

How widely do wages vary within jobs in the same establishment?

Within a given establishment, wages of workers vary considerably by job, particularly in certain occupations, such as public school teachers, and with incentive pay playing a role as well; although comparisons over time are problematic, evidence suggests that such wage dispersion has increased over the last two decades

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Wages in the United States vary widely. A full-time counter attendant in a fast-food restaurant may earn the Federal minimum wage of \$5.85 per hour, or \$12,200 a year, while the chief executive officer of a major corporation may command an annual salary of \$10 million. Analysts have studied this phenomenon extensively and identified a number of factors that affect wage rates. Factors such as occupation and the industry, geographic location, unionization, size, and ownership (private industry or government) of the establishment have been examined, as have individual characteristics such as the employee's knowledge and skills, tenure, performance, and sex. Most of these studies have focused on wage differences across occupations and establishments, and have illuminated the role that the various factors play in explaining why certain jobs pay more than other jobs.¹ Wages also can vary dramatically within a single occupation. For example, in 2004, 10 percent of computer programmers earned \$17.19 per hour or less, whereas the top 10 percent earned \$42.07 per hour or more.²

A different question asks, How do wages vary among workers in the same job within the same establishment? Are wages widely dispersed, or do they tend to be similar for all workers in the job? Finally, the question is posed, Has the dispersion of wages within establishment jobs changed over the last

quarter century? These questions are more difficult for researchers to tackle, because data sources are generally less conducive to studies within establishments. In order to answer these questions, researchers must examine individual wage rates within occupations, within establishments. However, individual wage records are rarely available to researchers, particularly for cross-industry, national studies.

Questions about wage dispersion within occupations, within establishments (hereafter referred to as *within-job dispersion*), are interesting ones when viewed against the backdrop of developments in employee compensation over the last decade. Some experts in employee compensation have proposed that competitive pressures impelled employers to move increasingly toward *variable-pay*³ schemes, in which employee pay varies from year to year or from pay period to pay period, depending upon employee or company performance. This idea contrasts with the traditional notion that employees receive an hourly wage or a fixed weekly, monthly, or annual salary as compensation for time worked. The past adoption of variable-pay policies by many employers would suggest that within-job dispersion ought to be greater today than it was 20 or 25 years ago.

The introduction of "broadbanding" by many companies in the 1990s also would suggest that pay was becoming more dis-

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persed over time. Broadbanding is a job classification system that defines jobs more broadly than traditional job descriptions, often by combining formerly separate jobs into a single classification. Accompanying the broader job description is a wider range of salaries (in comparison to those of traditional plans) that can be paid to workers in the broadbanded job. Thus, the adoption of broadbanding offers the potential for a greater diversity of wages among workers in the same company or government job.⁴

An examination of 2004 BLS wage data suggests that wages vary widely within a particular job in a particular establishment. For example, in private industry overall, the highest paid registered nurse is paid about 40 percent more, on average, than his or her lowest paid colleague in the same establishment job. Similarly, among State and local government establishments, the highest paid elementary school teacher earns double what the lowest paid teacher makes in a particular job. Pay differences within establishment jobs are even more pronounced for some private-industry sales occupations.

Occupational comparisons over the past 20 years are difficult to make, because the duties and responsibilities of many jobs have evolved with advances in technology and the economy. Nevertheless, a comparison of BLS data from 1983 and 2004 suggests that within-job wage dispersion has increased over that period: about three-quarters of the selected occupations compared showed a higher degree of dispersion in 2004 than in 1983.

Previous studies

Three 1980s BLS studies. In the 1980s, the BLS published three related studies that examined the extent to which wages varied. Two of these studies focused on the variation in actual wages paid. In a 1985 study by John Buckley, the subject was how wages differed for workers employed in the same occupation within the same establishment. In reviewing a variety of occupations across private industry, Buckley found that, for individual office clerical occupations and professional and technical occupations, the highest actual wage paid in the establishment was, on average, 20 percent to 35 percent higher than the lowest actual wage paid. Dispersion was generally less for skilled maintenance, toolroom, and powerplant jobs, with the highest wage for the job exceeding the lowest wage by 10 percent to 15 percent.⁵ For material movement and custodial jobs, dispersion varied widely, with the highest wages exceeding the lowest wages by an average of 13 percent for power truck operators (other than forklift) and by 45 percent for “Guards, I.”

