

Introducing new weights for the Employment Cost Index

Beginning in June 1986, ECI estimates will reflect employment counts from the 1980 census; while the change also involves some redefinition of occupational groups, disruptions to the historical series are expected to be slight

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The Employment Cost Index (ECI), an employment-weighted Laspeyres index, is a measure of change over time in the cost of employing a fixed set of labor inputs. The weights currently used are employment counts by industry and occupation from the 1970 Census of Population. The weights of most Laspeyres indexes are periodically updated, and the ECI is no exception. Beginning in June 1986, the ECI will be calculated using employment weights from the 1980 census.

This article reviews the ECI and its purposes, explains why the 1970 employment weights are to be replaced with 1980 weights, and discusses how the change in weights will affect what the index is measuring.

The ECI and its uses

The ECI was developed in the early 1970's to meet the needs of economic analysts and policymakers who required a conceptually sound measure of the change in the cost of labor as a factor of production.¹ The ECI was designed:

- To be a timely and comprehensive measure covering all elements of employee compensation (wages, salaries, and benefit costs) and all employees in the U.S. civilian economy;
- To be a fixed-weight index free from the influence of employment shifts among occupations, industries, and

establishments with different wage and compensation levels;

- To include internally consistent subseries (for example, occupational and industry groups) that describe the forces contributing to aggregate wage and compensation change.

At the time that the ECI was developed, a number of series prepared by the Bureau provided information on wage or compensation levels or changes, but none had all of the features desired for an economy-wide measure of wage and compensation change. Thus, analysts and policymakers of that inflationary period had to deal with wage and price increases without an adequate measure of labor cost change.²

The ECI is a quarterly series that relates to payroll periods including the 12th of March, June, September, and December. ECI estimates, first published for the period September–December 1975, initially covered only wage and salary change for the private nonfarm economy. Changes for broad occupational and industrial groups, as well as changes by union status, geographic region, and area size were also presented. In 1980, rates of compensation change were published for the private nonfarm economy and for a selected number of subindexes. In 1981, wage and compensation indexes for State and local governments were added, as well as indexes for the combined private nonfarm and State and local government work force. A comprehensive list of the ECI subindexes currently published is presented in tables 33–35 of the Current Labor Statistics section of this issue.

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The ECI will continue to expand in the future. The number of indexes available for the service-producing industries will increase over the next 5 years, as part of a government-wide initiative to develop more information on this growing sector of the economy. In 1985, quarterly rates of wage and salary and compensation change for the following industry groups will be published for the first time:

Civilian nonfederal workers:

Health services

Private industry workers:

Transportation and public utilities*

Transportation

Public utilities

Wholesale and retail trade*

Finance, insurance, and real estate*

Service industries*

Health services

State and local government workers:

Health services

*Wage and salary indexes are currently published.

As envisioned by its developers, the ECI is today used in analysis of inflation, in determining monetary policy, and in other studies requiring measures of change in labor cost. The index serves administrative purposes as well, because its clear definition and firm foundation in economic theory make it a valuable tool for such functions as adjusting the labor cost portion of long-term contracts or adjusting wage and compensation rates between labor negotiations.

As more detail for service-sector industries becomes available over the next few years, the ECI can be used to examine issues such as the impact of deregulation on compensation change. Relationships between government subsidies to industries such as health care and education and changes in compensation cost also can be studied.

Introducing the new weights

Fixed weights in the ECI. The ECI measures the change in cost of employing a fixed set of labor inputs by applying fixed employment weights at the level of the occupation within an industry. The industry structure of the ECI is based on the 1972 Standard Industrial Classification (SIC) system, as defined by the U.S. Office of Management and Budget. For the ECI, most industry categories for the private industry sector are specified at the 2-digit SIC level, such as textile manufacturing or personal services. The industry categories for State and local governments vary from specific 3-digit SIC's, such as elementary and secondary schools, to broader major industry divisions, such as public administration.

The current occupational categories for the ECI are based on the structure developed for the 1970 census. This structure defined 442 detailed jobs within 12 major occupational groups. The scope of the ECI is restricted to 414 of those jobs in 9 major groups. Within each industry, the ECI occupational categories may range in detail from one specific census occupation to all occupations in a major group. A sampling procedure is used in each establishment to select

a specific job to represent each occupational category defined for the industry. It is for those specific jobs that wage and benefit information is collected in the initial visit to the establishment and updated each quarter. The fixed employment weights, however, apply to the occupational category which the specific jobs represent.

