Analyzing employers' costs for wages, salaries, and benefits

Employment Cost Index data now provide a breakdown of hourly costs incurred; in March 1987, employee benefits accounted for more than one-fourth of compensation in private industry

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Employee compensation in private industry cost employers $13.42 per hour worked in March 1987. Straight-time wages and salaries—73.2 percent of the costs—averaged $9.83, while benefit costs—the remaining 26.8 percent—averaged $3.60.

These costs are based on data from the Bureau of Labor Statistics Employment Cost Index (ECI) which measures quarterly changes in employer costs for employee compensation. The ECI is a fixed-weight Laspeyres index that uses 1980 census employment counts as weights. Data collected for the ECI can be used to derive compensation cost levels at no additional burden on survey respondents, but current employment weights are required. The BLS Current Employment Statistics survey in combination with the ECI sample provide the current weights.

The ECI's establishment sample has been recently expanded, making it possible to produce estimates of compensation cost levels that are sufficiently reliable for analysis and publication. The Bureau plans to publish compensation cost estimates from the ECI sample annually, using March as the reference period. The estimates will be available in midsummer.

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This article presents cost estimates for the components of compensation for private industry workers,[1] by industry division and occupational group. In addition, relative errors associated with the estimates and costs as a percent of total compensation are shown. This article also discusses highlights of the compensation cost estimates, illustrates how the estimates were calculated, and briefly explains the standard errors associated with the estimates.

Compensation costs

During the post-World War II era, employee benefits have become an important part of labor costs and worker income. Today, slightly more than one-fourth of employee compensation is in some form of benefit. The largest category is legally required benefits, which accounts for 8.4 percent of total compensation costs. (See chart 1.) These legally required benefits include Social Security, workers' compensation, and unemployment insurance as well as other less common benefits, such as railroad retirement and State temporary disability benefits. Employer costs for legally required benefits averaged $1.13 per hour worked in March 1987—nearly a third of all benefit costs.

Lump-sum payments, provided in lieu of wage increases or to offset wage decreases, are becoming more widespread, particularly in collective bargaining agreements. Neverthe-

Glossary

Following are definitions of the compensation components covered by the Employment Cost Index.

Wages and salaries:
The hourly straight-time wage rate, or, for workers not paid on an hourly basis, earnings divided by corresponding hours. Wages and salaries include production bonuses, incentive earnings, commission payments, and cost-of-living adjustments, but exclude supplemental pay.

Benefits:
Paid leave—Paid vacations, paid holidays, paid sick leave, and other paid leave.

Supplemental pay—premium pay for overtime and work on weekends and holidays, shift differentials, nonproduction bonuses, and lump-sum payments.

Insurance benefits—life, health, and sickness and accident insurance.

Retirement and savings benefits—pension and other retirement plans, and savings and thrift plans.

Legally required benefits—Social Security, railroad retirement and supplemental retirement, railroad unemployment insurance, Federal and State unemployment insurance, workers' compensation, and other benefits required by law, such as State temporary disability insurance.

Other benefits—Severance pay, supplemental unemployment plans, and merchandise discounts in department stores.

less, they still account for a very small part of total compensation. These payments are included in the supplemental pay category, which averaged less than 3 percent of employer compensation costs.

Wages and salaries plus benefits that are paid in cash to the employee (paid leave and supplemental pay) accounted for 82.5 percent of total compensation costs per hour worked. The remaining 17.5 percent of employer costs was made up of noncash benefits purchased for the employee. These noncash benefits include insurance, pensions and savings, legally required and other benefits, such as supplemental unemployment plans and merchandise discounts in department stores.

By industry division. Hourly employer compensation costs were, on average, higher in goods-producing industries ($15.86) than in service-producing industries ($12.41).[2] However, within the service-producing sector, there was substantial variation in compensation costs. Among the service-producing industries for which data were published, costs were highest in transportation and public utilities ($20.24 per hour worked) and wholesale trade ($15.15), and lowest in service industries ($12.34) and retail trade ($7.85). (See chart 2.)

As noted previously, wages and salaries alone make up the major portion of compensation costs in all industries. However, the wage and salary proportion of compensation costs was less in relatively high-paid industries than in other industries. Wages and salaries made up 68 percent of total compensation costs for workers in transportation and public utilities, compared with 74.2 percent in wholesale trade, 75.7 percent in service industries, and 77.3 percent in retail trade.[3]

Industries also differ in the cost and relative importance of the various benefits. Benefit costs are related, in part, to wages and salaries because the costs for a number of benefits (paid leave and Social Security, for example), are tied to wage rates or earnings. But other factors are also important in explaining the industry-to-industry differences.

To illustrate the effects of some other factors, consider paid leave. This benefit is typically paid at the employee's wage or salary rate, but its cost is influenced by the amount and type of leave granted. Differences among industries in the amount of paid leave reflect variation in paid leave plans, in employees' length of service with the company, and in the mix of full- and part-time workers.

