Area labor market response to national unemployment patterns

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Unemployment varies widely among geographical areas in the United States. In 1980, the rate of joblessness ranged from a high of 8.2 percent in the North Central region of the country to a low of 6.4 percent in the South. (The unemployment rates in the two remaining major census regions—the Northeast and the West—were near the national rate of 7.1 percent.) The concern of policymakers with the sensitivity of regional labor markets to national economic conditions has generated a number of time series studies of the impact of national fluctuations in unemployment on regional jobless rates.[1]

Such studies measure regional sensitivity as the change in regional unemployment rates relative to the change in the national average rate. During recessionary periods, differences in regional sensitivities to national fluctuations imply that unemployment rates in some areas will rise faster than the national average. Thus, deflationary policy measures targeted at selected national economic aggregates may unintentionally impose a disproportionately large share of the recessionary burden on some regions. Conversely, during periods of national full employment, differences in sensitivities mean that some areas may experience far greater labor demand pressures, and consequent wage inflation, than others. Over the longer run, differences in the magnitude of changes in area rates relative to the national average may indicate growing structural imbalances (such as deterioration in the competitive position of industries in certain regions) of which the policymaker should be aware.

Heretofore, most research has focused only on short-run relationships among unemployment series. We undertook a study which used a time series model that distinctly characterized the sensitivity of regional unemployment to both short- and long-run fluctuations in national unemployment during 1967–80.[2] For our purposes, the short run is defined as that period within which business cycles occur. We used the National Bureau of Economic Research designation of the length of post-World-War II business cycles as a guide for defining the length of our cyclical component. Within our sample period, these cycles ranged in length from approximately 2 to 7 years. The long run refers to periods of more than 7 years.

Thus, we were able to explore several questions requiring the separation of short-run (business cycle) from long-run (secular) developments: Are there major geographical differences in the importance of short- and long-run cycles in unemployment? How do various regional and local labor markets differ in their sensitivity to fluctuations in national unemployment? And, are areas responsive to national business cycles also sensitive to secular changes in the national unemployment rate?

Subnational unemployment rate data were analyzed using a spectral approach, whereby each series was broken down into its component cycles and trends to determine which of these movements exerted the most influence on the original series. This method also permits the estimation of the sensitivity of the components of one series to the corresponding components of other series. For example, we can estimate the sensitivity of the components of regional unemployment to the corresponding components of the national unemployment rate series. Thus, we can assess not only the impact of aggregate national developments on regional labor markets but also the extent to which a region exhibits its own independent business cycle or secular movements. There has been longstanding argument as to whether independent area business cycles can exist in a highly interdependent economy such as ours.

Data and methodology

Our sample consisted of monthly unemployment data from the Current Population Survey (CPS) covering the period January 1967–June 1980 for census regions and divisions, and for the 15 most populous States. (See exhibit 1.) January 1967 is the earliest date for which such information is available for subnational areas.[3] Unemployment estimates for previous studies of data for earlier periods were based on counts of unemployment insurance benefit claimants, inflated to represent total unemployment for an area using the so-called "Handbook procedure." However, this technique is known to produce biased results, particularly for business cycle analyses.[4]

In our model, regional unemployment rates were broken down into four major components:[5] (1) a national cyclical component, which measures short-run fluctuations related to the national business cycle; (2) a regional cyclical component, reflecting short-run fluctuations that are independent of the national business cycle; (3) a national secular measure of long-run national trends; and (4) a regional secular component, which tracks long-run area developments that are independent of national trends.

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Regional differences in joblessness generally reflect both aggregate supply and demand considerations. Specifically, the long-run trend of output and employment in a particular region is primarily determined by supply, which is in turn governed by the growth of labor, capital, and technology. Short-run fluctuations, on the other hand, reflect the ups and downs in consumer and business demand or, in some instances, temporary capacity bottlenecks on the supply side.

Thus, we can roughly separate the forces that affect regional unemployment rates into: (1) those caused by changes in aggregate demand or by capacity constraints, which appear as short-run cycles in the regional unemployment rate series; and, (2) those that originate largely on the supply side of the labor market and are reflected as long-run trends. At the regional level, we can further distinguish between shifts in demand and supply that originate within and outside the region.