Reasons for reweighting. ECI measures are used in essentially three different types of analysis:

- Measurement of the total change in labor cost from the base period to any subsequent period;
- Comparisons of changes in labor costs over different sub-periods (for example, comparison of the change between December 1983 and December 1984 with that between December 1982 and December 1983);
- Measurement of the current rate of labor cost increase.

No single index can be ideal for all three types of analysis. Specifically, an index that is appropriate for analysis of long-run change will not be the best for measuring the current rate of labor cost increases, and vice versa.³

If the ECI were used only to measure the long-run change in labor costs, the weights would seldom need to be updated. Similarly, the value of the ECI in comparing changes in labor costs over different subperiods depends on holding the weights fixed for extended periods. The unchanging weights are necessary in these cases to ensure that the same set of labor inputs is being priced over time.

In contrast, if the ECI is to be used to measure the recent rate of labor cost increases, the weights should be as current as possible. With current weights, the index of labor cost would measure the change between December 1984 and March 1985 in the cost of purchasing the set of labor inputs employed in December 1984. The index with current weights differs from the existing ECI Laspeyres index which would estimate current labor cost increases as the change between December 1984 and March 1985 in the cost of purchasing the set of labor inputs employed at the time of the 1970 census. In general, the accuracy of a Laspeyres index as a measure of current labor cost change varies inversely with the magnitude of shifts in employment among industries and occupations since the reference period of the employment counts.

If the ECI's employment weights were changed every quarter to improve the measurement of current rates of labor cost increases, it would be possible to derive a type of Laspeyres index by multiplying together quarter-to-quarter changes (expressed as ratios).⁴ Such a "chain" index would provide a better estimate than the present ECI of the rate of labor cost increase for each quarter. The chain index would not, however, provide the change in the cost of a fixed set of workers for periods longer than one quarter, and changes for different subperiods would not be for the same set of labor inputs.

The ECI is a compromise between a pure Laspeyres index

and an index that uses new weights each quarter—that is, the ECI's weights are changed periodically, after remaining fixed for a number of years. Because the ECI's employment weights remain fixed for long periods, there arises the possibility that the index could lose its value as a measure of current change.

Fortunately, a number of price index studies have shown that the period-to-period change in a fixed-weight Laspeyres index is relatively insensitive to the weights used, when the weights vary within the range common to many economic variables. The quarter-to-quarter changes calculated using a Laspeyres index are apt to be quite close to the quarter-to-quarter changes using the previous quarter's employment weights.⁵

For this reason, the ECI has employed one set of weights for a number of years. This preserves the analytical value of the Laspeyres index as a measure of change in labor costs over the long run and over different subperiods. Empirical evidence presented below suggests that the age of the weights has not seriously affected the accuracy of the index as a measure of current rates of change.

As the weights become older, however, the danger grows that current rates of change using the fixed weights could differ from those based on more recent weights by an amount great enough to be important in economic analysis. To ensure that the ECI will continue to provide a good approximation of the current rate of labor cost increase, more recent weights are introduced.

Consequences of reweighting

Aggregate index. The new weights alter what the ECI is measuring when comparisons are made between estimates based on different sets of employment weights. That is, any change calculated by dividing an ECI index number based on new weights by an index number using earlier weights is not a proper Laspeyres estimate. Reweighting improves the currency of the index, but disrupts historical continuity.

The meaning of a reweighted index as a measure of change can best be explained by a brief example of how the reweighted ECI will be linked to the old index. Assume that in March 1986 the ECI using weights from the 1970 census has a value of 133.0 (June 1981 = 100). Also assume that between March and June 1986 the ECI rises 2 percent, based on weights from the 1980 census. The June 1986 index would be computed as $133.0 \times 1.02 = 135.7$, the product of the March 1986 index value, based on 1970 weights, and the relative increase in labor cost from March 1986 to June 1986, based on 1980 weights.