The following tabulation compares average wage and salary rates and paid leave costs per hour worked in selected industries, March 1987:

		Paid leave	
	Wages and salaries	*Cost*	*As a percent of wages and salaries*
Private industry	$ 9.83	$0.93	9.5
Goods-producing	11.12	1.09	9.8
Manufacturing	10.77	1.21	11.2
Service-producing	9.29	.87	9.4
Transportation and public utilities	13.77	1.75	12.7
Wholesale trade	11.24	1.05	9.3
Retail trade	6.07	.37	6.1
Service	9.34	.91	9.7

Also, there is a striking variation among industries in employer costs for providing employees with insurance (life, health, and sickness and accident)—a benefit dominated by health insurance with costs usually not tied to wages and salaries. This variation reflects differences in the types and extent of insurance benefits provided, as well as differences in employee contributions to insurance, and the proportion of workers covered. Even though an employer's health insurance costs for a plan are about the same regardless of the employee's pay level, there is a positive relationship across industries between the costs of insurance and the wage and salary rate.

This relationship is illustrated in the following tabulation which shows average wage and salary rates and employer insurance costs per hour worked in selected industries, March 1987:

	Wages and salaries	*Insurance cost*
Private industry	$ 9.83	$0.72
Transportation and public utilities	13.77	1.32
Wholesale trade	11.24	.80
Manufacturing	10.77	1.06
Service	9.34	.53
Retail trade	6.07	.35

By occupational group. Employer compensation costs also varied substantially by occupational group, being highest for managers and lowest for service workers.[4] (See chart 2.) Compensation costs per hour worked averaged more for white-collar workers ($15.56) than for blue-collar workers ($13.43), with wages and salaries accounting for the difference. Wages and salaries for white-collar workers ($11.61) were 24 percent higher than for blue-collar workers ($9.38). Benefit costs were about the same for both ($3.95 and $4.05, respectively). Compensation costs for service workers averaged $6.43 per hour worked, less than half that for white-collar or blue-collar workers. As a proportion of total compensation, benefit costs for service workers (22.8 percent) were less than those for either white-collar workers (25.4 percent) or blue-collar workers (30.2 percent). Insurance costs per hour worked for service workers (27 cents) were about a third of those for white-collar workers (77 cents) and blue-collar workers (87 cents).

Differences among occupational categories in employer costs for some benefits are related to the work performed. The following tabulation shows costs per hour worked for selected benefits, by occupation, March 1987:

	White-collar	*Blue-collar*	*Service*
Workers' compensation	$0.11	$0.39	$0.16
State unemployment	.11	.15	.10
Premium pay	.08	.34	.04
Shift pay	.03	.06	.02

The costs of workers' compensation, State unemployment insurance, premium pay, and shift differentials were higher for blue-collar workers than for either white-collar or service workers. On average, occupational injury and unemployment rates are higher for blue-collar workers, exerting an upward influence on unemployment insurance and workers' compensation rates for these workers. Shift work and overtime tend to be a more integral part of blue-collar work, so naturally, shift differentials and premium pay are provided more frequently to blue-collar occupations. (These

Chart 1. Relative importance of components of employer costs for compensation in private industry, March 1987

