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MEASURING BUSINESS CYCLES

CHAPTER 1

Working Plans

I The Point of Departure

THIS AND succeeding volumes of the National Bureau's *Studies in Business Cycles* take as their point of departure a definition reached in an earlier volume.[1] With modifications suggested by experience in using it, the definition runs as follows:

> Business cycles are a type of fluctuation found in the aggregate economic activity of nations that organize their work mainly in business enterprises: a cycle consists of expansions occurring at about the same time in many economic activities, followed by similarly general recessions, contractions, and revivals which merge into the expansion phase of the next cycle; this sequence of changes is recurrent but not periodic; in duration business cycles vary from more than one year to ten or twelve years; they are not divisible into shorter cycles of similar character with amplitudes approximating their own.

This definition lists the observable characteristics of what we assume, pending closer study, to be a distinct species of economic phenomena. It attempts to differentiate business cycles from the fluctuations in aggregate economic activity that occurred prior to the emergence of our business economy, and from other types of fluctuations in modern times. It is thus a tool of research, similar to many definitions used by observational sciences, and like its analogues is subject to revision or abandonment if not borne out by observation.

Whether an investigator needs to condense his concept of business cycles into a definition, and what kind of definition he needs, depends upon the researches he has in view. Many theorists feel justified in assuming that readers know what business cycles are; the use of that term or one

1 Wesley C. Mitchell, *Business Cycles: The Problem and Its Setting* (National Bureau of Economic Research, 1927), p. 468.

of its equivalents suffices to designate the range of experience they plan to explain. Others pave the way by defining business cycles as recurrent departures from and returns toward 'a normal state of trade', or 'a position of economic equilibrium'. Still others, intent from the start upon some line of explanation, begin by confining the discussion to movements arising from the factors they have in mind; they may say, for example, that business cycles are recurrent alternations of prosperity and depression generated by 'factors originating within the economic system itself', or that business cycles are departures from equilibrium arising from discrepancies between 'the' market rate of interest and 'the natural rate'.

Whatever their working concepts, and we have done no more than illustrate the diversities, all investigators cherish the same ultimate aim—namely, to attain better understanding of the recurrent fluctuations in economic fortune that modern nations experience. This aim may be pursued in many ways. The way we have chosen is to observe the business cycles of history as closely and systematically as we can before making a fresh attempt to explain them.

At the beginning of this investigation our knowledge of business cycles was derived partly from an imperfectly digested mass of factual observations, partly from a great variety of untested hypotheses. Journalists in many lands have been publishing impressions concerning changes in the state of trade week by week and year by year for many decades. Useful as are the business annals that have been compiled from these materials, they give at best vague accounts, in terms that are general and shifting. Within the last generation, statisticians have been making more precise observations by analyzing time series and compiling 'indexes of business conditions'. Their work is instructive; but differences in method make it difficult to compare and combine the results of the many investigations, and the best of the business indexes cover too short a period or are woefully incomplete in coverage. Meanwhile with increasing finesse economic theorists have been tracing causal relationships among the cyclical movements of different activities. Their work is often highly suggestive; yet it rests so much upon simplifying assumptions and is so imperfectly tested for conformity to experience that, for our purposes, the conclusions must serve mainly as hypotheses. Nor can we readily use the existing measures of statisticians to determine which among existing hypotheses account best for what happens. Satisfactory tests cannot be made unless hypotheses have been framed with an eye to testing, and unless observations upon many economic activities have been made in a uniform manner.

If we are to observe the business cycles of actual experience closely and systematically, we need a working definition that tells where to look and for what to look. It must list observable characteristics, particularly such as differentiate business cycles from other movements with which

they may be confused. To say that business cycles are departures from and returns toward a normal state of trade or a position of equilibrium, or that they are movements resulting from discrepancies between market and natural rates of interest, will not help, because we cannot observe normal states of trade, equilibrium positions, or natural interest rates. Nor, when we start observing, can we tell whether cyclical movements are due to factors originating within the economic system or outside of it.

Though business annals, time-series analysis, and business-cycle hypotheses in their present forms do not provide the knowledge we need, they put us in the path of learning more. It was by analyzing these three sets of contributions that our definition was developed. Considerable evidence can now be cited to support its every clause. But an intensive study of the best available records is necessary if we are to ascertain conclusively whether many economic activities really fluctuate in unison as the definition states, and how different activities behave with respect to the alleged cycles. Once that is accomplished we can proceed to the next step: to explain how business cycles run their course and their tendency toward variation.

II Questions Raised by the Definition

How much there is to learn about business cycles begins to appear when our working definition is examined critically. Every clause suggests hard questions, some of which raise doubts about the validity of the concept itself.

Thus the definition states that business cycles occur in 'nations' whose economic activities are organized 'mainly in business enterprises'. Does a large nation, such as the United States, have a single set of business cycles, or do the several geographical regions have substantially different cyclical movements? Or is a nation too small, rather than too large, a geographical unit to observe? May it not be best to treat business cycles as international movements? How far back in history can business cycles be traced? If they are associated with a form of economic organization that is itself evolving, are they subject to secular changes that make recent cycles noncomparable with those of earlier times? The term 'business enterprise' connotes a measure of individual initiative and competition. Do business cycles fade out when freedom of enterprise is drastically limited by governmental controls, or when competition is virtually suppressed by private monopoly? Did they disappear in Fascist Italy, Nazi Germany, Soviet Russia? Even in Great Britain and the United States, have not business cycles undergone progressive changes?

