Volume Title: Business Cycle Indicators, Volume 1

Volume Author/Editor: Geoffrey H. Moore, ed.

Volume Publisher: Princeton University Press

Volume ISBN: 0-870-14093-0

Volume URL: http://www.nber.org/books/moor61-1

Publication Date: 1961

Chapter Title: New Facts on Business Cycles

Chapter Author: Arthur F. Burns

Chapter URL: http://www.nber.org/chapters/c0722

Chapter pages in book: (p. 13 - 44)

CHAPTER 2

New Facts on Business Cycles

Arthur F. Burns

The Need for Scientific Work

DESPITE the relatively good business conditions of recent years, the business cycle continues to haunt the thinking of the American people. The reason is not only a wish to obliterate the human miseries and material wastes of recurring depressions. The reason is also political necessity. The old Marxist dogma that capitalism is doomed to collapse on the rocks of economic crisis has become a weapon of propaganda, used adroitly and energetically to confuse the uninformed and to stir discontent the world over. Our government and other democracies have met the challenge by building a variety of defenses against depression. How well the defenses have been built, no one yet knows. The business decline which started in the fall of 1948 has fortunately been checked, and some credit for this achievement can be assigned to governmental policy. But it is easy to exaggerate the influence of government on the course of events. An outstanding feature of the business situation during 1949 was the high and rising activity in the automobile and housing industries, which continued to feel the stimulus of war-induced shortages. Had these industries faced "normal" markets, it seems fairly certain that the contraction in business would have gone deeper. For the present, obituaries on the business cycle are romantic expressions of human impatience, not records of solid achievement. They serve neither the nation nor economics, and may prove seriously harmful if they lead to any relaxation of the scientific work on business fluctuations now going forward in universities and other research centers.

The National Bureau's research on business cycles began nearly thirty years ago. Our first publication on national income was already concerned with its fluctuations, and later studies have added materially to a growing body of knowledge about business cycles. But only a relatively small part of the results reached by the Bureau's investigation has as yet been published. Scientific work flourishes best when investigators are free to permit their researches to mature, and this inevitably means a

13

modest and highly uneven rate of publication. The current year, however, is one of plenty. Among the works on business cycles soon to be published is Wesley Mitchell's unfinished book *What Happens during Business Cycles*, which is remarkably complete as far as it goes. The list includes also Moses Abramovitz' scholarly volume *Inventories and Business Cycles* and three substantial Occasional Papers: *Behavior of Wage Rates during Business Cycles* by Daniel Creamer, *Cyclical Diversities in the Fortunes of Industrial Corporations* by Thor Hultgren, and *Statistical Indicators of Cyclical Revivals and Recessions* by Geoffrey H. Moore. [The last two are reprinted here, Chapters 11 and 7.]

I feel prompted by this upsurge of publications to give some account of the National Bureau's work on business cycles. I cannot attempt to summarize either the research in process or the completed studies. Instead, I shall describe a few facts developed by our investigation that may prove of some help to economists and men of affairs facing the hard task of appraising an uncertain future. What I shall say is based largely on American experience before World War II—a period to which all students must turn when they seek to form a considered judgment of how our business economy functions under peacetime conditions.

Dispersion of Specific Cycles

Economic activities generally move in cycles—that is, wavelike fluctuations lasting from about two to ten years. "Specific cycles" of this character appear in prices as well as output, in markets for securities as well as commodities, in the spending of incomes as well as saving, in the flow of goods to consumers as well as business enterprises. Of the hundreds of time series analyzed by the National Bureau, all but about 3 per cent have continuously undergone cyclical movements. The occasional exceptions include steady series like railroad commutation traffic, extremely volatile series like net gold movements between the United States and Great Britain, and series of "list" prices that sometimes remain unchanged for a decade or longer and then rise or fall by a vertical step.

These exceptional series are excluded from Chart 2.1; also all annual series, and such of the monthly or quarterly reports as cover merely a small part of the period between the two wars. Otherwise, the chart includes virtually all the American series that we have analyzed. They encompass a wide range of activities—producing commodities, merchandising, employment, disbursing incomes, commodity pricing, wages, interest rates, security transactions, inventory holdings, and the behavior of the banking system. Most series summarize some activity in the nation at large—for example, production of coal or sales by department stores—but a considerable number are of narrower geographic scope. The precise

14

CHART 2.1

Distribution of Turning Points of Specific Cycles in a Sample of over 600 Economic Time Series, 1919–39
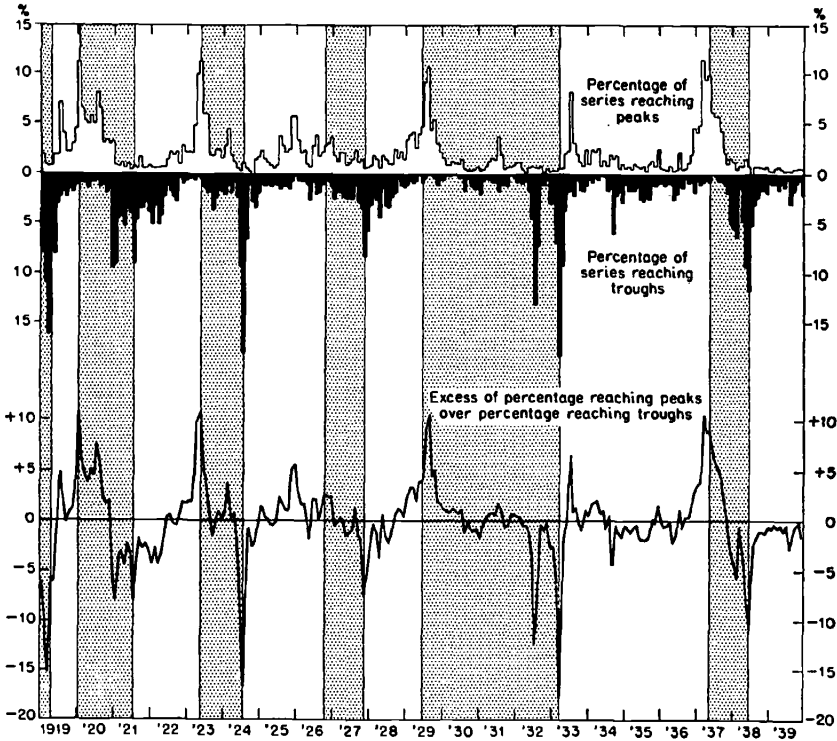
Shaded areas represent business contractions.
See appendix to this chapter.

list varies somewhat from one stretch of the interwar period to another; in most years the total number runs between six and seven hundred.

The chart sets forth the distribution, month by month, of the cyclical turns of this large and varied collection of time series. If anyone is so naive as to believe that most economic activities reach like turns on the same or almost the same month, this chart should disabuse him. What it shows is wide dispersion of cyclical peaks and troughs. Practically every month some series attain peaks while others reach troughs. The occasional gaps on the chart, it may be justly supposed, would be closed if our collection of time series were still more comprehensive.

From the wide dispersion of the specific turning points, a simple but important implication may at once be drawn. If in a given month or quarter some activities are at a peak, they must have been undergoing

15

CHART 2.2

Percentage of Series Undergoing Cyclical Expansion and Their Cumulative, 1919–39, Based on Sample of over 600 Economic Time Series

A Percentage of series undergoing cyclical expansion

B Excess of percentage of series undergoing cyclical expansion over percentage undergoing contraction

C Cumulative of B
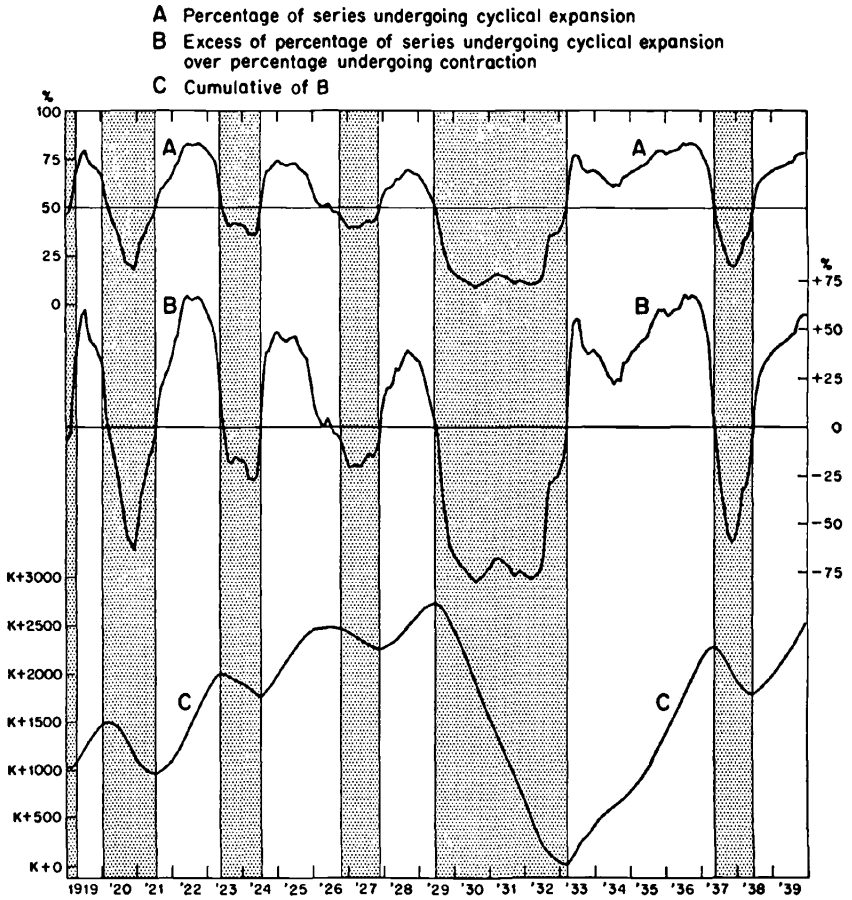
Shaded areas represent business contractions.
Origin of vertical scale of C is arbitrary, since K is any constant.
See appendix to this chapter.

cyclical expansion in immediately preceding months. If in the same month or quarter other activities are at a trough, they must have been undergoing cyclical contraction in immediately preceding months. Since in each month or quarter some activities attain cyclical peaks while others drop to troughs, it follows that expansions have run side by side with contractions all the time. This persistent feature of economic change is brought out vividly by Chart 2.2, which is simply an arithmetical

16

transformation of the frequencies of peaks and troughs displayed on the preceding chart. Curve A shows the percentage of series undergoing expansion each month from 1919 to 1939, and curve B shows the excess of the percentage expanding over the percentage contracting. The percentages in curve A fluctuate over a wide range but never reach 100 or 0.