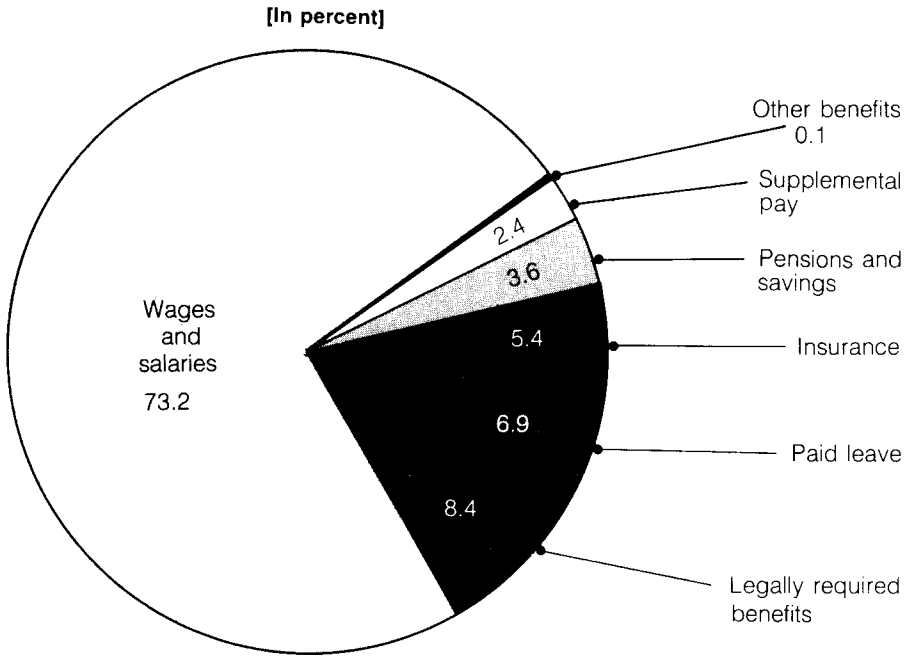
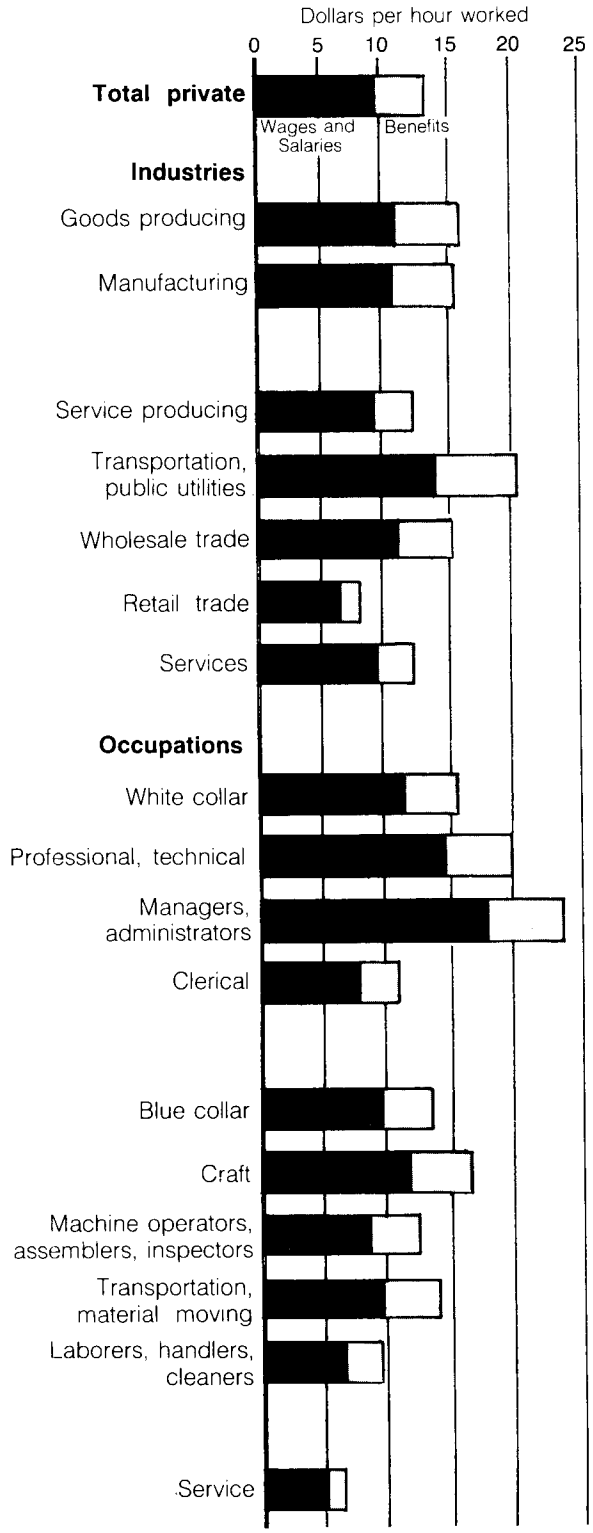


Chart 2. Employer costs for compensation in private industry by selected industries and occupations, March 1987



factors are also industry related—the higher costs reflecting the concentration of blue-collar workers in goods-producing industries.)

By occupation within industries. The wide variation in average compensation costs by industry and occupation persisted even when averages were examined by occupation within industries. For example, within each industry, compensation costs for the highest paid occupations were more than double those for the lowest paid.

The dispersion of compensation costs by occupation is illustrated in table 1, which categorizes average costs per hour worked into six ranges—under $5 per hour worked; $5–$9.99; $10–$14.99; $15–$19.99; $20–$24.99; and $25 or more. (The ranges are used because average compensation costs at this level of detail are not reliable for publication.) There was an overlap of occupational pay among industries with substantially different overall compensation costs. For example, the ranges for managers and professionals in service industries and retail trade—industries with relatively low overall compensation costs—equaled or exceeded the ranges for most occupational groups in manufacturing—an industry with relatively high overall compensation costs. This overlap demonstrates that analysis based on overall industry averages is insufficient for determining the impact on pay resulting from employment shifts occurring in the work force. The effect depends on which jobs are growing within each industry and which are declining.

How compensation costs are calculated

At least two approaches can be taken in measuring an employer's costs for employee compensation. One approach focuses on *past expenditures*—that is, the actual money an employer spent on compensation during a specified time, usually a past year. The other approach focuses on *current costs*—annual costs based on the current price of benefits under current plan provisions. The Bureau's previous measure of compensation cost levels, the Employer Expenditures for Employee Compensation survey, used the past expenditures approach.[5] Because the ECI measures change from one time to another, it uses the current cost approach.

To estimate the total compensation cost per hour worked, the ECI (1) identifies the benefits provided, (2) determines, from current cost information (current price and current plan provisions), the cost per hour worked for each benefit, then (3) sums the costs for the benefits with the straight-time wage or salary rate. The following examples illustrate how current costs are determined for specific benefit plans, and how they differ from costs based on past expenditures.

Example 1. For a given year, each employee in a company receives 10 paid holidays (five in each half of the year), and receives 8 hours of straight-time pay for each holiday. The hourly wage is $10 during the first half of the year, and increases to $11 on July 1. All employees work 2,000 hours a year.