The statement that cyclical expansions occur at about the same time in 'many economic activities' is vague. In some contexts 'economic activities' mean specific acts performed by individuals, while in others the same

words signify a few broad categories of actions performed continuously by millions of people, as when an economist speaks of the production, exchange and distribution of wealth. Clearly, our definition requires that we go back of broad aggregates or index numbers of economic activity, such as indexes of production and prices, or national aggregates of income, employment, bank clearings, and imports. But how far is it wise to break down the aggregates and examine their constituent parts? If broad aggregates hide differences among their constituents that are significant for understanding business cycles, may not economic activities be atomized to the point where cyclical movements are obscured by the idiosyncrasies of small units?

Our definition presents business cycles as a consensus among expansions in 'many' economic activities, followed by 'similarly general' recessions, contractions, and revivals. How 'general' these movements are, what types of activity share in them and what do not, how the consensus differs from one cyclical phase to another, and from one business cycle to the next, can be learned only by empirical observation. And that is more than a mere matter of counting the series that rise and that fall during a given phase. A rise in bankruptcies when most activities are expanding would be a movement counter to the tide; a fall is what we expect, usually find, and interpret as sharing in the consensus of movements. Copper prices move with the general tide if expressed in cents per pound; they move counter to the tide if expressed as pounds per dollar. Thus not only the character of the activity represented but also the form in which the record is kept determines whether a series is related positively or invertedly to business cycles. Hence, it is necessary to know precisely what each series represents and its bearing on economic activity as a whole.

The statement that similar cyclical movements occur 'at about the same time' in many activities admits the possibility of 'leads' and 'lags'. But the implication is that the cyclical turns of different processes are concentrated around certain points in time; for if there were no bunching of cyclical turns, there would be no business cycles answering to our definition. We can imagine a world in which every economic activity is subject to cyclical fluctuations, but in which the divergences in the timing of these cycles produce an unchanging total. The need for ascertaining leads and lags is thus clear from the start. And the significance of this inquiry grows as the results multiply and demonstrate characteristic differences in the timing of different types of activity.

The sequence of expansion, recession, contraction, and revival is said to be 'recurrent but not periodic'. To determine the respects in which and the regularity with which the sequence recurs, it is necessary to identify and compare successive business cycles. But will our definition enable us to identify business cycles among the other movements—seasonal variations, random changes, and secular trends—with which they

are interwoven? And is there only one set of cyclical fluctuations in general business activity? May not the business cycles we identify be the net resultants of several sets of general cycles running concurrently, each set perhaps periodic but combining with cycles of other periods to produce the variability our definition admits?

Another tacit implication of the definition is that business cycles run a continuous round; for the definition says that expansion is followed by recession, recession by contraction, contraction by revival, and revival by a fresh expansion. No intervals are admitted between one phase and its successor, or between the end of one cycle and the beginning of the next. Yet current reports sometimes speak month after month of a confused state of trade, and statistics often indicate that some industries or localities are doing well while others of equal importance are dull or depressed. Granted that our concept of business cycles fits the facts much of the time, can we claim that it fits them all of the time? To answer with assurance, it is again necessary to investigate the behavior of many activities and determine whether the alleged consensus among their cyclical movements is continuous or intermittent.

The definition gives 'more than one year' as the lower limit of duration of business cycles, and 'ten or twelve years' as the upper limit. These figures rest upon an earlier attempt to identify the cycles revealed by a considerable collection of business annals and a smaller collection of business indexes.[2] Neither set of materials is thoroughly satisfactory. We can hardly suppose that current commentators are infallible summarizers, or that the compilers of business annals are infallible digestors. Nor can we be confident that statistical indexes represent correctly the cyclical movements in the general condition of business.[3] Hence we cannot rely exclusively upon annals and business indexes to mark off business cycles and measure their durations. Even for that seemingly simple task, it is necessary to compare individual time series covering many activities, though the data become scantier and we know the results will be less assured the further back we go.

The last clause of the definition brings up a related problem. Our examination of business indexes, and less definitely of business annals, forbade us to think of business cycles "as sweeping smoothly upward from depressions to a single peak of prosperity and then declining steadily to a new trough".[4] On the contrary, the expansion and contraction of many cycles seem to be interrupted by movements in the opposite direction, and some cycles apparently have double or triple peaks or troughs. When the irregularities are slight they do not seriously complicate the task of identifying business cycles; but in some instances, notably in this country since

2 *Ibid.*, pp. 339-43, 391-407.
3 *Ibid.*, pp. 365-75.
4 *Ibid.*, p. 329 ff.

1930, they attain considerable proportions. Hence the need of criteria for deciding what reversals in direction mark the end of a cyclical phase. Most brief movements are excluded by the clause that business cycles cover 'more than one year'. By adding that they 'are not divisible into shorter cycles of similar character with amplitudes approximating their own', a rule is laid down for deciding when to treat movements lasting several years as a single cycle and when to recognize two or more cycles.[5] But this rule cannot be applied without knowing at least approximately what amplitudes are characteristic of business cycles.

III 'Inductive Verification' of Business-cycle Hypotheses

The need to answer the difficult questions suggested by our definition is not peculiar to the plan of research we have chosen. Any investigator who sets out to explain the business cycles of the actual world should know what he is explaining; that is, at some stage of his work, he should identify the cycles of historical record and study their characteristics.

