Diffusion indexes: a barometer of the economy

BLS diffusion indexes measure the breadth of employment change across industries, which is helpful in assessing the overall state of the economy, while also serving as a potential leading indicator of manufacturing employment levels

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The Bureau of Labor Statistics has improved the diffusion index of employment produced as part of the Bureau's Current Employment Statistics program. The old diffusion index, which included 185 industries, was replaced with a broader-based index, with 349 component industries.[1] This expanded index, which covers all nonagricultural industries, is supplemented by a new 141-industry diffusion index for manufacturing. Both diffusion indexes of employment are published each month in table 18 of the Current Labor Statistics section of the *Monthly Labor Review*.

A diffusion index is a measure of the dispersion of change. A diffusion index of employment provides insight into the breadth of employment change, which can be important in assessing overall economic trends. For example, increases of similar magnitude in total employment may be caused by growth in a few industries or growth in many industries. A sharp overall employment increase caused by increases in only a few industries can have different economic and policy implications than one caused by more widespread increases. The new diffusion indexes for employment change improve the potential for analysis of employment trends because they provide a broader-based measure for all private nonagricultural industries and a separate measure for the cyclically sensitive manufacturing sector.

The previously published index was based on the most comprehensive employment data available at the time of its introduction in December 1974. The component industries were, for the most part, 3-digit Standard Industrial Classification (SIC) levels in manufacturing and the less detailed 2-digit SIC levels for other industry divisions. As a result, manufacturing industries had a disproportionately large representation in the index. However, because of the expansion of data for the service-producing sector in recent years, 3-digit SIC estimates in all industry divisions now are available. This has allowed employment diffusion index computation to "catch up" with service sector expansion and to be more analytically useful than it had been. Nonetheless, it is important to note that the present SIC structure still provides more detail for manufacturing than for service sector industries. Consequently, the 349-industry index still gives greater weight to employment changes in manufacturing than to those in services.

The addition of a diffusion index for manufacturing provides more analytical possibilities. Because the previous series was primarily composed of manufacturing industries, it was fre-

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quently used to analyze factory employment trends. With the broadening of the all-industry measure, the Bureau has also introduced a "pure" manufacturing index to fill this analytical need.

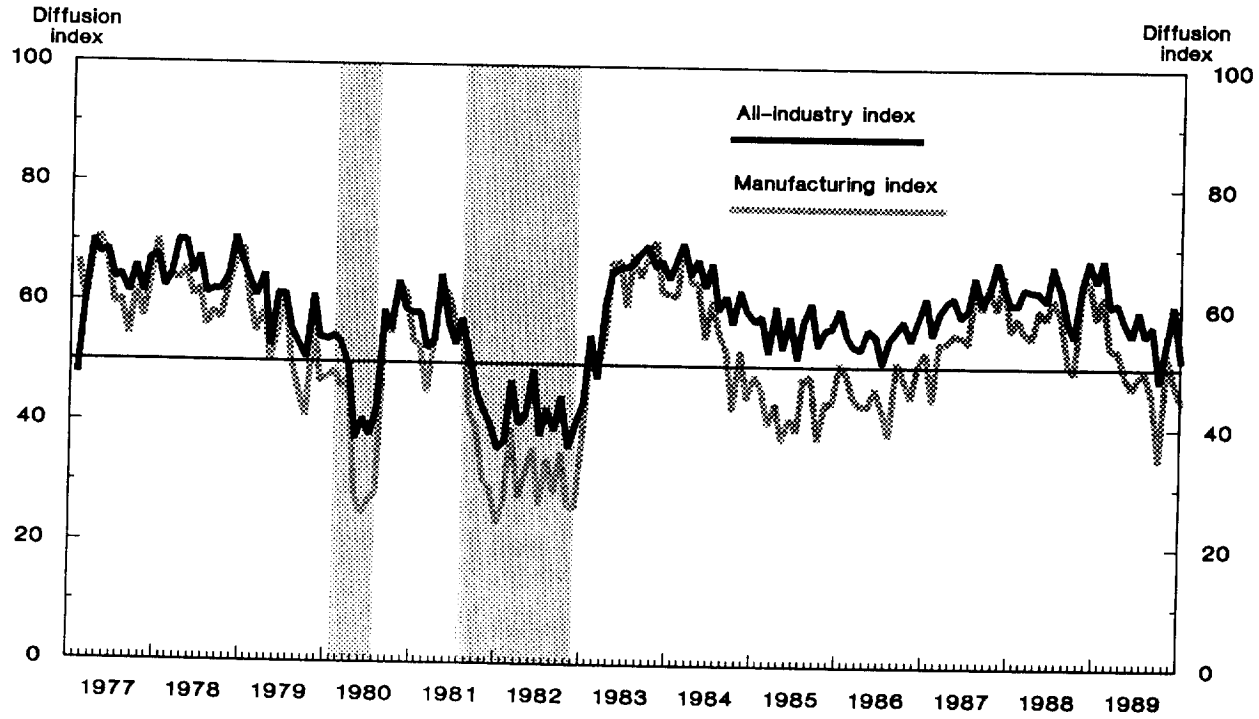
Historical series beginning in January 1977 are available for both the manufacturing and the new all-industry diffusion indexes for four timespans: 1 month, 3 months, 6 months, and 12 months. These data are presented in tables 1 and 2. Table 3 compares the industry composition of the old and new all-industry indexes. In the new index, the representation of the manufacturing component has dropped dramatically, from nearly 75 percent of the total number of industries to 40 percent, much more in line with the proportion of private nonfarm employment accounted for by manufacturing—22 percent. Services and retail trade have the most marked increases in representation.