The annualized current cost in this example is the rate at which each holiday is paid (8 hours of straight-time pay) times the number of holidays provided under current plan provisions. This annualized current cost is then divided by the annual hours worked to yield the current cost per hour worked. The formula for deriving the current cost is:

(number of holidays) × (hours of pay) × (hourly wage rate) = annualized current cost;

annualized current cost ÷ work hours per year = current cost per hour worked

Thus, in this example, the current cost at any time during the first half of the year is:

$10 \times 8 \times \$10 = \$800;$

$\$800 \div 2{,}000$ work hours $= \$.40$

At any time during the second half of the year (after the wage increase occurs), the current cost is;

$10 \times 8 \times \$11 = \$880;$

$\$880 \div 2{,}000 = \$.44$

The expenditure per hour worked, in contrast, is all holiday pay during the year divided by the number of hours worked—information that would not be available until the year ended:

(5 holidays × 8 hours of pay × $10 hourly wage) + (5 holidays × 8 hours of pay × $11 hourly wage) = $840;

$840 ÷ 2,000 annual hours worked = $.42 per hour worked

Another factor that would affect current costs and past expenditures differently in this example is a change in the number of holidays per year. For example, the current cost would reflect the higher cost of an added holiday at the point the new holiday becomes effective. In contrast, the annual expenditure would reflect a mix of the costs before and after the change becomes effective.

Example 2. A health insurance plan is provided all employees. The monthly premium for each employee is $120 for the first 6 months of a given year, and increases to $140 for the last 6 months. Each employee works 2,000 hours per year.

The formula for deriving the current cost is:

(12 months) × (monthly premium) = annualized current cost;

annualized current cost ÷ work hours per year = current cost per hour worked

In this example, the current cost at any time during the first half of the year is the annual premium divided by the annual hours worked:

$12 \times \$120 = \$1{,}440;$

$\$1{,}440 \div 2{,}000 = \$.72$

The current cost at any time during the second half, with the new premium rate, is:

$12 \times \$140 = \$1{,}680;$

$\$1{,}680 \div 2{,}000 = \$.84$

The expenditure per hour worked, in contrast, is the total premium paid over the year divided by hours worked—information that would not be available until the year ended:

(6 months × $120) + (6 months × $140) = $1,560;

$\$1{,}560 \div 2{,}000 = \$.78$

Other factors that would cause differences between current costs and past expenditures are the number of annual hours the employee works, changes in eligibility requirements affecting the employee, or the introduction or elimination of a plan.[6]

Employment weights. The ECI uses fixed employment weights from the 1980 census so that compensation cost changes can be measured, free from the influence of em-

Table 1. Compensation cost ranges, by occupational groups within industries, March 1987

Occupational group	Transportation, public utilities	Finance, insurance, real estate	Construction	Manufacturing	Wholesale trade	Services	Retail trade
Executive, managerial, administrative	$25 or more	$25 or more	$25 or more	$25 or more	$20–$24.99	$20–$24.99	$15–$19.99
Professional specialty, technical	25 or more	20–24.99	20–24.99	20–24.99	20–24.99	15–19.99	15–19.99
Precision production, craft, and repair	20–24.99	10–14.99	15–19.99	15–19.99	15–19.99	10–14.99	10–14.99
Transportation and material moving	15–19.99	5–9.99	10–14.99	15–19.99	10–14.99	5–9.99	10–14.99
Machine operators, assemblers, and inspectors	20–24.99	10–14.99	10–14.99	10–14.99	10–14.99	5–9.99	5–9.99
Administrative support, including clerical	15–19.99	10–14.99	10–14.99	10–14.99	10–14.99	10–14.99	5–9.99
Handlers, cleaners, helpers, laborers	15–19.99	5–9.99	10–14.99	10–14.99	5–9.99	5–9.99	5–9.99
Service	20–24.99	5–9.99	10–14.99	10–14.99	5–9.99	5–9.99	Under $5

NOTE: Ranges are based on compensation costs per hour worked. Ranges are used because average compensation costs at this level of detail are not reliable for publication.

Table 2. Employer costs for employee compensation per hour worked, relative errors,[1] and costs as a percent of total compensation, by major industry and occupational categories, March 1987