Systematic factual research is often thought of as belonging to the stage of 'inductive verification', and 'inductive verification' as a step to be taken *after* a 'theory' has been excogitated. Of course no writer has ever attempted to devise a hypothesis concerning business cycles entirely apart from the facts to be explained. But theorists have not infrequently been handicapped by a sadly incomplete, sometimes by a badly twisted, knowledge of the facts. Numerous writers have invented plausible explanations of business cycles before they have tried to ascertain what consensus actually prevails among the cyclical movements of different economic activities: which activities have a positive, which an inverted, relation to the supposed consensus, and which follow a path of their own; the timing relations among the movements and the relative amplitudes they attain; how considerable are the checks encountered and overcome by business-cycle expansions and contractions; how long these phases last; what changes in business cycles have accompanied or followed secular and structural changes in economic organization; how the cycles in different countries compare with one another in timing, duration, and amplitude—in short, without knowing definitely the actual behavior for which their explanations should account.

When this order of inquiry is followed—explanation preceding thorough knowledge of what is to be explained—the results are likely to be unhappy. (1) The theorist often stops before his work is finished, leaving 'inductive verification' to others, who may or may not take on the job. (2) When anyone tries to 'verify' a hypothesis about business cycles, he often finds that it rests on assumptions purposely chosen to simplify

[5] This rule is necessary as a 'brake' on an investigator's pattern sense which, while the source of all true knowledge, may lead to mischievous fictions.

the situation that is analyzed. In that case evidence drawn from the actual world has a problematical relation to the simpler world of the theorist's imagination; the hypothesis propounded may be logically impeccable, but it cannot be confirmed or refuted by an appeal to facts. (3) Granted that the hypothesis concerns actual experience, the worker who tries to verify it must examine the processes on which it centers attention; but unless he examines other processes as well, the test will be superficial. As pointed out in another volume:

> Recent writers upon business cycles differ . . . less in principle than in emphasis . . . Each gives chief attention to the one or more factors which he believes to play the chief causal role; but many writers also show how the changes produced by their chosen causes affect other processes, and in so doing they are likely to find use for the work of men whose distribution of emphasis differs from their own.
>
> Among the factors to which the leading role in causing business cycles has been assigned by competent inquirers . . . are the weather, the uncertainty which beclouds all plans that stretch into the future, the emotional aberrations to which business decisions are subject, the innovations characteristic of modern society, the 'progressive' character of our age, the magnitude of savings, the construction of industrial equipment, 'generalized over-production', the operations of banks, the flow of money incomes, and the conduct of business for profits. Each of these explanations merits attention from those who seek to understand business cycles; for each should throw light upon some feature or aspect of these complex phenomena.[6]

Hence, an investigator who seeks earnestly to discover the cause or causes of business cycles should not restrict himself to testing any single hypothesis. If he concludes that the facts of experience are consistent with one hypothesis, he should make sure that they are not equally consistent with other hypotheses. In the measure that he is thorough, his effort will broaden into an attempt to test many hypotheses and determine how they fit together.

Anyone who embarks upon such a venture will presently encounter all the difficulties that confront this investigation. He must satisfy himself whether there really are cyclical fluctuations in general business, and if so what are their characteristics. For that purpose he must study the cyclical behavior of many activities, determine which do and which do not fluctuate in unison, what are the timing relations among their expansions and contractions, what amplitudes these fluctuations attain; in brief, he must identify business cycles, and in the process answer as best he can the hard questions listed in the preceding section.

This work cannot be organized in the most effective way by taking up one hypothesis after another for 'verification'. "The plan of testing theories would indeed lead to work with the facts, but in an artificial order, and one involving much repetition." [7] The investigator can save

[6] *Ibid.*, pp. 11, 12.

[7] *Ibid.*, p. 58.

time, all the more important because the undertaking is so huge, by concentrating upon a systematic examination of the cyclical movements in different economic activities, classified in whatever fashion seems best suited to his purpose. In making this examination, he will not put the 'theories' aside; on the contrary he will use them continuously as hypotheses concerning what activities and what relations among them are worth studying. In that way they will be of inestimable value in his factual inquiries. Also, his detailed studies are likely to suggest new hypotheses from time to time, or modifications of old ones, and they too will direct his researches. But he will not think himself equipped to judge what contribution any hypothesis makes to the understanding of business cycles until he has attained as clear a view as he can of the whole congeries of interrelated movements. If this attitude of suspending judgment taxes patience at times, the investigator can comfort himself with the belief that, so far as he succeeds in showing what cyclical behavior is characteristic of economic activities, he will put others as well as himself in a better position to evaluate hypotheses.

IV The Data Needed for Observing Cyclical Behavior

The longest records of cyclical fluctuations in economic activities are the contemporary opinions of journalists. They show that men whose business it was to report the condition of trade were impressed by the alternations of prosperity and depression long before the concept of business cycles had been formulated. They indicate what years were deemed good and what years bad by contemporaries, and thus are helpful in identifying successive business cycles, and in making rough measures of their duration. Further, they often call attention to the branches of trade that prospered notably or suffered in exceptional degree at particular periods. But the business annals we now have, specifically the compilation made by Willard L. Thorp and published by the National Bureau in 1926, do not provide detailed and continuous observations upon the changing fortunes of many branches of trade.[8]

Better suited to our purposes are time series that record the fluctuations of specific processes or transactions from month to month, quarter to quarter, or year to year, though, as will be demonstrated in Chapter 6, annual data leave much to be desired. These materials must be sufficiently abundant to allow systematic comparisons of the behavior of different activities in the same business cycle, and of the same activity in different