History of diffusion indexes

The original diffusion index concept was introduced as an aid in identifying business cycles and business cycle turning points.[2] Further details on the purposes and properties of diffusion indexes were developed over several years. *Business Cycle Indicators,* published in 1961,[3] presented diffusion indexes for 21 economic indicators, including total nonagricultural employment. Two principal uses for diffusion indexes were suggested in that publication. The first was as a measure of dispersion for the corresponding aggregate economic activity. This measure of breadth or diffusion of change was considered important in determining when a business cycle turning point had been reached. The second proposed use of diffusion indexes was as leading economic indicators. This proposal arose from a noted tendency in the series studied for diffusion index turning points to lead aggregate activity by 6 to 12 months. Predictive value in anticipating business cycle turning points was not claimed, but it was noted that the indexes could provide auxiliary help in recognizing these events at the time they were occurring.

Diffusion indexes now are published for many economic time series. The U.S. Department of Commerce publication *Business Conditions Digest*[4] provides a compendium of the major diffusion indexes currently produced, presenting such indexes for more than 20 series, including composite indexes for leading, coinci-

Chart 1. **Seasonally adjusted diffusion indexes, 1-month span, 1977–89**



NOTE: Shaded areas indicate recessionary periods as designated by the National Bureau of Economic Research.

Exhibit 1. Turning points in employment levels versus diffusion indexes, using the 1-month span

Total private employment		All-industry index		
Date	Turning point	Date	Turning point	Relation to total private employment (in months)
September 1981	Peak	March 1978	Peak	—
December 1982	Trough	April 1980	Trough	—
		April 1981	Peak	led 5
		December 1981	Trough	led 12
		February 1984	Peak	—
		June 1986	Trough	—
		January 1989	Peak	—

Manufacturing employment		Manufacturing index		
Date	Turning point	Date	Turning point	Relation to manufacturing employment (in months)
June 1979	Peak	—	—	—
July 1980	Trough	May 1980	Trough	led 2
July 1981	Peak	October 1980	Peak	led 9
December 1982	Trough	December 1981	Trough	led 12
August 1984	Peak	October 1983	Peak	led 10
January 1987	Trough	April 1985	Trough	led 21
March 1989	Peak	November 1987	Peak	led 16

dent, and lagging economic indicators. Individual diffusion index series include, in addition to employment, average workweek in manufacturing, initial claims for unemployment insurance, stock prices, net manufacturing profits, and industrial production.

At the Bureau of Labor Statistics, the diffusion index was first published in 1974.[5] Its stated purposes were to serve as a measure of dispersion of employment change and as a leading indicator for employment levels. Currently, however, the Bureau focuses on the diffusion index only as a measure of dispersion, and not as a leading indicator. As discussed in detail later in this article, the leading indicator properties of the all-industry diffusion index currently appear to be tenuous.

Index computation and interpretation

The computation of a standard diffusion index is straightforward. Each component series is assigned a value of 0, 50, or 100 percent, depending on whether its employment showed a decrease, no change, or an increase over the given timespan. (Assigning a value of 50 percent to the unchanged components effectively counts one-half of them as rising and one-half as declining.) The average (mean) value is then calculated, and this percent is the diffusion index number.

Diffusion indexes are calculated for various timespans. As indicated earlier, the employment diffusion index is published for four timespans; seasonally adjusted data are used in the 1-, 3-, and 6-month series, and unadjusted data are used for the 12-month series. The index is reported for the center month of the span. For example, the published diffusion index value for the 6-month span for March 1989 measures the diffusion of change over the 6-month period from January 1989 to June 1989. It is calculated by comparing employment for each component industry in January 1989 with that in June 1989 to determine whether employment rose, fell, or remained unchanged. For the 1-month span, the diffusion index value is reported for the month to which the change is calculated. Thus, the published diffusion index for June 1989 represents change from May 1989 to June 1989.