This picture of the diffusion of cyclical movements over our economic system would be very different if the cycles in individual activities followed the same temporal course. In that event curve A would be a step-line, with ordinates of 100 for a stretch of months or years, succeeded by values of 0 for another stretch, then values of 100 again, and so on. With everything rising and falling in unison, there would be little need to fuss with specific factors in business, and one might center attention exclusively on aggregate activity. But business cycles—that is, the cycles in aggregate activity encountered in historical experience—are of a very different character. They are marked by expansions and contractions that are only partially diffused through the economy, and it is therefore of the utmost importance to obtain as clear a notion as we can of how the specific cycles of different activities are tied together.[1]

The Business Cycle as a Consensus of Specific Cycles

We have already taken one step in this direction by registering, month by month, the frequency with which specific peaks and troughs are reached, and then combining the frequencies so as to show the percentage of series expanding each month. Let us now carry this process of combination a step further. Assume that a series rises or falls each month by one unit. If, therefore, aggregate activity encompassed 100 items, of which 80 rose in a given month and 20 fell, the total rise during the month would be 60 units. If next month 85 rose and 15 fell, the total rise would be 70 units. By starting with a base figure and cumulating the net percentage of rising series—that is, the excess of the proportion rising over the proportion falling—we should get a schematic picture of the movements in aggregate activity itself. Curve C in Chart 2.2 has been constructed on this principle. It traces out five remarkably clear cycles, which idealize the fluctuations in several familiar indicators of aggregate economic activity—industrial production, factory employment, and freight carloadings—plotted on the next chart. Not only that, but the chronology of turning points in curve C is nearly identical with the chronology of business cycles previously determined by the National Bureau.

Curve C is, of course, no better than its antecedents. It shows the net

[1] For further analysis along the lines of this and the next section, see the following publications by the National Bureau: *Measuring Business Cycles*, Chapter 4, section II; *Twenty-sixth Annual Report*, pp. 22–24; Wesley Mitchell's *What Happens during Business Cycles: A Progress Report*, Chapter 5; and especially Geoffrey Moore's *Statistical Indicators of Cyclical Revivals and Recessions* [reprinted here, Chapter 7].

effect of the temporal distribution of the cyclical turns in our sample of series, and it shows nothing else. It is a highly artificial aggregate which abstracts from every other feature of its components. That is why its cycles are so clear and smooth, in contrast to the jagged fluctuation of most economic time series. It is significant, nevertheless, that this simple construct has enabled us to reproduce rather faithfully the familiar movements of recent business cycle history. For if "business cycles" can be built up, so to speak, from a mere knowledge of turning points of individual activities, the path to a scientific understanding of business cycles may be considerably shortened by concentrating on the timing relations among specific cycles.

We have seen in Chart 2.1 that the turning points of specific cycles are so widely scattered that expansions in some activities always accompany contractions in others. But the turning points are not distributed at random through time. If they were, sustained fluctuations such as have occurred in aggregate activity would be highly unlikely. The turns of the specific cycles come in clusters which have, as a rule, definite points of concentration. When the peaks are bunched the troughs are few, and vice versa. The bunching is brought out best in Chart 2.1 by the excess each month of peaks over troughs, which—except for occasional stray items—is continuously of the same sign for numerous months. But the proportion of advancing series must decline when peaks exceed troughs, and rise when troughs exceed peaks. Hence the bunching of cyclical turns is reflected in protracted periods when a majority of series undergo expansion, followed by protracted periods when a majority undergo contraction.

Charts 2.2 and 2.3 add the vital fact that each period in which expansion has been dominant matches closely the upward phase of aggregate economic activity, and each period in which contraction has been dominant matches closely the downward phase; in other words, the succession in time of expanding and contracting majorities is much the same as the succession of expansions and contractions of business cycles. Hence, as Wesley Mitchell observes in his book, "business cycles consist not only of roughly synchronous expansions in many activities, followed by roughly synchronous contractions . . . ; they consist also of numerous contractions while expansion is dominant, and numerous expansions while contraction is dominant." And just as the succession of a majority of individual expansions by a majority of individual contractions, or vice versa, has been accomplished in periods lasting from about two to eight years during the interwar era, so the cycles in aggregate activity have had this order of duration.

The substitution of one of these majorities for the other takes place gradually, and indeed follows a definite cyclical course as Chart 2.2

18

CHART 2.3

Simple Aggregate of Specific Cycles in over 600 Economic Time Series,
Industrial Production, Factory Employment, and Freight Carloadings,
1919–39
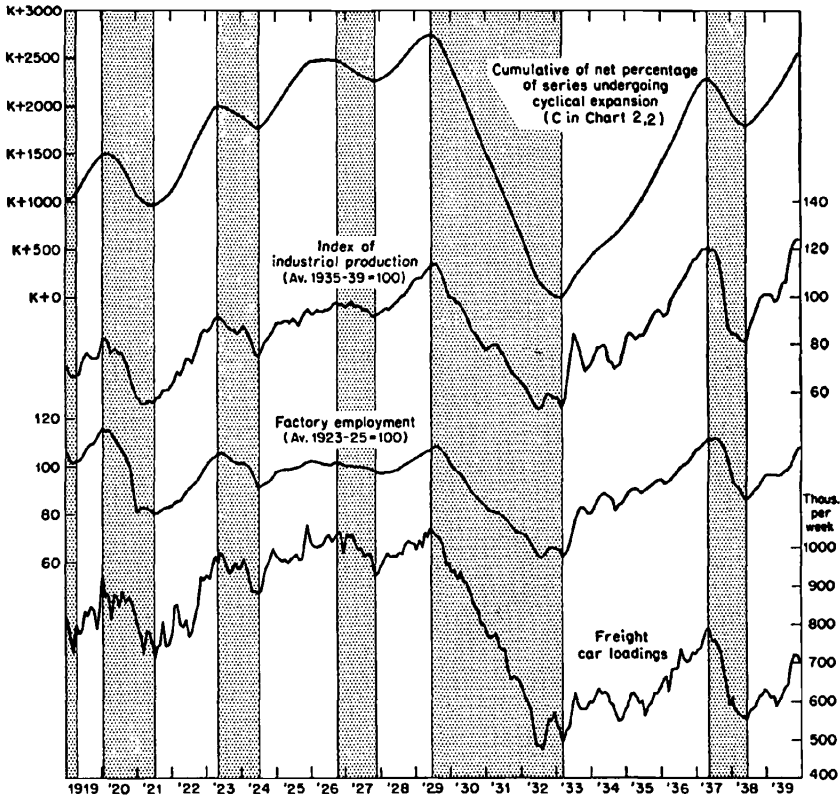
Shaded areas represent business contractions.
Origin of vertical scale of top curve is arbitrary, since K is any constant.
   Top curve is a simple aggregate of specific cycles, as explained in the appendix to this chapter.

demonstrates. Rising series are only a thin majority at the beginning of a business cycle expansion. Their number swells as aggregate activity increases, though expansion reaches its widest scope not when aggregate activity is at a peak, but perhaps six months or a year earlier. In the neighborhood of the peak, cross currents are the outstanding feature of the business situation. Once the economy is on the downgrade, the number of expanding activities becomes smaller and smaller, though the scope of expansion does not shrink indefinitely. Perhaps six months or a year