Thus, the relative difference in the index level between any two periods before March 1986 is the change in the cost of employing the 1970 work force. For any two periods after March 1986, the relative difference will be the change in the cost of employing the 1980 work force. But as indicated earlier, the ratio of an index for a period after March

Exhibit 1. Census Major Occupational Groups, 1970 and 1980

1970	1980
Managers and administrators	Executive, administrative, and managerial occupations
Professional and technical workers	Professional specialty and technical occupations
Salesworkers	Sales occupations
Clerical workers	Administrative support occupations, including clerical
Craft and kindred workers	Precision production, craft, and repair occupations
Operatives, except transport	Machine operators, assemblers, and inspectors
Transport operatives	Transportation and material moving occupations
Nonfarm laborers	Handlers, equipment cleaners, helpers, and laborers
Service workers	Service occupations

1986 and one for a period before March 1986 cannot be interpreted in terms of the cost of employing any fixed work force—that is, it is not a Laspeyres index number. The change between June 1981 and June 1990, for example, would simply be the change between June 1981 and March 1986 in the cost of employing the 1970 work force, times the change between March 1986 and June 1990 in the cost of employing the 1980 work force.⁶

Subindexes. Considered separately, the impact of reweighting on each ECI subindex is the same as on the aggregate index. The reweighting will cause the change in cost for the subindex to be closer to the change in current cost, but it will also result in a disruption of the index as a measure of long-run change and of change between periods before and periods after the new weights are introduced. Two additional issues are raised, however, when reweighted subindexes are introduced. One concerns the relationship between the change in the subindexes and the change in the aggregate index, and the other, the occupational composition of each subindex.

The aggregate Laspeyres index can be expressed as a weighted sum of any set of exhaustive and mutually exclusive Laspeyres subindexes, where the weights sum to unity.⁷ This is a very desirable property, for two reasons. First, it guarantees that the change in the aggregate index will fall within the range of changes in the subseries; the change in the aggregate index cannot be greater than the largest change among the subindexes, or less than the smallest. Second, the property also makes it possible to assign the increase in the aggregate index to the subseries—that is, one can determine how much of the change in the aggregate was

“caused” by the change in each subseries.

For comparisons spanning the date on which the new weights are introduced, however, the property that the aggregate Laspeyres index can be expressed as the weighted sum of any set of exhaustive and mutually exclusive subindexes is lost. It is possible, for example, that the change in the aggregate index between September 1985 and September 1986 might be larger, or smaller, than the change in any of the subindexes.

The second issue concerned solely with subindexes is the coverage of workers by each occupational subindex. As noted earlier, the 1970-based ECI weights used employment counts for more than 400 individual occupational titles as given by the 1970 Census of Population occupational classification system. The census aggregated these individual occupations within the scope of the ECI into nine major occupational groups, and ECI occupational indexes currently correspond to those occupational groups. There were a number of criteria used by the Census Bureau in deciding which occupational titles to combine in forming the groups, but the most important was the similarity of work performed.

The Standard Occupational Classification (SOC), a new occupational classification system developed during the 1970's, was used for the 1980 census. The 1980 census classification system, like that for the 1970 census, combined individual occupations into aggregate groups. And, again, the most important concern in defining the groups was similarity of work performed. However, there are differences between the two classification systems because some occupations disappeared during the 1970's while new oc-

cupations appeared, and because there were changes in the definitions of the groups and in the way occupational classification experts viewed the various jobs.

At the level at which ECI occupational indexes are published, the 1980 census definitions of the major occupational groups are similar to those for the 1970 census (exhibit 1). It is clear that the work performed by the jobs classified in the groups for 1980 is similar to that of jobs classified in the corresponding 1970 groups. Beginning in March 1986, the ECI occupational indexes will reflect the 1980 census definitions. These will be linked to the occupational indexes based on the 1970 definitions in the fashion described earlier for the aggregate index.

It must be noted that some detailed occupations that were defined in both 1970 and 1980 were shifted to a different major occupational group between the two years. For instance, cashiers were included with clerical workers in the 1970 system, but with sales occupations in the 1980 system. Hand packers and packagers were included with operatives, except transport, in 1970 but with handlers, equipment cleaners, helpers, and laborers in 1980. A list of the large categorical shifts is presented in table 1.

To aid in interpreting the table, consider the entry for cashiers. Had they remained in the clerical worker category in 1980, they would have accounted for 11.3 percent of total employment of the group. Instead, they were moved to the sales occupations category, where they accounted for 19.9 percent of the total in that group.