[8] Of course, fuller and probably more representative annals can be compiled by ransacking the sources, and much can be learned about business cycles by work of this sort. But no compilation can transcend the limitations of its data. We believe that at the present stage of research more can be accomplished by analyzing time series than by elaborating annals: though the latter effort promises to contribute heavily to knowledge of those periods and countries for which the statistical record is scanty.

cycles. Obviously, no single time series can reveal business cycles as we have defined them. At best a series reveals only the cyclical changes in one activity or group of activities, such as mining coal, building houses, hauling freight, paying wages, trading in securities, clearing checks. Nor do index numbers—whether of prices, production, employment, or what not—represent more than the average changes of specific factors in business. Even the audacious statistician who constructs what he calls an 'index of business conditions', perhaps basing it upon indexes of production, prices, sales, employment, and financial operations, is not charting the course of business cycles. Apart from the limitations of coverage, his composite shows net resultants, not similar movements in many activities.[9] A business index may establish a presumption that the activities it represents fluctuate in unison, but the presumption must be tested before it is accepted, and an adequate test entails examining the cyclical behavior of many series. To repeat: only by analyzing numerous time series, each of restricted significance, can business cycles be made to reveal themselves definitely enough to permit close observation. If we wish to know what the wholes are like, we must study the parts and then see what sort of wholes they make up.

V Requirements that Technique Must Meet

To determine the cyclical behavior characteristic of different economic activities, we should have a method that yields comparable results when applied to a wide variety of time series. If possible, the results should be in quantitative form, that is, we should *measure* the cyclical behavior of economic activities; otherwise we cannot say definitely what uniformities and what differences appear among the movements.

The questions raised in Section II suggest that we must ascertain, first of all, what economic activities reveal recurrent sequences of expansion, recession, contraction, and revival, lasting more than one year but not more than ten or twelve years. We call such cyclical movements in a time series its 'specific cycles'. According to our methods of observation, specific cycles appear in a preponderant majority of the time series in our collection. But there are some exceptions, and it is as much a part of our task to learn which economic activities are virtually immune to cyclical contagion as to learn which are sensitive to it. Without such knowledge we cannot judge how general is the alleged consensus among cyclical movements.

Next, we need to know how the specific cycles of different activities are related to one another in direction of movement, in the timing of their peaks and troughs, and in the duration of their expansions and contractions. Knowledge of the existence or nonexistence of specific cycles in

[9] See *ibid.*, pp. 307-26, for a critique of business indexes.

many economic activities, and of their agreement or nonagreement in direction of movement, timing, and duration are obvious prerequisites for determining empirically whether there are business cycles answering to our definition. Finally, we must have measures of the amplitude of the cyclical movements of individual activities and of their rate of change during cyclical expansions and contractions. These measures together with those showing the sequence in which different activities turn up at business-cycle revivals and turn down at business-cycle recessions are essential in tracing causal relations.

In order to observe these several features of specific cycles closely, the original data of time series must be subjected to several operations. Before the specific cycles of a series are identified, it is desirable to remove the seasonal variations. To compare the amplitudes and patterns of specific cycles in series that run in different physical units, different sums of money, or in the form of ratios, some common denominator is necessary. The simplest plan is to express the original data as percentages of their average value during a specific cycle, and determine in terms of these percentages the rise from trough to peak, the fall from peak to trough, and the change from one stage to another into which the phases of expansion and contraction may be broken. That plan has the further advantage of eliminating in step-wise fashion the secular trend of a series.

More elaborate preparations are required to measure cyclical timing. If we attempted to compare the turning dates of the specific cycles in all the series analyzed, millions of comparisons would be required; for our investigation, though far from complete, already includes over eight hundred monthly and quarterly series for the United States alone, a few of which cover more than twenty specific cycles. Our solution of this difficulty is to draw up a table of 'reference dates' that purport to mark off the troughs and peaks of successive business cycles, and to measure the leads or lags of specific-cycle troughs and peaks from these benchmarks. This step is the crux of the investigation; it involves passing from the specific cycles of individual time series, which readers not embarrassed by experience are likely to think of as objective 'facts', to business cycles, which can be seen through a cloud of witnesses only by the eye of the mind. We prepared for the transition by modeling the definition of specific cycles upon that of business cycles, as the reader may have noticed. Granted that the time series representing many economic activities show recurrent sequences of expansion, recession, contraction, and revival, lasting more than one year but not more than ten or twelve years, we should be able to determine whether there is a consensus among these movements. If there is, the dates of specific-cycle troughs of individual activities must be concentrated around certain points of time, and the like must be true of specific-cycle peaks. We can then proceed to identify business cycles in the country from which the time series come, assign approximate dates to

their troughs and peaks, and plunge into a study of the behavior of different economic activities within the periods thus marked off.

The logic of this procedure may seem to imply that the specific cycles in all series we intend to analyze for a country should be identified before attempting to identify its business cycles. That is a counsel of perfection on which we could act only if we knew at an early stage of the investigation many things learned in the course of the work. We did not know at the start just what time series should be analyzed among those readily available, or what gaps should be filled by new compilations. Nor did we know what importance to attach to different time series as indicators of cyclical turns in general business activity. Only as we discovered the relations of many activities to the general consensus among cyclical movements could we form intelligent judgments upon these matters. This process of 'learning on the job' would have been inefficient if we had confined analysis to specific cycles for a long while, and postponed trying to see how they fit together into business cycles.