19

CHART 2.4

Percentage of Series Undergoing Cyclical Expansion, Three Groups of Series, 1919–39
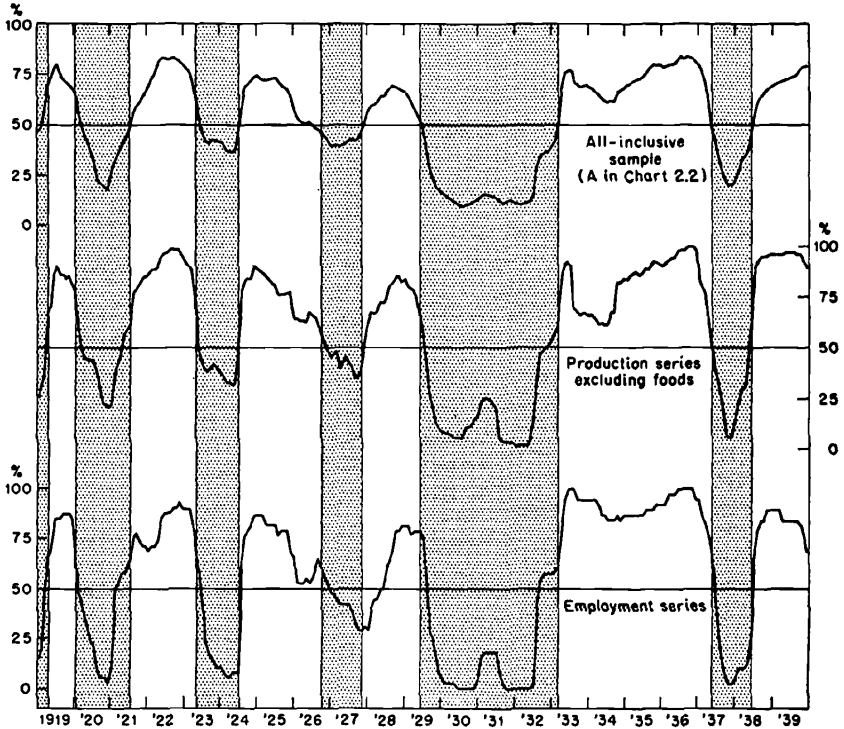
Shaded areas represent business contractions.
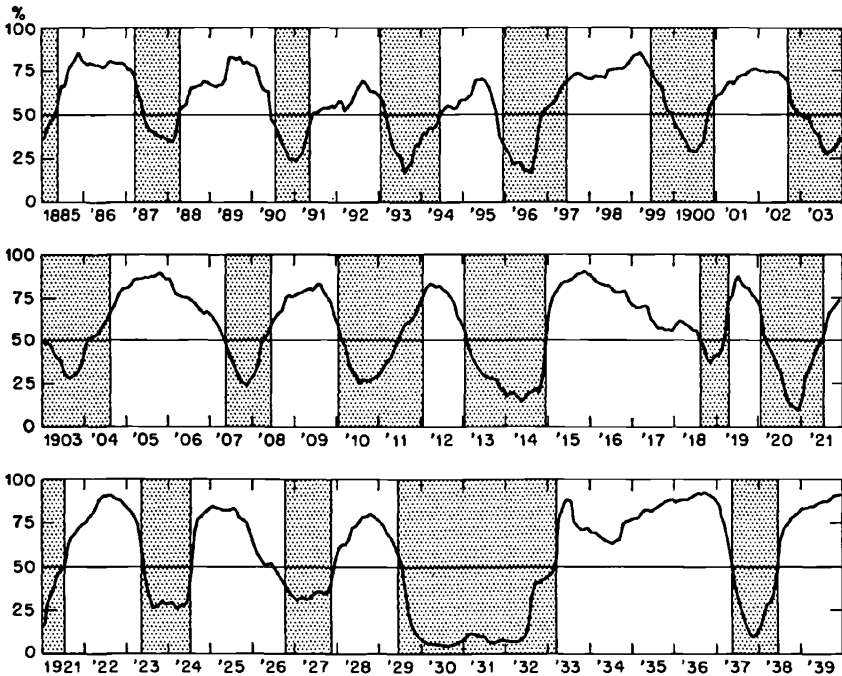See appendix to this chapter.

before the aggregate reaches a trough, the proportion of contracting activities is already at a maximum; thereafter the majority of contracting activities dwindles, while the minority of expanding activities becomes ever stronger and before long becomes the ruling majority.

Thus a continual transformation of the economic system occurs beneath the surface phenomena of aggregate expansion and contraction. A business cycle expansion does not mean that nearly everything within the economy is moving upward, nor does a business cycle contraction mean that nearly everything is shrinking. There are two cycles in economic activity, not one. First, there is the cycle of sustained expansions and contractions in the aggregate itself. Second, there is the cycle in the distribution of expansions and contractions within the aggregate. The first cycle is "seen" since we are accustomed to following comprehensive

CHART 2.5

Percentage of Series Undergoing Cyclical Expansion, Moore's Sample of Well-Conforming Series, 1885–1939

Shaded areas represent business contractions.
See appendix to this chapter.

records of business conditions. The second cycle is "unseen" since few of us subject the components of comprehensive aggregates to close examination. An "unseen" cycle in the relative distribution of expansions and contractions of specific activities corresponds to each "seen" cycle of their aggregate. But whereas the proportion of expanding activities moves in the same direction as the aggregate in the early stages of a business cycle expansion or contraction, it moves in the opposite direction in later stages. The proportion of expanding activities is already declining months before aggregate activity reaches a peak, and is already rising months before the aggregate reaches its trough.

Further evidence on these basic propositions is supplied by Charts 2.4 and 2.5. The first of these charts compares two fairly homogeneous groups of series—production and employment—with our all-inclusive sample. The next chart comes from Geoffrey Moore's Occasional Paper 31 [reprinted here, Chapter 7]. It is based on a mass of series selected on

21

account of their rather regular conformity to business cycles. Like Chart 2.1, it includes widely different activities, but spans more than half a century instead of a mere two decades. It appears from these exhibits that the features of business cycles I have emphasized—the variety of cyclical movements in individual activities, their tendency toward a consensus, and an inner cycle in the distribution of expanding and contracting activities within the external cycle of aggregate activity proper— cannot be ascribed to any special characteristics of the interwar period or to the heterogeneity of our full sample of series or the fuzziness of their aggregate, but must be reckoned as underlying properties of over-all aggregates of economic activity however defined.

Why Business Fluctuations Spread Unevenly

Before presenting more statistical results, it may be well to pause and consider the reasonableness of the picture of business cycles thus far developed. Let us suppose that economic activity, having recently moved at a depressed level, is jarred out of its routine by a moderate increase in "spending." The additional spending might be by business firms, governments, or consumers within the nation, or it might originate outside the domestic economy. For simplicity let it be assumed that domestic consumers, as a class, enlarge their spending, that they do so at a time when their income is unchanged, and that technological changes do not occur in the sequel. What, then, will be the likely consequences of this "autonomous" increase in spending?

It is plain that in the very short run the direct effects will dominate, and that they will depend upon the direction of the new outlay. If the spending is on railroad travel, theatrical performances, or the like, involving merely the use of some idle capacity, there will be an immediate increase in incomes, but both the number of men employed and their average workweek are likely to remain unchanged. If the spending is on personal services of barbers or lawyers, the number of man-hours worked is sure to increase at once and with it the national income, but not necessarily the number of men employed. If the spending is on imported commodities there will not be any immediate increase in domestic employment. So it may be also if the spending is on domestic commodities carried in stock; for dealers or manufacturers may not see fit or be unable to replenish their inventories. If the spending is on goods made to order employment is likely to rise, though that will not happen if the jobs generated in any short period by the new spending are insufficient to offset the decline in work on projects started in earlier periods. Even blinking this complication, it is useful to distinguish between additional spending on custom-made articles such as furniture, which may merely lengthen the workweek in existing shops, and increased spending on

new dwellings, which is practically sure to augment the numbers employed.

The preceding remarks may be generalized. Whether the consuming public or some other group is responsible for the increase in spending, as long as we look merely at what happens in the very short run we should expect spotty reactions through the economy, not over-all expansion. The impact of the new spending will be uneven, perhaps only a small minority of firms benefiting from it. Each firm has its own peculiar heritage of circumstances—size and condition of plant, goods on hand, work in process, liquid assets, outstanding contracts, customers' good will, labor relations, managerial skills. Hence different enterprises will appraise differently whatever expansion in sales they experience; those making fairly similar appraisals will still respond differently, and those who happen to respond in much the same way will not always achieve similar results. Indeed, we could not even be confident that the total number of men and women at work will increase in the circumstances envisaged, unless two conditions are met: first, that the new "spending" is on goods made to specification in new "shops" set up for the purpose; second, that purchases of this type ceased their decline some months back and are now at a stable level.

New construction meets adequately the first condition, and if we suppose that the second is also met, we can speak more definitely of the outcome. Practically all construction projects are built to fresh specifications. Each requires a new site on which a temporary factory, so to speak, is set up and a work force assembled. Hence any increase in spending on construction is reasonably certain to add promptly to the number employed. Not only will employment increase, but in view of the long period required to carry out construction projects, the increase will be sustained for months, sometimes years. The work on a construction job is unevenly distributed over time, but for every type of project there is a characteristic pattern of labor input, which often rises until the job is about half completed and then declines. Hence a jump in the rate of starting new construction will lead to a gradual increase in employment on construction sites. In the case we have supposed, employment will grow at an increasing rate for several months, the precise period depending upon the size and character of the projects initiated, then rise at a diminishing rate until a level proportionate to the higher rate of ordering is attained.

In this sketch I have tacitly assumed that the higher rate of new construction "starts" is maintained over a period at least equaling that required to carry out a typical construction project—which nowadays is probably a little over a half year. As employment on construction sites expands over a period of this duration, there may at first be no increase in the production of building materials. Dealers or fabricators who consider

their stocks excessive will permit them to go lower, and those who seek to augment their supplies may not be able to do so as readily in the case of one material as another. But if the rate of initiating construction is maintained at the new level, an increasing number of dealers will expand their purchases and more and more producers will expand their output. In the long run—which may need to be reckoned in years rather than months—orders, production, employment, shipments, inventories, and related business factors will be generally higher throughout the constructional trades.

Few industries, and none of a magnitude comparable with construction, have its power to convert a discontinuous increase in spending—whether it returns promptly or only after a few months to the old level—into a sustained expansion of employment, which for a time is even accelerative. But whatever the industry, if a higher rate of sales is maintained long enough, employment will surely rise and so will the activities associated with it. For a while the effects will be spotty, but with the passage of time adjustments will be set in motion throughout the industry as well as in those on which it closely depends for its materials and supplies. And as the higher rate of spending generates new incomes, its effects will spread out in new channels having little in common with the original direction of the new spending. People will spend part or all of their larger incomes, and their additional outlay will be swollen by that of business firms seeking to add to inventories or "fixed" plant. In this cumulative process the banking system and the capital market will play a part; and once the movement has gathered strength, it may continue of its own momentum even if the original increase in spending, which might have been a governmental instead of a consumers' buying spurt, is no longer maintained. But it is not my purpose here to examine the actual process whereby a business cycle expansion cumulates.