In both 1970 and 1980, the work performed by cashiers had much in common with that done by clericals and by

Table 1. Major changes in occupational classification between the 1970 and 1980 censuses

Occupation	1970 classification		1980 classification	
	Major occupational group	Percent of 1980 employment ¹	Major occupational group	Percent of 1980 employment
Cashiers	Clerical workers	11.3	Sales occupations	19.9
Accountants and auditors	Professional and technical workers	8.2	Executive, administrative, and managerial occupations	10.2
Hand packers and packagers	Operatives, except transport	5.7	Handlers, equipment cleaners, helpers, and laborers	12.6
Licensed practical nurses	Service workers	3.8	Professional specialty and technical occupations	4.1
Garage and service station related occupations	Operatives, except transport	3.1	Handlers, equipment cleaners, helpers, and laborers	6.8
Personnel, training, and labor relations specialists	Professional and technical workers	3.1	Executive, administrative, and managerial occupations	3.7
Butchers and meat cutters	Operatives, except transport	2.9	Precision production, craft, and repair occupations	2.5
Printing machine operators	Craft and kindred workers	2.4	Machine operators, assemblers, and inspectors	2.9
Cranemen, derrickmen, and hoistmen	Craft and kindred workers	1.1	Transportation and material moving occupations	3.2
Excavating, grading, and road machine operators	Craft and kindred workers	0.9	Transportation and material moving occupations	2.7
Locomotive operating occupations	Craft and kindred workers	0.6	Transportation and material moving occupations	1.7

¹The figures in this column refer to the percentage of 1980 employment the occupation would have accounted for had it remained in the 1980 census equivalent of its 1970 census major occupational group. Thus, for example, had cashiers been classified in administrative support, including clerical, they would have accounted for 11.3 percent of the employment

in that group.

NOTE: The percentages shown in this table are only approximate, because in many cases the 1980-census occupation was not identical to the 1970-census occupation.

salesworkers. The reclassification does not necessarily imply that the work performed by cashiers changed over the 1970–80 period so that it became closer to that performed by salesworkers. It is also possible that the tasks of salesworkers or of clerical workers in general changed, so that the work of salesworkers became more like that of cashiers.

Certainly, recent experience in collecting ECI data for retail trade supports the classification of cashiers and salesworkers in the same group. Frequently, employers themselves do not distinguish between the two occupations; their staffs carry out the duties of both salespersons and cashiers.

Thus, the occupational classification system for the 1970 census, based on similarity of work performed at that time, became less appropriate as duties and work covered by individual job titles changed over the decade. The 1980 reweighting provides the opportunity to regroup the individual job titles into aggregates that are more meaningful for economic analysis.

Sources of new weights

In deriving employment weights for the reweighted ECI, two sources of employment data were available—the Bureau's Occupational Employment Statistics (OES) Survey and the 1980 Census of Population. The BLS data are obtained from a periodic mail survey conducted by State employment security agencies of a sample of nonfarm establishments to obtain wage and salary employment by occupation.

For the reweighting, main reliance was placed on a 7-percent sample from the 1980 census, weighted up to represent all workers within scope of the ECI. Census data were used primarily because the occupational categories defined for that survey were based on SOC. (Beginning in 1983, OES also defined occupations on the basis of SOC; because OES is on a 3-year cycle, however, data will not be available on that basis for all industries until 1986.) In some cases it was necessary to supplement census data using OES; for example, because the census grouped all construction industries together, OES data were used to apportion the employment among the three broad construction industries.

Testing the effects of new weights

As noted above, studies have found that Laspeyres price indexes typically are insensitive to moderate changes in the set of weights used. To evaluate the impact on the ECI of using 1980 weights in place of those for 1970, a test was conducted estimating rates of change for 1981–85 using 1980 census weights, and comparing the results with the published figures based on 1970 census weights.

Some effect would be expected because there have been shifts over time in the distribution of employment among occupational categories and among industries, as shown in table 2. For example, the percentage of private industry wage and salary employment that is white-collar rose from 46.1 percent to 51.0 percent between 1970 and 1980, while

Table 2. Distribution of employment within scope of the ECI in private industry, by occupational category and major industry group, 1970 and 1980

Occupational category or industry group	1970	1980
All workers	100.0	100.0
Occupational category		
White-collar workers	46.1	51.0
Blue-collar workers	43.3	37.3
Service workers	10.6	11.6
Industry group		
Mining	1.1	1.4
Construction	6.2	6.1
Manufacturing	34.5	29.8
Transportation and public utilities	7.9	7.6
Wholesale trade	5.3	5.5
Retail trade	19.3	19.9
Finance, insurance, and real estate	6.2	7.5
Service industries	19.5	22.2

SOURCE: 1970 and 1980 Censuses of Population.

the percentage that is employed in manufacturing declined from 34.5 percent to 29.8 percent.