Exhibit 1. Regions and geographic divisions of the United States

Northeast
- New England
  - Connecticut
  - Maine
  - Massachusetts[1]
  - New Hampshire
  - Rhode Island
  - Vermont
- Middle Atlantic
  - New Jersey[1]
  - New York[1]
  - Pennsylvania[1]

North Central
- East North Central
  - Illinois[1]
  - Indiana[1]
  - Michigan[1]
  - Ohio[1]
  - Wisconsin[1]
- West North Central
  - Iowa
  - Kansas
  - Minnesota
  - Missouri[1]
  - Nebraska
  - North Dakota
  - South Dakota

South
- South Atlantic
  - Delaware
  - District of Columbia
  - Florida[1]
  - Georgia
  - Maryland
  - North Carolina[1]
  - South Carolina
  - Virginia[1]
  - West Virginia
- East South Central
  - Alabama
  - Kentucky
  - Mississippi
  - Tennessee
- West South Central
  - Arkansas
  - Louisiana
  - Oklahoma
  - Texas[1]

West
- Mountain
  - Arizona
  - Colorado
  - Idaho
  - Montana
  - Nevada
  - New Mexico
  - Utah
  - Wyoming

Pacific
- Alaska
- California[1]
- Hawaii
- Oregon
- Washington

[1]One of the 15 most populous States.

Links between unemployment series

During 1967–69, the first 3 years of the sample period, the national unemployment rate was slightly below 4 percent. It then rose sharply, reaching nearly 6 percent in 1971. Subsequently, joblessness remained between 4.5 and 6 percent until 1975, when it jumped to 9 percent. Thus, over the period studied, the national rate was characterized by a long upward movement, as well as by major short-run fluctuations. In fact, the 1967–80 period encompassed two complete business cycles, including the most severe contraction in the postwar era, and the first phase of a third cycle.

The secular rise in the national jobless series has prompted economists to continually revise upward their estimates of the national rate for "full employment." A number of labor supply factors have been offered as possible explanations for this rise, including demographic changes in the composition of the labor force, expanded income transfer programs, increases in the minimum wage, and growth in the number of multiworker families. The quantitative importance of these factors, however, remains to be established.[6]

Secular and cyclical forces. The relative importance of cyclical and secular movements in each area unemployment series is shown in table 1. Columns 1 and 4 provide the proportions of the total combined variation in national and regional unemployment due to secular and cyclical forces, respectively. The national series (columns 2 and 5) is given as a point of reference; its secular component accounts for 51 percent of the variation, compared to 40 percent for the cyclical component. This highlights the importance of the long-run trend in the national unemployment rate. The national pattern must, of course, be reflected in the regional unemployment rate series, because the former is a weighted average of the latter.

For all regions, 7 of the 9 divisions, and 11 of the 15 States, the secular component contributes more to variance than the cyclical component. However, there is considerable difference among areas in the relative size of the secular component, which ranges from a high of 57 percent in the Middle Atlantic division to a low of 37 percent in the Mountain and East South Central sections. The range for the 15 largest States is slightly wider, from 58 percent for New York to 33 percent for Indiana.

While generally smaller than the secular component, the cyclical component nevertheless accounts for a sub-

Table 1. Variance decomposition of unemployment rates by area, 1967–80

Area	Percent of variance accounted for by [1]						
	Secular component [2]			Cyclical component [2]			Seasonal component
	Total (1)	National (2)	Regional (3)	Total (4)	National (5)	Regional (6)	(7)
United States	51	51		40	40		2
Northeast	57	57	0	38	37	1	2
New England	56	50	6	38	35	3	2
Massachusetts	57	52	5	36	33	4	2
Middle Atlantic	57	56	2	38	36	2	2
New Jersey	57	55	1	37	34	3	2
New York	58	56	1	39	36	3	1
Pennsylvania	52	48	4	38	35	3	4
North Central	42	41	1	41	39	2	6
East North Central	41	40	1	42	40	2	6
Illinois	44	41	3	38	34	4	6
Indiana	33	28	5	45	35	10	6
Michigan	38	37	2	42	39	3	6
Ohio	38	37	1	43	41	3	6
Wisconsin	40	40	1	34	32	2	8
West North Central	40	39	1	34	31	3	11
Missouri	41	40	1	32	28	4	9
South	48	47	2	38	37	2	6
South Atlantic	53	50	3	38	35	3	4
Florida	55	52	3	39	34	5	2
North Carolina	34	29	5	44	35	9	8
Virginia	47	42	6	31	26	5	8
East South Central	37	32	5	38	33	5	10
West South Central	39	37	1	35	33	2	12
Texas	40	38	1	36	32	3	9
West	47	40	7	41	35	6	5
Mountain	37	35	2	36	31	5	12
Pacific	49	40	9	41	35	7	4
California	49	40	9	41	34	8	4