A 1981 study by Carl Barsky and Martin Personick analyzed the extent to which wages varied within industries in 43 manufacturing and 6 mining industries. They found that industries differed markedly in the extent of wage dispersion, and they also found that industries differed in how much of the variation was due to differences within establishments compared with differences across establishments.⁶

The third BLS study examined the impact of establishment pay policies. In a 1984 study of white-collar workers in medium and large establishments across most private industries, Martin Personick discovered that, among establishments with formal range-of-rates systems, the mean width of the rate range was generally 40 percent to 49 percent for technical and clerical workers, and 50 percent to 55 percent for professional and administrative workers.⁷ He also learned that actual pay rates were generally less dispersed than the rates designated in the establishment’s policy.

These three studies stemmed from earlier studies by H. M. Douty, who analyzed 1958–60 BLS industry and metropolitan area data.⁸ Building upon the work of Alfred Marshall and other early theorists, Douty argued that individual differences in the ability to contribute to production are important factors in making wages disperse within establishments.⁹

Other studies. Analysts have divided wage variation into several components by looking at variation across industries, across establishments, and within establishments. In a 1991 study using BLS data from six manufacturing industries, Erica Groshen found that both establishment and occupational pay differentials were important components of variation in pay.¹⁰ In another study, using BLS Occupational Employment Statistics data from 1996–97, Julia Lane, Laurie Salmon, and James Spletzer also found that the characteristics of the establishment and of the occupation explain nearly nine-tenths of wage variation, with the remainder due to pay differences within establishment jobs.¹¹

Some researchers have investigated the question from the opposite perspective: What impact do pay differences have on workers? For example, Matt Bloom examined the effects of pay differences on performance among professional baseball players, and Jeffrey Pfeffer and Nancy Langton studied the impact among college faculty.¹² Studies from this viewpoint have covered a variety of individual employment situations and are difficult to summarize. One theme that appears to emerge, however, is that wage dispersion within establishments does have an impact on characteristics such as employee performance (and team performance)

and job satisfaction, but the impact varies with the particular circumstances: the type of establishment, the occupation, and the nature and organization of the work.

Exhibit 1 summarizes the factors thought to contribute to wage dispersion, focusing on those which affect the wages of employees working in the same job within an establishment. Note, however, that it is not always clear how, or even whether, a hypothesis explaining wage variation across the economy applies to the narrower question of wage variation within establishment jobs. Thus, the exhibit should be interpreted as the authors' attempt to adapt various aspects of theory to the question at hand, rather than as an inventory of established theory.

This article builds upon the BLS studies conducted 20 years ago by looking at how wages varied within occupations, within establishments, in 2004. For purposes of comparability, the article adopts, as much as possible, the methods used by Buckley in 1985. Current research

on the topic uses a unique data source: the BLS National Compensation Survey (NCS), a comprehensive survey of wages and salaries and of employee benefits. Major outputs of the survey include the Employment Cost Index, a quarterly measure of trends in employment costs for wages, benefits, and compensation (the sum of wages and benefits); the quarterly Employer Costs for Employee Compensation, a measure that provides information on employer costs (expressed per hour worked) for wages, benefits, and compensation; and the various Employee Benefits publications, which report the incidence of employee benefits and the details of employee benefit plans. The NCS also publishes wage and salary information on several hundred occupations; among the survey's publications are about 80 locality reports each year, as well as reports on the 9 broad geographic regions (referred to as Census economic divisions) and on the Nation as a whole. Information for this article is drawn mainly from the NCS

Exhibit 1. Factors contributing to wage spreads in jobs within establishments

Incentive pay (*wider wage spreads*): Differences in performance (production, sales, etc.) lead to differences in pay.

Range-of-rates pay structures (*wider wage spreads*): Formal rate ranges tend to be wide.

Tenure-based pay scale (*wider wage spreads*): Differences in length of service lead to different pay rates.

Systems that pay for the "person," such as education-based pay scales, and pay-for-knowledge or pay-for-skill plans (*wider wage spreads*): Differences in education lead to different pay rates. The acquisition of knowledge, training, or skills boosts pay in comparison to the pay of other workers in the same job.

Broadbanded job system (*wider wage spreads*): Salary ranges tend to be wide, and employees may stay in the job for a long time, rather than be promoted into another job.

Unionized occupation (*narrower wage spreads*): Unions often bargain to limit differences in pay among workers in the same job, by setting standard rates for a job, narrowing rate ranges, or introducing other types of "compressed" pay structures.¹

Pay compression (*narrower wage spreads*): Pay differences narrow over time as workers within a job reach the highest rate of pay for the job. In addition, percentage differences in pay rates are reduced when cents-per-hour increases are given to all workers regardless of pay rate. By contrast, if there is turnover in a job in which tenure affects pay, large differences can exist between new hires and senior employees.

Narrowly defined job system (*narrower wage spreads*): Employees may rapidly be promoted into another job, so the spread within individual jobs is narrow.