My aim has been merely to suggest that there are economic reasons why cross currents are more prominent in some stages of the business cycle than at others. Factors peculiar to individual businesses and markets are always at work. The adoption of new technical processes, introduction of new products, opening up of new sources of supply, migration of people, shifts in demand, formation of new firms, disappearance of old ones, and the weather itself—these factors, whatever their precise role may be in generating or transmitting business changes, create cross currents in both good times and bad. Nevertheless, I have tried to set forth reasons for expecting the cross currents to be especially numerous at the beginning of a business cycle expansion. As expansion progresses, we should expect its scope to widen, as actually happens according to our statistical summary. But after some time obstacles to further expansion are likely to multiply, though aggregate activity keeps climbing. Here and there

banking facilities will be inadequate to finance further expansion. Here and there in the industrial process "bottlenecks" will emerge, and the increase in supplies slow down or vanish. Here and there prices will remain steady in the face of rising costs, and discourage programs for expansion. Here and there nearly everyone in the labor force will be at work, and the growth of some firms will be at least partly balanced by the decline of others in the neighborhood. Thus it is reasonable to expect what our charts so forcefully show, that with the passage of time the scope of a business cycle expansion will shrink though the expansion still continues.

Typical Sequences Within a Business Cycle

I need not stop to adapt these commonplaces to the phenomena of a business cycle contraction. For present purposes it is sufficient that the statistical finding on which I have dwelt is a meaningful and reasonable result, namely, that the proportion of economic activities undergoing expansion traces out a cyclical curve which precedes the movements of aggregate activity, whether it be rising or falling. In view of this finding two broad propositions may be set down. First, a business recession starts while aggregate activity is still expanding and a recovery starts while the aggregate is still contracting. Second, a recession or recovery spreads gradually over the economic system and in time reverses the tide of aggregate activity. These propositions naturally raise the question whether the transitional changes in business cycles have a stable economic character. For example, the decline in the proportion of advancing series toward the close of expansion might be produced by cyclical peaks in a random assortment of activities. On the other hand, it might be produced by substantially the same set of activities, cycle after cycle; in other words, the sequence of downturns in one cycle might be much like the sequence in any other. To grapple with this issue, the veil of anonymity clothing our time series must be lifted.

Chart 2.6 does this in part by segregating three highly important groups of series in our sample—those reporting orders for investment goods, industrial production, and income payments. The curves are constructed on the same principle as the cumulative in Chart 2.2 which, it will be recalled, is based solely on a specification of the cyclical turning points in individual series. But whereas the simple aggregate of that chart includes our full sample of series, the aggregates of Chart 2.6 are constructed from "homogeneous" subgroups. The curve marked "orders for investment goods" combines all series relating to construction contracts, building permits, equipment orders, and orders for materials such as are predominantly used in making investment goods. The curve for production includes all the production series in our full sample except foodstuffs. The curve for income payments includes all available series

25

CHART 2.6

Simple Aggregates of Specific Cycles in Three Groups of Series, 1919–39
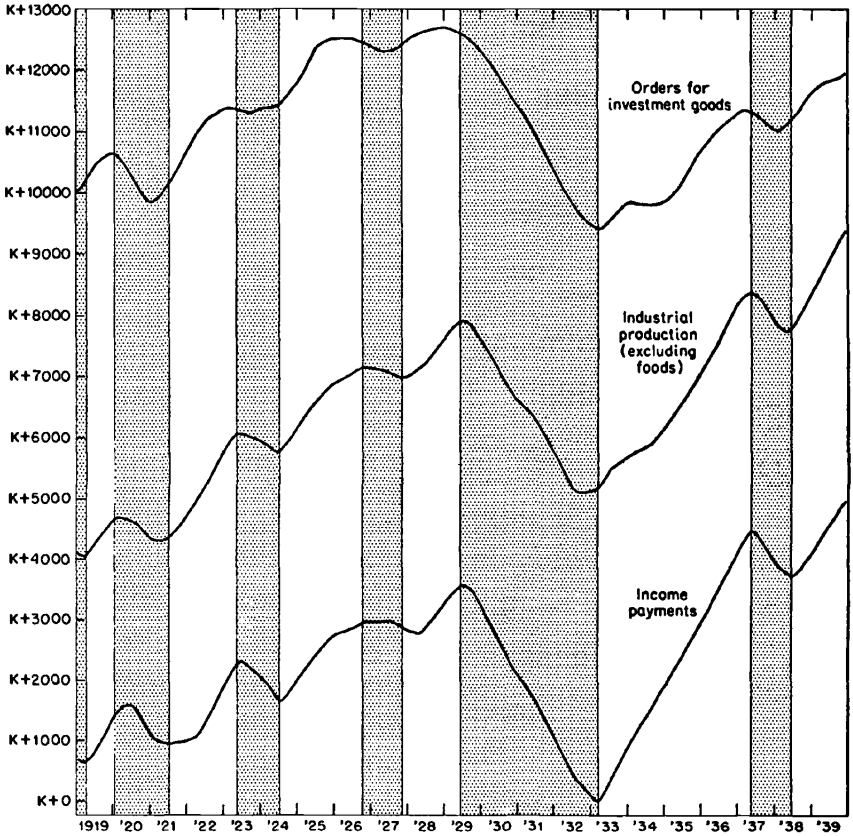
Shaded areas represent business contractions.
Origin of vertical scale is arbitrary, since K is any constant.
See appendix to this chapter.

of this type, though it happens to be dominated by payrolls. Taken together, these three groups account for about a third of the series in the full sample.

The simple aggregates of the specific cycles in our several groups trace out movements that correspond closely to one another and to the cycles in business activity identified by the National Bureau. But the cyclical timing of the groups varies: as a rule the maxima and minima of investment orders lead the corresponding turns of production, which again lead the corresponding turns of income payments. Now, a maximum or minimum represents a point of balance between expanding and

26

contracting series within a group. Hence the sequence of maxima means that at a downturn in aggregate activity the shift from a majority to a minority of expansions comes first in the group on investment orders, later in production, a little later still in income payments. At an upturn in aggregate activity there is a similar succession of shifts from a majority to a minority of contractions. These systematic sequences express a tendency of our several groups to occupy similar positions relative to one another within each cluster of turns surrounding a business cycle turn.

The results depicted in Chart 2.6 are restricted to investment decisions at the time they become effective, the physical volume of production, and the disbursement of incomes. This is only part of the evidence that a system exists in individual upturns at business revivals and in individual downturns at recessions. Speaking broadly, our studies indicate that new orders, construction contracts or permits, stock prices and transactions, security issues, business incorporations, and hours worked per week tend to lead the tide in aggregate activity; so do the liabilities of business failures on an inverted basis. On the other hand, production, employment, commodity prices, imports, and business profits tend to move with the tides in aggregate activity; while income payments, wages, interest rates, retail sales, and inventories are laggards.[2] These cyclical traits are not infrequently obscured or deflected by special circumstances, but when numerous time series and long periods are analyzed a tendency toward repetition in cyclical sequences comes clearly to the surface.

To gain more definite knowledge of cyclical sequences, it is well to concentrate on series of broad economic coverage. Table 2.1, which is adapted from Wesley Mitchell's analysis of "comprehensive" series in *What Happens during Business Cycles*, will serve my immediate purpose. Each series in the table has some right to the claim of being a "true" aggregate or average of its kind, in contrast to the artificial ones I have largely used hitherto. The table shows directions of movement during a typical business cycle—here divided into eight stages, four each for expansion and contraction. Of course, each stage covers several months, and the table is therefore insensitive to minor differences in timing, such as the short lag in income payments. Further, it hides many cross currents that would appear in less comprehensive series, and completely omits certain business factors of which we should take account—especially wage rates, inventories, banking, and governmental finance. But with all its faults, the table identifies actual time series and thus shows more

[2] See the following publications by the National Bureau: Bulletin 69 [reprinted here, Chapter 6]; *Measuring Business Cycles* (Chapters 4, 9–12); Occasional Papers 26, 31, and 32 [the last two are reprinted here, Chapters 7 and 11]; Evans' *Business Incorporations in the United States, 1800–1943* (Chapter 9); and the studies by Mitchell, Abramovitz, and Creamer, previously mentioned. See also the earlier studies by W. M. Persons, especially his papers in *Review of Economic Statistics*, January and April 1919.

