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Chapter 2

DEVELOPING GROWTH CYCLE CHRONOLOGIES FOR MARKET-ORIENTED COUNTRIES

METHODOLOGY

Before considering how we have adapted the traditional Burns-Mitchell methodology for measuring classical cycles to the demands of growth cycle analysis, it is well to review briefly the original Burns-Mitchell view of trend. Unlike older ways of undertaking cyclical analysis (the Harvard Method of Cyclical Analysis, for example), in which a rigid differentiation of trend, seasonal, cyclical, and irregular variation is postulated, the Burns-Mitchell method was to establish the cycle, including the trend, as the unit of experience under study. Burns and Mitchell, consequently, began by distinguishing "intercycle trend" from "intracycle trend." Only the former, which usually pushes the average level of one cycle to a higher level than that of the previous cycle, was to be eliminated via their averaging procedure. The impact of trend *within* a cycle, which usually prevents recessions from taking the economy down as far as the preceding or following expansion carries it up, was to be retained. As has recently been said of the result, " . . . the only trend forces measured in the traditional Burns-Mitchell business cycle analysis are the intercyclical ones, that is, a step function of changes in levels from cycle to cycle, not a continuous trend line."[1]

Clearly, the differentiation of trend from cycle would be easier to encompass were one's view restricted to linear trend. But this was never the Burns-Mitchell approach, and thus our adaptation of tra-

ditional techniques for measuring classical cycles to growth cycles has not required as radical a shift in the basic view of trend as might be thought. In this connection Haberler once commented that "the statistical decomposition of time series cycles and trend is an insoluble problem."[2] Rather than being an insoluble problem, we should perhaps say that there is no ideal solution. The solution chosen must, therefore, depend upon the objective being sought. In the case of growth cycle analysis the objective sought is a statistical one: to measure those long-run movements in economic time series that are statistically independent of the short-run movements and analyze the latter separately. Even Hicks, in his well-known trade cycle model, ultimately took a view of trend consistent with Haberler's. His model basically revolves around a long-run average rate of growth for the system. But, of course, *any* rate of change, no matter how irregular, could be smoothed out into some long-run average. Hicks, therefore, comments, "The actual course of autonomous investment cannot possibly be so very regular—it must experience autonomous fluctuations on its own."[3] He accordingly redraws his long-run trend in nonlinear fashion, not unlike the flexible trends we produced in our growth cycle analysis.

In dating growth cycles we have continued, as in the case of classical cycles, to base the selection of reference turns on computer-selected turns in a number of series, rather than on a single aggregate measure or index. We believe, moreover, that a growth cycle, like its classical predecessor, should have a duration of more than one year from peak to peak or from trough to trough. Cycle phases, in general, must be at least six months (or two quarters) in length. In terms of amplitude, we have followed the general rule that cycles should never be divisible into shorter periods with amplitude as large as that of the selected cycle.

When we began our present work on growth cycle analysis in 1973, we took advantage of the earlier work on postwar West Germany done by Ilse Mintz.[4] Mintz relied exclusively on the computer for processing her series and ultimately for determining the turning points. Similarly, an essential part of our study has been to subject all the data to computer analysis. However, we have reviewed all the computer-selected turns visually and occasionally eliminated, altered, or added turns to those selected by the computer.[5] Throughout this study we have used an asterisk in our charts to identify computer-selected turns. When we have rejected the computer turn we circle the asterisk, and when we have selected a different turning point we place the asterisk inside a square. As will be noted, the percentage of alterations is, however, small.

Our work in growth cycle analysis involved both turning point selection and trend adjustment. The turning point selection program was developed by Gerhard Bry and Charlotte Boschan[6] to select turning points in classical cycles according to the specifications inherent in the Burns-Mitchell approach. This program is capable of selecting turns in either original, seasonally adjusted time series or in trend-adjusted time series, applying the same criteria to both.

The Bry-Boschan program identified turning points in a preliminary fashion from time series smoothed by a twelve-month moving average in which only extreme observations have been replaced. Employing Spencer curves as a further aid in eliminating erratic movements in the data, the program also utilizes the months for cyclical dominance technique to smooth the data and thus identify the highest (and lowest) value within plus or minus five months of the turns in the Spencer curve. With this as a basis, the actual turns are then selected from the original, unsmoothed monthly or quarterly data. Turns are then eliminated which occur within six months of the beginning or end of the time series, which identify cycles of less than fifteen months, or which identify phases lasting less than five months. Unfortunately, the program does not use an explicit measure of the amplitude of change as a turning point determinant—the smoothing procedures do this only indirectly. This explains a large number of the judgmental divergences from the turns selected by the computer.

In adapting the computer program for dating classical cycles to the task of producing a growth cycle chronology, we have built on the technique of trend adjustment developed by Mintz.[7] Trend-adjusted or growth cycles are sometimes referred to as "deviation cycles" because they are measured by calculating the deviations of the monthly observations from the trend. Our technique for measuring the long-run trend involves a two-stage procedure. The first stage is to subject the data to a seventy-five-month moving average, as Mintz did. This seventy-five-month period is long enough to smooth away virtually all of the irregular variation and most of the cyclical variation, since growth cycles rarely exceed six years in duration. Nevertheless, we found that there was still some tendency for the seventy-five-month moving average to exhibit undue flexibility in the resulting trend rate of growth. That is, we found the trend rate to be noticeably affected by the shorter cycles in the data.

We therefore have refined the results by adding a step to the determination of the trend from which the deviations producing the growth cycle turning points are measured. The basic requirement was to devise a trend-fitting technique that would work on series of

varying lengths containing shorter cyclical movements of varying duration, and that could be brought up to date without extensive revision of earlier results.

We found that the "Phase-Average Trend" technique (PAT) provided the best results. After smoothing the seasonally adjusted data with a seventy-five-month moving average, we calculate the deviations of the seasonally adjusted, individual observations from the trend.[8] This computation produces a rough "deviation cycle" from which it is possible to pick tentative peaks and troughs according to the procedures already specified and so arrive at a first approximation of a growth cycle chronology for the series. The initial cycle phases so measured are often of widely varying lengths. We then break this chronology into phases—that is, expansion, contraction, expansion and so forth—and compute a three-phase moving average of the original, seasonally adjusted data, interpolating monthly between the centered values of these averages. This procedure produces a final estimate of trend that is more satisfactory than the original, because the three-phase moving average does a more complete job of separating cyclical influences from the underlying trend.[9] We then use this refined and flexible trend estimate to calculate the deviations of the original, seasonally adjusted data from this final trend.

The deviation cycles so calculated represent periods when the rate of growth in the series was above the long-run trend rate, alternating with periods when it was below the trend rate. The trend-fitting method yields relatively stable trend rates of growth, unassociated with the shorter cycles, which are our primary concern. This is often not the case when the trend is represented by a moving average of any fixed length, including the seventy-five-month period used for the initial determination of phases. Since trend rates of growth are useful data for other purposes, such as studies of long-run growth, this is a considerable advantage. Finally, unlike most trend-fitting procedures using regression techniques, the method provides for updating the trend without extensive revision of past observations, other than those occasioned by revisions of the recent cycle dates. For an example of the fitted trend, the trend-adjusted data, and the turning points in U.S. industrial production, together with the U.S. growth cycle reference chronology, see Figures 2-1 and 2-2.

These graphs make several important aspects of our method visually apparent. Figure 2-1 suggests that cycles in the original data, when the economy under examination has been experiencing rapid growth, may well be difficult to observe clearly. How much sharper and clearer the underlying cycles are when viewed from a growth

How to Read Figure 2-1 and Figure 2-2.

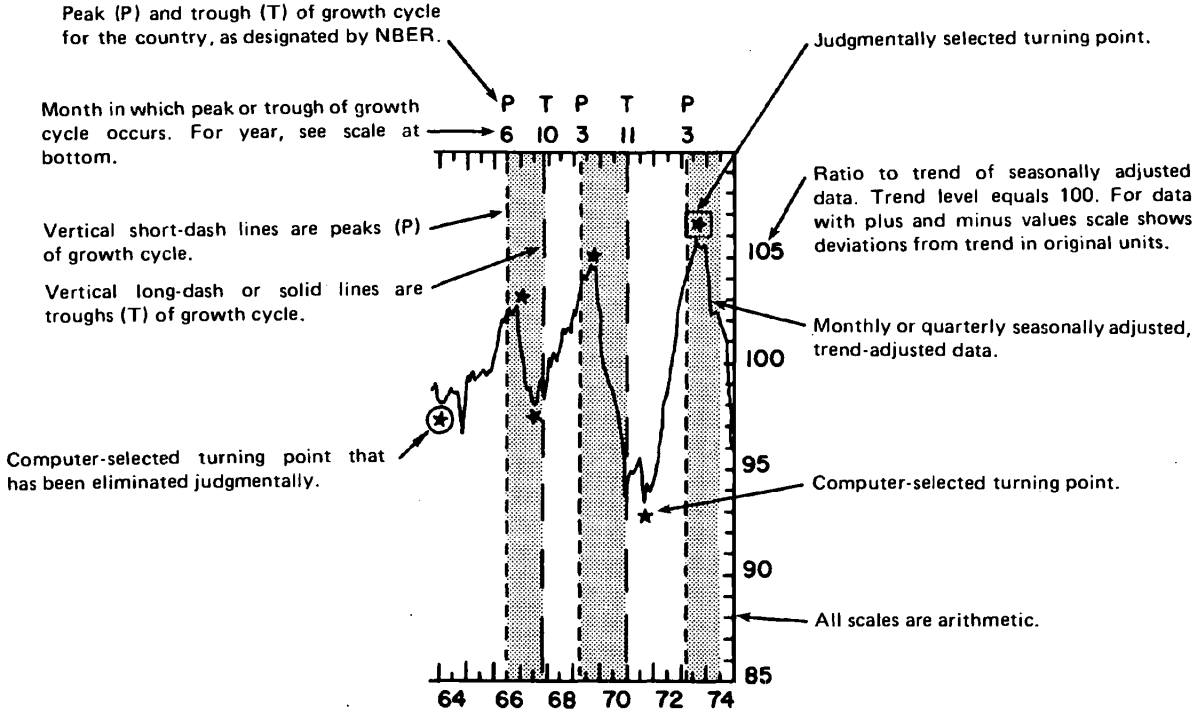


Figure 2-1. U.S. Index of Industrial Production: Original Data and Trend.

