, which was also present in Example III, in which income in the third quarter was in part determined by the increase of income from the first to the second quarter.

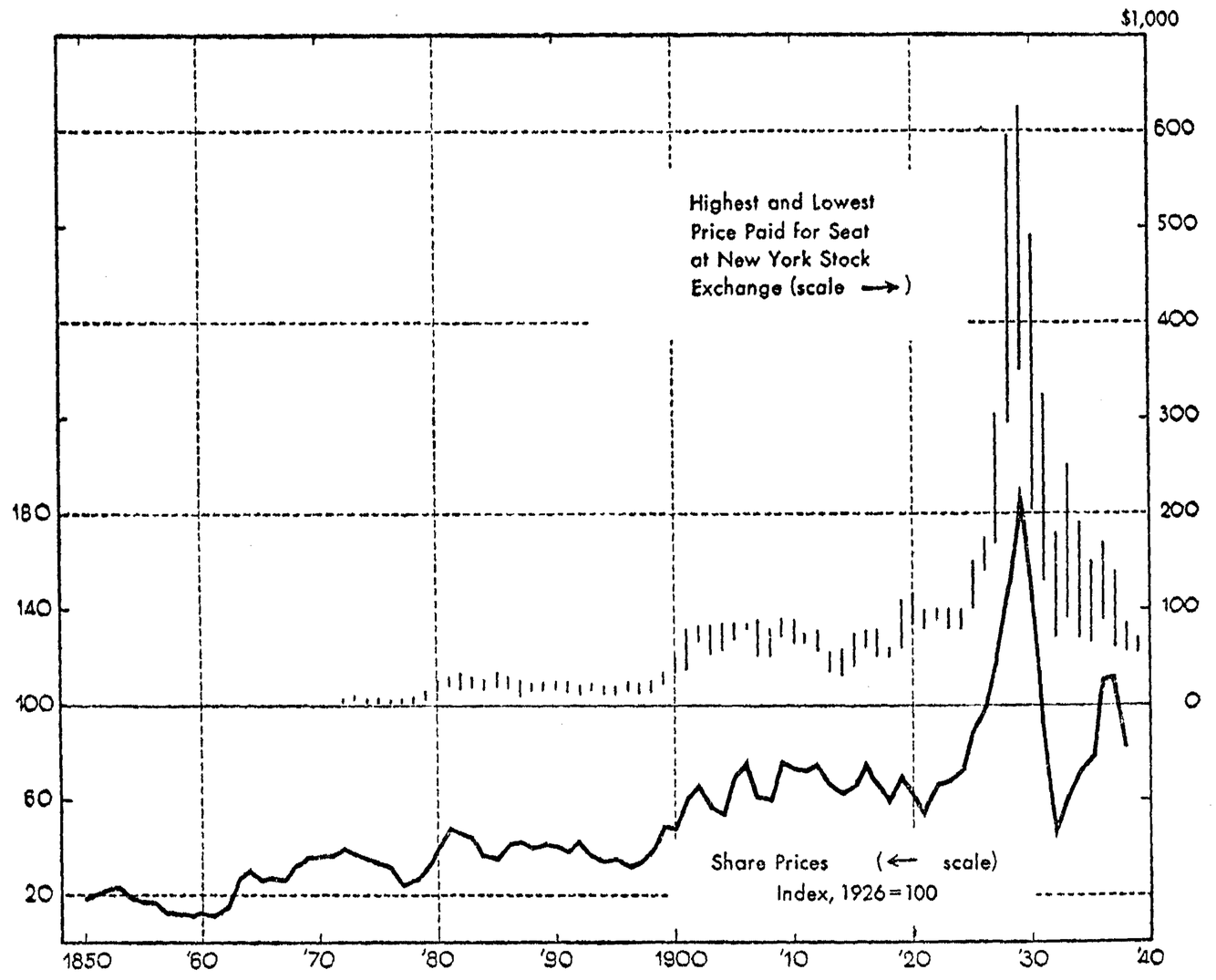


FIG. 49.—Price paid for a Stock Exchange seat in New York (in thousands of dollars) and index number of share prices at the New York Stock Exchange (1926 = 100).