[1] The percentages for the secular, cyclical, and seasonal components of a series do not add to 100 because there is other variation (principally random) not accounted for.
[2] The national and regional subcomponents may not add to the total because of rounding.

stantial portion of the variance. In fact, cyclical variation in joblessness in the East North Central division and 3 of its 5 States—Indiana, Michigan, and Ohio—was even greater than the secular variation. This was also the case for North Carolina. Cyclical variation as a percent of the total was smallest for Virginia and Missouri.

Table 1 also indicates the relatively minor contribution of independent regional cycles to total variance.[7] Column 6 provides the portion of the variance accounted for by the independent cyclical component of regional unemployment. In three States—Indiana, North Carolina, and California—this component was 8 to 10 percent of the total variance in the unemployment rate series, accounting for more variation than the seasonal movements (column 7). In the remaining 12 States, the regional cyclical component was 5 percent or less of the variance. Clearly, national fluctuations account for most of regional cyclical unemployment patterns.

On the other hand, there is evidence that distinct regional business cycles, although relatively small, do exist. Some have asked how such cycles could develop. In a highly interdependent economy such as ours, one might expect economic impluses to be diffused rapidly, and that there would thus be strong conformity between regional and national business cycles. But, in fact, these cycles may be normal by-products of a dynamic economy.

For example, it has been established that random events in time series can generate wavelike movements with business cycle properties.[8] At the regional level, unexpected changes in relative demands for goods and services become shocks to the labor market, the effects of which tend to persist because the supply of labor adjusts slowly to new conditions. However, these random disturbances tend to cancel out in the aggregate. That is, shocks in one region tend to be offset by countershocks in other regions. For example, assume there is a country with an area whose economy depends upon the production of slide rules, while in another area of the same country a new industry develops that produces pocket calculators. Suddenly, the demand for slide rules falls and that for pocket calculators rises. It is entirely possible that, at the national level, these changes would be offsetting. But because it takes time for an area to switch production emphasis (either to producing more or less), local business cycles may persist for a while, independent of national movements. Only when such shocks accumulate in one direction are national business cycles generated.

Of course, this also implies that the larger the regional economy, the less important will be independent regional business cycles, because internal shocks tend to average out. This hypothesis is supported by our observation that the smaller the area, the larger the independent regional cyclical component—3 percent for census regions, 4 percent for census divisions, and 5 percent for the 15 States.

The independent secular component of regional unemployment (column 3 in table 1) is relatively weak. And, on average, independent long-run regional fluctuations account for only 3 percent of the total variation in the State unemployment rates. California, at 9 percent, is the one notable exception; Virginia followed at 6 percent. Based on these statistics, it would appear that area labor markets conform to long-run national developments, rather than manifesting their own distinctive secular trends.

Sensitivity of regional to national unemployment. Our technique also provides estimates of the sensitivity of the components of regional unemployment to corresponding components in the national series.[9] These estimates are presented in table 2. The larger the index value, the greater is the amplitude of the national component in the regional unemployment rate series. For a secular index value greater than 1, this implies a tendency for a region's unemployment rate to rise above that of the Nation during a long-run upswing in the national

rate and to remain there for an extended period. This was the case for the jobless pattern in the Northeast, which was very sensitive to the national unemployment rate trend. In the other three census regions, the index was less than 1, indicating a tendency for the long-run rise in the regional rate to be less than that in the national rate.