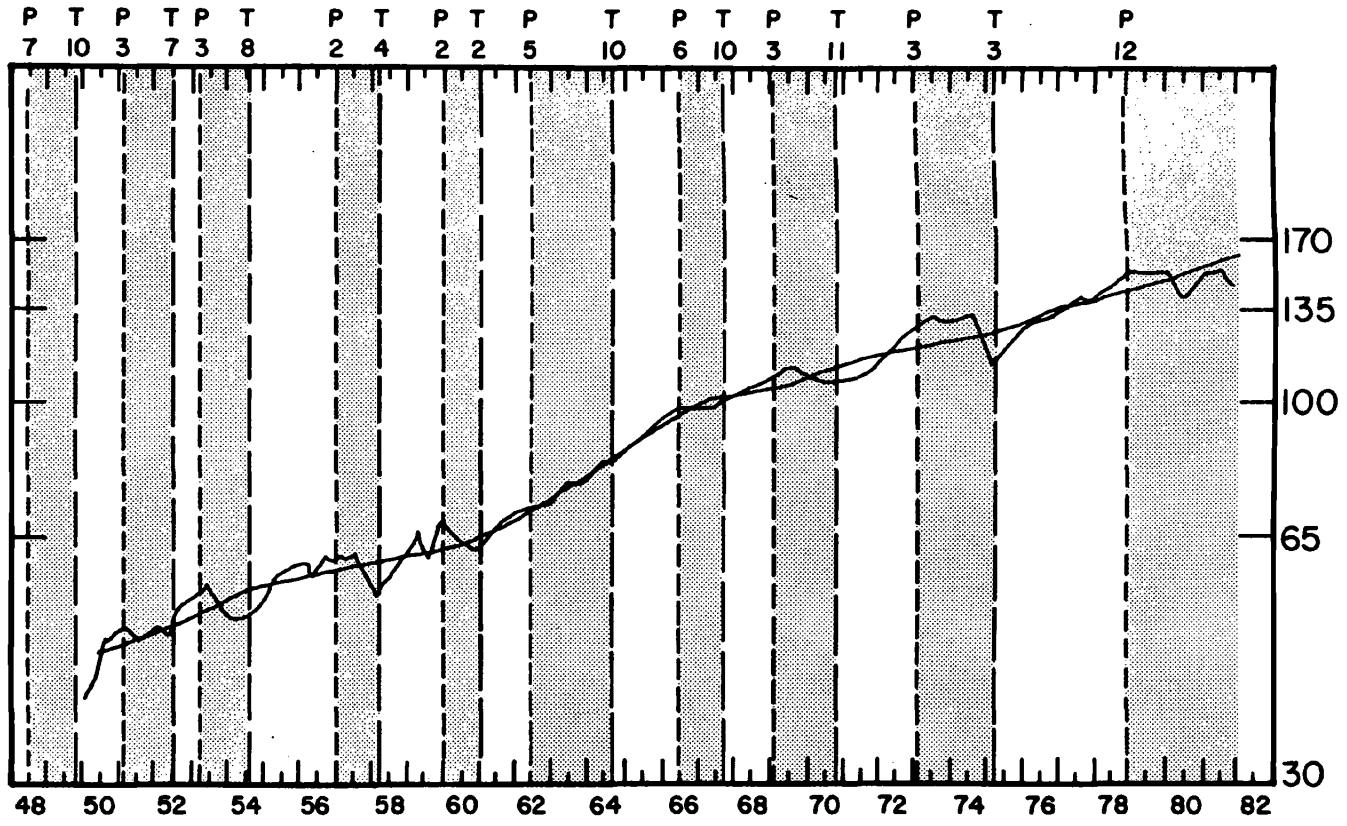


Figure 2-2. U.S. Index of Industrial Production: Deviations from Trend.

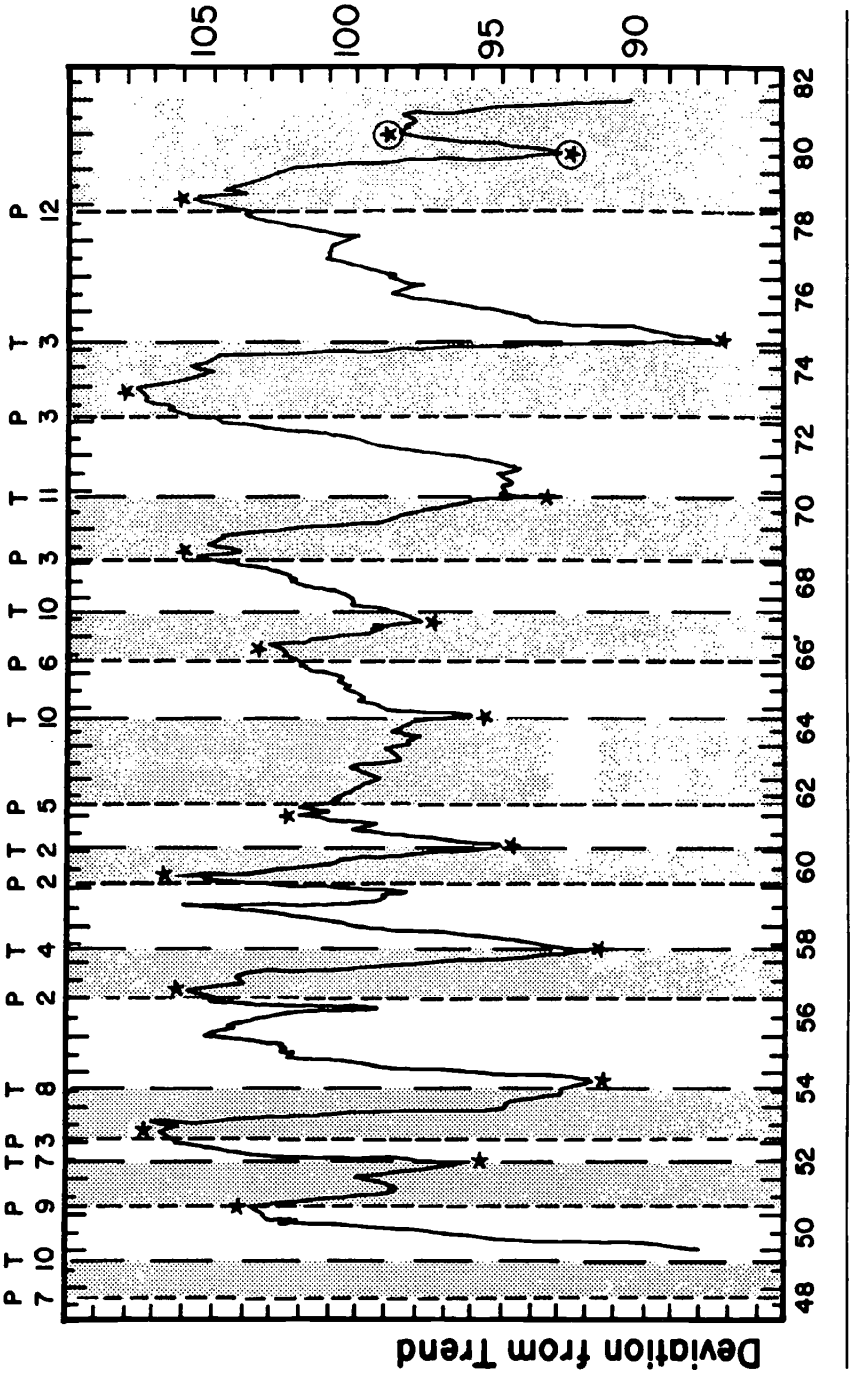


Figure 2-2. U.S. Index of Industrial Production: Deviations from Trend.

cycle perspective (i.e., as deviations from a rising trend) is made evident by comparing Figure 2-2 with Figure 2-1. We may note, too, that the selection of growth cycle turning points is carried out, as stated earlier, under rules that conform to those for selecting classical cycle turning points, and so all possible peaks and troughs are not always selected. Sometimes the amplitude and duration are both inappropriately small, as, for example, is the case in the small upturn visible in Figure 2-2 during the contraction from 1950 to 1952. Sometimes the amplitude is acceptable but the duration is too short to justify including the turns in a chronology of cycles, as is the case in the same chart for the disturbance in 1959, where a steel strike accounted for most of the short, sharp contraction. In general, though, the rules for choosing turning points of growth cycles (i.e., from detrended series) reflect the original rules developed by Burns and Mitchell as incorporated into the Bry-Boschan program previously described.

It should perhaps be added that the basic data underlying this study have in most instances been obtained from official government agencies (usually the central statistical office in each country). In certain cases data were obtained from private or semiofficial agencies. Where data were not available in seasonally adjusted form,[10] these adjustments were made. Summary information on data sources is given in Appendix 2A.[11]

The technical difficulties involved in adapting the classical cycle computer program at the NBER to the requirements of the growth cycle were complex, but we feel were ultimately adequately dealt with. The resulting turning points in individual series were, as noted previously, reviewed visually and in certain cases amended. These turning points in the roughly coincident series were then employed to select reference chronologies for each country. These chronologies, therefore, represent periods when aggregate economic activity was rising more rapidly or less rapidly than its long-run trend. The classical and growth cycles correspond in many respects, but not entirely. For example, since 1948 there were three growth cycle downswings in the United States that do not show up as classical recessions. They were periods of reduced, but not negative, growth. In 1980-81 there was a classical cycle expansion but no growth cycle expansion. In addition, as we have considered in some detail in Chapter 1, where classical cycles and growth cycles overlap, growth cycle phases will often be dated somewhat differently. As Mintz has stated:

> ... In those instances in which an absolute decline in activity has occurred, [growth cycle dates] will tend to differ from dates selected on the basis of

> the classical business cycle concept. Downturns will come earlier, upturns later in trend-adjusted series with upward trends than in unadjusted series. Therefore upswings will be shorter and downswings longer than in classical cycles.[12]

This systematic difference in the choice of turning points in individual time series will, of course, show up as well in the reference turns based on them. An example is provided in Table 2-1.