TABLE 2.1

Characteristic Direction and Amplitude of Twenty-six "Comprehensive" Series During a Business Cycle

Series No.	Series	TYPICAL DIRECTION OF MOVEMENT DURING A BUSINESS CYCLE[a]								No. of Business Cycles Covered	% of Conforming Movements During Span of Stages in Which Series Is Said To		Av. Amplitude[b] of Movements During Span of Stages in Which Series Is Said To	
		Expansion				Contraction								
		Trough to First Third	First to Middle Third	Middle to Last Third	Last Third to Peak	Peak to First Third	First to Middle Third	Middle to Last Third	Last Third to Trough		Rise	Fall	Rise	Fall
1.	Bond sales, NY Stock Exchange	+	−	−	−	−	−	+	+	14	86	79	35.0	14.7
2.	RR bond prices	+	+	+	−	−	+	+	+	19	65	74	7.4	3.8
3.	Commercial failures, liab., inv.	+	+	+	−	−	−	−	+	14	86	93	74.5	57.8
4.	Common stock prices	+	+	+	−	−	−	−	+	16	94	82	26.8	20.2
5.	Shares sold, NY Stock Exchange	+	+	+	−	−	−	−	+	16	94	88	40.6	36.2
6.	Corporate security issues	+	+	+	−	−	−	−	+	8	100	75	46.9	46.1
7.	Construction contracts, value	+	+	+	−	−	−	−	+	7	86	75	43.2	30.4
8.	Deposits activity	+	+	+	−	−	−	−	+	16	94	88	14.3	16.7
9.	Bank clearings, NYC	+	+	+	+	−	−	−	−	18	100	89	30.8	26.6
10.	Incorporations, no.	+	+	+	+	−	−	−	−	19	84	80	26.9	10.2
11.	Bank clearings, outside NYC	+	+	+	+	−	−	−	−	14	100	79	25.5	12.8
12.	Bank clearings, total	+	+	+	+	−	−	−	−	14	100	86	29.2	20.4
13.	Imports, value	+	+	+	+	−	−	−	−	16	94	75	26.1	18.9
14.	Industrial production, total	+	+	+	+	−	−	−	−	5	100	100	35.2	32.5
15.	Fuel & electricity production	+	+	+	+	−	−	−	−	5	100	100	25.5	14.6
16.	Pig iron production	+	+	+	+	−	−	−	−	16	100	88	54.2	44.9
17.	RR freight ton-miles	+	+	+	+	−	−	−	−	6	100	100	27.8	25.1
18.	Factory employment	+	+	+	+	−	−	−	−	6	100	100	21.8	22.8
19.	Factory payrolls	+	+	+	+	−	−	−	−	5	100	100	36.3	39.9
20.	Income payments, total	+	+	+	+	−	−	−	−	4	100	50	22.6	17.6
21.	Corporate profits	+	+	+	+	−	−	−	−	4	100	100	168.8	174.6
22.	Commercial failures, no., inv.	+	+	+	+	−	−	−	−	16	75	88	22.3	26.1
23.	Department store sales	+	+	+	+	−	−	−	−	4	100	75	17.6	9.1
24.	Wholesale trade sales, value	+	+	+	+	−	−	−	−	3	100	100	17.7	19.1
25.	Wholesale commodity prices	+	+	+	+	−	−	−	−	11	82	91	8.7	8.9
26.	RR bond yields	−	−	−	−	+	−	−	−	19	74	65	3.7	6.2

[a] A plus denotes rise, a minus denotes fall. Series 3 and 22 are inverted here.
[b] Expressed as percentage of mean value during a cycle.

SOURCE: See appendix to this chapter.

28

concretely than have previous exhibits the typical round of developments that constitute a business cycle.

Let us then take our stand at the bottom of a depression and watch events as they unfold. Production characteristically rises in the first segment of expansion; so do employment and money income; and so do commodity prices, imports, domestic trade, security transactions. Indeed, every series moves upward except bond yields and bankruptcies. In the second stage the broad advance continues, though it is checked at one point—the bond market where trading begins to decline. Bond prices join bond sales in the next stage; in other words, long-term interest rates—which fell during the first half of expansion—begin to rise. In the final stretch of expansion, declines become fairly general in the financial sector. Share trading and stock prices move downward; the liabilities of business failures, which hitherto have been receding, move up again; security issues and construction contracts drop; the turnover of bank deposits slackens; and bank clearings in New York City, though not as yet in the interior, become smaller.

These adverse developments soon engulf the economic system as a whole, and the next stage of the business cycle is the first stage of contraction. Production, employment, commodity prices, personal incomes, business profits—indeed, practically all processes represented in the table—decline. Of course, the liabilities of business failures continue to rise, which merely attests the sweep of depression. Long-term interest rates also maintain their rise. But in the next stage the downward drift of bond prices ceases; that is, the rise in long-term interest rates is arrested. By the middle of contraction, bond sales join the upward movement of bond prices. More important still, the liabilities of business failures begin declining, which signifies that the liquidation of distressed business firms has passed its worst phase. These favorable developments are reinforced in the following stage. Share trading and prices revive; business incorporations, security issues, and construction contracts move upward; money begins to turn over more rapidly; even total money payments expand. Before long the expansion spreads to production, employment, prices, money incomes, and domestic trade. But this is already the initial stage of general expansion—the point at which our hurried observation of the business cycle started.

This recital of cyclical developments is rough and inadequate. Of course, it delineates characteristic movements during business cycles, not invariant sequences. That the description fits imperfectly individual business cycles is apparent from the conformity percentages in Table 2.1. Yet these percentages also suggest that the deviations from type are not so numerous as to destroy the value of our generalized sketch. And if this much can be accepted, an important conclusion immediately

follows, notwithstanding the omissions of the table; namely, that the check to the dominant movement of business activity, whether it be expansion or contraction, is typically felt especially early in financial processes and activities preparatory to investment expenditure.

The sequences in the table express interrelated developments; they are not disconnected facts. Even my bleak description has not escaped causal overtones. An informed reader who makes the effort will not find it hard to forge explicit causal links. Take, for example, the early recovery of the bond market from depression. The explanation can partly be found in the behavior of commercial banks. With reserves growing, short-term interest rates declining, and "sound" loans difficult to arrange, the banks naturally seek to expand their holdings of bonds. Private investors attempt to do likewise, but at the expense of stocks since business profits are still declining rapidly. The broad result is a revaluation of security holdings: bond prices and trading move upward, while the stock market keeps going down. But high-grade preferred stocks are a fairly close substitute for gilt-edged bonds, and blue-chip common stocks for preferred stocks. As the yield on bonds diminishes, stocks of strong concerns become more attractive to alert investors. In time declining interest rates exert an upward pressure on stock prices generally, offsetting the influence of falling profits. And so one may continue to link the signs recorded in the table, and fill the blanks in our knowledge of how expansions and contractions cumulate. But if the links are to be of tolerable strength, they must be hammered out of materials beyond those in the table, among which some knowledge of what goes on within broad aggregates is essential.

The Cyclical Behavior of Profits

Of this I shall give a large illustration. The operations of our business economy depend in a significant degree on the relation that unit costs, unit prices, and the physical volume of sales bear to one another. These three factors are summed up in profits—the driving force of business enterprise. According to Table 2.1 corporate profits characteristically rise throughout the expansion and decline throughout the contraction of business cycles. That this is a tolerably faithful summary of recent experience is evident from Chart 2.7, which sets profits against industrial production and the National Bureau's chronology of business cycles since 1920. Reliable reports on quarterly profits are not available for earlier years, and we must be content with a span of observations hardly long enough for confident generalization. However, the evidence on profits seems reasonable in view of the behavior of production, just as the latter seems reasonable in view of the behavior of security issues and

CHART 2.7

Corporate Profits and Related Movements, 1920–38

Av. 1935–39 = 100
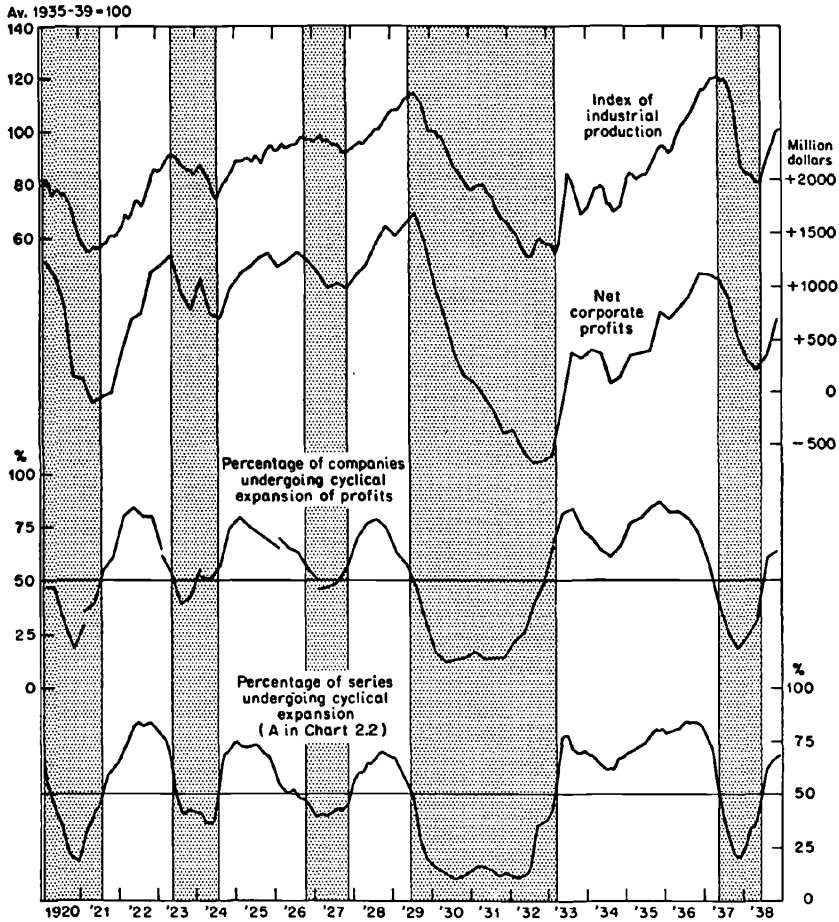
Shaded areas represent business contractions.
See appendix to this chapter.

construction contracts. Thus, it appears at first blush that profits tend to favor the continuation of prosperity or depression practically until the end of the phase, and that forces capable of reversing the tides of business activity are ordinarily not to be found in profits as such. Reasoning along these lines will lead one to suppose that actual profits are an unsatisfactory gauge of prospective profits, and to seek this key to business movements elsewhere—in orders, sales, inventories, the price-wage ratio, the stock exchange, or other places.