Of the nine census divisions, the Middle Atlantic and New England States were the most sensitive to long-run national patterns. The South Atlantic and East North Central divisions have index values very close to 1, indicating that the amplitude of the secular component of their unemployment rates was roughly the same as that of the corresponding national component. Among the 15 largest States, Massachusetts and New Jersey were the most sensitive, as were the divisions in which they are located. On the other hand, jobless patterns in Florida and Michigan were somewhat unique in that they were much more sensitive to the national rate than were their divisions. Texas and the West South Central area ranked by far the lowest in degree of sensitivity to the national rate.

Turning to the cyclical component (column 2, table 2), the jobless pattern in the Northeast was the most sensitive to national business cycles, while those of the South and the West were least sensitive. The North Central index value, which is close to 1, suggests that national business cycles tend to be transmitted to this region with unchanged amplitude. However, this essentially results from the counterbalancing unemployment relationship between its two divisions: Jobless patterns in the East North Central division were very sensitive to national business cycles, while those in the West North Central division were not.

There is a broad range of sensitivity to the national business cycle in the jobless patterns of the 15 largest States; indexes ranged from a high of 1.66 in Michigan to a low of 0.54 in Texas. Index values dropped off rapidly, with Massachusetts and New Jersey following Michigan. At the lower end of the sensitivity spectrum, Virginia was the only State relatively close to Texas.

Generally, if an area was sensitive to national secular patterns, it was also sensitive to national business cycles. Indiana was the only clear-cut exception, being responsive only to national secular developments.

Table 2. Amplitude of national secular and cyclical components in area jobless series, and mean unemployment rate, 1967–80

Area	Index value		Mean unemployment rate (3)
	Secular (1)	Cyclical (2)	
United States	1.00	1.00	5.7
Northeast	1.50	1.38	6.2
New England	1.50	1.42	6.0
Massachusetts	1.73	1.56	6.2
Middle Atlantic	1.50	1.37	6.2
New Jersey	1.72	1.53	6.9
New York	1.63	1.48	6.5
Pennsylvania	1.15	1.11	5.8
North Central	.87	.99	5.2
East North Central	.99	1.15	5.7
Illinois	.89	.93	5.0
Indiana	.84	1.17	5.4
Michigan	1.35	1.66	7.9
Ohio	.93	1.15	5.7
Wisconsin	.81	.83	4.5
West North Central	.60	.61	4.0
Missouri	.83	.79	4.6
South	.81	.82	5.2
South Atlantic	1.04	.99	5.2
Florida	1.50	1.37	5.9
North Carolina	.72	.98	4.9
Virginia	.76	.68	4.4
East South Central	.66	.81	5.4
West South Central	.53	.57	4.9
Texas	.52	.54	4.5
West	.79	.84	6.8
Mountain	.60	.65	5.6
Pacific	.86	.91	7.2
California	.86	.90	7.2

Interpretation of results

There is no unified theory of the determinants of a region's response to national cycles and trends. Differences in industry mix, local multiplier effects (propensities of residents to spend their income outside their home region), competitive market strengths, layoff policies,[10] unemployment insurance benefit levels,[11] labor force composition, growth,[12] and inflationary impacts[13] have all been cited as likely causes of the variance in regional jobless patterns.

Our findings indicate that the unemployment patterns in the New England and Middle Atlantic divisions and selected States in the East North Central division were affected more strongly than those in other areas by national economic trends over the period under study. Most States in these divisions tend to be highly sensitive to both short- and long-run national developments. These divisions comprise what geographers call the "manufacturing belt"—an area characterized by cyclically sensitive durable goods industries. For example, Michigan, which is dominated by the automobile industry, exhibited the highest cyclical sensitivity among the States studied.

At the same time, long-run structural factors may have resulted in a deterioration in the competitive position of the manufacturing belt, in which most of the older central cities are located. Aging capital and rising energy prices appear to have rendered these areas less viable for manufacturing.

In contrast, California was neither cycle- nor secular-sensitive, exhibiting the most independence from national patterns. In fact, there was some evidence that California may have a cycle of its own.