In selecting final reference dates, we utilize three summary measures as aids in the selection process. The first is the composite index developed originally by Julius Shiskin and now widely used to summarize the behavior of a number of series that are homogeneous with respect to some specific, cyclical characteristic. In this case, of course, the relevant characteristic is rough coincidence with the business cycle, and composite indexes of roughly coincident indicators were constructed for each country. In order to construct a composite index, month-to-month percent changes are calculated for each individual time series to be included. These rates of change for each series are then standardized so that their average, without regard to sign, over a specified period (e.g., 1955-70) is unity. The standardized month-to-month changes for all the series to be included in a composite index are averaged for each month, the resulting averages are again standardized, and then cumulated to form an index with a certain base period (say 1967) set equal to 100.[13]

These indexes have been constructed from seasonally adjusted data without adjustment for trend; the trend-adjustment procedure is applied to the index as a final step. This method has the advantage of yielding indexes with and without trend, as well as the trend line for the index itself, all of which may be useful in identifying classical turning points, as for the period 1973-75. Also, as has already been noted, the trend for the most recent period is based on extrapolation, and so it is useful to know exactly what that trend is.[14]

When we began our work in 1973, we did not attempt to allow systematically for the effect of inflation on series expressed in current prices. In some cases deflated data were not readily available, and we believed that the trend-adjustment procedure would remove much of the impact of inflation. But inflation soon accelerated sharply in the countries with which we were concerned, and we therefore adopted the practice of deflating series expressed in current prices. As was noted in Chapter 1, there are but two exceptions to this rule among the leading indicators: we have not attempted to deflate stock price or raw materials price indexes. Also, among the lagging indicators, we have not attempted to adjust interest rates for inflation.

Table 2-1. United States, Comparison of Growth Cycle and Classical Cycle Turning Points, 1948-1982.

Peaks			*Troughs*		
Growth Cycles[a]	*Classical Cycles*	*Lead (-) or Lag (+), in Months*	*Growth Cycles*[a]	*Classical Cycles*	*Lead (-) or Lag (+), in Months*
7/48	11/48	-4	10/49	10/49	0
3/51	—	—	7/52	—	—
3/53	7/53	-4	8/54	5/54	+3
2/57	8/57	-6	4/58	4/58	0
2/60	4/60	-2	2/61	2/61	0
5/62	—	—	10/64	—	—
6/66	—	—	10/67	—	—
3/69	12/69	-9	11/70	11/70	0
3/73	11/73	-8	3/75	3/75	0
12/78	1/80	-13	—	7/80	—
—	7/81	—	12/82	11/82	+1
Mean Timing at Peaks		-7			
at Troughs					0
at Peaks and Troughs			-3		
Median Timing at Peaks		-6			
at Troughs					0
at Peaks and Troughs			-1		

Note:
a. The growth cycle concept used here and elsewhere in this volume corresponds to what Mintz termed "deflated," namely, all series used in determining the dates were expressed either in physical units or in constant prices.
Source: Growth Cycles: Ilse Mintz, "Dating United States Growth Cycles" in NBER, *Explorations in Economic Research* 1, no. 1: 60, as revised and updated at the Center for International Business Cycle Research. Classical Cycles: National Bureau of Economic Research.

Finally, we apply a *reverse* trend-adjustment procedure to each of the indexes. Since trend rates of growth vary from one series to another, and since the particular series available vary to some extent from one country to another, the trend rates of growth in the composite indexes also vary to some extent. This could conceivably reduce the comparability of the results from one country to another. It also means that the trend rate of growth in the leading, coincident, and lagging indexes might differ. Julius Shiskin devised a method of allowing for this possibility by adjusting the original trend in each index so that it conforms to some target trend, for example, that in the coincident index.

We have utilized this basic approach by setting the trends in our indexes equal to the long-run rate of growth in real GNP during a specified period.[15] These real growth rates of course vary from country to country.

We also use a second summary measure—cumulative diffusion indexes—in selecting reference dates. Diffusion indexes represent a somewhat different method of summarizing the cyclical behavior of a group of time series. Essentially, as its name suggests, a diffusion index shows how widely diffused among its components a movement may be at any one time. A diffusion index of roughly coincident indicators, for example, shows what percentage of these indicators are rising in each month covered.

The basic notion of diffusion has been a part of the Burns–Mitchell view of economic fluctuations from the start. Along with duration and amplitude of fluctuations in any particular sector of the economy, the question of how widely diffused any particular cyclical manifestation may be has always constituted a major consideration in identifying business cycles. In *Measuring Business Cycles* Burns and Mitchell summarized a section on the "Diffusion of Specific Cycles" by noting: "Our hypothesis . . . is that a period in which expansions are concentrated is succeeded by another in which cyclical peaks are concentrated, by another in which contractions are concentrated, by another in which cyclical troughs are concentrated; and this round of events is repeated again and again."[16] This basic notion of diffusion implies that turning points will cluster in what Burns and Mitchell called turning zones. Diffusion can also be applied to any group of time series, and so aids in identifying turning points in industries, sectors, or an entire economy.

Historical diffusion indexes are based on cyclical turning points in time series determined by the methods outlined above. A particularly valuable characteristic of diffusion indexes is that their turning points typically lead the turning points in the aggregate of the series

whose behavior they are designed to summarize. On the other hand, when diffusion indexes are cumulated through time (i.e., the net percent expanding in each month is added to the sum of all preceding months), the turning points in the cumulated index represent a type of summary of the turning points in the individual component series. Such indexes have been used in determining the growth cycle chronologies reported below.

We also use a third summary statistic, which consists of computing for each turning point the median date of each cluster of peaks (or of troughs) in all the roughly coincident indicators. Together, the median dates, the turns in cumulated diffusion indexes, and the turns in composite indexes have all been used in determining the growth cycle reference dates, along with a careful study of the individual indicators of aggregate activity, including gross national product, industrial production, nonfarm employment, unemployment, personal income, and volume of trade.

It should be underscored that this methodology reflects a number of long-standing convictions resulting from the many years of research on cyclical activity begun by Burns and Mitchell. One of these convictions is that the type of fluctuation being analyzed is best viewed as a pattern of instability reflecting the interaction of a number of significant economic activities. No single measure, no matter how broad, can be relied upon to represent accurately the most balanced judgment concerning when a given economy has moved from expansion to contraction, or contraction to expansion. When turning points in the several measures of aggregate economic activity are closely concentrated in a short span of time, of course, the turning point selection process is relatively easy. In spite of the well-known tendency of these turning points to cluster, it is precisely *because* there will be times when the "turning zones" are extended that reliance on any single measure is inadvisable. Some countries have utilized the index of industrial production as a proxy for all the measures of aggregate economic activity our methods are designed to encompass. The reader will note a number of instances in the growth cycle chronologies discussed below when the turn in the chronology diverges from the turn in the production index, which means that other evidence did not support the latter. In many advanced market-oriented economies the service industries are the fastest-growing sector and industrial production (mining and manufacturing) is consequently a decreasing percentage of aggregate economic activity.

As we shall see, the Organization for Economic Cooperation and Development, which has recently taken an interest in developing reference chronologies for its twenty-four member countries, has

chosen "output—broadly defined" as the appropriate measure to use. This presumably encompasses GNP as well as industrial production, but ignores other dimensions such as employment, income, and volume of trade. We shall return to this question in a later discussion.

TEN GROWTH CYCLE CHRONOLOGIES

For many years following World War II real growth rates were high in many of the major industrialized market-oriented economies. Increasingly, too, inflation appeared to have become an endemic economic problem. As a result of both tendencies, a system for monitoring instability from the perspective implicit in the growth cycle concept became more and more appealing. The period 1973–1975 reveals that the classical cycle is by no means dead. Accordingly, there is much to be said for maintaining the kind of classical cycle monitoring system that Burns and Mitchell inaugurated in the United States. The National Bureau of Economic Research has continued its periodic review of economic activity with a view to updating the classical chronology. This chronology is used in the monthly publication of the Department of Commerce, *Business Conditions Digest.* The Commerce Department has also considered carefully the question of growth cycles, and at some future time they may begin monitoring these cycles, along with classical cycles. The primary drawback to this procedure, of course, is that the use of two different business chronologies might be confusing to the public and considerably more cumbersome to work with.

In other countries cyclical indicator systems patterned after the Burns-Mitchell approach have been developed in recent years. Canada and Japan have had such systems since the 1950s, and the United Kingdom inaugurated its system in 1974. Britain was the first to utilize the growth cycle approach reported in this study. Similarly, the international organizations now interested in monitoring cycles—principally the OECD and the EEC—have chosen to concentrate on growth cycles. A major advantage in growth cycle analysis, of course, if one is to opt for only one system, is that all classical recessions will show up in a growth cycle chronology as periods of negative growth, whereas growth cycle slowdowns may not show up at all in a classical cycle chronology. In any case, the kind of comparison of growth cycle turns with classical cycle turns presented for the United States in Table 2-1 cannot at this time be repeated for most other countries.[17] We therefore present only growth cycle chronologies for these countries. On the other hand, the cycle chronologies for the pre-World War II era growing out of the work of Burns and Mitchell

are for classical cycles, and we have not yet ventured to produce growth cycle chronologies for this period, either in the United States or elsewhere.

Table 2-2 shows how pervasive growth cycles have been in ten major market-oriented economies. There is also a good deal of evidence to suggest that growth cycles are typical now in many other economies. The chronologies of Table 2-2 can perhaps be more easily reviewed by examining them in the schematic form of Figure 2-3. A major question raised by any analysis of growth cycles, of course, is whether they represent simply a new manifestation of the interrelationships typically reflected in the pre-World War II period by classical cycles, or whether they describe a significantly different phenomenon.[18] Ideally, this question could best be approached by careful comparison of growth cycle and classical cycle chronologies for a large number of countries, but, as noted above, this has not been attempted. Approximations could be achieved by comparing growth cycle and classical cycle turning points in important aggregate indicators. Comparisons of this nature were made by Burns and Mitchell in their 1946 volume, *Measuring Business Cycles*, and they revealed differences similar to those shown in Table 2-1.

Growth cycles and classical cycles are, of course, merely different ways of looking at the overall phenomenon of instability. Sometimes the interactive forces making for business cycles are severe enough to produce fluctuations in the level of activity and sometimes they are less severe, producing only fluctuations in the rate of change. Analyzing both growth cycles and classical cycles is, therefore, a way to organize the record of economic instability so as to learn more about how instability affects the economy. The introduction of trend-adjustment procedures in the examination of growth cycles is an integral part of this process.