Wage level (*spreads widen as wages increase*): Higher levels of wages imply greater levels of responsibility and more opportunity for differentiating one's performance. Calculations of spreads are affected by the highest paid workers' very high earnings. In contrast, lower levels of wages imply lower levels of responsibility and less opportunity for differentiating one's performance. Still, although minimum-wage laws provide a floor beneath which the lowest paid workers cannot be paid, larger percentage differences in wage spreads can arise when differences are divided by a small denominator.

Work level (*spreads widen as work levels increase*): Higher levels of responsibility provide more opportunity for differentiating one's performance. Conversely, lower levels of responsibility provide less opportunity for differentiating one's performance.

Turnover, difficulty in recruiting (*unclear effect*): A concentration of workers at the top or bottom of rate ranges leads to narrower differences in pay. But it can also be argued that, in cases where one long-serving employee persists in the job, turnover increases dispersion because there are always new employees (often at low pay rates) in the job.

Size of establishments (*unclear effect*): Larger establishments may have wider wage spreads because they are more likely to have formal range-of-rate systems, which tend to have wide rate ranges. But it has also been argued that *smaller* establishments have wider spreads, because they are less constrained by formal pay systems, have more flexibility in varying pay, and can gear pay more closely to performance. Also, smaller companies do not have as predictable a source of funds to share with employees as larger companies do, which leads to greater pay diversity.

¹Pay "compression" refers to pay structures in which pay differentials are narrow between newly hired and more experienced workers (see George T. Milkovich and Jerry M. Newman, *Compensation*, 5th ed. (New York, McGraw-Hill, 1996), pp. 50–51) or between lower graded and higher graded

workers. For a discussion of pay compression in State and local governments, see Michael A. Miller, "The public-private pay debate: what do the data show?" *Monthly Labor Review*, May 1996, pp. 18–29; on the Internet at www.bls.gov/opus/mlr/1996/05/art2full.pdf.

national wage and salary estimates for 2004.

NCS data collection methods

To understand the data on wage dispersion presented subsequently, it is important to understand how NCS data are collected. The methods for selecting jobs to survey and for collecting wage and salary information are of particular importance. The 2004 NCS included 20,400 establishments with one or more employees. An establishment was generally defined as a nonagricultural business, other than a private household, operating out of a single physical location.¹³ State and local government establishments were included, but the Federal Government was not. The survey used a three-stage sample design. First, a sample of 79 metropolitan areas and 73 nonmetropolitan areas was selected to represent the United States.¹⁴ Second, within each of these 152 areas, a sample of private-industry and State and local government establishments was selected. Third, within each establishment selected, a sample of jobs was selected.

The number of jobs (four, six, or eight) selected in an establishment depends upon the number of employees in the establishment.¹⁵ The sampling generally uses a list of all jobs or employees within the establishment. The sampling is proportional to the number of employees in the job, so the more employees in a job, the greater is the chance that the job will be selected for the sample.

Selection of the job is, in turn, a multistage procedure. Usually, the BLS survey selects the most detailed job recognized by the establishment. For example, a small establishment may consider all computer programmers to be a single job, whereas a large corporate headquarters may define several different jobs within the computer programmer series.

Once the establishment job is defined, it is matched with a BLS occupation. For the 2004 NCS wage publications, a system of 480 occupations derived from the 1990 census was used.¹⁶ For example, an establishment job titled “Cost Accountant III” might be matched with the BLS job “accountants and auditors.”

The job selected is further refined to ensure that all workers in the job share one or the other of each of the following three characteristics: full time or part time, union or nonunion, and incentive pay or time-based pay.

For example, if the Cost Accountant III job had both full-time and part-time incumbents, either the full-time workers would be selected for the survey, to the exclusion of the part-timers, or the part-time workers would be selected for the survey, to the exclusion of the full-timers.¹⁷

Finally, the job selected is classified into 1 of 15 work levels or grades on the basis of a point factor system that assigns different levels based upon (1) the knowledge required for the job; (2) the job’s complexity, scope, and effect; (3) the degree of autonomy the employee has; and (4) several other factors. For example, full-time, nonunion, time-based-pay Cost Accountants III with several years of experience and who are fully qualified to deal with a wide variety of difficult accounting problems might be classified into the survey job of accountants and auditors, level 11.¹⁸

This successive refinement process ensures that, in most cases, the job studied comprises a homogeneous set of employees. Although the broadness or narrowness of the job surveyed depends on how broadly or narrowly the job is defined by the establishment, the BLS refinement process does tend to identify relatively discrete company or government jobs by and large.