Compensation component	Private industry workers		Goods-producing industries		Service-producing industries		Manufacturing industries		Nonmanufacturing industries		White-collar workers		Blue-collar workers		Service workers	
	Cost	Relative error	Cost	Relative error	Cost	Relative error	Cost	Relative error	Cost	Relative error	Cost	Relative error	Cost	Relative error	Cost	Relative error
Total compensation	$13.42	1.1	$15.86	1.5	$12.41	1.4	$15.51	1.3	$12.80	1.3	$15.56	1.6	$13.43	1.3	$6.43	1.6
Wages and salaries	9.83	1.2	11.12	1.3	9.29	1.6	10.77	1.2	9.55	1.5	11.61	1.8	9.38	1.1	4.96	1.6
Total benefits	3.60	1.1	4.74	2.0	3.12	1.3	4.73	1.7	3.26	1.2	3.95	1.4	4.05	1.9	1.47	2.4
Paid leave	.93	1.5	1.09	2.2	.87	2.0	1.21	2.2	.85	1.9	1.20	1.9	.82	2.0	.30	3.9
Vacation	.46	1.8	.55	2.3	.43	2.5	.61	2.2	.42	2.4	.58	2.5	.43	2.4	.15	3.4
Holiday	.31	1.3	.40	2.4	.28	1.7	.45	2.1	.27	1.6	.39	1.8	.30	2.1	.09	3.8
Sick	.12	2.5	.10	4.4	.12	3.0	.11	5.0	.12	2.9	.17	2.4	.06	3.3	.04	9.8
Other	.03	5.1	.03	6.9	.04	6.5	.04	7.6	.03	6.2	.05	4.4	.03	11.3	.02	15.7
Supplemental pay	.32	2.6	.53	3.6	.23	3.6	.52	4.0	.25	3.3	.28	4.7	.47	3.5	.08	6.4
Premium pay	.16	3.1	.33	3.8	.09	4.5	.34	3.9	.11	4.1	.08	4.1	.34	3.8	.04	9.7
Nonproduction bonuses	.12	6.1	.13	11.9	.11	6.8	.10	14.7	.12	7.2	.18	7.4	.07	8.3	.02	14.1
Shift pay	.04	4.6	.07	5.7	.02	6.5	.08	5.7	.02	6.4	.03	7.4	.06	5.5	.02	9.4
Insurance	.72	1.3	1.02	2.6	.60	1.6	1.06	2.4	.62	1.6	.77	1.6	.87	2.5	.27	5.7
Pensions and savings	.48	2.2	.64	4.5	.41	3.0	.58	3.5	.45	2.8	.57	2.8	.50	4.0	.12	8.4
Pensions	.42	2.3	.56	4.9	.36	3.3	.49	3.6	.40	3.0	.48	3.3	.47	4.2	.11	7.9
Savings and thrift	.06	5.6	.08	6.3	.05	8.6	.09	7.0	.05	8.1	.10	4.9	.03	6.7	[2]	[2]
Legally required[3]	1.13	.9	1.43	1.9	1.01	.9	1.31	1.5	1.08	1.0	1.12	1.1	1.37	1.6	.69	1.8
Social Security	.75	.8	.88	1.3	.69	.9	.87	1.2	.71	.9	.85	1.1	.75	1.2	.39	1.7
Federal unemployment	.03	.9	.03	1.3	.03	1.1	.03	1.6	.03	1.0	.03	1.5	.03	.9	.03	1.4
State unemployment	.12	1.8	.18	2.9	.10	2.1	.17	3.3	.10	2.1	.11	2.1	.15	2.6	.10	4.2
Workers' compensation	.21	2.4	.32	4.6	.16	2.5	.23	4.6	.20	2.5	.11	3.3	.39	3.2	.16	3.8
Other benefits[4]	.02	6.8	.04	9.5	[2]	[2]	.04	9.2	[2]	[2]	.02	7.7	.03	8.9	[2]	[2]
	Percent of total compensation															
Total compensation	100.0		100.0		100.0		100.0		100.0		100.0		100.0		100.0	
Wages and salaries	73.2		70.1		74.8		69.5		74.6		74.6		69.8		77.2	
Total benefits	26.8		29.9		25.2		30.5		25.4		25.4		30.2		22.8	
Paid leave:	6.9		6.8		7.0		7.8		6.6		7.7		6.1		4.7	
Vacation	3.5		3.5		3.4		4.0		3.3		3.8		3.2		2.4	
Holiday	2.3		2.5		2.2		2.9		2.1		2.5		2.2		1.4	
Sick	.9		.6		1.0		.7		.9		1.1		.5		.7	
Other	.3		.2		.3		.2		.3		.3		.2		.2	
Supplemental pay:	2.4		3.3		1.8		3.4		2.0		1.8		3.5		1.3	
Premium pay	1.2		2.1		.7		2.2		.8		.5		2.5		.7	
Nonproduction bonuses	.9		.8		.9		.7		1.0		1.1		.5		.3	
Shift pay	.3		.4		.2		.5		.2		.2		.5		.3	
Insurance:	5.4		6.4		4.8		6.8		4.8		4.9		6.4		4.2	
Pensions and savings:	3.6		4.1		3.3		3.8		3.5		3.7		3.7		1.9	
Pensions	3.1		3.5		2.9		3.2		3.1		3.1		3.5		1.7	
Savings and thrift	.5		.5		.4		.6		.4		.6		.2		.2	
Legally required[3]	8.4		9.0		8.1		8.5		8.4		7.2		10.2		10.7	
Social Security	5.6		5.6		5.6		5.6		5.6		5.5		5.6		6.1	
Federal unemployment	.2		.2		.3		.2		.2		.2		.2		.5	
State unemployment	.9		1.1		.8		1.1		.8		.7		1.1		1.5	
Workers' compensation	1.6		2.0		1.3		1.5		1.6		.7		2.9		2.5	
Other benefits[4]	.1		.2		.1		.3		.1		.1		.2		.1	

[1] The relative error is the standard error expressed as a percent of the cost. We can be 95 percent confident the interval around the cost estimate bounded by two times plus and minus the relative error contains the "true" cost.