A larger number of cycles usually emerges when growth cycle techniques are employed than when classical cycle techniques are used, because the former represent a more sensitive measure of instability.[19] Classical cycles and growth cycles usually occur at approximately the same time, allowing for the systematic differences in turning points previously commented on. All this suggests, of course, that it is probably safe to conclude that growth cycles are simply the most commonly encountered form currently taken by the instability long visible in market-oriented economies. But the growth cycle notion itself—the more or less cyclical variations in growth rates—has been discussed in NBER work and elsewhere for many years.[20] More rapid real growth, various changes in economic institutions that mitigate recessions, and greater attention to countercyclical policy

Table 2-2. Growth Cycle Chronologies for Ten Market-Oriented Economies.

Date of Turn and Interval, in Months, from Preceding Turn

Table 2-2. Growth Cycle Chronologies for Ten Market-Oriented Economies.

Date of Turn and Interval, in Months, from Preceding Turn							
United States		*Belgium*		*Canada*		*France*	
Peak	*Trough*	*Peak*	*Trough*	*Peak*	*Trough*	*Peak*	*Trough*
7/48							
	10/49 (15)						
3/51 (17)				4/51			
	7/52 (16)				12/51 (8)		
3/53 (8)				3/53 (15)			
	8/54 (17)				10/54 (19)		
2/57 (30)				11/56 (25)		8/57	
	4/58 (14)				8/58 (21)		8/59 (24)
2/60 (22)				10/59 (14)			
	2/61 (12)				3/61 (17)		
5/62 (15)				3/62 (12)		2/64 (54)	
	10/64 (29)				5/63 (14)		6/65 (16)
6/66 (20)		10/64		3/66 (34)		6/66 (12)	
	10/67 (16)		7/68 (45)		2/68 (23)		5/68 (23)
3/69 (17)		9/70 (26)		2/69 (12)		11/69 (18)	
	11/70 (20)		7/71 (10)		12/70 (22)		11/71 (24)
3/73 (28)		7/74 (36)		2/74 (40)		5/74 (30)	
	3/75 (12)		10/75 (15)		10/75 (20)		6/75 (13)
				5/76 (7)			
					7/77 (14)		
12/78 (45)		6/79 (44)		9/79 (26)		8/79 (50)	
					6/80 (9)		

Average Durations, in Months							
Expansions	22	35		21		33	
Contractions	17	23		17		20	
Cycles (P to P)	40	59		42		53	
Cycles (T to T)	38	44		38		48	

(*Table 2-2. continued overleaf*)

Table 2-2. continued

United States		Italy		Japan		Netherlands	
Peak	*Trough*	*Peak*	*Trough*	*Peak*	*Trough*	*Peak*	*Trough*
7/48							
	10/49 (15)						
3/51 (17)						7/50	
	7/52 (16)						6/52 (23)
3/53 (8)				12/53			
	8/54 (17)				6/55 (18)		
2/57 (30)		10/56		5/57 (23)		10/56 (52)	
	4/58 (14)		7/59 (33)		1/59 (20)		5/58 (19)
2/60 (22)						3/61 (34)	
	2/61 (12)						
5/62 (15)		9/63 (50)		1/62 (36)			
	10/64 (29)		3/65 (18)		1/63 (12)		2/63 (23)
6/66 (20)				7/64 (18)		11/65 (33)	
	10/67 (16)				2/66 (19)		8/67 (21)
3/69 (17)		8/69 (53)		6/70 (52)		11/70 (39)	
	11/70 (20)		9/72 (37)		1/72 (19)		8/72 (21)
3/73 (28)		4/74 (19)		11/73 (22)		8/74 (24)	
	3/75 (12)		5/75 (13)		3/75 (16)		7/75 (11)
		12/76 (19)				9/76 (14)	
			10/77 (10)				11/77 (14)
12/78 (45)		2/80 (28)		2/80[a] (59)		12/79 (25)	
			Average Durations, in Months				
Expansions 22		34		25		32	
Contractions	17		22		17		19
Cycles (P to P)	40		56		43		52
Cycles (T to T)	38		49		47		51

Table 2-2. continued

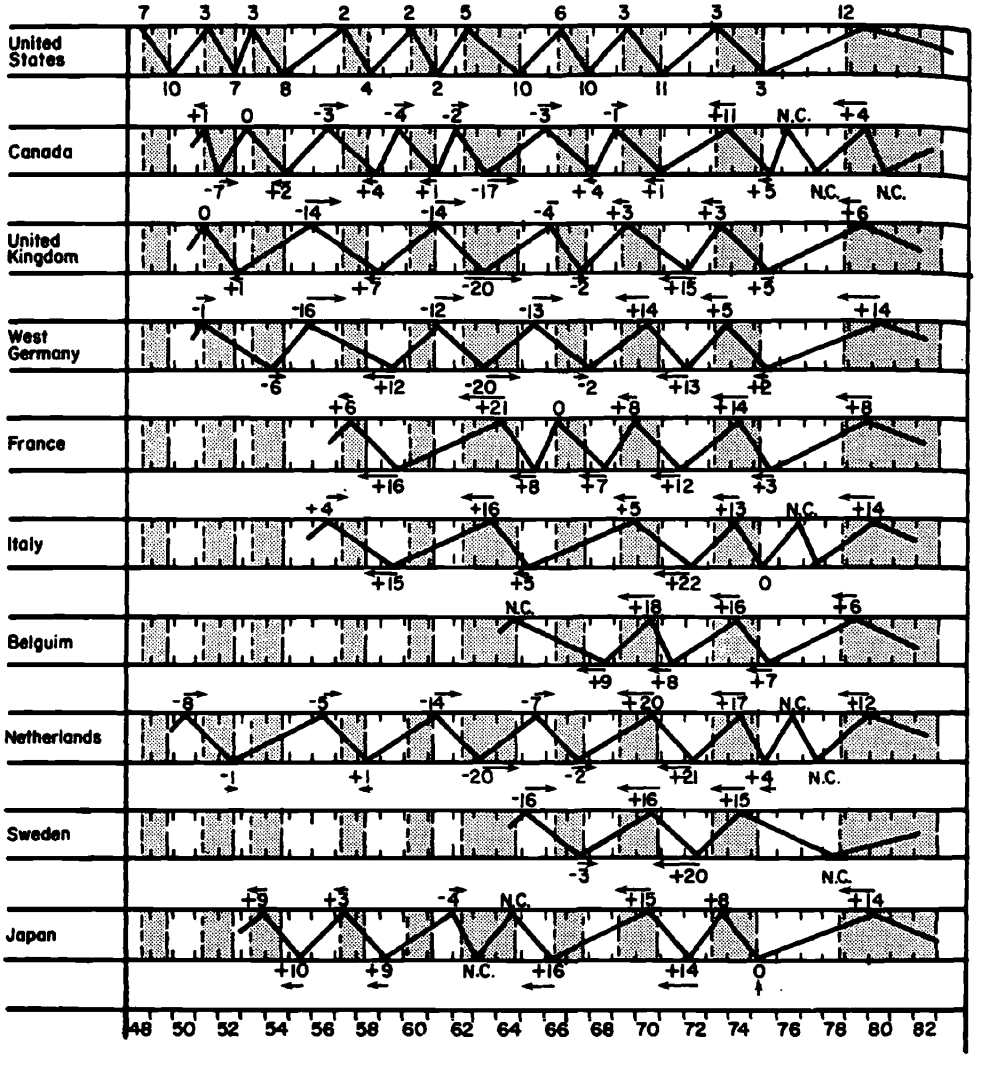
Cycles (T to T)	38		49		43 47		52 51	

Table 2-2. continued

United States		*Sweden*		*United Kingdom*		*West Germany*	
Peak	*Trough*	*Peak*	*Trough*	*Peak*	*Trough*	*Peak*	*Trough*
7/48	10/49 (15)						
3/51 (17)	7/52 (16)			3/51	8/52 (17)	2/51	
3/53 (8)	8/54 (17)						2/54 (36)
2/57 (30)	4/58 (14)			12/55 (40)	11/58 (35)	10/55 (20)	4/59 (42)
2/60 (22)	2/61 (12)			3/61 (28)		2/61 (22)	
5/62 (15)	10/64 (29)				2/63 (23)		2/63 (24)
6/66 (20)	10/67 (16)	2/65	7/67 (29)	2/66 (36)	8/67 (18)	5/65 (27)	8/67 (27)
3/69 (17)	11/70 (20)	7/70 (36)	7/72 (24)	6/69 (22)	2/72 (32)	5/70 (33)	12/71 (19)
3/73 (28)	3/75 (12)	6/74 (23)		6/73 (16)	8/75 (26)	8/73 (20)	5/75 (21)
			7/78 (49)				
12/78 (45)				6/79 (46)		2/80 (57)	
			Average Durations, in Months				
Expansions 22		30		31		30	
Contractions	17		34		25		28
Cycles (P to P)	40		56		57		58
Cycles (T to T)	38		66		55		51

Note:
a. Based on composite index.
Source: Center for International Business Cycle Research.

Figure 2-3. Growth Cycle Chronologies for Ten Countries, and Leads (-) and Lags (+) vis-à-vis the U.S. Chronology.



Notes:
An arrow pointing right (→) indicates a lead relative to the U.S. turn equal to the number of months shown. An arrow pointing to the left (←) indicates a lag relative to the U.S. turn equal to the number of months shown.

Figure 2-4. Coincident Composite Indexes, Deviations from Trend for Ten Countries.