Once an establishment job has been refined in this manner, the BLS takes a census by collecting individual wage rates for each employee in the selected job. Incentive pay, including commissions, piece rates, and production bonuses, is included, as are cost-of-living allowances, hazard pay, deadhead pay,¹⁹ and amounts deferred under a salary reduction program. Excluded are shift differentials, overtime pay, and bonuses not tied directly to production.²⁰ Also excluded are uniform and tool allowances, free room and board, on-call pay, and payments (such as tips) made by parties other than the employer.

Thus, the backdrop for the NCS data on wage dispersion is the collection of the rate of pay for each worker in occupations that are relatively homogeneous and narrowly defined. Knowing each worker’s wage allows measures of wage dispersion to be calculated for each job selected within each establishment. The progressive refinement of the job surveyed facilitates a relatively narrow definition of *job*, compared with definitions produced by other sources of information.

Measuring wage dispersion

The subsequent analysis follows the 1980s BLS studies by calculating several measures of dispersion. To illustrate these measures, four occupations have been selected: registered nurses, janitors and cleaners, hotel clerks, and salesworkers of motor vehicles and boats. Summary data for these occupations are presented in table 1. In each case, most workers were in establishments in which more than one rate was paid for the job.

Wage spread. The primary measure of dispersion pre-

Table 1. Wage dispersion measures for four private-industry occupations and selected work levels, 2004

[In percent]

Occupation	Proportion of workers in establishment jobs with multiple pay rates	Mean wage spread	Median wage spread	Coefficient of variation	Proportion of across-establishment variation	Index of wage dispersion
Registered nurse, overall	84	43	40	29	84	34
Registered nurse, grade 9.....	85	42	41	24	84	30
Janitors and cleaners, overall	68	50	38	37	90	47
Janitors and cleaners, grade 1....	75	47	38	33	91	36
Hotel clerk, overall.....	74	31	19	20	72	24
Hotel clerk, grade 3.....	83	39	30	17	60	23
Salesworkers, motor vehicles and boats, overall	85	481	275	75	40	100
Salesworkers, motor vehicles and boats, grade 5.....	76	530	262	68	45	108

sented in the analysis that follows is termed *wage spread*. This measure is calculated by determining the percentage by which the highest paid worker's wage in the establishment job exceeded that of the lowest paid worker. For example, suppose that in the establishment job of pediatric nurse the highest paid full-time worker earned \$70,000 per year and the lowest paid earned \$40,000. Then the wage spread would be calculated as 75 percent: $[(\$70,000 - \$40,000)/\$40,000] \times 100$. The spread for each establishment job is calculated in this manner and is then averaged across each establishment and occupation composing a segment of the workforce. Since the NCS takes a census of all employees in the job, variability in the aggregate wage spreads is due to sampling establishments and jobs within establishments, but not from taking a subset of workers within the establishment jobs.²¹

The wage spread is calculated for jobs within establishments in which more than one rate of pay was granted. Jobs with a single incumbent and jobs whose incumbents received the same wage are not included in the calculations. For the survey as a whole, 64 percent of private-sector employees were in jobs with more than one rate of pay, 13 percent were in jobs in which all workers received the same pay, and 23 percent were in single-incumbent jobs. In State and local governments, 83 percent of employees were in jobs with multiple pay rates, 7 percent were in jobs with only one rate, and 10 percent were in single-incumbent jobs.

The wage spread is a measure of the dispersion of wages in a single job within a single establishment.²² For example, the average spread in wages for registered nurses in private industry was 43 percent in 2004. In other words,

among all private establishments paying registered nurses different rates, the wage of the highest paid nurse was about 40 percent higher, on average, than that of his or her lowest paid counterpart in the same nursing job within the establishment.

Two statistics measuring the wage spread are calculated: the mean and the median. The mean, or average, is computed by summing the wage spread in each establishment job surveyed and dividing by the number of observations. The median is a "positional" statistic that is computed by arraying each of the wage spreads in numeric order from the lowest spread to the highest. The wage spread in the exact middle is the median spread. (A few other "positional" statistics besides the median are displayed. For example, at the 25th-percentile wage spread, one-quarter of the observations had the same or a lower spread and three-quarters the same or a higher spread. Conversely, at the "75th percentile," three-quarters of observations had the same or a lower spread and one-quarter the same or a higher spread.)²³

The reason both statistics are examined is that the wage spread is affected by extreme values within an establishment job, because only the highest and lowest rates enter into the calculation. Calculated over many observations, average spreads will be less affected by extreme values in a few establishments, but in those cases where there are fewer observations, or where a few observations have extremely high wage spreads, the mean, or average, spread can be heavily affected. For example, although the mean wage spread for workers selling motor vehicles and boats is 481 percent, the median is 275 percent. The reason for this difference is that in about 1 in 10 establishment jobs

the highest paid salesworker earned 10 or more times what the lowest earned.