[2] Cost is $0.01 or less.

[3] Includes railroad retirement, railroad unemployment, railroad supplemental unemployment, and other legally required benefits, in addition to those shown separately.

[4] Includes severance pay, supplemental unemployment benefits, and merchandise discounts in department stores.

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

ployment shifts among occupations and industries. Compensation cost levels, however, should reflect the current industry and occupational mix each year they are published. Thus, to estimate current cost levels for the aggregate series, it is necessary to have employment data that refer to the current mix.

Such data are obtained by apportioning industry employment from the Bureau's Current Employment Statistics pro-

Table 3. Employer costs for employee compensation per hour worked, relative errors,[1] and costs as a percent of total compensation, selected major industry groups, March 1987

Compensation component	Private industry		Goods-producing industries				Service-producing industries									
			Total[2]		Manufacturing		Total[3]		Transportation and public utilities		Wholesale trade		Retail trade		Service	
	Cost	Relative error	Cost	Relative error	Cost	Relative error	Cost	Relative error	Cost	Relative error	Cost	Relative error	Cost	Relative error	Cost	Relative error
Total compensation	$13.42	1.1	$15.86	1.5	$15.51	1.3	$12.41	1.4	$20.24	2.6	$15.15	2.8	$7.85	2.2	$12.34	2.0
Wages and salaries	9.83	1.2	11.12	1.3	10.77	1.2	9.29	1.6	13.77	2.3	11.24	2.8	6.07	2.0	9.34	2.0
Total benefits	3.60	1.1	4.74	2.0	4.73	1.7	3.12	1.3	6.47	3.8	3.91	3.4	1.78	3.4	3.00	2.3
Paid leave	.93	1.5	1.09	2.2	1.21	2.2	.87	2.0	1.75	3.9	1.05	5.0	.37	5.3	.91	4.1
Supplemental pay	.32	2.6	.53	3.6	.52	4.0	.23	3.6	.51	13.3	.35	6.1	.15	5.7	.19	5.3
Insurance	.72	1.3	1.02	2.6	1.06	2.4	.60	1.6	1.32	3.6	.80	3.4	.35	5.8	.53	2.9
Pensions and savings	.48	2.2	.64	4.5	.58	3.5	.41	3.0	1.17	6.9	.49	7.9	.14	8.8	.37	5.8
Legally required	1.13	.9	1.43	1.9	1.31	1.5	1.01	.9	1.70	2.3	1.21	1.9	.74	2.0	1.00	1.6
Other benefits[4]	.02	6.8	.04	9.5	.04	9.2	(5)	(5)	.03	23.9	(5)	(5)	.02	12.6	(5)	(5)
	Percent of total compensation															
Total compensation	100.0		100.0		100.0		100.0		100.0		100.0		100.0		100.0	
Wages and salaries	73.2		70.1		69.5		74.8		68.0		74.2		77.3		75.7	
Total benefits	26.8		29.9		30.5		25.2		32.0		25.8		22.7		24.3	
Paid leave	6.9		6.8		7.8		7.0		8.6		6.9		4.8		7.4	
Supplemental pay	2.4		3.3		3.4		1.8		2.5		2.3		1.9		1.5	
Insurance	5.4		6.4		6.8		4.8		6.5		5.3		4.5		4.3	
Pensions and savings	3.6		4.1		3.8		3.3		5.8		3.3		1.8		3.0	
Legally required	8.4		9.0		8.5		8.1		8.4		8.0		9.5		8.1	
Other benefits[4]	.1		.2		.3		.1		.1		.1		.2		0	

[1] The relative error is the standard error expressed as a percent of the cost. We can be 95 percent confident the interval around the cost estimate bounded by two times plus and minus the relative error contains the "true" cost.

[2] Includes mining and construction, in addition to manufacturing.

[3] Includes finance, insurance, and real estate, in addition to the industries shown separately.

[4] Includes severance pay, supplemental unemployment insurance, and merchandise discounts in department stores.

[5] Cost is $0.01 or less.

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

gram, using occupational employment by industry from the ECI sample. Industry employment estimates from the Current Employment Statistics program are published monthly, and are adjusted each year to a universe of all nonfarm establishments from March of the previous year.