Which way will the forces that operate in the share market affect the cyclical pattern? The most striking and, for recent cyclical history, the most important example is provided by the Stock Exchange boom in the United States in 1929, to which we have referred. Speculative tendencies on the part of the public pushed share prices up above their intrinsic value, which we may define now as the value shares would have had on the basis of their dividends, taking account of the expected lower future

dividend rate as in normal periods. Hence share yields became extremely low, thus providing an additional stimulus for investment. During the period when share prices increased, speculative incomes were also very high; hence total consumption expenditure was also stimulated. Both these movements could not continue; a fall in incomes was probable as soon as share prices ceased to increase. The moment at which the two stimulating factors disappeared was in part determined by random exogenous events which contributed to the end of the Stock Exchange boom in October, 1929. In this connection, reference has been made by some authors to the second large crop after that of 1928 and to the increase of the discount rate above the critical level. To explain the upward turning point, however, it is by no means necessary to seek the assistance of such an extraneous event. We have seen in Example III that the turning point can also occur as a necessary phase in the movements of a model of the sort treated there—and the formation of share prices in periods of acute speculation approaches that model.

SUMMARY: SUCCESSION OF THE DIFFERENT PHASES OF THE CYCLE

In order to summarize our analysis of the cyclical mechanism, we shall now provide a short description of the most important reactions in the order in which they occur. One should realize, however, that such a description has a great scientific danger. It suggests rather than proves. A really exact explanation of cyclical movements can be given only along the lines of our models I–IV, expanded as far as necessary in the ways indicated in the pages just preceding. Since it appeared that the occurrence or nonoccurrence of turning points depends on the intensity of certain reactions and not simply on qualitative considerations, a purely qualitative description cannot be considered as a proof. But we shall give it, nevertheless, because it may make for livelier exposition and thus contribute to a better understanding.

A second danger in this description should be mentioned, that of generalization. It is not implied that every cycle develops according to exactly the same scheme. Often the intervention of

disturbances is so important that they completely change the entire picture; there are also systematic differences between cycles, to which we shall refer below.

We start our description in the depression period, characterized by a low level of production, low prices and incomes, unemployment, and large liquidity of business. This low level has, after a certain period, led to a certain consolidation which makes it possible for entrepreneurs to pay attention to certain more favorable developments. These will develop gradually and more or less automatically. Inventories have been reduced; there is a certain need for the replacement of the means of production; labor productivity increases under the pressure of the depression. Speculative incomes, which had been negative as long as commodity and share prices fell, become zero. The rate of profit becomes higher by the reduction of capital at a constant level of profits: the natural rate of interest increases. On the other hand, the discount rate and the wage rate are low. These factors lead to a resumption of expenditure, both for investment and consumption: recovery starts. Sometimes an exogenous factor may provide an impulse; but in any case the preparedness to respond to favorable impulses has been increased by the factors we enumerated.

Once the recovery has started, it has a tendency to reinforce itself. The process of recovery is cumulative. Larger expenditures lead to increases in income, hence higher profits, and these in turn will lead to larger expenditure. Higher demand will raise prices. The increase in prices creates speculative incomes and so will the increase in share prices as a result of increased profits. As prices rise, the wage rate will increase too, but with a certain lag. The increasing tendency to invest will lead to an increasing demand for credits, after use has been made first of the liquid means which were at the disposal of the economy. Initially, financing will be done with short-term credits and lead to an increase in the short-term rate of interest. As profits increase, short-term credits will be consolidated. As production increases, stocks will be brought to a higher level too. Gradually the boom phase of the cycle is approached, with high production, high prices, high incomes, and little unemployment. Sometimes an

absolute peak is reached in the sense that production cannot be expanded further, either because total productive capacity is in use, at least in certain industries, or because the credit system cannot stand any further expansion and banks start to ration credit, or, finally, because no further labor is available in certain industries. But even without such ceilings or bottlenecks, certain less favorable tendencies will develop. The rate of profit is affected unfavorably by the increase in total capital; speculative incomes decline as the rate of increase in prices and share prices falls. The need to replace means of production slackens; labor productivity declines. Production may remain for a certain time at a high level because it lags behind orders, but the entire economy becomes more vulnerable. As Kaldor has put it, the equilibrium of the economy is now stable with respect to upward shocks but unstable with respect to downward shocks.