There are several different interpretations possible, and useful, for diffusion index analysis. Diffusion indexes are sometimes described as representing the percent of components that increased over a given timespan. In the case of

Table 1. **Diffusion indexes of employment change, private nonagricultural payrolls, 349 industries,[1] seasonally adjusted**

[Percent]

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
	Over 1-month span											
1977	63.5	60.5	70.3	67.9	68.6	63.8	64.5	61.3	65.9	61.3	67.0	67.9
1978	62.5	64.3	70.2	70.1	64.6	67.6	61.6	62.2	62.0	64.3	70.9	66.6
1979	63.9	61.0	64.8	52.7	61.6	61.3	55.7	53.2	50.7	61.3	54.2	53.9
1980	54.6	53.4	49.7	37.4	40.8	38.0	42.3	59.0	55.7	63.8	59.3	58.6
1981	58.5	52.7	54.0	64.5	57.0	53.3	57.7	51.3	45.8	42.3	40.3	36.0
1982	37.2	47.3	40.1	41.5	49.3	38.1	42.8	39.1	44.7	36.2	40.1	43.6
1983	55.0	47.9	60.2	65.6	66.3	66.5	67.2	68.9	70.1	66.6	67.6	64.6
1984	67.8	70.6	65.2	67.8	63.3	67.2	59.6	61.9	57.2	62.9	59.3	57.7
1985	58.5	52.3	60.2	53.2	58.5	51.4	57.6	60.7	53.6	56.3	56.6	59.7
1986	55.4	53.7	53.2	56.3	55.2	50.7	54.7	56.3	57.9	54.6	58.0	61.7
1987	55.6	59.3	61.0	61.9	58.6	59.7	65.3	60.6	63.0	67.8	64.5	60.7
1988	60.7	63.5	63.0	62.8	61.3	67.2	63.6	58.0	55.4	63.9	68.2	64.6
1989	68.3	60.5	61.0	58.2	55.6	59.7	55.6	57.4	47.9	55.3	60.9	51.9
	Over 3-month span											
1977	70.2	74.5	76.4	79.2	74.8	72.1	69.3	72.1	70.5	73.5	73.6	72.5
1978	71.9	73.8	76.9	76.9	74.9	71.1	69.2	65.8	68.3	73.5	74.8	76.2
1979	69.5	71.8	65.8	66.2	62.0	64.0	58.9	53.3	57.6	58.6	62.2	56.2
1980	56.6	51.4	42.0	38.3	35.5	37.4	42.8	50.9	65.3	66.9	68.5	64.3
1981	59.5	55.6	58.9	64.6	63.3	60.7	57.0	52.4	43.3	40.0	34.0	30.9
1982	31.2	34.8	37.7	41.5	40.3	40.3	34.8	38.3	35.4	35.8	34.0	46.6
1983	48.4	57.0	62.6	71.9	72.1	74.4	72.6	77.2	77.2	74.6	71.6	73.6
1984	74.9	75.5	78.2	72.8	73.6	68.8	67.8	65.5	64.6	62.2	61.9	61.6
1985	58.3	58.3	55.6	59.0	55.4	57.6	56.6	58.7	58.5	56.9	59.5	59.3
1986	57.7	53.0	54.4	55.4	53.3	51.4	52.9	58.7	57.0	59.7	62.0	62.0
1987	60.7	62.0	66.6	65.2	65.8	65.9	67.8	71.1	71.2	72.3	70.9	65.9
1988	64.8	65.6	69.5	70.2	71.1	71.9	71.2	64.2	65.3	70.1	73.4	74.6
1989	71.6	70.1	64.5	61.9	61.6	60.7	61.6	53.4	54.6	55.7	57.2	61.7p
	Over 6-month span											
1977	79.1	81.8	78.7	78.4	78.1	79.7	76.2	76.2	77.5	76.6	78.1	78.4
1978	77.8	81.4	81.2	79.8	78.7	76.2	73.6	76.9	75.6	76.8	76.1	77.8
1979	74.6	73.9	71.2	66.8	63.2	57.9	62.9	59.5	57.7	58.6	60.9	57.7
1980	48.6	44.7	41.1	37.4	37.1	37.5	44.4	51.9	61.2	70.9	68.9	66.2
1981	66.5	65.2	62.9	64.9	61.3	58.0	50.3	43.0	39.0	32.2	32.5	28.7
1982	28.5	29.7	33.0	38.8	37.2	36.8	34.5	33.8	34.8	38.1	39.1	43.1
1983	55.2	62.2	67.3	71.1	76.4	78.2	79.4	79.5	78.2	77.2	78.1	77.7
1984	78.7	78.9	80.2	77.1	74.4	72.6	70.1	68.6	64.9	63.9	61.6	62.6
1985	58.7	59.7	58.2	57.6	58.6	57.6	57.6	56.2	59.5	59.7	58.3	55.6
1986	55.6	56.6	52.7	52.9	53.4	56.0	55.6	57.0	62.3	61.6	62.9	63.2
1987	67.3	65.8	64.8	66.8	67.6	69.5	71.3	73.5	73.2	71.5	71.8	72.2
1988	69.9	70.2	71.5	73.9	73.9	69.1	70.2	74.6	73.5	73.9	74.5	75.8
1989	75.1	69.5	68.2	66.0	63.0	57.9	57.7	60.2	53.4	59.0p	58.2p	—
	Over 12-month span											
1977	79.2	80.1	81.8	81.9	84.8	84.7	84.5	83.4	83.7	83.0	82.5	82.1
1978	81.9	82.2	81.8	81.9	83.0	82.8	83.4	81.4	81.7	75.8	78.1	75.5
1979	75.9	75.4	74.8	72.1	68.2	66.0	66.0	63.6	59.7	57.6	52.0	48.7
1980	47.0	46.4	46.8	45.3	43.7	43.8	43.6	42.8	44.3	50.6	57.2	62.2
1981	71.2	68.3	68.1	61.3	53.4	48.0	42.3	38.8	36.4	33.1	34.1	32.2
1982	32.4	31.1	29.7	30.4	30.4	31.4	35.0	35.1	38.8	43.4	46.7	51.4
1983	57.0	61.9	66.5	72.8	75.8	77.2	76.8	80.7	80.4	81.4	83.0	81.9
1984	81.7	79.5	78.7	77.1	76.2	74.1	73.1	70.2	69.1	65.2	63.8	61.5
1985	59.5	59.2	59.2	56.9	56.6	58.5	55.9	55.9	56.7	55.6	55.2	53.7
1986	54.4	54.6	53.9	55.6	55.2	56.3	57.2	59.3	60.0	62.0	61.3	63.6
1987	66.6	68.2	68.2	71.8	71.9	72.5	72.2	74.1	75.4	72.5	73.8	76.9
1988	76.2	76.1	74.8	74.6	75.8	74.9	78.1	75.5	75.5	74.8	74.9	74.1
1989	73.2	43.6	69.6	67.6	66.6	62.6	63.9p	64.0p	—	—	—	—