The March 1987 Current Employment Statistics data used to calculate the compensation costs were total employment estimates for 2-digit major industry groups (such as primary metal manufacturing or food stores), as defined by the U.S. Office of Management and Budget's Standard Industrial Classification system. The employment data from these 2-digit groups were distributed to major occupational groups (such as executives, administrators, and managers or machine operators, assemblers, and inspectors), using the relative importance of the groups as estimated from the ECI sample.[7]

It is important to emphasize that because weights for the ECI remain fixed while weights for cost levels change as employment shifts occur, year-to-year changes in the cost level estimates will differ from changes in the ECI. Employment shifts among industries and occupations with different wage and benefit levels do not affect the ECI, but they do affect cost levels. Thus, for example, if there is a shift in employment toward relatively high wage industries or occupations, the change in the cost levels will exceed the change in the ECI.[8]

Standard errors. As is the case for all sample surveys, compensation cost level estimates from the ECI will differ from the "true" values because data were collected from a sample rather than from all units within the ECI's private industry coverage.[9] To determine the precision of the cost levels, a standard error was calculated for each estimate using a balanced repeated replication method with 64 pseudo replicates.[10]

The standard error defines a range (confidence interval) around the cost estimate. The approximate 95-percent confidence interval is the estimate plus and minus twice the standard error. For example, the 95-percent confidence interval for a cost estimate of $10 with a standard error of 10 cents would be $9.80 to $10.20.

If repeated samples are taken from the population, each sample will have an estimate and confidence interval. Ninety-five percent of those confidence intervals will include the "true" cost. That is, we can be 95 percent confi-

Table 4. Employer costs for employee compensation per hour worked, relative errors,[1] and costs as a percent of total compensation, selected major occupational groups, March 1987

Compensation component	Private industry		White-collar workers						Blue-collar workers								Service workers	
			Total[2]		Professional specialty, technical		Executive, administrative, managerial		Administrative support, including clerical		Total		Precision production, craft, repair		Machine operators, assemblers, inspectors		Transportation, material moving		Handlers, equipment cleaners, helpers, laborers			
	Cost	Relative error	Cost	Relative error	Cost	Relative error	Cost	Relative error	Cost	Relative error	Cost	Relative error	Cost	Relative error	Cost	Relative error	Cost	Relative error	Cost	Relative error	Cost	Relative error
Total compensation	$13.42	1.1	$15.56	1.6	$19.81	2.5	$23.81	2.7	$10.94	1.5	$13.43	1.3	$16.85	1.8	$12.44	1.8	$13.83	2.4	$9.81	3.0	$6.43	1.6
Wages and salaries	9.83	1.2	11.61	1.8	14.66	2.5	17.86	3.0	7.91	1.4	9.38	1.1	11.92	1.6	8.44	1.6	9.65	2.2	6.93	2.7	4.96	1.6
Total benefits	3.60	1.1	3.95	1.4	5.15	2.7	5.95	2.4	3.04	1.9	4.05	1.9	4.93	2.5	4.00	2.5	4.17	3.2	2.89	4.0	1.47	2.4
Paid leave	.93	1.5	1.20	1.9	1.66	3.6	1.99	2.8	.85	2.8	.82	2.0	.98	2.3	.89	3.0	.85	5.1	.51	5.2	.30	3.9
Supplemental pay	.32	2.6	.28	4.7	.32	6.1	.54	10.5	.20	3.9	.47	3.5	.57	4.4	.55	5.2	.39	6.9	.29	6.3	.08	6.4
Insurance	.72	1.3	.77	1.6	.92	3.1	.98	2.8	.72	2.0	.87	2.5	.99	3.6	.93	3.4	.84	4.2	.63	5.4	.27	5.7
Pensions and savings	.48	2.2	.57	2.8	.85	6.1	.88	4.5	.42	4.2	.50	4.0	.69	6.1	.42	4.9	.50	7.3	.36	8.5	.12	8.4
Legally required	1.13	.9	1.12	1.1	1.40	2.0	1.55	1.4	.85	1.4	1.37	1.6	1.67	2.3	1.17	1.9	1.58	3.4	1.08	3.1	.69	1.8
Other benefits[3]	.02	6.8	.02	7.7	(4)	(4)	.02	11.8	(4)	(4)	.03	8.9	.04	13.4	.04	9.8	(4)	(4)	(4)	(4)	(4)	(4)
	Percent of total compensation																					
Total compensation	100.0		100.0		100.0		100.0		100.0		100.0		100.0		100.0		100.0		100.0		100.0	
Wages and salaries	73.2		74.6		74.0		75.0		72.3		69.8		70.8		67.9		69.8		70.6		77.2	
Total benefits	26.8		25.4		26.0		25.0		27.7		30.2		29.2		32.1		30.2		29.4		22.8	
Paid leave	6.9		7.7		8.4		8.4		7.7		6.1		5.8		7.1		6.1		5.2		4.7	
Supplemental pay	2.4		1.8		1.6		2.3		1.8		3.5		3.4		4.4		2.8		3.0		1.3	
Insurance	5.4		4.9		4.6		4.1		6.5		6.4		5.9		7.5		6.1		6.5		4.2	
Pensions and savings	3.6		3.7		4.3		3.7		3.8		3.7		4.1		3.3		3.6		3.7		1.9	
Legally required	8.4		7.2		7.0		6.5		7.8		10.2		9.9		9.4		11.5		11.0		10.7	
Other benefits[3]	.1		.1		.1		.1		.1		.2		.2		.3		.1		.1		.1	

[1] The relative error is the standard error expressed as a percent of the cost. We can be 95 percent confident the interval around the cost estimate bounded by two times plus and two times minus the relative error contains the "true" cost.

[2] Includes salesworkers, in addition to occupations shown separately.