At an early stage of the investigation we thought it prudent to compare the specific cycles in numerous series.[10] Rough tabulations of specific-cycle turns suggested that they clustered around certain months, which usually came in years when business annals reported a recession or revival. These results were reassuring, but we wished to test them systematically. The best way was to settle on an experimental set of 'reference dates' and see how they met expectations, when applied in the analysis of new series. By a process of trial and error, we were able to work out several years ago a set of dates that fitted fairly well both the annals and what we then knew about specific-cycle turning dates. These reference dates have been utilized in analyzing additional series and thus subjected to further tests. And this process of refinement must continue: the reference dates, like our definition of business cycles, are a tool of research subject to revision as more is learned about the phenomena they help us investigate.

But once a set of fairly well tested reference dates is obtained for a country, we can show in detail how different activities behave during business cycles: how the cyclical turns of different series are related to one another, and how their movements compare in magnitude and direction from stage to stage of business cycles. For the latter purpose, every time series is broken into segments corresponding to the periods occupied by the business cycles of the country to which the series refers, and the seasonally adjusted data for each segment are turned into percentages of their average value. This step enables us to measure in a common unit the rise or fall of different economic activities from stage to stage of business-cycle expansions and contractions.

For an economic historian concerned with what happened in a par-

10 The methods used to identify business cycles and date their troughs and peaks are described in Ch. 4.

ticular period these measures of the behavior of time series during individual specific or business cycles may be sufficient. An economic theorist, however, wishes to know primarily what features have appeared in all or in most cycles, though he should be interested also in the variability of the phenomena, which is one of their most striking characteristics. The thousands of people who nowadays anxiously follow the course of business cycles have practical needs that combine those of the historian and theorist. They are as deeply immersed in what happens at a particular period as any historian; but in trying to foresee what will happen in the near future they require knowledge of the type a theorist strives for. Thus our historical studies of individual business cycles should be supplemented by efforts to learn whatever we can concerning the uniformities and diversities among them.[11] This final requirement laid upon our technique of observation calls for averaging the measures of cyclical behavior during successive specific cycles and during contemporaneous business cycles. Of course, we must examine also the way in which measures of individual cycles are distributed about their means.

VI The Symbols Used in Observing Business Cycles

When we speak of 'observing' business cycles we use figurative language. For, like other concepts, business cycles can be seen only 'in the mind's eye'. What we literally observe is not a congeries of economic activities rising and falling in unison, but changes in readings taken from many recording instruments of varying reliability. These readings have to be decomposed for our purposes; then one set of components must be put together in a new fashion. The whole procedure seems far removed from what actually happens in the world where men strive for their livings. Whether its results will be worth having is not assured in advance; that can be determined only by pragmatic tests after the results have been attained.

This predicament is common to all observational sciences that have passed the stage of infancy. An example familiar to everyone is meteorology. The layman observes the weather directly through his senses. He sees blue sky, clouds, snow, and lightning; he hears thunder; he feels wind, temperature and humidity; at times he tastes a fog and smells a breeze; he sees, hears, and feels storms. The meteorologist can make these direct observations as well as a layman; but instead of relying upon his sense impressions he uses a battery of recording instruments—thermographs, barographs, anemometers, wind vanes, psychrometers, hygrographs, precipitation gauges, sunshine recorders, and so on. That is, he transforms much that he can sense, and some things he cannot sense, into numerous sets of symbols stripped of all the vivid qualities of personal experience.

[11] Cf. *ibid.*, p. 469.

It is with these symbols from his own station and with similar symbols sent to him by other observers dotted over continents and oceans that he works. They show the weather broken down into numerous factors, which he must put together again in his mind. To that end he plots certain of his symbols on a weather map, which he compares with maps drawn a few hours earlier. From these maps, a new set of symbols, he derives conclusions about air masses of different types and about the weather likely to be produced by their movements and internal changes. By these highly artificial operations he arrives at forecasts concerning actual conditions over wide areas, that will soon be judged right or wrong by millions who sense their local weather.

All of us can observe economic activities as easily and directly as we can observe the weather, for we have merely to watch ourselves and our associates work and spend. What we see in this way has a wealth of meanings no symbols can convey. We know more or less intimately the hopes and anxieties, efforts and fatigues, successes and failures of ourselves and a few associates. But we realize also that what happens to us and our narrow circle is determined largely by what is being done by millions of unidentified strangers. What these unknowns are doing is important to us, but we cannot observe it directly.

A man tending an open-hearth furnace has a close-up view of steel production. But what he sees, hears, smells and feels is only a tiny segment of a vast process. He works at one furnace; he cannot see the hundreds of other furnaces in operation over the country. And smelting is only one stage in a process that includes mining and transporting iron ore, limestone, coal, and alloys; the getting of orders for steel, the erection of plants, and the raising of capital; importing and exporting, hiring and training workers, making and selling goods that give rise to a demand for steel, setting prices, and keeping accounts of outgo and income. No man can watch personally all these activities. Yet those engaged in them and in the activities dependent on the steel industry need an over-all view of what is happening. To get it they, like meteorologists, resort to the use of symbols that bear no semblance to actual processes and that are compiled mainly by other men.