As a result of such systematic factors, possibly reinforced by random factors, screened as it were (if Kaldor is correct) in the unfavorable sense that only the downward factors make themselves felt, the tide turns. If the boom has had a very speculative character, the turning point may be very sharp and may lead rapidly to a lower level. Once the downward process has started, it, too, has a tendency to be cumulative. The reduction in profits will lead to a fall in investment, to a further decline in incomes, and hence to a general decline in expenditure. This chain of events will repeat itself. Reduced demand for commodities will make prices fall; this will lead to negative speculative incomes. Such negative speculative incomes will also occur as a result of a fall in share prices. These declines may be reinforced by forced sales of those who cannot obtain credits to bridge temporary deficits. There is a temporary illiquidity which, in earlier crisis periods, has often led to a financial crisis of serious consequences. Gradually, however, the phenomena to which we referred in the beginning of our summary will make themselves felt and the whole cycle is completed.

OVERSAVING VS. OVERINVESTMENT

We must now turn to a question which has played an important role in discussions of the cyclical problem. Can an upper

turning point be prevented by saving more or by consuming more? Some writers maintain that the recovery ends because of a lack of savings; investments cannot be financed and will therefore have to be reduced. Other writers, on the other hand, have held the opinion that a larger volume of consumption was necessary to maintain recovery. The proper answer to the question depends on the assumptions of the different theories—often tacit assumptions. In order to test the applicability of the theories, it is necessary to verify the realism of the assumptions made.

The most essential point in connection with the maintenance of a high level of activity is whether total expenditure for consumption and investment combined will be increased or decreased. A second point is whether increased or decreased amounts will correspond also to increased or decreased quantities. If a certain industry is fully employed, then a greater total amount spent on its products will lead only to an increase in prices, not to an increase in production. Much depends, therefore, on whether one assumes the existence of full employment in one or both of the two industries, the industry producing investment goods and the industry producing consumption goods. After these preliminary remarks we may try a direct answer to the question.

Total expenditure consists of expenditure of income plus the expenditure of amounts obtained through credits. The latter are mainly investment expenditures. A shift by consumers in favor of consumption expenditure, accompanied by an equally large reduction of savings, will tend to increase total expenditure as long as the creation of credit is not completely inelastic. The entrepreneurs who desire to make investment expenditure will, if they have less savings at their disposal, compensate in any case part of this reduction by an increased demand for credit. The increase in consumption expenditure is matched, therefore, by a smaller reduction in investment expenditure. Hence there is an increase in total demand. Only if (1) the creation of credit were entirely inelastic would the total demand of expenditure, as a limiting case, remain the same; in that case it would as a first approximation be indifferent whether consumption ex-

penditure or savings increased. And if then, further, (2) consumption goods industries were fully occupied and (3) the investment industries were not fully employed, an increase in consumption might reduce the total volume of production and an increase in saving might increase it. It would also be possible that the total volume of production would decline if condition (2) were fulfilled, even though total expenditure and consumption expenditure increased, that is to say, if assumption (1) were not fulfilled.

These three assumptions which have to be satisfied in order that (*a*) an increase in consumption expenditure will lead to a crisis and (*b*) an increase in savings would prevent that crisis have indeed been made, explicitly or implicitly, by the first group of writers referred to, among whom Hayek should be mentioned in particular. The first assumption is in accordance with reality with respect to many a period of very tight credit, especially before 1914. Even then, however, the second and third assumptions were rarely fulfilled. And since 1914 the first assumption has not been fulfilled either.