As table 1 shows, the mean wage spread is usually higher than the median. In some occupations, such as registered nurse, the two figures are similar, but in other occupations they diverge. Because of this divergence, both statistics are examined in this article.

The wage spread considers only the highest and lowest wage rates in a job, so it is subject to fluctuations from pay period to pay period as employees are hired or leave the job. These fluctuations should be mitigated in cases where a large number of observations are averaged, but caution should nonetheless be exercised in interpreting data for subsets of the workforce for which the survey had smaller numbers of observations. Note that sample errors are not calculated for the wage dispersion measures to be discussed, so no statements as to their statistical reliability can be made. For this reason, the analysis that follows concentrates mainly on cases with a relatively large number of observations.

The wage spreads for larger groupings of employees, such as salesworkers or workers in unionized jobs, are calculated by combining the wage spread data from individual occupations. Thus, patterns in the wage spreads for large subsets of the workforce can be traced back to the impact of individual occupations.

Three broader statistics. To provide an additional perspective, three other measures are calculated that show how wages vary in occupations *across* establishments. The *coefficient of variation* for an occupation is computed by calculating the standard deviation for the occupation and dividing it by the average wage for the occupation. The coefficient of variation includes all sources of variability: differences in wages across industries, across establishments in the same industry, and across jobs within establishments, as well as the source that is the focus of this article: differences in wages in jobs within establishments. The coefficient of variation also provides a yardstick for comparing the wage variability of one occupation with another. For example, private-industry *registered nurses* had a coefficient of variation of 29 percent in 2004, *janitors* 37 percent, *hotel clerks* 20 percent, and *salesworkers of motor vehicles and boats* 75 percent. These figures partly reflect industry employment patterns: because hotel clerks are employed almost entirely in hotels, wage variation across the various industries under which those hotels are subsumed is nearly zero. *Janitors and cleaners*, by contrast, are employed in many industries, and *registered nurses*, though concentrated in the health care industry, also are employed

in other industries, such as clinics in manufacturing plants and health units in corporate headquarters.

In examining the coefficient of variation for larger subsets of the economy, such as professional workers or workers in small establishments, it is important to bear in mind that it will be affected by different wage rates among occupations. For example, among State and local governments, the service workers major occupational group includes a large number of relatively highly paid occupations, such as police officers and firefighters, as well as many lower paid occupations, such as cooks and janitors. The coefficient of variation for service workers is the highest among the State and local government major occupational groups, because of the disparate wages among occupations rather than because of wide wage spans within particular establishment jobs. Unlike the wage spread, the coefficient of variation is not an average of its components. For example, the coefficient of variation for all workers in government was 54 percent, but the figure for the major occupational group with the highest coefficient of variation was 47 percent.

To help put the coefficient of variation in perspective, consider the proportion of variation attributable to wage differences across establishments. This proportion is calculated by dividing the variation of wages across establishments by the total variation in wages. For example, among private-industry registered nurses, 84 percent of total wage variation was due to cross-establishment variation in wages. The remaining 16 percent was due to variation among occupations within establishments and within establishment jobs. However, instances of the same occupation being reported for more than one job within an establishment are uncommon in the NCS, so for the rest of this article the two proportions will be referred to as *cross-establishment* and *within-job* variation.

The final statistic examined, the *index of wage dispersion*, is computed by dividing the difference between the 75th-percentile wage and the 25th-percentile wage by the median (or 50th-percentile) wage. The index of wage dispersion thus gauges the breadth of the central portion of the distribution of wages. While the coefficient of variation includes all wage rates, the index of wage dispersion includes only the middle 50 percent of wages and is not affected by extreme values.²⁴ In the four sample jobs, the index of wage dispersion was close to the coefficient of variation.

Overall results

Table 2 shows that, for all occupations together, the mean wage spread was 53 percent for private industry and 62

Table 2. Wage dispersion measures for private industry and for State and local governments, 2004

[In percent]

Sector	Wage spread						Coefficient of variation	Proportion of across-establishment variation	Index of wage dispersion
	Mean	10th percentile	25th percentile	Median	75th percentile	90th percentile			
Private industry	53	7	16	32	55	92	88	90	84
State and local governments ..	62	11	24	47	83	122	54	71	76

percent for State and local governments. The columns listing percentiles indicate that the mean spreads were substantially affected by a minority of observations with very high wage spreads. The private-industry median wage spread was 32 percent, but the 90th-percentile spread was 92 percent. State and local governments had a similar pattern, with a median spread of 47 percent and a 90th-percentile spread of 122 percent.²⁵ (This skewed pattern is often seen in wage rates. For example, the 2004 NCS survey indicated that the median hourly wage for the Nation was \$14.48, but the average was higher, namely, \$18.09, and the 90th-percentile wage was \$32.45.)