With few exceptions, independent regional cycles, although in evidence, contributed very little to regional fluctuations. And systematic leads or lags in regional unemployment rates relative to the national rate could

not be detected. Apparently, national aggregate supply and demand disturbances are quickly transmitted throughout the economy, and both short- and long-run changes in regional labor market conditions conform closely to national developments. Regions do differ, however, in the degree of their sensitivity to changing national conditions. But generally, areas that are responsive to national secular trends are also sensitive to national business cycles. □

FOOTNOTES

[1] Frank Brechling's "Trends and Cycles in British Regional Unemployment," *Oxford Economic Papers*, March 1967, pp. 1–22, is foremost among these studies. A number of European and Canadian studies followed Brechling's approach; see, for example, C.P. Harris and A.P. Thirwall, "Interregional Variations in Cyclical Sensitivity to Unemployment in the UK 1949–1964," *Bulletin Oxford University Institute of Economics and Statistics*, February 1968, pp. 55–56; J.J. Van Duijn, "The Cyclical Sensitivity to Unemployment of Dutch Provinces," *Regional Science and Urban Economics*, May 1975, pp. 107–32; and L.J. King and G.L. Clark, "Regional Unemployment Patterns and the Spatial Dimensions of Macro-Economic Policy: The Canadian Experience 1966–1975," *Regional Studies*, 1978, pp. 283–96. Similar U.S. studies include Robert M. Fearn, "Cyclical, Seasonal, and Structural Factors in Area Unemployment Rates," *Industrial and Labor Relations Review*, April 1975, pp. 424–31, and Thomas Hyclak and David Lynch, "An Empirical Analysis of State Unemployment Rates in the 1970's," *Journal of Regional Science*, No. 3, 1980, pp. 377–86.

[2] Richard B. Tiller and Robert W. Bednarzik, "A Detailed Analysis of Regional and State Unemployment Patterns in the U.S.: 1967–1980," unpublished paper presented at the Atlantic Economic Society meetings, October 1981.

[3] During the first 3 years of our sample period, the national unemployment rate, while lower than for earlier years in the decade, was near full employment (4 percent). In subsequent years, the unemployment rate at full employment was redefined substantially upward. Thus, although our sample starts at a somewhat lower than average national jobless rate, the distortion effects on our estimate of the secular component of unemployment rates should be small.

[4] See Richard Tiller, "An Exploratory Time Series Analysis of Errors in Area Estimates of Unemployment," *Proceedings of the Business and Economic Statistics Section of The American Statistical Association*, 1979, pp. 165–69, for more detail.

[5] This is done using spectral analysis, which is a time series analysis technique in the frequency domain whereby a series is decomposed into uncorrelated (random) components according to frequencies. "Frequency" simply refers to the fraction of a cycle completed in a given period. The spectrum at a particular frequency represents the contribution of that frequency to the total variation of the series. This method of analysis is quite general in that it does not require strong assumptions concerning the properties of the series being decomposed. A more complete description of the procedures used to develop the discussion in this article is available from the authors upon request.

[6] See, for example, Paul O. Flaim, "The effect of demographic changes on the Nation's jobless rate," *Monthly Labor Review*, March 1979, pp. 13–23, and Joseph Antos and others, "What is the current equivalent to unemployment rates of the past?" *Monthly Labor Review*, March 1979, pp. 36–46. Some economists argue that the long-run rate of unemployment will fall because the birth cohorts of the baby boom are now moving into age groups characterized by more stable work experience; in this regard, see Michael L. Wachter, "The Demographic Impact on Unemployment: Past Experience and the Outlook for the Future," in *Demographic Trends and Full Employment* (Washington, National Commission for Manpower Policy, 1976), pp. 27–98. Some of our preliminary analysis tends to lend evidence for the view that the long-run rate may be falling. When business cycle frequencies were eliminated from the national and regional unemployment series, a clearly visible long-run cycle was left that appears to have peaked in most series in 1975.

[7] The spectral decomposition of a series is analogous to an analysis of variance problem. The importance of each component of the series can be assessed in terms of its contribution to the total variance of the series. A measure of the proportion of variance in Ur(f) (fth frequency component of regional series) not accounted for by UR(f) (fth frequency component in national series) is equal to 1-[Var V(f)/Var Ur(f)], where Var V(f) is equal to the variance of the residual component of Ur(f) and Var Ur(f) is equal to the variance of the fth frequency component of regional unemployment.

[8] J. H. McCulloch, "The Monte Carlo Cycle in Business Activity," *Economic Inquiry*, September 1975, pp. 303–21.