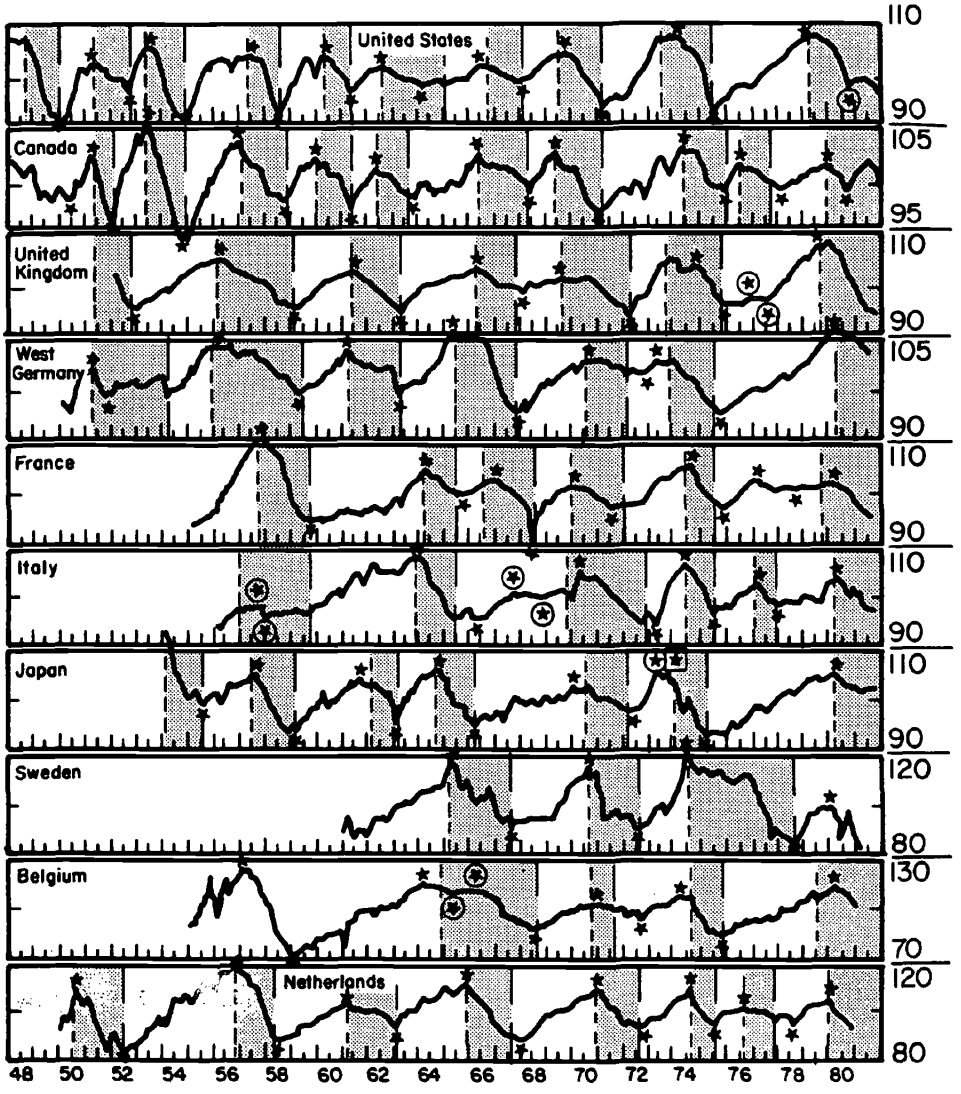
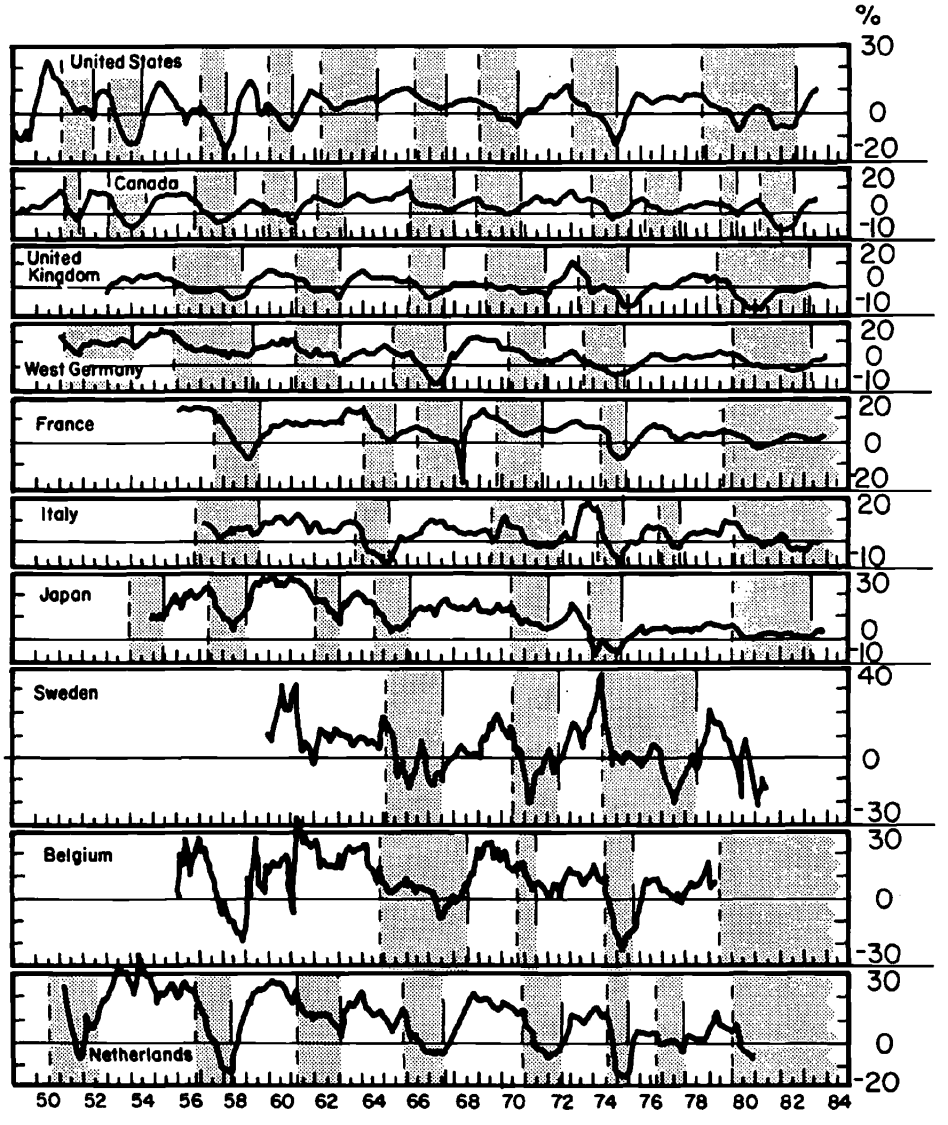


Figure 2-5. Coincident Composite Indexes, Six-month Smoothed Rates of Change for Ten Countries.



can reduce declines that might earlier have been severe absolute declines compared to the milder disturbances we now call growth recessions. The 1973-75 experience, on the other hand, proved that classical recessions are still a real, if less frequent, threat as well.

The growth cycle chronologies may be visualized in another way in Figure 2-4, which shows the trend-adjusted coincident composite indexes for the ten major countries we have analyzed. Figure 2-5 displays the rate of change in these indexes. We shall return to a consideration of the evidence revealed in these figures in Chapter 6, which is concerned with the existence of a "world cycle." At this point, however, we simply conclude that the growth cycle chronologies give an encouraging, affirmative answer to at least the opening questions our project posed: Is the notion of the growth cycle a useful approach to the study of cyclical instability in a number of market-oriented economies, and can growth cycle chronologies be established in a comparable manner for a number of market-oriented economies? Clearly it is and they can.[21]

OTHER GROWTH CYCLE CHRONOLOGIES

In the period since 1973, when we began the International Economic Indicators project, a number of other chronologies have appeared. While there are disadvantages to having more than one chronology for a single country, one of the by-products that we hoped would result from the project was a general upsurge of interest in growth cycle analysis in other countries. At the time the project was launched there were few chronologies for classical business cycles in the postwar period outside the United States and only one for growth cycles (Mintz's German chronology). Classical chronologies had been produced for Austria, Canada, Japan, Italy, and the United Kingdom,[22] but these studies did not employ a common methodology. In the United Kingdom the decision of the Central Statistical Office to develop a growth cycle chronology of its own was a direct result of its involvement in the early stages of the IEI project.[23]

Some of the characteristics of emergent growth cycle chronologies may be seen by using the United Kingdom experience as an illustration. Table 2-3 shows the current CSO chronology, as well as its earlier chronology. We have also included the OECD chronology, which is based on "output—broadly defined." In principle this chronology ought to resemble the official national chronology. Except for the latest peak it does not. Included in the table as well is the original chronology produced for the present work on growth cycles (labeled Klein) and the chronology devised by Desmond O'Dea.

Table 2-3. United Kingdom, Six Alternative Growth Cycle Chronologies.

Dates of Peaks (P) and Trough (T), and Lead (-) or Lag (+), in Months, from CIBCR Chronology

CIBCR 1981		*CSO[a] 1981*		*OECD[b] 1981*	
P	T	P	T	P	T
3/51	3/52				
12/55	11/58		12/58 (+1)		12/58 (+1)
3/61	2/63	4/60 (-11)	1/63 (-1)	4/60 (-11)	1/63 (-1)
2/66	8/67	12/64 (-14)	3/67 (-5)	12/64 (-14)	3/67 (-5)
6/69	2/72	5/69 (-1)	2/72 (0)	5/69 (-1)	2/72 (0)
6/73	11/75	5/73 (-1)	8/75 (-3)	5/73 (-1)	8/75 (-3)
6/79		5/79 (-1)		8/78 (-10)	
Average Timing at:					
P		-6		-7	
T			-2		-2
P + T		-4		-4	

Sources:

a. Central Statistical Office, 1981. Report on Reference Cycle Chronologies and Composite.

b. OECD, Paris, Unpublished Cyclical Indicators, Working Party on Cyclical Analysis and Leading Indicators, Paris (March 1981).

c. Central Statistical Office, "Cyclical Indicators for the United Kingdom," *Economic Trends*, no. 257 (March 1975): 98.

d. Philip A. Klein, "Postwar Growth Cycles in the United Kingdom, An Interim Report," NBER, *Explorations in Economic Research* 3, no. 1 (Winter 1976): 110.

e. D. J. O'Dea, *Cyclical Indicators for the Postwar British Economy*, National Institute of Economic and Social Research (Cambridge: Cambridge University Press, Occasional Paper XXVIII, 1975), Table 7.2, p. 39.