In contrast, the broader measures, which include all types of variability, showed greater wage dispersion in private industry than in State and local governments. Differences across establishments, rather than within jobs, contributed more to the overall variability of wages in private industry than in State and local governments. This finding is not too surprising, considering the greater diversity of industries and occupations found in the private sector.

The proportion of variation attributable to across-establishment differences is high—nine-tenths in private industry and seven-tenths in governments, in line with some of the studies mentioned earlier.²⁶ Given the sampling and data collection techniques of the NCS, which result in a relatively homogeneous group of employees within the job, we would expect that most overall variation would be of the establishment and occupational, rather than the within-job, variety.

Major occupation. In private industry, median wage spreads ranged from 28 percent for transportation and material movement workers to 38 percent for salesworkers. As expected, the mean spread had a much wider range, from around 40 percent for clerical workers, precision craft

workers, machine operators, and helpers and laborers, up to 113 percent for salesworkers. (See chart 1, page 24.) Among the major occupations, the coefficient of variation and the index of wage dispersion showed roughly similar patterns.

The category of salesworkers includes a wide array of occupations, from the populous job of cashiers (41 percent mean, and 33 percent median, wage spread), in which pay is almost always determined strictly by hours worked, to various salesworkers and sales representatives, who are often paid commissions geared to sales. For example, nearly all salesworkers of motor vehicles and boats had incentive-based (commission) pay, with an average spread of 481 percent. Salesworkers paid on the basis of time worked had an average wage spread of 45 percent (and a median of 33 percent), while their incentive-paid counterparts had an average wage spread of 404 percent (and a median of 110 percent). As a group, salesworkers had the highest wage dispersion from all sources, with a coefficient of variation of 104 percent, coupled with the lowest proportion of total variation due to differences across establishments (76 percent).

The patterns seen in the mean wage spreads are similar to those found in the earlier BLS studies. Professional and managerial workers generally are employed at higher work levels than clerical, blue-collar, and service workers and have a greater opportunity than the latter workers do to differentiate their performance. (Note, however, that most salesworkers were not included in the earlier BLS studies.)

Mean and median spreads tracked much more closely among the major occupational groups in State and local governments than they did among those in private industry. (See chart 2, page 25.) Mean spreads were lowest among the sparsely populated machine operators and precision craft workers major occupational groups. Professional workers (a