[9] This results from an extension of spectral analysis to the bivariate, called cross-spectral analysis. Specifically, a gain statistic (which compares the amplitude of the regional jobless series to that of the national series) is generated and, as such, is similar to a regression slope coefficient.

[10] Lynn E. Browne, "Regional Industry Mix and the Business Cycle," *New England Economic Review*, November-December 1978, pp. 35–53.

[11] John Barron and Wesley Mellow, "Interstate Differences in Unemployment Insurance," *National Tax Journal*, April 1981, pp. 105–14.

[12] Philip L. Rones, "Moving to the sun: regional job growth, 1968 to 1978," *Monthly Labor Review*, March 1980, pp. 12–19.

[13] Benjamin H. Stevens and Glynnis A. Trainer, "Differential Regional Impacts of Inflation with Special Reference to Recent Experience in the Northeastern U.S.," in P.B. Carbin and M. Sabrin, eds., *American Geographical Society's First Symposium on Geographical Aspects of Inflationary Processes, Part Two* (Pleasantville, N.Y., Redgrave Publishing Co., 1976), pp. 54–65.

Occupational deaths declined in 1980, BLS survey finds

Bureau of Labor Statistics survey results show that 4,400 work-connected deaths occurred during 1980 in private sector workplaces employing 11 workers or more.[1] (See table 1.) This was 11 percent less than the 4,950 deaths in 1979. The corresponding fatality rate per 100,000 employees dropped from 8.6 in 1979 to 7.7 in 1980.[2]

Employers participating in the Bureau's Annual Survey of Occupational Injuries and Illnesses were asked to supply specific information about all deaths caused by hazards in the work environment, that is, the object or event most closely associated with the circumstances of the fatality. Fatality percentage estimates by cause have been calculated for both the 1979 and 1980 surveys combined rather than for each year separately, as large sampling errors at the industry division level preclude precise comparisons based on year-to-year changes. Some key survey results:

- Thirty percent of all occupational fatalities were associated with the operation of over-the-road motor vehicles. (See table 2.)

Table 1. Occupational injury and illness fatalities and employment for employers with 11 employees or more by industry, 1979 and 1980

Industry	Annual average employment[1]				Fatalities			
	1979		1980		1979		1980	
	Number (thousands)	Percent	Number (thousands)	Percent	Number	Percent	Number	Percent
Private sector	61,660	100	61,677	100	4,950	100	4,400	100
Agriculture, forestry, and fishing	876	1	943	2	110	2	140	3
Mining	890	1	944	2	490	10	460	10
Construction	3,138	5	3,141	5	960	19	830	19
Manufacturing	20,325	33	19,630	32	1,100	22	1,080	25
Transportation and public utilities	4,637	8	4,665	8	915	19	810	18
Wholesale and retail trade	14,938	24	14,474	23	930	19	580	13
Finance, insurance, and real estate	3,905	6	4,078	7	85	2	150	3
Services	12,951	21	13,802	22	360	7	350	8

[1] Annual average employment for nonagricultural industries is based on the employment and earnings survey conducted by BLS, in cooperation with State agencies. The employment estimate for the services division is adjusted to exclude the nonfarm portion of agricultural services and nonclassifiable establishments. The employment estimates have been adjusted based on County Business Patterns to exclude establishments with fewer than 11 employees. Annual average employment for the agriculture, forestry, and fishing division is a composite of data from State unemployment insurance programs and estimates of hired farmworkers engaged in agricultural production provided by the Department of Agriculture. The agricultural production employment estimate as originally published by the Department of Agriculture is adjusted to exclude employment on farms with fewer than 11 employees.

NOTE: Because of rounding, components may not add to totals.

- Deaths from heart attacks (11 percent) accounted for about 1 of 9 cases.
- Industrial vehicles or equipment were linked to 10 percent of the deaths, and falls accounted for 9 percent.
- The remaining 40 percent of the deaths were largely caused by electrocutions (8 percent), aircraft crashes (5 percent), objects other than vehicles or equipment striking workers (5 percent), or gun shots (4 percent).
- Heart attack cases were concentrated about equally in manufacturing and trade industries at approximately 20 percent of the total. (See table 3.)