The table suggests broad agreement concerning the number of growth cycles experienced by the British economy and relatively high correspondence in the dating of growth cycle peaks and troughs. This correspondence is notable because while all the more recent chronologies were produced by subjecting the underlying data to some variant of the Bry-Boschan turning point program as adapted to growth cycles, they do not all include the same time series. Moreover, we make it a practice to review the turns judgmentally, and this practice may not be followed consistently elsewhere. Nevertheless,

Table 2-3. continued

Dates of Peaks (P) and Trough (T), and Lead (-) or Lag (+), in Months, from CIBCR Chronology (continued)

CSO[c] *1974*		*Klein*[d] *1976*		*O'Dea*[e] *1975*	
P	T	P	T	P	T
		2/51 (-1)		2/51 (-1)	
			10/52 (+2)		7/52 (-11)
		12/55 (0)		12/55 (0)	
	10/58 (-1)		11/58 (0)		9/58 (-2)
3/60 (-12)		11/60 (-4)		7/60 (-8)	
	10/62 (-4)		2/63 (0)		1/63 (-1)
12/64 (-14)		8/65 (-6)		1/65 (-13)	
	12/66 (-8)		8/62 (0)		8/67 (0)
5/69 (-1)		12/68 (-6)		3/69 (-3)	
	3/71 (-11)		2/72 (0)		2/72 (0)
7/73 (+1)					
-6		-3		-5	
	-6		0		-1
-6		-2		-3	

the consilience among the lists of growth cycles and their dating suggests that the subjective element is minimal. It is noteworthy, however, that all of the chronologies exhibit a tendency for the peaks and troughs to precede those established by the CIBCR. A partial explanation may be that our chronology places more weight on employment and unemployment statistics, which display some tendency to lag (see Chapters 4 and 5).

Virtually all the chronologies produced in recent years have been based on the growth cycle concept. Major exceptions include the classical chronologies currently used in the United States, Canada, and Japan. In order to establish empirical regularities, it is necessary to compare the evidence contained within these two approaches to describing business cycles. According to theory, growth peaks were expected to lead classical peaks, and the growth troughs were expected either to coincide with or follow the classical troughs (in economies with rising trends). Our review of the U.S. evidence (Table 2-1) corroborated these expectations. Table 2-4 suggests that the evidence for Canada and Japan is in line with these theoretical expectations as well. Growth peaks precede classical peaks quite con-

Table 2-4. Japan and Canada, Comparison of Growth Cycles and Classical Cycles, 1954-1971.

Japan						*Canada*					
Classical Cycles[a] *(1)*		*Growth Cycles*[b] *(2)*		*Lead (-) or Lag (+) in Months (2) vs. (1) (3)*		*Classical Cycles*[c] *(4)*		*Growth Cycles*[d] *(5)*		*Lead (-) or Lag (+) in Months (5) vs. (4) (6)*	
P	T	P	T	P	T	P	T	P	T	P	T
6/51	10/51					5/51	12/51	4/51	12/51	-1	0
1/54	11/54	12/53	6/55	-1	+7	5/53	6/54	3/53	10/54	-2	+4
6/57	6/58	5/57	1/59	-1	+7	1/57	1/58	11/56	8/58	-2	+7
						3/60		10/59		-5	
12/61	10/62	1/62	1/63	+1	+3		1/61	3/62	3/61		+2
10/64	10/65	7/64	2/66	-3	+4			3/66	5/63		
7/70	12/71	6/70	1/72	-1	+1			2/69	2/68		
11/73	3/75	11/73	3/75	0	0	5/74		2/74	12/70	-3	
		2/80					3/75		10/75		+7
								5/76	7/77		
						10/79	6/80	9/79		-1	0
						6/81					

Average Timing at:						
P	-1			-2		
T			+4			+3
P + T		+1			0	

Sources:

a. Japanese Economic Planning Agency. Based upon a number of roughly coincident indicators selected and analyzed by the EPA. The data are not adjusted for long-run trend.

b. Center for International Business Cycle Research, Columbia University.

c. Philip Cross, "The Business Cycle in Canada 1950-1981," *Current Economic Analysis* (March 1982), Statistics Canada Catalogue 13-004E.

d. CIBCR, Columbia University.

sistently but not by very long intervals. At troughs the growth turns follow the classical turns quite regularly in both countries.[24]

It is interesting to note that the placement of turning points for growth cycles in the alternative chronologies exhibits larger deviations from the peaks emerging through our method than is the case at troughs. This suggests that dating of growth cycle peaks may be more difficult—that is, more uncertain—than dating growth cycle troughs.

Different methods may obviously produce different turning points, but a most important factor in rendering useful the comparison of growth cycles in a number of countries is that turning points be selected by means of a common methodology. There is ground for the view that economic experts in a particular country are in the best position to select cyclical turning points because they are most intimately acquainted with economic developments in that country, and can pinpoint genuine cyclical changes. It is, of course, precisely for this reason that we have urged that basic data should be acquired from official government agencies wherever possible, and that our analysis should be carried out with the closest possible cooperation from experts in each country. This is surely the most promising path to accurate results and productive work in this field.

From the outset of the discussions at the OECD, we have also urged the adoption of a standard method so that results would make international comparisons meaningful. This point has generally been accepted, and most of the chronologies have been based on some variant of the Bry-Boschan method. There is, however, no uniformity in the decision to review evidence judgmentally or not. Some countries do and others apparently do not.

Even more contentious has been the question of what measure of economic activity the chronology should pertain to. We have taken the position—initiated by Burns and Mitchell for classical cycle analysis—that a number of measures of aggregate economic activity—including output, employment, income and trade—should be used. The OECD working party, on the other hand, concluded that growth cycle chronologies ought to pertain to "output—broadly defined." Because each country has been left to define this term for itself, the number and types of indicators included in the evidence used to derive growth cycle chronologies have varied.

One of the avenues of greatest productive potential emerging from the development of growth cycle chronologies for a number of countries is the possibility of furthering our understanding of the transmission mechanisms involved in the international spread of economic instability and inflation. Progress in this area will continue to be hin-

dered if experts in different countries do not utilize comparable methodologies, if no consideration is given to basing chronologies on comparable time series, or if different experts in a given country utilize different chronologies. We maintain the hope, however, that, as work on growth cycles proceeds, common understandings will be possible concerning the measurement of growth cycles and a consensus will emerge on the dating of turning points. The long history of business cycle chronologies in the United States, which in recent years has converged on the one established by the National Bureau, shows that these are not unreasonable objectives. Progress can be furthered through the cooperative endeavors of the CIBCR, the OECD, the EEC, and the national statistical agencies in the countries here under review.

ASSESSING THE IEI GROWTH CHRONOLOGIES

The Burns-Mitchell definition of business cycles pointed to measures of aggregate economic activity but did not specify what measures. One of the major pieces of U.S. legislation bearing on macro-economic policy was the Employment Act of 1946, which specifically mentioned employment, output, and purchasing power as the appropriate dimensions of activity to be considered. The Humphrey-Hawkins Act of 1979 called for a similar perspective on economic activity.

The coincident indicators that we have used for the United States include three measures in constant dollars (gross national product, personal income, and manufacturing and trade sales), and three expressed in physical units (industrial production, employees on nonfarm payrolls, and the total unemployment rate). Thus, the major dimensions of aggregate economic activity are covered. As will be clear in the next chapter, we were able to find reasonable equivalents to most of these measures for each of the foreign economies involved. (See Appendix 2C for the list of indicators utilized for each country.)

We have already alluded to some of the difficulties encountered in settling on a common list of indicators. In many countries employment, for example, is regarded as a lagging indicator, and during 1982 the U.S. unemployment rate became the country's best known lagging indicator.[25] We have also already noted that the OECD decided not only to use "output—broadly defined" as the appropriate aggregate to measure, but to leave the precise definition of this term to each country. Equivalent measures of aggregate activity are, of course, not always available. In our own work we have aimed for

comparability in the series chosen in order to facilitate the international comparative analyses considered later in this book. In the end, much is to be said for developing two sets of cyclical indicators: one designed to maximize international comparability by stressing commonality in the series included and the analytical techniques employed; the other designed to develop the most cyclically sensitive set of indicators country by country. The discussion in this volume, particularly in Chapter 1, leads to the expectation that these two approaches would nonetheless produce a large area of agreement.

How accurate or valid are the reference dates we have selected for each of the ten countries? This is, of course, always the crucial question in connection with any reference chronology. The simplest way to consider the degree to which turning points represent the central movement of coincident indicators is to examine the composite indexes derived from these indicators and consider how well they reflect the turns (see Figure 2-4). At the same time, one should bear in mind that while turning point selection is based solely upon the behavior of the measures of aggregate activity represented in the coincident indicators, a full evaluation of their appropriateness involves a further examination of the consistency with which leading activities lead and lagging activities lag the reference turns selected. This we shall be doing in the next chapter.

In a large proportion of cases the median lead or lag of the composite indexes of the coincident indicators at growth cycle peaks and troughs was zero. This simply means that the growth cycle chronologies fit the coincident indexes closely, and vice versa.[26] The following chapters contain figures and tables describing the behavior of individual time series at growth cycle turning points in each country. From the coincident indicators in these illustrations the reader will be able to verify that the composite indexes of Figure 2-4 do indeed accurately summarize the economic history of those countries under study. As we develop the evidence further, deal with the behavior of other indicators, and utilize the chronologies in particular economic investigations, the choice of turning points may, however, require some revision.

NOTES TO CHAPTER 2

1. Charlotte Boschan and Walter W. Ebanks, "The Phase-Average Trend: A New Way of Measuring Economic Growth," Proceedings of the Business and Economics Statistics Section, American Statistical Association (1978): 332.

2. Gottfried Haberler, *Prosperity and Depression*, New and Revised Edition (Cambridge, Mass.: Harvard University Press, 1958), p. 458. To the above comment Haberler appended the following interesting footnote:

> It is perhaps more correct to say that the problem is meaningless, at least in the sense in which it is—or rather was, for it is no longer a very live issue—usually formulated. The question is usually framed as a causal one: How to separate the effects of the causes responsible for the cycle from the effects of the causes responsible for the trend. The further assumption is made that the two sets of effects are additive. This assumption is surely unwarranted. The causes making for cyclical fluctuations, when impinging on a growing system, will produce very different results than they would produce in a stationary system. And similarly the growth factors would produce different results in an economic system that, unlike the one we live in, is not subject to cyclical fluctuations. As a consequence, if we could make the experiment of abstracting from the actual system which is subject to the joint operation of both sets of causes, first those that make for cycles, and second those that make for trend, the sum of the two effects would change.

3. J.R. Hicks, *The Trade Cycle* (Oxford: Clarendon Press, 1950), p. 120.

4. Ilse Mintz, *Dating Postwar Business Cycles: Methods and their Application to Western Germany, 1950-67* (New York: NBER, Occasional Paper No. 107, 1969).