Since it would appear to be better from the cyclical point of view to have larger consumption rather than larger saving, what point, if any, is there in saving? The answer is that here too there are limits. An increase of consumption expenditure will lead, as we have seen, to an increase in total expenditure because of the expansion of credits. When the point of full employment of the total economy is reached, any further increase in consumption expenditure will only lead to increases in prices and no longer to an expansion of production. That would be the limit of a desirable expansion of consumption.

ECONOMIC STRUCTURE AND CYCLICAL PATTERNS

We observed in chapter vii that cyclical movements do not follow the same pattern in every country. We shall endeavor now to seek an explanation of the differences between cycles in different countries and to see in particular to what extent these differences can be explained on the basis of differences between the countries in their economic structure.

It is clear that active economic intercourse between various countries will tend to even out any differences between their cyclical patterns and in this way set a limit to the magnitude of such differences. This was the normal situation in the nineteenth and early twentieth centuries. In such circumstances, cyclical fluctuations in all countries tended to run parallel; in fact, economic conditions in small countries with a relatively large foreign trade were almost completely determined by the conditions prevailing in the larger countries.

The tendency toward parallel development operates first of all through prices, which tend to move up and down jointly in all countries as a result of international competition. This applies in particular to the prices of goods and services which have a world market, such as the relatively light raw materials and the services of capital. It applies much less to goods and services with a restricted mobility, such as relatively heavy commodities (iron), commodities which cannot be moved (dwellings), and labor. Even without the existence of specific restrictions, international competition with respect to such commodities and services can operate only in an indirect fashion, via their products or through competing commodities or services.

The tendency toward parallelism exercises itself also through the quantities in international trade. A depression in country A will make itself felt by a reduction in the quantity it will import from country B; country B may also be affected, as the yield of its investments in country A declines. Both factors would show up in the balance of payments of country B which would develop in an unfavorable direction, with consequent pressure on the currency of country B. If this country were to try to stay aloof from the depression in surrounding countries and to maintain its wage level and price level, its exports would decline even more and its imports would tend to increase. It is clear, therefore, that there must be a strong pressure on country B to follow the cyclical pattern of other countries.

Despite these tendencies toward parallelism, differences in the cyclical pattern can well occur. There may, first, be differences in amplitude. If country X produces relatively more commodities that are subject to large fluctuations in demand and

country Y more commodities with a smaller fluctuation in demand, country Y will be less affected by a depression than will country X. The differences indicated may be due to the fact that the production of country X is concentrated heavily on capital goods, luxury items, or raw materials; as we have seen, the amplitude of the cyclical fluctuations in the sale of these commodities is greater than for other commodities.

Second, differences in phase are possible. A country will undergo cyclical fluctuations relatively later than other countries if it produces mainly types of commodities that are relatively slow in feeling changes in business conditions. But since the lags involved are usually small, no large differences are possible on this account.

Differences in period are not likely to occur. If they did, they would soon lead to differences in the actual cyclical position which would tend to be evened out by the operation of the factors mentioned above. Differences in period become more likely, however, as the connection between the various countries becomes less intense and particularly if the period of the cycle in one country is a multiple of that of the cycle in other countries. The difference in the period of the cycle between the United States and Europe fulfils these two conditions. Owing to its size, the United States is much less influenced by international economic conditions than are most European countries. The period of three and one-half years which appears to characterize the United States economy is just about one-half the period of the cycles in European countries. The two cyclical patterns have continued to exist side by side for a considerable time, with every other recession in the United States coinciding with one in Europe.

It goes without saying that much greater differences in the cyclical pattern become a possibility as soon as international competition is severely limited. This occurs, unintentionally, in periods of disturbed exchanges; and it is the specific object of such policies as import quotas, import duties, and exchange control measures. The most extreme examples of such policies were seen in the U.S.S.R. after 1918 and in Germany after 1933. In both countries the entire economy became at the same mo-

ment controlled in a high degree, as a result of which business cycles were practically eliminated.