[1] Based on seasonally adjusted data for 1-, 3-, and 6-month spans and unadjusted data for the 12-month span. Data are centered within the span.

p = preliminary.

NOTE: Figures are the percent of industries with employment increasing plus one-half of the industries with unchanged employment, where 50 percent indicates an equal balance between industries with increasing and decreasing employment.

Establishment survey estimates are currently projected from March 1988 benchmark levels. When more recent benchmark data are introduced, all unadjusted data (beginning April 1988) and all seasonally adjusted data (beginning January 1985) are subject to revision.

Table 2. **Diffusion indexes of employment change, manufacturing payrolls, 141 industries,[1] seasonally adjusted**

[Percent]

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
	Over 1-month span											
1977	66.0	59.9	68.4	70.9	67.0	59.6	60.3	54.3	62.1	57.4	63.1	70.2
1978	63.1	64.5	63.8	65.6	61.0	62.4	56.0	58.5	57.1	62.8	66.3	69.1
1979	60.3	55.0	58.9	50.4	55.7	61.7	50.0	45.0	41.1	57.4	46.8	47.9
1980	48.6	46.1	47.5	28.4	24.8	27.0	28.7	58.2	55.0	63.1	61.7	53.9
1981	53.2	45.0	55.0	63.1	61.3	56.7	56.0	42.2	39.4	30.5	29.4	23.4
1982	27.0	39.4	28.0	31.9	36.2	26.6	34.4	28.4	35.5	26.6	26.2	39.4
1983	53.2	48.6	55.3	67.0	67.4	59.9	68.8	64.9	68.1	70.9	62.4	62.1
1984	61.7	70.6	64.5	63.8	54.6	61.0	56.0	52.8	42.9	52.8	44.7	48.6
1985	46.5	40.4	44.0	37.6	41.5	39.4	47.9	48.6	37.9	44.3	44.0	50.7
1986	48.9	45.0	43.6	43.6	46.5	43.3	38.7	51.1	48.6	45.0	50.7	52.8
1987	44.3	53.9	54.3	55.7	55.3	54.3	62.8	59.9	63.8	59.9	65.6	56.4
1988	58.5	56.0	55.0	59.9	58.5	61.7	59.6	51.1	49.3	62.8	64.9	58.5
1989	62.4	53.5	53.2	49.6	46.8	48.6	49.6	45.4	34.8	52.1	48.2	44.7
	Over 3-month span											
1977	70.6	77.0	78.7	78.7	72.0	66.7	62.4	64.9	62.4	67.7	69.1	76.2
1978	77.0	72.3	72.3	69.9	69.1	62.8	61.3	58.2	62.4	67.0	70.9	73.4
1979	64.9	62.8	59.6	59.9	58.5	59.2	50.0	36.5	44.0	43.6	52.5	42.9
1980	44.7	40.4	28.4	20.2	18.4	19.5	27.7	39.7	64.2	67.7	67.4	61.3
1981	51.8	50.4	56.4	64.5	66.7	64.9	55.0	42.6	28.0	25.5	17.7	17.4
1982	17.0	19.1	21.3	22.0	22.0	22.3	18.1	18.8	20.6	18.4	17.7	33.3
1983	46.1	53.9	61.7	71.3	70.9	73.8	70.6	76.2	77.0	74.1	72.0	67.4
1984	71.6	71.6	75.2	65.6	65.2	58.9	57.1	50.7	47.5	42.9	45.7	44.7