[3] Includes severance pay, supplemental unemployment benefits, and merchandise discounts in department stores.

[4] Cost is $0.01 or less.

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

dent that the interval derived for each cost estimate from the ECI sample includes the "true" cost.

The standard error can also be expressed as a percent of the estimate, that is, as the relative error. The relative error is shown with each cost estimate in table 2 (page 8), table 3 (page 9), and table 4 (page 10). Table 2 shows, for example, that total compensation for private industry workers averaged $13.42 per hour worked with a relative error of 1.1 percent. That is, the approximate 95-percent confidence interval is $13.42 plus and minus 2.2 percent (2 times 1.1 percent), or $13.12 to $13.72. At the 95-percent confidence level, this range contains the "true" cost. □

FOOTNOTES

[1] For some individual benefits, the cost is not published. Individual benefits with costs less than 1 cent per hour worked, such as severance pay and supplemental unemployment benefits, are not provided, and life, health, and sickness and accident insurance are reported as one cost. The reason for combining insurance is that a large proportion of respondents (approximately 25 percent) report the cost of these benefits together.

[2] Goods-producing industries include mining, construction, and manufacturing. Service-producing industries include transportation, public utilities, trade, finance, insurance, real estate, and services.

[3] The wage rates presented in this article differ from the earnings published in the Bureau's Average Hourly Earnings series. The Average Hourly Earnings series excludes executive, managerial, and administrative employees in all industries and all white-collar employees in goods-producing industries, while the ECI sample includes all occupational groups in all industries. Also, the Average Hourly Earnings series measures gross earnings, derived by dividing gross payroll by payroll hours, whereas wages and salaries from the ECI are straight-time wages or, for workers not paid on an hourly basis, earnings divided by corresponding hours, excluding supplemental pay. (Both the Average Hourly Earnings series and wages and salaries from the ECI exclude nonproduction bonuses and lump-sum payments.)

[4] Service workers are found in a variety of industries and perform a variety of duties, such as food, health, cleaning, and guard services. Service industries, in contrast, consist of establishments which employ workers from all occupational groups and have the function of providing services for individuals and businesses and other agencies.

[5] The Employer Expenditures for Employee Compensation (EEEC) survey was discontinued in 1977. While differing from the ECI in that it measured expenditures rather than current costs, the EEEC survey had other characteristics similar to those of the ECI. It covered virtually the same benefits and reported the costs on a work-hour basis. The scope of the EEEC survey was also similar to that of the ECI in that it covered the private nonfarm work force.

[6] For a more complete description of how ECI benefit costs are calculated, see *BLS Handbook of Methods*, Bulletin 2134, Volume I (Bureau of Labor Statistics, 1982), pp. 78-87.

[7] The major occupational group employment counts from the ECI are, on average, 2 to 3 years old. However, comparisons of cost level estimates showed that differences of a few years in the age of occupation data within industries have a negligible impact on the estimates.

Some potential bias (systematic error) may affect the cost estimates because of the age of the ECI sample. (Industry samples are replaced on a 4-year cycle.) To evaluate the extent of potential bias, a detailed analysis was conducted comparing compensation costs and other data between 4-year-old and current industry samples. Because the current samples had no bias resulting from age, the differences in cost levels between the old and new samples would reflect bias in the older samples. In most cases, no significant probability of bias was found. In those instances when the hypothesis that the bias equaled zero could not be rejected, the magnitude and nature of the bias was not such that it raised any concern about the series recommended for publication.

[8] By comparing year-to-year changes in compensation cost levels with year-to-year changes in the ECI, it will be possible to gain insights into the effect of employment shifts on compensation cost levels. Thus, for example, if the change in the cost levels is greater than that in the index, then the shift has been toward the relatively high-paying industries or occupations or both.

[9] The "true" value is also subject to nonsampling error.

[10] Kirk M. Wolter, *Introduction to Variance Estimation* (New York, Springer–Verlag, 1985).

Research fellowships

The American Statistical Association and the Bureau of Labor Statistics, under a grant from the National Science Foundation, are sponsoring a Senior Research Fellow and Associate Program for 1988–89. The terms of appointment range from 1 semester to 1 year and are part or full time. Research will be conducted at BLS in Washington, DC.

Fellowship applicants should have a recognized research record and considerable expertise in their area of proposed research. Senior Research Fellows will be selected by a review board consisting of representatives of ASA, BLS, the American Economic Association, the Committee on National Statistics, and the Social Science Research Council. Associates will assist the Fellows on their projects. Associate applicants should have a Ph.D in an appropriate field or have made significant progress toward the degree (at least 2 years of graduate study). Substantial computer experience will, in most cases, be required of Associates. Associates will be selected by the Senior Research Fellows with the approval of the review board.

The program is coordinated by the BLS Office of Research and Evaluation. Current research being conducted by this office includes index number theory and measurement, price measurement, cost-of-living and demand studies, survey response error, workers' compensation, compensating wage differentials, productivity analysis, relationship of union membership to employment variability, model-based seasonal adjustment, prediction properties of index estimators, measures of central location based on censored data, upper and lower probability inferences for outliers, and variance estimation.

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