31

These lines of investigation are worth pursuing. At the same time, much can be learned about changes in prospective profits from the distribution of actual profits. After all, business firms do not have a common pocketbook. As long as we reason from aggregates we assume that they behave as if they had one, and it is only common sense to stop and ask how much difference separate pocketbooks do make. The third curve from the top in Chart 2.7 supplies as good a statistical answer as now seems attainable. It is based on the cycles of profits in a sample of companies analyzed by Thor Hultgren. The curve shows that "at every stage of the business cycle the fortunes of some companies . . . ran counter to the main stream."[3] Not only that, but the proportion of firms experiencing an expansion of profits began to decline well before the peak in total profits or total economic activity, and to increase long before the trough. In other words, developments in the sphere of profits that actually foreshadow reversals in the direction of aggregate activity are obscured when we view profits in the aggregate.

Earlier in this report I noted that there are two cycles in economic activity, one "seen" and another "unseen," and that the "unseen" cycle in the distribution of individual activities throws its shadow ahead of the "seen" cycle in the aggregate. We now find two cycles in profits, the "unseen" cycle in the distribution of companies throwing its shadow ahead of the "seen" cycle for all corporations. Chart 2.7 demonstrates, moreover, that in the period covered the "unseen" cycles in profits and in general economic activity follow similar paths. The two curves are made from widely dissimilar and independent materials, but this fact merely corroborates our earlier conclusion that recession and recovery start well in advance of any reversal in the direction of aggregate activity. However, the causal links between the curves are as yet obscure; and while the available data will not permit exhaustive analysis, we should attempt to determine as well as may be whether the companies whose profits run counter to the dominant cyclical movement are in fact the foci of gathering recovery or recession.

Meanwhile, it may be observed that the behavior displayed on our chart accords with rational expectations. In the early stages of an expansion unit costs often decline as industrial facilities are improved or utilized more fully. But as prosperity cumulates, unit costs tend to mount for business firms generally; and since in many cases selling prices cannot be raised, profit margins here and there will narrow, thus offsetting the influence on profits of an increase in sales or reinforcing the effects of an

[3] See Hultgren's *Cyclical Diversities in the Fortunes of Industrial Corporations*, Occasional Paper 32 [reprinted here, Chapter 11]. Cf. J. Tinbergen, *Statistical Testing of Business-Cycle Theories: A Method and Its Application to Investment Activity*, Geneva, 1939, and L. Klein's note in *Thirtieth Annual Report of the National Bureau of Economic Research*, Part Three.

occasional reduction in sales. The "squeeze" on profits becomes more widespread the longer the business expansion continues. In the first place, all firms do not have the same power to advance prices; some are prevented or limited by custom, trade marks, or governmental regulation. Secondly, errors pile up as mounting optimism warps the judgment of an increasing number of businessmen concerning the sales that can be made at profitable prices. Thus, after a business expansion has run for some time, the proportion of firms experiencing rising profits begins to shrink, although the profits of business in the aggregate continue to climb. Such a development spreads doubt or financial pressure to firms whose profits are still rising, and in time moderates their investments in sympathy with that of the growing number of firms whose business fortune is waning. Of course, a check to investment from this source strengthens an emerging tendency to postpone investment projects until a time when, it is felt, construction costs and financing charges will recede from the abnormal level to which they have been pushed by prosperity.

Minor changes aside, these are some of the crucial developments generated by prosperity, as Mitchell originally analyzed the problem in his *Business Cycles*, published in 1913. A series of converse developments may be expected in depression. A great deal of evidence may now be cited in support of these expectations, though definite knowledge is not yet available of the scale on which investment projects are shelved in late expansion or resuscitated in late contraction, or of the links that tie firms with declining and rising profits into a system of cumulating responses.

One reason for emphasizing the role of profits in the business cycle is their extraordinarily wide fluctuation. Thus far I have abstracted from the cyclical amplitudes of different processes, which together with the variations in timing transform the internal composition of the economy during a business cycle. Of this fundamental feature of business cycles I can say little on the present occasion; but I at least wish to call attention to the wide differences among the amplitudes of the "comprehensive" series in Table 2.1, and to record the finding that in our economic system, taken as a whole, production fluctuates more widely than sales to final users. As a consequence of the latter, additions to inventories trace out cyclical movements that conform closely to the cycles in production, and account for a considerable part of the changes in it. These facts were first glimpsed by Simon Kuznets. Later Moses Abramovitz, besides making more refined and extensive measurements, developed their rich implications in his *Inventories and Business Cycles*.[4] More recently, Ruth

[4] See Abramovitz' book, especially Chapters 1 and 21; also Bulletin 74 by Kuznets. Cf. Alvin H. Hansen, *Fiscal Policy and Business Cycles*, New York, 1941, Chapter 1–2.

Mack has brought fluctuations of shorter time span than business cycles within the orbit of the original generalization, and compiled evidence suggesting that inventory investment plays an even more important part in the variations of production that occur every few months than in those that extend over a business cycle.

Forecasting Business Cycles

I have stressed in this report some of the repetitive features of business cycles established by the National Bureau's studies. Yet the very charts on which I have relied as my witnesses attest also variability in the duration of business cycles, in the relative length of their phases of expansion and contraction, their amplitude, their economic scope, the speed with which a sizable majority of expanding activities is converted into a minority or vice versa, the intervals separating the upturns or downturns of different activities, and even their sequence. As everyone knows, the contraction of 1929–33 was exceptionally long and deep, as well as very widely diffused. The contraction of 1926–27, on the other hand, was mild though not exceptionally brief. Chart 2.6 gives some inkling of the dynamic impact of investment outlays for new plant and equipment during business revivals and recessions, but this branch of expenditure was not the active factor in lifting the nation out of depression in 1914 or 1933. In recent years monetary and fiscal management has left only faint traces of the cyclical pattern of long-term interest rates which ruled before the 1930's and which I have recorded in Table 2.1. The same table states that stock prices move early in revivals and recessions, but is silent on the occasional lapses from this tendency. None of the exhibits in this report shows agricultural production, a major industry dominated in the short run by the weather, or singles out exports which fluctuated in virtual independence of business cycles before World War I.

I take it as a matter of course that it is vital, both theoretically and practically, to recognize the changes in economic organization and the episodic and random factors that make each business cycle a unique configuration of events. Subtle understanding of economic change comes from a knowledge of history and large affairs, not from statistics or their processing alone—to which our disturbed age has turned so eagerly in its quest for certainty. If I have emphasized the repetitive elements in business cycles gleaned from statistical records, it is because a constructive contribution can come also from that direction. Findings such as I have reported add to the understanding of business cycles, and may even prove helpful in predicting reversals in the direction of total economic activity—or at least in identifying them as such promptly. That this hope is not entirely a pipedream is indicated by Chart 2.8.

CHART 2.8

Simple Aggregates of Specific Cycles in Two Groups of Series
Differentiated by Their Cyclical Timing, 1919–39
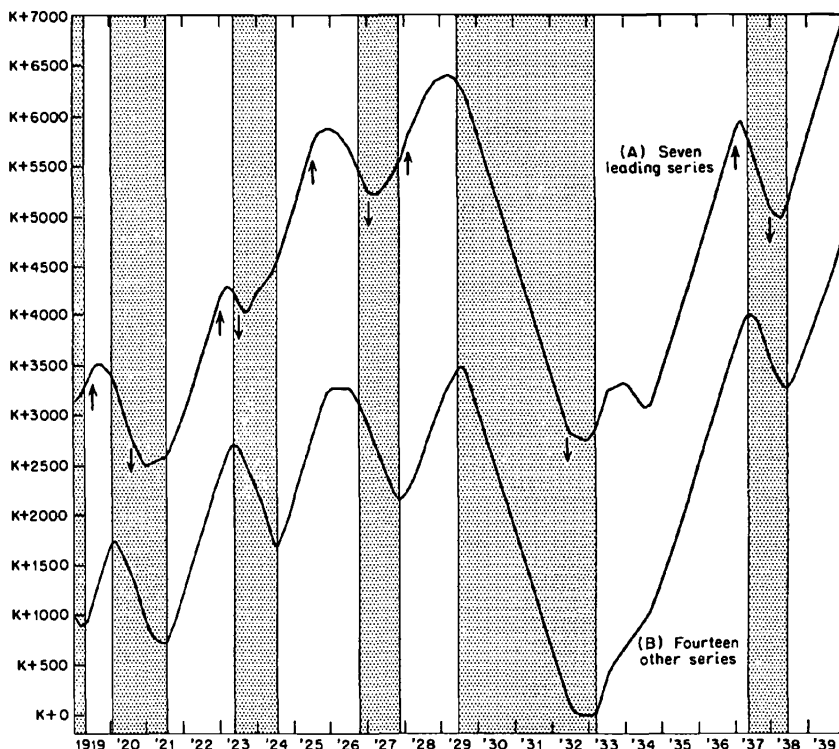
Shaded areas represent business contractions.
Origin of vertical scale is arbitrary, since K is any constant.
See text for explanation of arrows, and appendix for other explanations.