Chart 1. Wage spread by major occupation, private industry, 2004

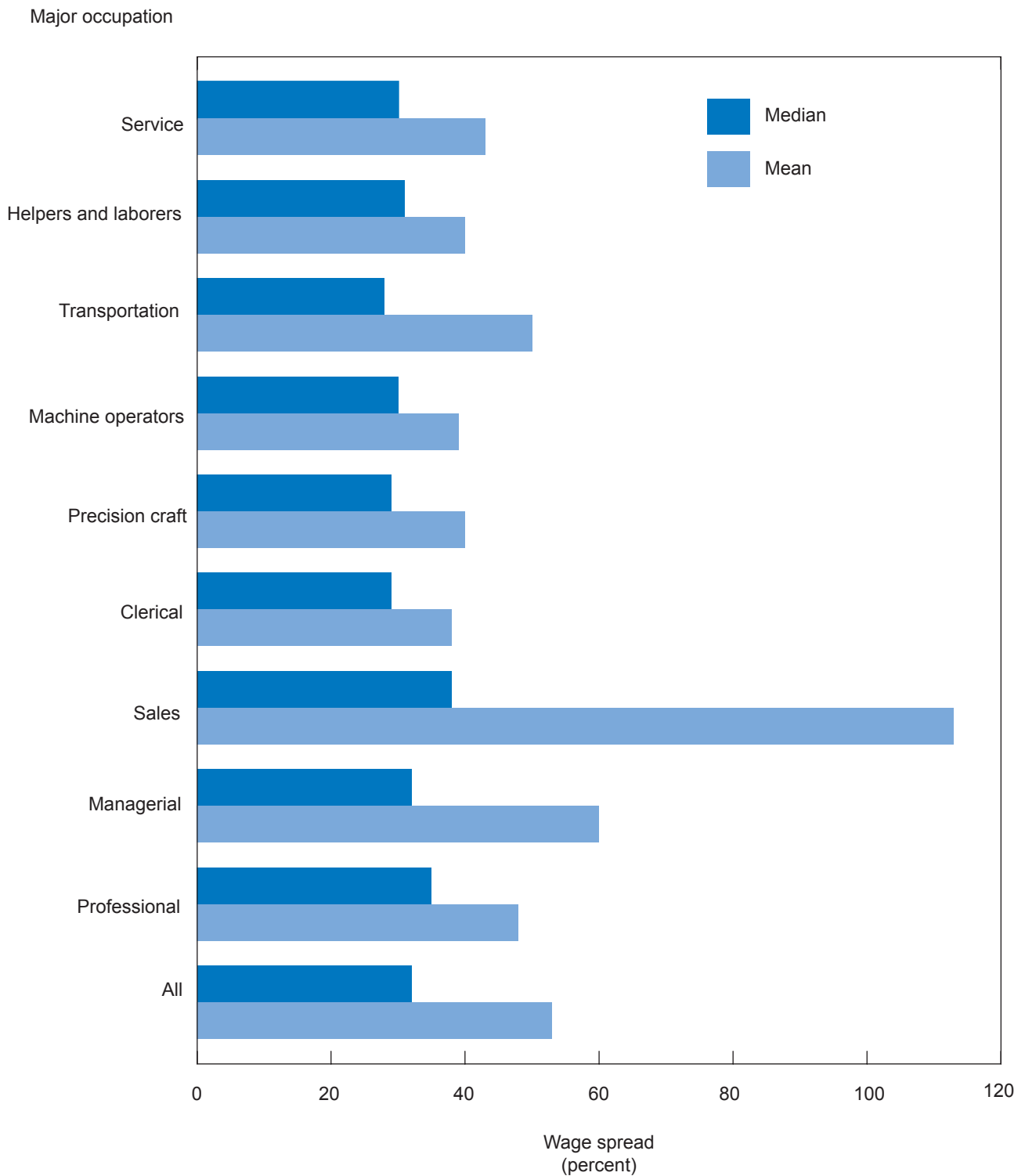
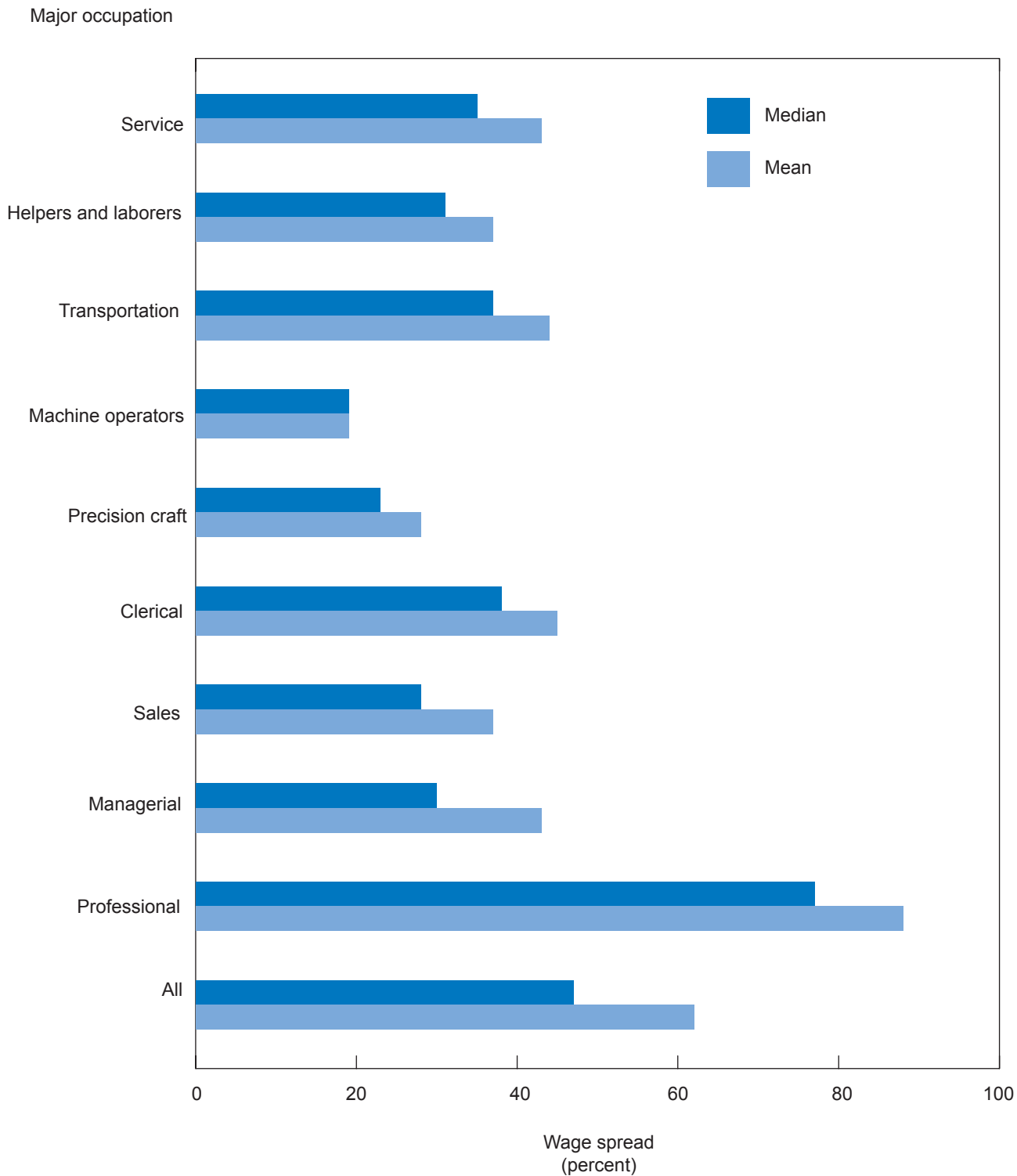