For the intermittent process of making steel in a furnace with its heat and noise, its dim shadows and blinding glares, they substitute a column of figures purporting to show how many tons of steel ingots have been turned out by all the furnaces in a given area during successive days or weeks. That colorless record gives no faintest idea of what the operation looks like or feels like; it does not tell whether the work is hard or easy, well or ill paid, profitable or done at a loss. It suggests continuous operation, which is achieved at no furnace. It hides differences of location and types of product. And it separates the one act of turning out tonnage from all the other activities with which it is interwoven. Many, though not all,

of these interrelated changes are likewise recorded in columns of figures; but each record is as devoid of reality and as divorced from its matrix as the record of tons produced.

It is with such symbolic records that a 'realistic' investigator who wishes to find out what happens during a business cycle must work. Not all the activities he wishes to study are recorded; some of the most interesting figures are not published; of the published figures many are defective in one way or another. Less obvious are the difficulties of combining what one learns from time series of very limited, very comprehensive, or intermediate coverage. The most detailed series keep closest to individual experience; but they are likely to be so dominated by circumstances peculiar to single enterprises, groups, or localities that common behavior traits are hard to descry. These difficulties can be reduced to a minimum, and much labor saved, by confining study to broad aggregates or indexes. But then the field of vision becomes as dim as it is wide. Highly significant differences in cyclical timing and amplitude may be hidden from sight.[12] Nor can one tell whether the movements in these comprehensive series are net resultants of concomitant or of divergent fluctuations in individual activities. Records of intermediate coverage are less affected by 'disturbing circumstances' than the most detailed and reveal more of individual experience than the most inclusive series; but they have the defects of these qualities, being more remote from individual experience than the first and more affected by disturbing circumstances than the second. If all activities were recorded in equal detail, an investigator might use series belonging to each of these coverage groups, or a larger number than our rough classification recognizes, just because they give him different pictures of the process he wants to understand. In practice the available data differ considerably from one activity to another, so that he cannot maintain uniform standards. On the contrary, he must often compare the cyclical behavior of activities represented by symbols that relate to details in one case and broad aggregates in another. Then he must mix a large element of personal judgment into his comparisons.

In trying to compose a picture of business cycles from these diverse materials, the would-be objective student is forced to devise further artifices. He must take apart every record he uses in order to separate as best he can the cyclical fluctuations from movements of other kinds. In so doing he must solve the technical problems of 'time-series analysis' in some fashion, and the solutions he chooses will shape the new set of symbols he derives from the symbols that constitute his 'raw data'. And a still higher pitch of abstraction is reached if the investigator seeks, as we do,

12 When the differences in timing are considerable, the amplitude of the cyclical fluctuations of an aggregate differs widely from the average cyclical amplitude of its components. See Wesley C. Mitchell and Arthur F. Burns, Production during the American Business Cycle of 1927–1933 (National Bureau of Economic Research, *Bulletin 61*, Nov. 9, 1936), Sec. IV.

to get a picture of the cyclical behavior characteristic of each activity by averaging measures covering as many cycles as his time series include.

Nor is that the end of the story. We conceive business cycles to consist of roughly synchronous movements in many activities. To determine whether this thought symbol represents experience or fantasy, our measures of the cyclical behavior characteristic of many activities must be assembled into the end products of which our definition is the blueprint. In statistical jargon, time-series analysis must be followed by a time-series synthesis. Most of this assembling job is reserved for a future volume. But if the measures described in this volume are later to be fitted together, they must be designed with that use in view. This requirement explains our effort to develop a method of analysis that can be applied in uniform fashion to a wide variety of time series. More than that, it explains one step toward the ultimate synthesis taken in this volume, namely, the fixing of 'reference dates' that are meant to show when successive business cycles reached their peaks and troughs. Having fixed these dates as best we now can, we derive measures of characteristic behavior during business cycles that will serve as the basic symbols for our later synthesis.

Thus the concept of business cycles ties together in our minds, and gives meaning to, a host of experiences undergone by millions of men, few of whom think of themselves as influenced by cyclical pressures and opportunities. The concept, as we develop it, is itself a symbol compounded of less comprehensive symbols representing the cyclical behavior characteristic of many unlike activities. In turn, these symbols are derived by extensive technical operations from symbolic records kept for practical ends, or combinations of such records. We are, in truth, transmuting actual experience in the workaday world into something new and strange, much as a meteorologist transforms our experience of sunshine into new and strange symbols that record solar radiation.

The hazards of our undertaking are many. What makes the venture worth trying is that the symbols constituting our basic data have for the most part been made for practical ends and found useful; also our notions about the ways in which different activities fit into one another are borrowed at first or second hand from experience; our analytic methods when applied to many time series yield results that broadly confirm one another, and these time series cover a goodly part of the activities we should like to include. With such materials, a staff of workers should be able at least to attain a better approximation to knowledge of what happens during a business cycle than has been available hitherto.

VII Range Covered by the Observations

The range of activities whose cyclical behavior can be measured in the manner sketched in Section V, the number of countries that can be

covered, and the periods over which the observations can be extended are limited by the time series that have been or might be compiled. But much narrower limits have been set to this investigation by the funds available to us and by our capacity to integrate diverse inquiries.

The subjects we have sought to cover so far include the production of commodities, construction work, transportation and communication, prices at wholesale and retail, sales by merchants and manufacturers, the stocks of goods held by various hands, foreign trade, hours of work, wage rates and employment, the disbursement of money incomes to individuals, the profits or losses of business enterprises, the formation of new businesses, savings and investments, dealings in securities, interest rates, currency, banking, and the aggregate volume of business transactions. We hope to expand this list by analyzing also changes in the balance-sheet items of business enterprises, public finance, and the social concomitants of business cycles.[13] All these processes are stressed in the theoretical literature of business cycles; but our actual selection of individual series has been determined as much by the puzzles that turned up in the course of work with the data as by the suggestions gleaned from theoretical writings.