The chart shows artificially simple aggregates, struck on the plan previously described, of the specific cycles in two small groups of series. Taken together, they are the 21 indicators of cyclical revivals selected by the National Bureau in 1937 on the basis of performance in past revivals.[5] After ranking these 21 series according to their average timing at revivals through 1933, the top third were segregated from the rest. Curve A includes this top third, which spans average leads from 7.8 to 4.2 months. Curve B covers the remaining two-thirds, the extreme series having an

[5] See *Statistical Indicators of Cyclical Revivals*, Bulletin 69 [reprinted here, Chapter 6].

average lead of 3.6 months and an average lag of 1.8 months. In view of the method of selecting the two groups, curve A may be expected generally to lead curve B at recoveries. There is no technical reason, however, for a lead at recessions, or for that matter at the recovery of 1938. Nevertheless, curve A turns down and up in every instance before curve B; more important still, it does so before the turning points of general business activity expressed by our chronology of business cycles. If there were no genuine tendency toward stability of cyclical sequences, the probability of attaining such regular results would be slender.

Four forecasting principles are embodied in Chart 2.8, and they are more significant than their particular expression. First, since the cyclical timing of single processes cannot be implicitly trusted, a measure of protection against surprises of the individual case may be won by combining the indications of numerous series. Second, since there is a tendency toward repetition in cyclical sequences, economic series may be grouped into two or more classes according to their timing. Third, while the group with the longest leads is of keenest interest, groups that tend to move later serve the important function of confirming or refuting the indications offered by the vanguard. Fourth, since the "unseen" cycle in the distribution of cyclical expansions and contractions within an aggregate tends to throw its shadow before the movements of the aggregate, this propensity may be harnessed by the forecaster. How that practice would extend the lead of curve A over B is indicated by the upward and downward pointing arrows on the chart, which are placed respectively at the maxima and minima of the proportion of series in group A undergoing expansion.

These matters are being investigated further by Geoffrey Moore. Besides improving the selection of indicators made in 1937, he has devised a technique for grafting current monthly observations onto cyclical units such as I have combined in Chart 2.8 on empirical and in Chart 2.6 on economic considerations. His tentative results are presented in Occasional Paper 31 [reprinted here, Chapters 7 and 20], and should prove extremely helpful to the many economists who can master statistical devices without being mastered by them.

Mild and Severe Depressions

The fear of business cycles which rules economic thinking is a fear of severe depressions. The reasons for concern about the magnitude of emerging economic movements are compelling, and extend beyond the sphere of private activity or profit. Our society can readily make political as well as economic adjustments to a mild contraction such as that of 1926–27 or 1948–49, perhaps even to rapid but brief declines such as occurred in 1907–08 and 1937–38. The really serious threat to our way of

life comes not from business contractions of this character, but from the long and deep depressions that devastate homes and industries—as in the 1870's, 1890's, and the early 1930's. To glimpse economic catastrophe when it is imminent may prevent its occurrence: this is the challenge facing business cycle theory and policy. A preceding generation concentrated on the causes and cures of commercial crises; later interest shifted to business cycles, and more recently to fluctuations in employment. But the crucial problem of our times is the prevention of severe depressions, not of business or employment cycles. It is in this direction that research must move in the future, and the first and fundamental task is to determine why some business contractions are brief and mild while others reach disastrous proportions.

Some insight into this problem is afforded by the experience of the 1920's. Each of the successive cyclical waves during this decade carried further the belief in a "new era" of boundless prosperity. As speculative fever mounted, even the business declines that occurred were ignored or explained away. The boom in common stocks of that decade and its aftermath are notorious, but speculation was by no means confined to stocks. Ilse Mintz has recently added an important chapter on foreign bonds, and Raymond Saulnier has contributed another on urban mortgage lending.[6] Mrs. Mintz' study is concerned with American loans extended to or guaranteed by foreign governments from 1920 to 1930. After observing that "the 1920's were the defaultless era in foreign lending," she suggests that the quality of the loans progressively deteriorated during the decade. This was well concealed until severe depression brought a test of quality. "Only 6 per cent of the issues of 1920 defaulted in the 1930's while 63 per cent of those of 1928 suffered this fate; dividing the period into its earlier and its later half only 18 per cent of all issues from 1920 to 1924 became bad while the corresponding ratio for 1925 to 1929 is as high as 50 per cent." Saulnier's sample survey of urban mortgage loans by life insurance companies suggests a similar relaxation of credit standards during the late twenties. It shows, for example, that of the loans extinguished in 1935–39 the foreclosure rate was 40 per cent on such of the loans as were made during 1925–29, but only 32 per cent on those made in 1920–24 and 25 per cent on those made in 1930–34.

These new facts accord with an old hypothesis; namely, that developments during "prosperity"—which may cumulate over one or more expansions—shape the character of a depression.[7] But the results I have cited do not explain, for example, why the revival in the first half of 1931

[6] See *Deterioration in the Quality of Foreign Bonds Issued in the United States, 1920–1930*, by Ilse Mintz, New York, NBER, 1951; and *Urban Mortgage Lending by Life Insurance Companies*, by R. J. Saulnier, New York, NBER, 1950. See also an earlier study by George W. Edwards, *The Evolution of Finance Capitalism*, New York, 1938, pp. 231–232.

[7] See, for example, *Measuring Business Cycles*, p. 460.

proved abortive. That unfortunate episode cannot be understood without study of foreign conditions, the policies pursued by the Federal Reserve System, and other matters. I make these remarks merely to suggest that a host of developments during a business decline, largely unconnected with what happened during the preceding "prosperity," may convert what might have been a mild contraction into a severe one. This too is an old hypothesis, and of course it supplements rather than rivals the hypothesis that the sources of deep depression are imbedded in preceding prosperity.

Our past work on business cycles has laid an excellent foundation for comparative study of mild and severe cyclical movements. *Measuring Business Cycles* demonstrates a high and positive correlation between the amplitude and economic scope of business cycle phases. Abramovitz has found an inverse correlation between the length of a business cycle phase and the proportion of the change in gross national product that is accounted for by inventory accumulation or decumulation.[8] Geoffrey Moore has found qualitative differences in the movements of agricultural prices and production during mild and severe depressions.[9] In Occasional Paper 34 Daniel Creamer supplies important information on the behavior of wages during business cycles of varying intensity, and Milton Friedman is now investigating monetary changes during mild and vigorous cyclical movements. But we have only begun to exploit our vast collection of records which cover expansions and contractions of widely different length and depth in several countries. Full investigation of the problem why some business declines remain mild while others reach catastrophic magnitude is a natural extension of our research program, and one for which we have long prepared. It will call for considerable new effort, and the merging of the skills of the historian, economic theorist, and statistician. If we can turn to it promptly and energetically, we may make a telling contribution to the economic knowledge our society so sorely needs.

Appendix

GENERAL NOTE

Only a relatively small fraction of the series summarized in this paper were used in deriving the National Bureau's chronology of business cycles. For the chronology, see Appendix A. Concerning the methods used in dating specific and business cycles, see Burns and Mitchell, *Measuring Business Cycles*, Chapter 4.

Except when otherwsie noted, all the series in the following charts are monthly.

[8] See Abramovitz, *Inventories and Business Cycles*, Chapter 21.
[9] See his "Harvest Cycles" (Ph.D. dissertation, Harvard University, 1947).

CHART 2.1

The sample is an extension of Moore's sample of well-conforming series, briefly described in the note to Chart 2.5. The present sample includes series that conform poorly or slightly as well as those that conform well to business cycles. New series analyzed by the National Bureau since Moore's compilation was made (autumn 1948) are not included in Chart 2.1 or in any of the subgroups in later charts.

Except for the first year and a half of the period, the number of series in the comprehensive sample exceeds 600 every month. The average number is 656 for the twenty-one years 1919–39 and 665 for 1921–39. From 642 in January 1921, the number rises to more than 680 throughout 1922–28, after which it declines gradually to 635 in 1939.

The comparatively small number of series in the beginning of the period is due to the fact that many series in the National Bureau's collection begin in 1919, together with our practice of counting such series as additions to the sample only from the month of their first cyclical turn. A better practice would have been to introduce such series into the tabulations from the month of their first observation; and we have in fact adjusted this way the tabulations of the subgroups shown in later charts. These corrections proved to be so slight in the subgroups that we have not deemed it essential to make them in the full sample. After 1921 the effects produced by the corrections are not at all significant; they are not carried in the subgroups beyond 1922. A comparable inexactitude attends our practice of treating series that terminate during the period 1919–39 as if they ended in the month following their last observed cyclical turn; but the number of series affected thereby is negligible throughout the period.

To take account of the fact that some series characteristically behave invertedly (falling during business cycle expansions and rising during contractions), the peaks of such series are counted as troughs and the troughs as peaks. For a precise definition of inverted behavior, see *Measuring Business Cycles*, Chapter 5, Sec. I and X. Concerning duplications and weighting, see notes to Charts 2.4 and 2.6.

CHART 2.2

The basic data used are the same as in Chart 2.1. As noted, the sample changes somewhat during the period covered; but the meaning of curves A, B, and C may be conveyed most readily by assuming a fixed number of series.

Let t represent the number of series reaching troughs in a given month, let p represent the number reaching peaks, let e and c represent the number expanding and contracting respectively, and let subscripts identify the month. Then $e_n = e_{n-1} + t_{n-1} - p_{n-1}$. Thus curve A is essentially derived from the bottom curve in Chart 2.1.

39

Curve B, in principle, is defined as follows: $e_n - c_n = e_{n-1} - c_{n-1} + 2(t_{n-1} - p_{n-1})$. Of course, when e and c are percentages, $e_n - c_n = 2e_n - 100$.