5. In cases where there are "double" peaks or troughs, for example, the choice of a single peak or trough sometimes hinges on factors of judgment in which the computer program makes one choice that, on balance, is less appropriate than can be justified by all the evidence. There are also occasional turns selected by the computer that are too near the beginning or the end of a series for us to be ready to accept them. Occasionally, too, the computer selects a peak and a trough that identify a cycle of much smaller amplitude than those that are characteristic of the series. The program does not explicitly include an amplitude criterion. Our judgment, therefore, is that the computer program is extremely useful in preselecting turning points, but that the computer choices are best reviewed visually for judgmental corroboration.

6. Gerhard Bry and Charlotte Boschan, *Cyclical Analysis of Times Series: Selected Procedures and Computer Programs* (New York: NBER, Technical Paper No. 20, 1971).

7. Mintz experimented with several methods of dating growth cycle turning points. She adapted one technique, based on what are called step cycles, from earlier work by Milton Friedman and Anna Schwartz. Cf. Milton Friedman and Anna Schwartz, *A Monetary History of the United States* (New York: NBER, 1963). Cf. also their more recent study *Monetary Trends in the United States and the United Kingdom, 1870-1975*, esp. Chapter 3 (New York: NBER, 1982). The technical details involved in step cycles need not concern us here for the reasons explained below. The other major technique Mintz used was based on taking deviations from a seventy-five-month moving average. Mintz concluded that in 96 out of 147 cases both techniques produced exactly the same turning point for her West German data. In another 48 cases she found "matching" turns, even though there was some discrepancy in the exact month selected by the two methods. She found only 3 turns in 147 deviation cycles and 19 of 163 turns in step cycles were not matched at least roughly by turns in the cycles measured by the other technique. Because in the final analysis both techniques give such similar results, and deviation cycles are considerably simpler to explain,

we use the deviation technique. Our adaptation of it is, therefore, the one explained in the text.

8. The trend at the beginning (and end) of the series is extrapolated by using the rate of change between the average of the first (last) seventy-five months and that of the seventy-five months starting two years later (earlier). The final steps in the procedure modify these results.

9. Pursuant to the point raised in Note 8 concerning the treatment of trend estimates at the beginning and end of the series, we assume the first phase starts with the first observation and ends with the first turn, the last phase starts with the last turn and ends with the last observation, and we then extrapolate by computing the slope from the first (last) midpoint in the three-phase triplets so that the trend values of terminal segments in both directions equal the sum of the original observations. That this can be a source of forecasting error is evident.

10. Trading-day adjustments (adjustment for the variation from month to month in the number of working days) were included routinely in seasonal adjustments whenever appropriate, and when necessary, information for such adjustments was obtained from officials in each country.

11. More complete information on data sources are available in *International Economic Indicators: A Sourcebook*, by Geoffrey H. Moore and Melita H. Moore (Westport, Conn.: Greenwood Press, 1985). This book describes in some detail the source and construction of the basic indicator series employed in seven of the ten countries included in this study. (The countries not included in the source book but included here are Sweden, the Netherlands, and Belgium.)

12. Mintz, *Dating Postwar Business Cycles*, p. 9.

13. Details of composite index construction may be found in Julius Shiskin, *Signals of Recession and Recovery: An Experiment with Monthly Reporting* (New York: NBER, Occasional Paper No. 77, 1961), Appendix A; and Victor Zarnowitz and Charlotte Boschan, "Cyclical Indicators: An Evaluation and New Leading Indexes," *Business Conditions Digest* (May 1975): pp. v-xix (reprinted in *Handbook of Cyclical Indicators*, Department of Commerce [1976]).

14. Of course the same objectives could be reached by computing two indexes, one based on trend-adjusted data and the other on raw data, but this would clearly be more cumbersome. Moreover, the implicit trend in the indexes is a more complex estimate, but not necessarily better. We should add that in calculating composite indexes for our work on international indicators we have modified one of the final steps in the Shiskin procedure. We have adjusted the composite indexes to the average rate of change without regard to sign in the cyclical component ($\bar{c}$) of the index of industrial production for each country.

15. The Department of Commerce adjusts its current indexes in similar fashion by making the composite index trend equal to the average trend of the four roughly coincident indicators on the 1975 list. This is approximately the same as the trend rate for real GNP. Our international version of the same process involves setting the composite index equal to the average trend in real GNP in each country for the period 1969-79. This is done by computing the average per month change in both the composite index and the GNP for the period 1969-79, calculating the difference, and multiplying the index each month by the differential trend.

16. Burns and Mitchell, p. 70. For a fuller discussion of diffusion indexes, see Arthur F. Burns, "New Facts on Business Cycles" (NBER, 1950) reprinted in Geoffrey H. Moore, ed., *Business Cycle Indicators* (New York: NBER, 1961), pp. 13-44; Julius Shiskin, *Signals of Recession and Recovery*, pp. 56 ff; Ilse Mintz, "Dating United States Growth Cycles," *Explorations in Economic Research* 1, no. 1 (Summer 1974): 22-23; and Geoffrey H. Moore, "Diffusion Indexes," in D. Greenwald, ed., *Encyclopedia of Economics* (New York: McGraw-Hill, 1982), pp. 240-43.

17. The CIBCR has made such comparisons only for Canada and Australia.

18. The question was discussed in Philip A. Klein, *Business Cycles in the Postwar World: Some Reflections on Recent Research* (Washington, D.C.: American Enterprise Institute, 1976), especially Chapter II ("Growth Cycles: New Wine or New Bottles?").

19. A recent exception occurred in the United States, where in 1980-81 a classical cycle expansion took place but with such a modest growth rate that it could not be classified as a growth cycle expansion. Hence, there were two classical recessions between 1980 and 1982 but only one growth recession in the 1978-1982 period.

20. See, for example, G.H. Moore's foreword to Mintz's *Dating Postwar Business Cycles*, page 107, in which he notes that students of instability have long considered the notion that business cycles might appropriately be viewed as deviations from long-term trend. He cites particularly Henry L. Moore, Warren M. Persons, Frederick R. Macaulay, and Edwin Frickey, all of whom developed this approach during the period 1910-30. Mitchell himself adjusted for trend in a number of cases in *Business Cycles: The Problem and its Setting* (New York: NBER, 1927), especially pages 190-233.

21. In this report we concentrate our attention on ten countries: the United Kingdom, Canada, Japan, West Germany, France, Italy, Belgium, the Netherlands, Sweden, and of course the United States. We have also produced growth cycle chronologies for Australia, South Korea, and Switzerland, which are presented in Appendix 2B, and additional data have been gathered for several other countries. The Center for International Business Cycle Research has instituted a series of training seminars to afford interested economists the opportunity to familiarize themselves with our computer programs and methods and to experiment with data from their own countries. One of the results has been evidence of the feasibility of developing growth cycle chronologies in several smaller economies—Austria, Denmark, Israel, Malaysia, South Africa, Taiwan, and Venezuela. Consultations have been held with officials in Ireland and Finland. Other countries, of course, are working in this area through participation in the OECD experiment with indicators.

22. See for example, R.C. Drakatos, "Leading Indicators for the British Economy," *National Institute Economic Review* (May 1963): 42-49; R.C.O. Matthews, "Postwar Business Cycles in the United Kingdom," in M. Bronfenbrenner, ed., *Is the Business Cycle Obsolete?* (New York: Wiley-Interscience, Division of John Wiley and Sons, 1969), pp. 99-135; Gunther Tichy, *Indikatoren der Osterreichischen Konjunktur 1950 bis 1970*, Österreichisches Institut für Wirtschaftsforschung (Vienna, 1972); Angus Maddison, "The Post-War Busi-

ness Cycle in Western Europe," *Banca Nazionale del Lavoro Quarterly Review* (June 1960); Gideon Rosenbluth, "Changes in Canadian Sensitivity to United States Business Fluctuations," *Canadian Journal of Economics and Political Science* 23 (1957): 480-503; "Changes in Structural Factors in Canadian Sensitivity to United States Business Fluctuations," *Canadian Journal of Economics and Political Science* 24 (1958): pp. 21-43. Chronologies had also been produced in Japan by the Japanese Economic Planning Agency, and in Italy by Istituto Nazionale per lo Studio della Congiuntura.

23. The United Kingdom was the first major country for which we collected the basic data. Indeed, even before the IEI project was initiated, Desmond O'Dea had begun work at the National Institute of Economic and Social Research on cyclical indicators for the British economy during the postwar period. O'Dea, however, largely eschewed the idea of a general reference chronology in favor of developing what he called target indicators for particular variables, such as employment, investment, etc. His work culminated in the publication of *Cyclical Indicators for the Postwar British Economy* (Cambridge University Press, 1975). An interim report of interest is D. J. O'Dea, "The Cyclical Timing of Labor Market Indicators in Great Britain and the United States," *Explorations in Economic Research* 2, no. 1 (Winter 1975).

The availability of data and interest in indicators by the NIESR, the Central Statistical Office, and the NBER made early progress in the United Kingdom possible. The CSO cooperated fully with Klein during the 1973-1974 year in collecting and analyzing data on indicators for the United Kingdom. A report on this initial effort in international economic indicators, "Postwar Growth Cycles in the United Kingdom—An Interim Report" by Philip A. Klein appeared in *Explorations in Economic Research* 3, no. 1 (Winter 1976). The study developed a tentative growth cycle chronology for the United Kingdom, which is shown in Table 2-3. The study also analyzed the behavior of the U.K. equivalents to the U.S. leading, coincident, and lagging indicators at postwar U.K. growth cycle turning points. Hence, it was an early test of the feasibility of the kind of analyses reported in this study.

24. The Japanese chronology is a variant on the usual classical type, because it is based upon particularly sensitive coincident indicators rather than aggregates such as GNP. The aggregates showed no cyclical declines in Japan before the 1970s.

25. At recent classical cycle turns the evidence for employment in the United States is mixed. Since 1948, nonfarm employment has lagged by one month at two of the seven troughs and by three months at a third, but has coincided exactly at the other four. At peaks the record is even more variable: leads of -2, -1, -5 months at the earlier peaks, an exact coincidence in 1960, but lags of 3, 11, and 2 months at the most recent peaks. The unemployment rate has usually led at classical peaks and lagged at troughs. But the leads and lags of employment and unemployment are generally short, and this justifies, in our view, their classification as roughly coincident.