The adequacy of the statistical records, and therefore of our observations upon cyclical behavior, differs widely from subject to subject. For example, statistics of inventories, sales by manufacturers, savings, and retail trade, are meager. On the other hand, price quotations at wholesale, and data upon exports and imports of individual commodities are so abundant that we cannot afford to analyze all the available series—which does not mean that we can obtain just the data we should like best to have on these subjects.

To investigate adequately how the business cycles of different nations are related to one another,[14] it would be necessary to observe perhaps twenty nations. That we cannot do. But neither can we confine analysis to a single nation. A man interested solely in the business cycles of the United States could not understand them by studying American data alone; for they would not show the changes in foreign business conditions that stimulated or retarded American expansions, and mitigated or aggravated the contractions. Our compromise between what we should like and what we are able to do is to observe business cycles in the four large nations that led in commercial, industrial, and financial developments during the nineteenth century—Great Britain, France, Germany, and the United States. These nations have had close business relations with one another, possess good statistical records as such things go, and present a

[13] Matters such as birth and death rates, marriage and divorce rates, poor relief, unemployment benefits, school attendance, and crime.

[14] Willard L. Thorp's *Business Annals* (National Bureau of Economic Research, 1926) suggests that contemporaneous cycles in nations trading freely with one another have much in common. For a summary of the evidence, see Mitchell, *Business Cycles: The Problem and Its Setting*, pp. 424-50.

variety of economic conditions. In dealing with some activities we may be forced to extend the geographical range of observation.[15] But for the most part we shall have to rest content with a four-country sample, knowing full well that it does not represent adequately the cyclical tides that sweep round the world.

Meanwhile it is important to observe carefully the business cycles of single nations. The domestic idiosyncrasies of these cycles are not less significant than their international similarities. Most time series upon which we are dependent refer to conditions in a single nation or one of its subdivisions: these are the ultimate sources from which we must build up knowledge even of international business cycles. The latter bear much the same relation to the cycles of different nations as the business cycles of a single nation bear to the specific cycles of its different economic activities. As we must get knowledge of domestic business cycles by studying a complex of interrelated movements in many industries and markets, so we must get knowledge of world cycles by studying the interrelated expansions, recessions, contractions, and revivals in many nations.

Regrettably, our analysis cannot be pushed back far enough to answer the questions raised by our definition about the beginnings of business cycles. The periods we can cover in practice are determined mainly by a factor beyond our control—the availability of continuous statistical data. Relatively few time series in monthly form begin before the 1870's. More than half of our collection dates from 1900 or later, and a considerable fraction is confined to years since World War I. Our general rule is to cover as long a period as the data allow. In one series our results may therefore sum up two or three generations of experience, in another they may represent barely a decade. The problem of combining materials with such varied time reference may become acute at a later stage.[16] At present, in trying to ascertain what is characteristic of the cyclical behavior of economic processes taken singly or in small groups, it would be profligate to discard half or more of the evidence concerning one factor merely because we cannot get evidence for the same years about other factors.

Tables 1-3 show the range of time series we had analyzed by July 1, 1942. Of the 1,277 series,[17] 76 per cent relate to the United States, 11 per cent to Great Britain, 7 per cent to Germany, and 6 per cent to France. Over 40 per cent of the series cover production, construction work, and transportation. These and the holding of commodity stocks are the activities we have studied most thoroughly so far, and upon which monographs

[15] One colleague who is studying the cyclical behavior of foreign trade has been driven to construct series representing the imports and exports of 'Outlandia', that is, a combination of countries outside the four covered systematically by our compilations.

[16] See, however, the tests in Ch. 10-12, which are reassuring as far as they go.

[17] This count is confined to series subjected to the full analysis described in subsequent chapters. It omits a large number of series that have been only partially processed or used for special purposes without processing.

TABLE 1

Series Classified According to the Process Represented, Country, and the Time Unit

(Series analyzed by July 1, 1942)

Group	United States	Great Britain	Germany	France	Four countries
PROCESS					
Production	214	23	25	22	284
Construction	133	21	15	15	184
Transportation	53	11	5	8	77
Commodity prices	144	20	10	7	181
Inventories	67	1	..	..	68
Merchandising	41	..	..	..	41
Foreign trade	19	13	4	8	44
Personal incomes	115	12	5	2	134
Profits and losses	40	1	1	..	42
Savings and investments	17	6	3	2	28
Security markets	11	9	1	3	24
Interest rates	26	6	5	3	40
Money and banking	75	14	7	6	102
Aggregate transactions	17	4	3	4	28
Total	972	141	84	80	1,277
TIME UNIT					
Monthly	727	92	52	53	924
Quarterly	84[a]	19	3	1	107
Annual	161	30	29	26	246
Total	972	141	84	80	1,277

[a] Includes 57 series relating to the status of national banks through 1914, at 5 irregularly spaced 'call dates' within the year.