1985	43.6	37.9	32.6	33.0	31.2	37.6	40.8	37.9	38.3	36.5	42.9	46.8
1986	45.0	40.8	38.3	38.7	39.4	37.2	37.2	44.0	46.5	47.5	52.5	49.3
1987	52.1	51.4	59.6	61.3	58.5	62.8	67.0	71.6	68.4	70.6	67.7	64.5
1988	63.1	61.0	62.4	64.9	67.4	67.0	64.5	58.2	62.1	66.7	71.3	70.9
1989	67.4	63.8	55.7	51.8	49.3	48.6	47.9	34.0	41.8	41.5	46.5	42.9p
	Over 6-month span											
1977	81.6	81.9	79.1	77.3	75.2	74.8	67.7	68.4	70.9	75.2	80.5	77.7
1978	77.7	79.8	78.0	72.3	73.0	68.8	63.5	68.1	69.9	71.3	67.0	69.9
1979	68.4	66.3	62.1	58.2	52.1	43.6	48.2	41.5	39.7	40.1	42.6	42.9
1980	33.0	27.0	23.4	16.7	17.4	19.1	26.2	39.7	52.8	70.6	67.4	65.2
1981	65.2	62.8	62.8	68.1	61.7	55.3	40.1	29.1	22.3	17.0	18.4	12.4
1982	10.3	10.6	13.5	20.6	15.6	15.2	12.4	12.1	14.5	18.1	21.3	27.3
1983	46.8	59.6	64.9	67.0	75.5	76.2	78.7	77.3	76.2	73.8	75.9	74.8
1984	75.2	72.3	72.7	70.2	62.1	58.2	54.6	52.5	48.6	44.7	39.4	41.8
1985	35.5	34.8	29.4	31.9	33.3	33.0	31.9	32.6	38.3	40.1	38.3	37.6
1986	37.6	38.7	35.5	33.3	34.0	38.3	37.9	41.1	45.4	49.6	50.4	51.1
1987	57.4	56.7	55.3	62.4	64.9	67.0	67.4	70.6	71.3	69.5	69.5	68.1
1988	66.3	66.3	67.7	69.5	66.7	64.2	66.0	70.9	68.8	69.9	71.6	74.1
1989	69.5	58.5	55.7	52.8	48.9	39.0	40.1	41.8	34.4	38.3p	39.7p	—
	Over 12-month span											
1977	77.0	77.7	75.9	76.6	81.2	82.6	84.0	81.9	83.3	80.5	78.0	77.3
1978	75.2	77.7	76.2	77.0	77.0	77.0	75.2	70.6	70.9	65.6	69.1	64.9
1979	67.0	64.2	62.4	57.4	51.8	48.6	48.9	47.5	42.2	36.5	29.1	24.8
1980	20.6	22.3	23.8	25.2	23.0	22.3	21.3	22.7	23.8	30.5	45.7	59.6
1981	72.0	69.1	69.1	52.8	40.4	35.1	27.7	21.6	17.7	15.2	13.8	12.4
1982	12.1	12.4	9.2	11.3	8.2	9.9	13.5	14.2	15.2	21.6	25.5	33.7
1983	43.3	50.0	56.0	66.0	71.6	75.5	76.2	78.4	78.0	78.7	80.1	76.2
1984	77.0	72.3	68.1	66.0	62.4	61.0	57.8	54.6	50.4	44.0	40.1	33.7
1985	31.6	30.9	30.1	28.4	27.7	28.4	29.1	29.8	32.6	30.9	32.6	29.8
1986	30.9	30.1	34.8	34.8	36.2	39.0	38.3	39.7	42.9	46.1	48.6	50.0
1987	55.3	58.5	58.5	63.5	66.3	67.4	71.6	72.7	71.6	69.1	68.4	72.3
1988	73.8	70.2	70.9	71.6	72.0	69.9	70.9	69.1	71.6	70.2	69.9	67.0
1989	63.1	63.8	57.1	53.5	49.6	42.9	43.6p	42.6p	—	—	—	—

[1] Based on seasonally adjusted data for 1-, 3-, and 6-month spans and unadjusted data for the 12-month span. Data are centered within the span.

p = preliminary.