If countries are completely separated from each other, each will show the cyclical pattern reflecting its own economic structure. If the separation is incomplete, it is no longer true that the structure of each country determines the cyclical pattern of that country. In part, the pattern will reflect the structure of the countries with which it trades. The more intimate the trade connections are, the less will be the difference between the cyclical patterns in the different countries.

In successive periods of time, changes in the cyclical pattern may be expected even within one country, as a result of changes in the economic structure of that country over time.

Which are the structural characteristics that are particularly responsible for differences in cyclical patterns? In order to answer this question, we have to refer to our explanation of the cycle and to see which structural coefficients were of particular importance in determining the shape of cyclical movements. As we have seen, the formation and use of income and hence the magnitudes which determined these processes were of dominating significance, namely: (1) the marginal propensity to consume and a coefficient which, on the basis of analogy, may be called the "marginal propensity to invest"; (2) the lag between income and consumption; (3) the tendency toward speculation, determining the magnitude of speculative incomes; and (4) the lifetime of capital goods (to the extent that the echo principle is of importance). In addition to these major coefficients, a number of others are also of considerable importance, and some of them, such as the elasticity of the supply of goods and of factors of production, may be of primary significance in particular phases of the business cycle.

Differences in cyclical patterns should therefore be expected particularly where there are striking differences between the structural characteristics mentioned. Most pronounced in this connection is, no doubt, the difference between free and controlled economies in the marginal propensity to invest, "controlled economy" to be interpreted in a wide sense so as to include economies in which the state would engage in a public

works policy in a depression to compensate the decline in private investment. The most pronounced differences in cyclical patterns existed, accordingly, between the U.S.S.R. and Germany, on the one hand, and most other countries, on the other hand.

It may well be possible that the short period of the American cycle (the Kitchin) is due to the shortness of the lags between income and expenditure in the United States.[23]

It is almost certain that the lifetime of machinery has been reduced from the nineteenth to the twentieth centuries. The reduction in the period of the cycle in the course of the nineteenth century has sometimes been ascribed to this cause. It is to be noted, however, that the tendency toward reduction in the period is not clearly observable after 1914.

There are no clear indications of differences in the marginal propensity to consume, either between countries or between the early nineteenth century and the present time. No conclusions can therefore be drawn as to any possible effect of this crucial coefficient on differences in cyclical patterns.

When there is full employment of productive resources and of the credit resources of a country, the elasticity of supply of both mineral materials and capital is very small. This situation may materially affect the shape of cyclical movements. Conditions of full employment occurred more frequently before 1914 than after that time, at least in countries with free economies. Whether this change has been accompanied by a different cyclical pattern can be determined only after a more detailed analysis of the effects of temporary reductions in elasticity of the type indicated. Since, even before 1914, full utilization of resources occurred for brief intervals of the cycle only, it is not probable that the total period of the cycle or the rate of damping would have been materially affected by it. The shape of the cyclical peak and the relative importance of price and quantity movements in the cycle did, however, depend on it: in the cycles referred to, prices of mineral raw materials and the rate of interest showed very sharp peaks. But such peaks were by no means characteristic of all pre-1914 cycles.

23. Cf. p. 188, *supra*.

Finally, certain general reasons may be advanced to make it plausible that no great change in cyclical patterns occurred in the course of the past century. In the first place, two very fundamental characteristics of the economy have remained unchanged: the use of money and the profit motive. Furthermore, the distribution of the national income among the factors of production has not changed much, which would make it appear plausible that the marginal propensity to consume had remained approximately unchanged. Third, the period of one year has remained the natural unit of time in many respects. Certain typical lags in the formation and use of income and in the periodic appraisal of business conditions have thus remained unchanged. However this may be, the absence of adequate statistical material with respect to the nineteenth century makes it particularly difficult to analyze the effects of possible changes in factors such as those mentioned here.