TABLE 2

Periods Covered by American and Foreign Series

(Series analyzed by July 1, 1942)

No. of years covered[a]	United States			Three European countries			Four countries		
	Monthly & quarterly	Annual	All series	Monthly & quarterly	Annual	All series	Monthly & quarterly	Annual	All series
Under 10	13	..	13	1	..	1	14	..	14
10 – 19	338	24	362	40	1	41	378	25	403
20 – 29	204	21	225	15	3	18	219	24	243
30 – 39	69	16	85	55	7	62	124	23	147
40 – 49	98	33	131	38	14	52	136	47	183
50 – 59	43	20	63	39	25	64	82	45	127
60 – 69	16	10	26	8	8	16	24	18	42
70 – 79	19	24	43	10	8	18	29	32	61
80 – 89	10	4	14	13	8	21	23	12	35
90 – 99	1	4	5	..	6	6	1	10	11
100 – 109	..	4	4	..	2	2	..	6	6
110 – 119	..	..	..	1	..	1	1	..	1
120 – 129	..	..	..	..	..	..	..	..	..
130 – 139	..	..	..	..	..	..	..	..	..
140 – 149	..	1	1	..	3	3	..	4	4
Total . . .	811	161	972	220	85	305	1,031	246	1,277

This table shows roughly the periods covered by our analyses, many of which stopped in 1932 or 1933 at the time the table was prepared. Since then another cycle has been added in a majority of the series.

[a] Determined from the years in which our cyclical analysis starts and ends, irrespective of the month or quarter. Cf. Table 17.

TABLE 3

Number of Business Cycles Covered by American and Foreign Series

(*Series analyzed by July 1, 1942*)

No. of business cycles covered	United States			Three European countries			Four countries		
	Monthly& quarterly	Annual	All series	Monthly& quarterly	Annual	All series	Monthly& quarterly	Annual	All series
1	7	..	7	2	..	2	9	..	9
2	15	..	15	3	..	3	18	..	18
3	100	1	101	22	2	24	122	3	125
4	235	30	265	18	2	20	253	32	285
5	121	6	127	10	3	13	131	9	140
Under 5	357	31	388	45	4	49	402	35	437
5 – 9	262	22	284	111	35	146	373	57	430
10 – 14	134	48	182	46	31	77	180	79	259
15 – 19	49	48	97	17	12	29	66	60	126
20 – 24	9	7	16	..	..	..	9	7	16
25 – 29	..	5	5	1	3	4	1	8	9
Total...	811	161	972	220	85	305	1,031	246	1,277

See note to Table 2.

are nearest completion. As any part of the field is worked over intensively, we find that the series selected in advance should and can be supplemented by additional analyses. Doubtless many more series will eventually be used in the section on prices and in the sections from merchandising to money and banking than is indicated by Table 1; some will be added even to the first three sections.

The analysis rests as far as possible on monthly records which constitute 72 per cent of the series analyzed; quarterly records contribute 8 per cent, and annual series 19 per cent. Annual data as a rule run back much farther than monthly: over half of our annual series cover 50 years or more, a bare 16 per cent of the monthly and quarterly series are so long. Of the monthly and quarterly series 39 per cent include fewer than 5 business cycles, 36 per cent include 5-9 cycles, 25 per cent include 10 or more cycles. The corresponding figures for the annual series are 14, 23, and 63 per cent. The series including 15 or more cycles make 7 per cent of the monthly or quarterly and 30 per cent of the annual group.

VIII The Program as a Whole

This volume, the second of the National Bureau's *Studies in Business Cycles*,[18] sets forth in detail the methods of measuring cyclical behavior that we are using; presents various tests of the methods; discusses their limitations for the purpose they are meant to serve; and analyzes four types of changes that may occur in cyclical behavior and compromise our averages.

[18] The first volume is *Business Cycles: The Problem and Its Setting*, by Wesley C. Mitchell.

The monographs to follow will give the results obtained by applying our technique to time series representing various groups of economic activities. Their aim is to summarize the statistical results, and to explain, so far as possible, the differences found to be characteristic of the cyclical behavior of different activities, the role these activities play in the domestic economy of a country, and their bearing upon international business relations. Since these tasks require much technical knowledge of industries and markets, each monograph is entrusted to a specialist. The dozen monographs thus far initiated include the cyclical behavior of agriculture, mining and manufacturing production, construction work, transportation and communication, inventories, prices at wholesale and retail, wages and employment, consumer income and expenditures, formation of new business firms, money and banking, foreign commerce, and international financial relations. We hope to add, as promptly as conditions permit, monographs on public finances, incomes and expenditures of business firms, security markets, and savings and investment, and to embark on a series of historical studies of business cycles. None of the monographs will attempt to present a general theory of business cycles. If our conception of the problem is sound, that task cannot be performed satisfactorily until the cyclical behavior of all the activities we are attempting to study has been measured and the salient differences in behavior have been examined with care.

Our original plan called for a final volume that would weave the results established by the monographs together with existing knowledge into a theoretical account of how business cycles run their course. The outbreak of war and the need to anticipate post-war adjustments have led us to modify this leisurely program. Several of our collaborators are giving all or part of their time to the government, and it will not do to postpone the theoretical analysis of business cycles until all their investigations can be completed. In view of the pressure of the times, we think it advisable to make available as soon as possible the best summary that can now be framed of what typically occurs in the course of a business cycle. This 'preview' will be published shortly under the title *What Happens during Business Cycles: A Progress Report,* by Wesley C. Mitchell.

When better days return, we hope to expand and to revise the 'preview'. The final volume will attempt to fulfill the many promises made in different places in this monograph. It will draw heavily upon the studies of collaborating specialists, and carry through some fresh investigations. We hope that other students will find the *Studies in Business Cycles* as useful in their theoretical constructions as the National Bureau expects to find them.