NOTE: Figures are the percent of industries with employment increasing plus one-half of the industries with unchanged employment, where 50 percent indicates an equal balance between industries with increasing and decreasing employment.

Establishment survey estimates are currently projected from March 1988 benchmark levels. When more recent benchmark data are introduced, all unadjusted data (beginning April 1988) and all seasonally adjusted data (beginning January 1985) are subject to revision.

the employment index, however, it must be remembered that one-half of the unchanged components are counted as increasing. A more precise interpretation is to consider the reference point for a diffusion index as 50 percent, the value which indicates that the same number of component industries have increased as have decreased. Index numbers above 50 show that more industries had increasing employment, and values below 50 show that more had decreasing employment. The margin between the percent that increased and the percent that decreased is equal to the difference between the index number and its complement, which is 100 minus the index. For example, an index of 65 percent means that 30 percent more industries had increasing employment than had decreasing employment [(65 − (100 − 65) = 30)].

For dispersion analysis, the direction and distance of the index number from the 50-percent reference point are the most significant observations, for they indicate whether growing or declining industries predominate and by what magnitude. For example, a diffusion index value of 75 percent in a given month would indicate that growing industries predominated, and by a much larger margin than an index of 55 percent suggests. Similarly, an index of 35 percent would indicate that declining industries predominated, and by a much larger margin than if the index were 45 percent.

Performance of the index

The old index values fall between the broader-based index and the new manufacturing index values, but are closer to the manufacturing index. As indicated earlier, this reflects the more detailed breakout of manufacturing than of nonmanufacturing industries in the old all-industry index. For simplification, the following discussion focuses on the two new indexes. The main emphasis of analysis of employment from the establishment survey is current over-the-month employment change. Therefore, the analysis concentrates on the 1-month span of the diffusion indexes.

Both the broad-based all-industry diffusion index and the manufacturing index show similar trends over time; they are lowest in recession years and climb most steeply during the early months of a recovery. (See chart 1.) There are some striking differences, however, in the magnitude of the trend swings. In assessing the performance of the all-industry versus the manufacturing diffusion index, the analysis can be divided into five distinct periods: 1977–82, 1983, 1984–first-quarter 1987, second-quarter 1987–1988, and 1989.

Prior to 1983, the all-industry index yielded generally higher values than the manufacturing index, the difference being especially pronounced during the recessions of the early 1980's. The manufacturing index is characterized by both lower peaks and deeper troughs than the broad-based index. This can be attributed both to the continuing growth in many of the service-producing industries and to the cyclical sensitivity of the manufacturing industries. It is well documented that, in terms of employment, the U.S. economy has gradually shifted over time from a goods-producing to a predominantly service-producing base. Even during the two recessions of the early 1980's, most of the service-producing industries posted steady employment gains. As a result, the all-industry index never fell below 36 and averaged 44. Conversely, the cyclically sensitive manufacturing industries suffered widespread and sustained job losses, as reflected by index values dipping as low as 23 and averaging 34 throughout the 1980 and 1981–82 recessionary periods.

It is interesting to note that the manufacturing index reflected a severe drop approximately 4 to 6 months prior to each of the two recessions, indicating possible leading indicator properties. The concept of leading indicators with respect to the diffusion indexes is addressed later in this article.

During 1983, at the beginning stage of the recovery, the two indexes tracked very closely, both rebounding sharply from the depressed levels encountered during the prior two recessions. In October 1983, the manufacturing index reached its peak level (70.9) and in some months was actually slightly above the broad-based index. This, while very uncommon, is probably attributable to the restoration over sev-

Table 3. **Composition of old and new diffusion indexes by industry division**

Industry division	Percent of employment, 1989 annual averages	Diffusion indexes			
		Old index		New index	
		Number of series	Percent of total series	Number of series	Percent of total series
Total private	100.0	185	100.0	349	100.0
Mining	.8	5	2.7	14	4.0
Construction	5.8	3	1.6	14	4.0
Manufacturing	21.6	136	73.5	141	40.4
Transportation and public utilities	6.3	9	4.9	31	8.9
Wholesale trade	6.9	2	1.1	18	5.2
Retail trade	21.5	8	4.3	41	11.7
Finance, insurance, and real estate	7.5	8	4.3	26	7.4
Services	29.6	14	7.6	64	18.3

Exhibit 2. Turning points in the reference cycle versus diffusion indexes, using the 1-month span