Falls continued to take a heavy toll in the construction industry (48 percent of deaths) as do cases where employees are caught in, under, or between objects other than vehicles or equipment (47 percent).

The 4,400 work injury and illness fatalities in 1980 for units with 11 employees or more represent all deaths reported resulting from an occupational injury or illness that occurred in 1980, regardless of the length of time between the injury and death or the length of the illness resulting in death. Of these, about 500 were related to illness.

Slight decreases in employment and fatalities oc-

Table 2. Causes of fatalities resulting from occupational injury and illness in 1979 and 1980[1] in units with 11 employees or more, private sector, by industry, distribution by industry

[In percent]

Cause[2]	Total[3]	Agriculture, forestry, and fishing	Mining oil and gas extraction only	Construction	Manufacturing	Transportation and public utilities[4]	Wholesale and retail trade	Finance, insurance, and real estate	Services
Total	100	100	100	100	100	100	100	100	100
Over-the-road motor vehicles	30	28	21	16	18	46	48	53	29
Heart attacks	11	15	10	9	9	9	14	24	16
Industrial vehicles or equipment	10	20	20	15	12	5	2	4	8
Falls	9	4	9	22	9	4	2	5	8
Electrocutions	8	5	15	12	6	9	3	1	9
Aircraft crashes	5	6	10	1	4	11	4	11	3
Struck by objects other than vehicles or equipment	5	8	5	8	8	4	2	1	1
Plant machinery operations	4	2	1	1	12	1	2	0	2
Gun shots	4	1	0	(5)	1	3	17	1	6
Caught in, under, or between objects other than vehicles or equipment	3	1	1	6	4	1	1	0	(5)
Fires	3	5	2	1	6	2	2	0	2
Explosions	2	2	2	3	4	1	1	0	(5)
Gas inhalations	2	2	1	2	4	1	(5)	0	1
All other	4	2	4	3	4	4	3	1	16

[1] It is impossible to estimate year-to-year changes precisely because at the industry division level sampling errors are large. Therefore, the results are for both years rather than a comparison between them.

[2] Cause is defined as the object or event associated with the fatality.

[3] Excludes coal, metal and nonmetal mining, and railroads for which data are not available.

[4] Excludes railroads.

[5] Less than 1 percent.

NOTE: Because of rounding, percentages may not add to 100.

Table 3. Causes of fatalities resulting from occupational injury and illness in 1971 and 1980[1] in units with 11 employees or more, private sector, by industry, distribution by cause

[In percent]

Cause[2]	Total[3]	Agriculture, forestry, and fishing	Mining oil and gas extraction only	Construction	Manufacturing	Transportation and public utilities[4]	Wholesale and retail trade	Finance insurance and real estate	Services
Over-the-road motor vehicles	100	3	4	11	16	28	26	5	7
Heart attacks	100	4	5	17	22	15	21	6	11
Industrial vehicles or equipment	100	6	11	30	33	9	4	1	6
Falls	100	1	6	48	27	7	3	2	7
Electrocutions	100	2	11	30	22	20	7	([5])	9
Aircraft crashes	100	4	11	5	19	40	11	6	5
Struck by objects other than vehicles or equipment	100	5	6	28	40	13	8	([5])	1
Plant machinery operations	100	1	1	6	79	2	8	0	3
Gun shots	100	([5])	0	1	7	11	70	1	11
Caught in, under, or between objects other than vehicles or equipment	100	1	2	47	40	5	5	0	1
Fires	100	5	5	6	56	13	11	0	5
Explosions	100	2	4	28	47	12	7	0	1
Gas inhalation	100	3	2	22	59	7	3	0	5
All other	100	2	5	12	24	16	12	1	29

[1] It is impossible to estimate year-to-year changes precisely because at the industry division level sampling errors are large. Therefore, the results are for both years rather than a comparison between them.

[2] Cause is defined as the object or event associated with the fatality.

[3] Excludes coal, metal and nonmetal mining, and railroads for which data are not available.

[4] Excludes railroads.

[5] Less than 1 percent.