How much difference would it make for published rates of change in compensation cost if estimates for 1981–85 had been derived using 1980, rather than 1970, weights? Table 3 presents evidence that, had more current weights been used, the impact for private industry workers would have been slight. For example, the estimated change in compensation cost over the year ended December 1984 based on 1980 weights (4.7 percent) is only 0.2 percentage point lower than the change derived using 1970 weights. The 3-month changes never differ by more than three-tenths of a percentage point, and the index levels as of March 1985 are virtually identical.

The closeness of the percentage changes indicates that there is little, if any, systematic relationship between the

Table 3. Index levels and percent changes in compensation costs for private industry workers, 1970 weights and 1980 weights

Quarter	Based on 1970 weights			Based on 1980 weights		
	Index level	3-month change	12-month change	Index level	3-month change	12-month change
June 1981	100.0	—	—	100.0	—	—
September 1981	102.0	2.0	—	102.0	2.0	—
December 1981	104.0	2.0	—	104.1	2.1	—
March 1982	105.8	1.7	—	105.7	1.5	—
June 1982	107.2	1.3	7.2	107.2	1.4	7.2
September 1982	109.3	2.0	7.2	109.3	2.0	7.2
December 1982	110.7	1.3	6.4	110.6	1.2	6.2
March 1983	112.6	1.7	6.4	112.8	2.0	6.7
June 1983	113.9	1.2	6.3	114.2	1.2	6.5
September 1983	115.6	1.5	5.8	115.9	1.5	6.0
December 1983	117.0	1.2	5.7	117.2	1.1	6.0
March 1984	119.0	1.7	5.7	119.1	1.6	5.6
June 1984	120.1	.9	5.4	120.2	.9	5.3
September 1984	121.1	.8	4.8	121.3	.9	4.7
December 1984	122.7	1.3	4.9	122.7	1.2	4.7
March 1985	124.2	1.2	4.4	124.3	1.3	4.4

NOTE: Estimates based on 1980 weights were derived by applying the new weights at the industry and major occupational group level.

change in compensation cost and the change in employment by industry and occupation. In general, the 1980-weighted index will be greater than the 1970-weighted index if compensation costs for those occupations and industries for which

employment has risen the most—for example, white-collar workers and service industries—increase more than those in industries and occupations where employment has risen the least. □

—FOOTNOTES—

¹For descriptions of the ECI, see: Victor J. Sheifer, "Employment Cost Index: a measure of change in the 'price of labor'," *Monthly Labor Review*, July 1975, pp. 3–12; Victor J. Sheifer, "How benefits will be incorporated into the Employment Cost Index," *Monthly Labor Review*, January 1978, pp. 18–26; and *BLS Handbook of Methods*, Bulletin 2134–1 (Bureau of Labor Statistics, 1982), pp. 78–85. For a more theoretical discussion of labor cost measurement, see: Jack E. Triplett, "Introduction: an essay on labor cost," in Jack E. Triplett, ed., *The Measurement of Labor Cost* (Chicago, The University of Chicago Press for the National Bureau of Economic Research, 1983).

²Comparisons of the ECI with other measures of wage and compensation change since 1975 show that those other series, if used as measures of compensation change, frequently could be very misleading. See G. Donald Wood, "The Employment Cost Index and Related Series on Wage and Compensation Change," in American Statistical Association, *Proceedings of the Section on Survey Research Methods*, 1983, pp. 466–69.

³Jack E. Triplett, "Reconciling the CPI and the PCE Deflator," *Monthly*

Labor Review, September 1981, pp. 10–11.

⁴An index of this type is called a chain-weight index. The ECI can be considered a Laspeyres chain-weight index, but with the "chaining" occurring every 10 to 15 years, rather than every quarter.

⁵For example, Jack Triplett compared the year-to-year changes in price inflation as measured by the 1972 expenditures-weighted Laspeyres index of personal consumption expenditures with changes in the personal consumption expenditures chain-weight index. The largest difference was for 1980—the 1972 fixed-weighted index gave a change of 11.0 percent, while the chain-weight index gave a change of 10.6 percent. See Triplett, "Reconciling the CPI," p. 8.

⁶In general, the index value for any time t in the future will be the index value of March 1986, based on 1970 weights, times the index value at time t , relative to March 1986, based on 1980 weights.

⁷See G. Donald Wood, "Estimation procedures for the Employment Cost Index," *Monthly Labor Review*, May 1982, pp. 40–42.