26. The full information with respect to these median leads and lags is shown in Table 3-1.

APPENDIX 2A
CURRENT SOURCES OF INTERNATIONAL ECONOMIC INDICATORS

International

Main Economic Indicators, Organization for Economic Cooperation and Development, Paris.
United Nations Monthly Bulletin of Statistics and its *Supplement*, United Nations, New York.
Statistical Indicators of Short Term Economic Changes in ECE Countries, United Nations Economic Commission for Europe, Geneva.
European Economy, Commission of the European Communities, Luxembourg.
International Economic Scoreboard, The Conference Board, New York.
International Financial Statistics, International Monetary Fund, Washington.
International Economic Indicators, Center for International Business Cycle Research, New York.

Canada

Current Economic Analysis, Statistics Canada, Ottawa.
Canadian Statistical Review, Statistics Canada, Ottawa.
Bank of Canada Review, Bank of Canada, Ottawa.

France

Bulletin Mensuel de Statistique, Institut National de la Statistique et des Etudes Economiques, Paris.
Tendances de la Conjoncture, Institut National de la Statistique et des Etudes Economiques, Paris.
Informations Rapides, Institut National de la Statistique et des Etudes Economiques, Paris.

Italy

Congiuntura Italiana, Istituto Nazionale per lo Studio Della Congiuntura, Rome.
Bollettino Mensile di Statistica, Istituto Centrale di Statistica, Rome.
Indicatori Mensile, Istituto Centrale di Statistica, Rome.

Japan

Japanese Economic Indicators, Japanese Economic Planning Agency, Tokyo.
Economic Statistics Monthly, Bank of Japan, Tokyo.
Monthly Statistics of Japan, Statistics Bureau, Prime Minister's Office, Tokyo.

United Kingdom

Monthly Digest of Statistics, Central Statistical Office, London.
British Business, Department of Industry and Trade, London.
Economic Trends, Central Statistical Office, London.

United States

Business Conditions Digest, and *Handbook of Cyclical Indicators*, 1984 U.S. Department of Commerce, Washington, D.C.
Survey of Current Business, U.S. Department of Commerce, Washington, D.C.
Federal Reserve Bulletin, Board of Governors of the Federal Reserve System, Washington, D.C.
Economic Indicators, Joint Economic Committee, Washington, D.C.

West Germany

Wirtschaft und Statistik, Statistisches Bundesamt, Wiesbaden.
Statistiche Beihefte zu den Monatsberichten der Deutschen Bundesbank, Deutsche Bundesbank, Frankfurt am Main.
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APPENDIX 2B
GROWTH CYCLE CHRONOLOGIES FOR FOUR COUNTRIES, 1948–83

Peak or Trough	*Australia*	*South Korea*	*Switzerland*	*Taiwan*
P				
T			2/50	
P	4/51		3/51	
T	11/52		2/53	
P				
T				
P	8/55		6/57	
T	1/58		9/58	
P	8/60			
T	9/61			2/63
P			4/64	
T				
P				
T				
P	4/65			4/65
T	1/68	8/66	5/68	8/67
P	5/70	1/69	5/70	11/68
T	3/72	3/72	1/71	1/71
P	2/74	2/74	4/74	12/73
T		6/75	8/75	2/75
P		7/76		6/76
T	10/77			7/77
P				8/78
T				
P	6/81			
T	5/83			10/82

Source: Center for International Business Cycle Research.

APPENDIX 2C
U.S. CYCLICAL INDICATORS AND ROUGH EQUIVALENTS, NINE OTHER COUNTRIES

United States	*Canada*	*United Kingdom*
Leading Indicators	*Leading Indicators*	*Leading Indicators*
Average workweek, mfg.	Average workweek, mfg.	Average workweek, mfg.
Average initial claims, unemployment insurance (inverted)	Initial claims, unemployment insurance (inverted)	
Net business formation		New companies registered
		Business failures (inverted)
New orders, consumer goods and materials*	New orders, durable goods*	
Contracts & orders, plant and equipment	New orders, machinery and equipment*	New orders, engineering industries, volume
	Nonresidential building permits	New orders, construction, private industry*
New building permits, private housing units	Residential building permits	Housing starts, thousands
Change in business inventories (q)*	Change in nonfarm business inventories (q)*	Change in stocks and work in progress (q)
Industrial materials price index	Industrial materials price index	Basic materials price index
Stock price index, 500 S&P common	Stock price index, Toronto Stock Exchange	Common stock price index
Corporate profits after taxes (q)	Corporate profits after taxes (q)*	Companies' profits less U.K. taxes (q)*
Ratio, price/unit labor cost, nonfarm business (q)	Ratio, price to unit labor cost, mfg.	Ratio, price to unit labor cost, mfg.
Change in consumer installment credit*	Change in consumer credit outstanding*	Increase in hire purchase debt*
Roughly Coincident Indicators	*Roughly Coincident Indicators*	*Roughly Coincident Indicators*
Personal income*	Personal income*	Personal disposable income (q)*
Gross national product (q)*	Gross national expenditure (q)*	Gross domestic product (q)*
Industrial production	Industrial production	Industrial production
Mfg. and trade sales*	Retail trade*	Retail sales*
Employees on nonfarm payrolls	Nonfarm employment	Employment in production industries
Unemployment ratio (inverted)	Unemployment rate (inverted)	Unemployed (inverted)

Unemployment ratio (inverted)	Nonfarm employment Unemployment rate (inverted)	Employment in production industries Unemployed (inverted)
Lagging Indicators	*Lagging Indicators*	*Lagging Indicators*
Unemployment rate, 15 weeks & over, inverted	Long-term unemployment, inverted	Long-term unemployment, inverted
Business expenditure, new plant & equipment, (q)*	Plant and equipment, Canadian dollars*	Investment in plant and equipment*
Mfg. & trade inventories*	Business inventories, Canadian dollars*	Changes in stock & work in progress
Output per manhour, percent change of reciprocal (q)	Change in the inverse of output per manhour	Changes in employment per unit output
Commercial and industrial loans outstanding*	Industrial loans in Canadian dollars*	Loans to industry*
Prime rate on short-term business loans	Canada prime rate	Prime rate

(*Appendix 2C. continued overleaf*)

Appendix 2C. continued

West Germany	*France*	*Italy*
Leading Indicators	*Leading Indicators*	*Leading Indicators*
Number working short hours (inverted)	Average workweek, mfg.	Hours per month per worker in industry
Applications for unemployment compensation (inverted)		
	Change in unfilled orders, total	Change in unfilled orders, total
Insolvent enterprises (inverted)		Declared bankruptcies (inverted)
New orders, investment goods industry, volume		
Housing permits, interior space		
Residential construction orders*	Building permits, residential	Building permits, residential
Inventory change		
Stock price index	Index of stock prices	Stock price index
Net income from entrepreneurial activity*		
Ratio, price to unit labor cost	Ratio, price to unit labor cost, mfg. (q)	
Change in consumer credit*		
Roughly Coincident Indicators	*Roughly Coincident Indicators*	*Roughly Coincident Indicators*
Employment in mining & manufacturing	Employment, nonfarm	Nonfarm employment
Unemployment rate	Registered unemployed (inverted)	Unemployment rate (inverted)
Gross national product*	Gross domestic product (q)*	Gross domestic product (q)*
Industrial production	Industrial production	Industrial production
Disposable income*		
Manufacturing sales volume	Retail sales volume	Retail sales*
Retail trade volume		

Lagging Indicators	*Lagging Indicators*	*Lagging Indicators*
Investment in machinery, equipment and construction*		
Level of inventories	Inventory of finished goods, survey, change over four months	Inventory of finished goods, survey, change over four months
Bank credits to the economy*		
Percent change in the reciprocal of output/manhour		
Bank rates on large loans	Commercial banks, prime rate	Commercial banks, prime rate

(*Appendix 2C. continued overleaf*)

Appendix 2C. continued

Belgium	*Netherlands*	*Sweden*	*Japan*
Leading Indicators	*Leading Indicators*	*Leading Indicators*	*Leading Indicators*
Monthly hours working	Temporary short-time workers	Number of hours worked (in industry)	Index of overtime workers, mfg.
		Number of new job offerings	
Inland orders*	Change in unfilled orders	Value of new orders*	
Bankruptcies (inverted)	Bankruptcies (inverted)		Business failures, number (inverted)
Number of nonresidential building permits	Nonresidential building permits (q)		New orders, machinery and construction works
Number of residential building permits	Dwellings started	Number of housing starts	Dwelling units started
	Change in industrial inventories (q)*		Change in inventories (q)*
	Prices, raw materials and semi-mfred. goods	Raw materials prices	Raw materials price index
Industrial share price	Stock price index	Stock price	Stock price index
	Ratio, price to labor cost (q)	Ratio, price to unit labor cost	Ratio, price to unit labor cost, mfg.
		New loans to households	Change in consumer and housing credit outstanding (q)*
Coincident Indicators	*Coincident Indicators*	*Coincident Indicators*	*Coincident Indicators*
	Employment, mfg. (q)	(Nonfarm) employment	Regular workers' employment, all industries
Unemployment rate (inverted)	Registered unemployed, number (inverted)	Unemployment rate	Unemployment rate (inverted)
Real gross domestic product*		Gross domestic product	Gross national expenditures (q)
Industrial production	Industrial production	Industrial production index	Industrial production
		Disposable income, 1975 prices	Wage and salary income*
Retail sales*	Manufacturing sales (q)*	Retail sales, volume	Retail sales*
	Retail sales*		

Retail sales*	Manufacturing sales (q)* Retail sales*	Retail sales, volume	Retail sales*
Lagging Indicators	*Lagging Indicators*	*Lagging Indicators*	*Lagging Indicators*
	Long-term unemployed (inverted) (q)	Long-duration unemployment rate (inverted)	
	New plant equipment expenditures (q)*		Gross fixed capital formation
Finished goods inventories, change over 4-month span	Industrial inventories (end of q)*		Inventory level
	Output per manhour, 12-month span (inverted)	Output per manhour, 12-month span (inverted)	Output/manhour, percent change of reciprocal, 12-month span
		Personal loans on checking accounts*	Commercial bank loans and discounts*
Bank lending rates to prime borrowers		Discount rate	Contracted rate on loans

* = Deflated series.
q = Quarterly series. All other series are monthly.