NOTE: Because of rounding, percentages may not add to 100.

curred in manufacturing industries during 1979 and 1980. (See table 1). Construction employment remained constant in 1980 at 5 percent of the total as did the percentage of deaths at 19 percent; however, the number of fatalities decreased 14 percent. Another industry which showed a substantial decrease in deaths was wholesale and retail trade, which dropped 38 percent, while employment declined only slightly. Agriculture, forestry, and fishing; mining; and the services industries recorded some increases in employment and relatively minor fluctuations in their proportion of fatalities.

Industry characteristics

The following is a summary by industry of the objects or events associated with fatalities.

Agriculture, forestry, and fishing. Almost half of all deaths in this industry involved vehicles—28 percent highway cars and trucks and 20 percent industrial types of vehicles or equipment such as tractors, logging equipment, and so forth. Heart attacks accounted for 15 percent and the worker being struck by objects, such as falling trees, for 8 percent.

Mining—oil and gas extraction only. Over-the-road and industrial vehicles were traced to more than 2 of 5 deaths in this section of the mining industry. Electrocutions were the cause of 15 percent of the fatalities and heart attacks, for 10 percent.

Construction. Falls continue to be the major cause of death in the construction industry—22 percent of all cases. Vehicles, both highway and industrial, were charged with almost one-third of the deaths; electrocutions accounted for 12 percent, and heart attacks, 9 percent.

Manufacturing. Vehicles (industrial and highway) were blamed for 30 percent of the deaths, and the operation of plant machinery resulted in 12 percent.

Transportation and public utilities. As in past years, highway motor vehicle accidents were connected with close to one-half of all occupational deaths and aircraft, for 11 percent. Heart attacks were responsible for an additional 9 percent, as were electrocutions primarily in the public utilities.

Wholesale and retail trade. Of all deaths caused by gun shot, 7 of 10 were in this industry. However, 48 percent of the deaths were because of car and truck accidents and 14 percent were traceable to heart attacks.

Finance, insurance, and real estate. Over three-fourths of all fatalities in this industry were attributed to motor vehicles (53 percent) and heart attacks (24 percent). Eleven percent were caused by aircraft crashes.

Services. Following the same pattern as other industries, almost one-third of the fatalities that occurred were connected with over-the-road motor vehicles, while heart attacks made up 16 percent. However, 16 percent of deaths in this industry were caused by objects or events not specified in the tables. These come under "all other" causes and include, for example, contact with toxic substances, drowning, and freezing or extreme cold among the many other causes of occupational death.

Background of survey

The Occupational Injuries and Illnesses Survey is a Federal and State program in which reports are received and processed by State agencies participating with BLS. The occupational fatality data reported through the annual survey are based on the records which employers maintain under the Occupational Safety and Health Act of 1970. Excluded from coverage under the act are working conditions which come under other Federal safety and health laws.

The survey covers units in private industries. Excluded are the self-employed; farmers with fewer than 11 employees; private households; and employees in Federal, State, and local government agencies. In a separate reporting system, agencies of the Federal Government are filing reports comparable with those of private industry with the Secretary of Labor.

The 1980 survey, to which a response was mandatory, involved a sample of 220,000 units with 11 employees or more. Estimates based on a sample may differ from figures that would have been obtained had a complete census of establishments been possible using the same schedules and procedures. A relative standard error is calculated for the estimates generated from the Annual Survey of Occupational Injuries and Illnesses. □

FOOTNOTES

[1] Since 1977, the fatality data have been published only for units with 11 employees or more because the reductions of the survey samples affected primarily employers with fewer than 11 employees. The reductions were in response to Presidential directives on reducing the paperwork burden of employers selected to participate in statistical surveys. Data for occupational fatalities in coal, metal, and nonmetal mining and railroads were provided by the Mine Safety and Health Administration of the U.S. Department of Labor and by the Federal Railroad Administration of the U.S. Department of Transportation; however, data were not provided on the objects or events which resulted in on-the-job deaths for these industrial activities.

[2] The change may be attributed to sampling error.

A note on communications

The *Monthly Labor Review* welcomes communications that supplement, challenge, or expand on research published in its pages. To be considered for publication, communications should be factual and analytical, not polemical in tone. Communications should be addressed to the Editor-in-Chief, *Monthly Labor Review,* Bureau of Labor Statistics, U.S. Department of Labor, Washington, D.C. 20212.