Let $e_0 - c_0$ be 0; in other words, fix the origin where $e = c$. Also, let T_n stand for $(t_n - p_n)$. Then the ordinate of curve C in month n is defined, in principle, as follows: $K + (e_1 - c_1) + (e_2 - c_2) + \ldots + (e_n - c_n)$, where K is an unknown constant. The indicated sum equals $K + 2[nT_0 + (n-1)T_1 + (n-2)T_2 + \ldots + T_{n-1}]$; the expression in brackets is a cumulative of the cumulative of T.

The meaning of curve C may be grasped without going through the preceding steps. Take a monthly time series, mark off its specific cycles, and discard all information pertaining to it except the dates of its cyclical turns. Draw a straight line with a slope of unity from the date of the first trough to the date of the succeeding peak, connect this peak and the following trough by a straight line with a slope of unity, and so on. Repeat these operations on every series in the group; that is, convert each series into a "triangular curve." The arithmetic sum of such converted series will be curve C. That is why it is briefly described in the text and in later charts as a "simple aggregate of specific cycles." That is why, also, the scale of the curve is expressed in an abstract unit. (Curve C is described on the chart as the cumulative of B, which is expressed in percentages. From the viewpoint of curve C the percentages serve merely the function of splicing segments based on varying numbers of series.)

Curve C has interesting properties. Assume that its shape is as follows: the curve is continuous, it moves in cycles, the tops and bottoms of the cycles are rounded (first derivative zero), and there is just one point of inflection between the peak and trough. Let the trough come at date a, the point of inflection at i, the peak at s. Then $e_a = c_a$; $e_s = c_s$; $e_n > c_n$ between a and s; e_n increases between a and i; e_n decreases between i and s; $t_n > p_n$ between a and i; $t_n < p_n$ between i and s; and $\Sigma t_n = \Sigma p_n$ between a and s.

CHART 2.3

The specific time series on this chart are so well known that brief identification will suffice.
1. Index of industrial production: Federal Reserve Board, 1943 revision
2. Index of factory employment: Bureau of Labor Statistics
3. Freight carloadings: Association of American Railroads, Car Service Division

The series are seasonally adjusted: (1) by the compiler, (2) by Federal Reserve Board, (3) by National Bureau.

CHART 2.4

The total number of series included in the production group during some part of the period 1919–39 is 115; the average number in any month is over 100, and in no month is the number less than 97.

The total number of series in the employment sample is 41; the average number in any month is 40, and the number is never less than 38.

Like the "all-inclusive" sample in Chart 2.1, both the production and the employment subsamples contain duplications. These arise chiefly because comprehensive series as well as some of their components are included. Another reason is that some processes are represented by different series, as when records are compiled by different investigators. We have also studied nonduplicating groups consisting of 58 production and 21 employment series, and these give results that are almost indistinguishable from those yielded by the 115 production and 41 employment series, respectively. For the list of 21 employment series, see *Twenty-sixth Annual Report*, p. 24. Experiments with weighting, apart from those implicit in duplications, have not been made.

The subgroup samples are handled differently than the all-inclusive sample, in that peaks and troughs of "inverted series" are not interchanged, but are tabulated as they come.

See notes to Charts 2.1 and 2.2.

CHART 2.5

For a full description of how this sample of well-conforming series was selected, see Chapter 7.

The number of series in a particular month changes steadily from 75 in January 1885 to 233 in January 1919, through a maximum of 366 in June 1922, to 330 in December 1939. By quinquennial dates, in June, the numbers in (A) Moore's sample and (B) our "all-inclusive" sample in Chart 2.1 are as follows:

	A	B
1920	336	602
1925	360	686
1930	356	674
1935	340	648

For the treatment of "inverted series," see note to Chart 2.1.

CHART 2.6

The number of series included in the group of new orders for investment goods during some part of the period 1919–39 is 70; the average number in any month is over 65, and the number is never less than 63.

The group on income payments consists predominantly of payroll series, the only exceptions being (1) dividend payments and (2) total

income payments to individuals. There are 33 payroll series in all, some of which are aggregates that overlap other series included in the sample. The average number of series in the group on income payments in any month is 35, and in no month is the number less than 34. Analysis of a nonduplicating sample for this group yielded results very similar to those shown on the chart; cf. note to Chart 2.4.

For the group on industrial production (excluding foods), see note to Chart 2.4. See that note also for the treatment of inverted series. For other details or interpretations, see notes to Charts 2.1 and 2.2.

Not all of the cyclical turning points can be easily made out in this chart. They are as follows:

Cyclical Turn	Orders for Investment Goods	Industrial Production (Excluding Foods)	Income Payments
Trough	Jan. 1919[a]	Mar. 1919[b]	Mar. 1919[b]
Peak	Dec. 1919	Feb. 1920	June 1920
Trough	Jan. 1921	Apr. 1921	July 1921
Peak	Mar. 1923	May 1923	June 1923
Trough	Sep. 1923	July 1924	July 1924
Peak	May 1926	Nov. 1926	July 1927
Trough	May 1927	Nov. 1927	Apr. 1928
Peak	Jan. 1929	July 1929	July 1929
Trough	Mar. 1933	Oct. 1932	Mar. 1933
Peak	Mar. 1937	May 1937	May 1937
Trough	Feb. 1938	May 1938	June 1938

[a] Or earlier.   [b] Uncertain.

CHART 2.7

Industrial production: see note to Chart 2.3.

Net corporate profits: series is quarterly, seasonally adjusted, and comes from Harold Barger, *Outlay and Income in the United States, 1921–1938*, National Bureau, 1942, pp. 297–299.

Per cent of companies undergoing cyclical expansion of profits: series is quarterly and comes from Thor Hultgren, *Cyclical Diversities in the Fortunes of Industrial Corporations* [reprinted here, Chapter 11]. Breaks in the series are due to expansion of the sample of companies. In each segment the number of companies is constant, being as follows in successive intervals:

Period	No. of Companies	Period	No. of Companies
1920–21	17	1926–27	153
1921–23	31	1927–29	155
1923–24	71	1929–33	185
1924–26	101	1933–38	244

None of these profits series enters the "all-inclusive" sample of Chart 2.1. Further details on the composition and coverage of the profits sample will be found in the work cited.

CHART 2.8

The 21 series on which this chart is based are listed below. The first seven constitute the group with longest average leads at revivals; the remainder comprises the group with shorter average leads or with lags at revivals.

1. Dow-Jones index of industrial stock prices
2. Liabilities of business failures (inverted)
3. Inner tube production
4. Railway operating income
5. Paper production
6. Bank clearings outside NYC
7. Residential building contracts, floor space

8. Passenger car production
9. Steel ingot production
10. Industrial building contracts, floor space
11. Pig iron production

12. Index of wholesale prices, Bradstreet's and BLS
13. Ton-miles of freight hauled by railroads
14. Truck production
15. Index of industrial production, Federal Reserve Board
16. Average hours per week, manufacturing
17. Index of business activity, A.T. & T.
18. Index of production, Standard Statistics Co.
19. Factory employment, total
20. Department store sales
21. Factory employment, machinery

For sources and brief descriptions of the behavior of these series, see W. C. Mitchell and A. F. Burns, *Statistical Indicators of Cyclical Revivals*, Bulletin 69, May 28, 1938 [reprinted here, Chapter 6]. Readers who consult that bulletin will discover, however, that the top seven series in the present listing are not the same as the top seven presented there, nor are the ranges of the average timing measures the same in the bulletin and the present paper. These discrepancies are the result of revisions of the analyses on which Bulletin 69 was based, and reflect either changes in the basic data or of the seasonal adjustments, or both. Though the ranking of series has been altered, the changes in average timing measures are slight.

For another analysis along the lines of Chart 2.8, see Chapters 7 and 20. The latter presents a method of utilizing current monthly observations in a framework similar to that based on specific cycle units but not requiring the prior identification of specific cycles.

See note to Chart 2.1 for the treatment of the inverted series, and note to Chart 2.2 for the interpretation of the curves.

TABLE 2.1

The rise in series 26 and the fall in series 2 might have been treated as extending through midcontraction. See *Measuring Business Cycles*, pp. 192–193, 195.

In series 2, 17, and 24, the number of expansions covered is greater by 1 than the number of full cycles. In series 4, 7, 10, 19, 21, and 26, the number of contractions covered is greater by 1 than the number of full cycles. In series 17, there are two additional contractions (they arise from a gap in the series).

Most series in this table are identified in the source cited. See Appendix C, notes to Table 21, for series 1, 3–4, 8, 9, 11–13, 17, 22, 25; notes to Chart 9, for series 6; notes to Chart 3, for series 14; and notes to Chart 8 and Tables 18–19, for series 19. Concerning series 2, 5, 16, 26, see *ibid.*, Chapter 6, note 7.

To identify series 7, 18, 20, see Appendix I of *Historical Statistics of the United States, 1789–1945* (a supplement to the *Statistical Abstract of the United States*).

Series 10: G. Heberton Evans, Jr., *Business Incorporations in the United States, 1800–1943*, National Bureau, 1948, pp. 80–81.

Series 15: Computed by National Bureau by compiling a weighted aggregate of seasonally adjusted production data for anthracite coal, bituminous coal, crude petroleum, and electric power. The weight for each is the average value of a unit of output during 1922–31, except that the unit value for electric power is net of the cost of fuel consumed and of current purchased.

Series 21: Barger, *op. cit.*, pp. 297–299.

Series 23: Dollar volume of sales adjusted for price changes. Seasonally adjusted dollar sales from *Federal Reserve Bulletin*, August 1936, p. 631, and subsequent issues. Deflating index supplied by Federal Reserve Bank of New York.

Series 24: Federal Reserve Board index; seasonally adjusted by compiler. *Federal Reserve Bulletin*, December 1927, pp. 26–27, and subsequent issues.