Business cycle		All-industry index			Manufacturing index		
Date	Turning point	Date	Turning point	Relation to reference cycle (in months)	Date	Turning point	Relation to reference cycle (in months)
January 1980	Peak	March 1978	Peak	led 22	—	—	—
July 1980	Trough	April 1980	Trough	led 3	May 1980	Trough	led 2
July 1981	Peak	April 1981	Peak	led 3	October 1980	Peak	led 9
November 1982	Trough	December 1981	Trough	led 11	December 1981	Trough	led 11
		February 1984	Peak	—	October 1983	Peak	—
		June 1986	Trough	—	April 1985	Trough	—
		January 1989	Peak	—	November 1987	Peak	—

eral months of many manufacturing jobs which were lost during the recessions of the early 1980's. Both indexes held at consistently high levels in the second half of 1983, as many industries continued to add workers to their previously shrunken payrolls. This marked a dramatic turnaround from the low levels experienced during the 1981–82 recession.

Beginning in 1984, well into the current economic expansion, the gap between the two indexes widened, with the all-industry index generally holding between 10 to 20 points above the manufacturing index through the first quarter of 1987. During this period, the all-industry index was always above the 50-percent level, while the manufacturing index was usually below this reference point.

The sharp declines in the manufacturing index in the second quarter of 1984 were a signal of the imminent manufacturing employment declines that originated in late 1984 and persisted throughout the next couple of years. Once again, the difference in the indexes reflects the widely dispersed growth in the service-producing industries as opposed to manufacturing, which experiences more-confined growth in good economic times.

From the second quarter of 1987 through the fourth quarter of 1988, the gap between the two indexes narrowed, with the difference usually in the 5- to 10-percentage-point range. The manufacturing index yielded values above the 50-percent level in every month but one. After establishing a postrecession employment trough in January 1987, many manufacturing industries have shown renewed strength. Indeed, job levels in some industries approached those recorded prior to the recessions of the early 1980's.

The employment diffusion indexes fell steadily through the first three quarters of 1989 before rebounding in the fourth quarter, and the difference between the two indexes is again growing. The all-industry index declined markedly during most of 1989, but, except for the September observation (47.9), the index remained above 50. Total private employment continued to increase, but at a slower rate. The declining diffusion index shows that the employment growth has been confined to fewer industries, underscoring the breadth of the slowing economy.

During the first three quarters of 1989, the manufacturing index declined even more sharply, from 62.4 in January 1989 to 34.8 in September, before increasing slightly in the fourth quarter. The September value is low by recovery period standards, and marks the first time since the prolonged manufacturing employment declines experienced throughout 1985 and 1986 that the index has fallen below 40. Since peaking in March 1989, manufacturing employment declined in every remaining month of 1989. This marks the first consecutive quarterly decline since the third and fourth quarters of 1986. Interestingly, the recent employment declines were prefaced by a sharp decrease in the manufacturing diffusion index beginning in February 1989, suggesting some leading aspects of the index. Moreover, the diffusion index was under 50 percent for each month in the second and third quarters, illustrating that the employment declines were widespread among manufacturing industries—more of the 141 manufacturing industries were losing jobs than were gaining.

Leading indicator properties

In addition to measuring the breadth of change, a second property often attributed to diffusion indexes is as leading indicators for changes in

aggregate levels.[6] Most economic changes, including those in employment levels, rarely occur as sudden, dramatic shifts. Instead, some industries will begin to experience increases (decreases) in employment well in advance of others. Theoretically then, over the short term, a diffusion index should lead changes in direction by the aggregate series. In other words, the number of industries increasing employment will maximize before the employment growth maximizes and a diffusion index thus will reach its peak (trough) well in advance of an employment peak (trough).

An employment diffusion index may also be regarded as a leading indicator for economy-wide trends, because business cycle turning points usually coincide closely with employment level turning points. If an employment diffusion index leads changes in employment level turning points, it follows that the index should lead changes in business cycle turning points.

The new diffusion indexes improve the potential for analysis of employment trends.

To examine leading indicator properties for the all-industry and manufacturing diffusion indexes, turning points for all spans (1, 3, 6, and 12 months) were identified through standard National Bureau of Economic Research (NBER) methodology.[7] The turning points for the two indexes for the 1-month span are measured against turning points for total private and manufacturing employment in exhibit 1.

In regard to total private employment level turning points, the all-industry index shows poor leading indicator qualities for the period researched (January 1977–present). As exhibit 1 illustrates, there are only two employment level turning points identified through standard NBER methodology, while there are seven turning points identified for the all-industry index, indicating a preponderance of false leads by the index.

The manufacturing index, however, reveals much stronger leading indicator qualities in regard to manufacturing employment levels. Standard NBER methodology identified seven manufacturing employment level turning points and six manufacturing diffusion index turning points for the period studied. The manufacturing index led all six corresponding employment turning points, with the leads ranging from 2 to 21 months; there was a mean lead of 12 months and a median lead of 11 months. Thus, the manufacturing diffusion index presents a strong case as a leading indicator for manufacturing employment levels.

Exhibit 2 compares identifiable turning points of the two indexes to the NBER official business cycle turning points (which define official recessionary periods) for January 1977 to the present. The all-industry index led all four NBER business cycle turning points (two peaks and two troughs), though not by a consistent amount; leads ranged from 3 to 22 months, resulting in a mean lead of 11 months and a median lead of 7 months. This index, however, identified two peaks and a trough subsequent to the last NBER-designated turning point in November 1982, thereby providing three false signals.

The manufacturing diffusion index performance is less effective in predicting business cycle turning points. In fact, this index rates rather poorly as a cyclically sensitive economy-wide indicator. It has no identifiable turning point to coincide with the January 1980 business cycle peak. Further, it designates three turning points subsequent to the NBER November 1982 trough, indicating a preponderance of false leads for the index. The three corresponding turning points tracked fairly closely, with leads of 2, 9, and 11 months, respectively; nevertheless, the number of false leads mitigates its usefulness as a leading indicator. While the manufacturing diffusion index performs well as a leading indicator for manufacturing employment levels, it is not as satisfactory an indicator of overall economy-wide trends.

Six-month span diffusion indexes sometimes prove to be the most cyclically sensitive and portray the best leading indicator properties. For example, in the Federal Reserve Board's diffusion index for industrial production, the 6-month span is cited as "generally showing more pronounced cyclical patterns when compared to indexes based on changes over shorter periods."[8] Some of this may be because longer spans remove the "noise" or distortions caused by erratic over-the-month changes and focus on the underlying trends. However, there is no conclusive evidence, based on the limited number of observations during the period studied, to support this theory for employment diffusion indexes. The 6-month span does demonstrate some characteristics of a leading indicator of reference and employment turning points, but there is no evidence that its leading indicator properties outperform the other spans.

Finally, as evidenced earlier, the BLS employment diffusion indexes function as summary indicators—assessing the overall state of the economy. The index number measures whether increasing or decreasing industries predominate, and to what extent. Further, while the indexes' leading indicator properties currently appear tenuous, there is evidence that the manufacturing diffusion index does lead movements in manufacturing employment levels. However, more time is needed to discern the usefulness of the indexes as leading indicators. □

Footnotes

[1] Patricia M. Getz, "Introduction of New Diffusion Indexes," *Employment and Earnings*, February 1989, pp. 7–8.

[2] Geoffrey Moore, "Occasional Paper 31" (Cambridge, MA, National Bureau of Economic Research, 1950).

[3] Geoffrey Moore, *Business Cycle Indicators*, vol. 1 (Princeton University Press, 1961).

[4] *Business Conditions Digest* is a monthly publication of the U.S. Department of Commerce, Bureau of Economic Analysis.

[5] John F. Early, "Introduction of Diffusion Indexes," *Employment and Earnings*, December 1974.

[6] Moore, *Business Cycle Indicators*.

[7] Gerherd Bry and Charlotte Boschan, *Cyclical Analysis of Time Series: Selected Procedures and Computer Programs* (National Bureau of Economic Research, Columbia University Press, 1971).

[8] See "Table 7. Industrial Production: Diffusion Indexes," *Federal Reserve Statistical Release*, Dec. 14, 1988.

A people-oriented corporate culture

Today's work place assumes a far greater role in the personal lives of workers than ever before. It is no longer possible for workers to leave their personal problems at home, as company cultures dictate—because someone is rarely home to solve them. The demands for a more supportive work environment come at a time when business must invest more in its people. According to several management experts, respect for human capital is the prescribed antidote to plunging productivity.

A more people-oriented corporate culture also may be a way to attract talented people in a time of labor shortages. Not only is there a shrinking labor pool, but it is becoming increasingly diverse—with more women and minorities than ever before. This new diversity challenges company recruitment efforts, benefits plans, productivity incentives, and work schedules that were designed primarily for male breadwinners. It is becoming obvious that the grease which kept the work force running smoothly in the industrial era may not keep the squeaks out of the human machinery of the post-industrial age. Management finds itself pushing the same old buttons, but no longer getting the desired responses from its workers. Without accommodations to family needs, some companies are losing their ability to attract and retain productive workers. These are only some of the reasons why family issues are becoming a bottom-line concern of business.

—Dana E. Friedman and Wendy B. Gray
"A Life Cycle Approach to
Family Benefits and Policies,"
Perspectives, No. 19 (The Conference Board,
Inc., 1989), p. 1.