Chart 2. Wage spread by major occupation, State and local governments, 2004



group that includes teachers) had the highest spreads (with a median of 77 percent and a mean of 88 percent).²⁷ The two most populous teaching occupations had mean spreads of more than 100 percent: elementary school teachers had a mean spread of 106 percent (the median was 98 percent), and secondary school teachers averaged 104 percent (with a median of 100 percent). Public school teachers are commonly paid according to a combination of length of service and educational attainment. For example, a teacher with a master's degree and 20 years of experience might earn \$70,000 per year, while a beginning teacher with a bachelor's degree might earn \$35,000. The other major occupational groups had mean spreads ranging from 37 percent to 45 percent and medians of 28 percent to 38 percent. (There are few salesworkers in governments, and they are rarely paid commissions.)

Unlike the situation in private industry, the coefficients of variation and indexes of wage dispersion for the major occupations did not follow the same pattern as the mean wage spread. Differences among major occupational groups were small when the most inclusive measure, the coefficient of variation, was used, and ranged from 31 percent for transportation workers to 47 percent for service workers. As noted earlier, government service workers are a mix of high- and low-paying occupations.

Grade levels. The theory of compensation suggests that wages should be more disperse for higher graded jobs, because they offer workers greater autonomy and more opportunity for differentiating their performance.²⁸ Charts 3 and 4 show that wage spreads did indeed tend to be greater in higher graded jobs, but the pattern was not seamless. For both private industry and State and local governments, wage spreads tended to be lowest among the lower level jobs (grades 1–4), in which many clerical, service, and blue-collar workers are concentrated. In these grades, the work generally follows set procedures and guidelines, is closely supervised, and does not require complicated decisionmaking.

Private-industry median wage spreads were widest among workers in grades 11 and higher. At these grades, professional, administrative, and managerial employees typically have mastered the knowledge required by the job, can select among work methods, and follow only general guidelines. The narrowing of the mean spreads at the highest levels may be attributable to the fact that establishment jobs with workers at grades 14 and 15 generally were found only in a small number of establishments and often had few incumbents per establishment. Workers at these levels are often senior managers, scientific experts,

or senior professors. The last two of these types of employees may have been clustered at the top of the salary range for their jobs, but the survey data do not permit any verification of this supposition.

Median and mean wage spreads were more closely aligned in State and local governments than in private industry. Public-sector employees in grades 8 and 9, into which many elementary and secondary school teachers are classified, had relatively high wage spreads. Wage spreads also were high for government workers in grades 11–15 (typically journey-level and senior expert grades for professional and managerial employees).

Level of pay. Because higher levels of work are generally associated with higher levels of pay, the division by wage level looks very much like the division by work level. That is, jobs with higher average salaries tended to have wider spreads than lower paid jobs. In private industry, there was a relatively steady progression (as measured by mean wage spreads), with wage dispersion increasing in tandem with increases in hourly wages. (See chart 5, page 28.) Jobs averaging less than \$7 per hour had a mean wage spread of 33 percent, compared with 116 percent for jobs averaging more than \$32 per hour.²⁹ Although the median figures showed a similar trend, the differences were less pronounced, ranging from 25 percent in the lowest category to 41 percent in the highest, with little difference among the middle categories (\$7 per hour to under \$32 per hour).

A similar pattern applied to State and local government workers, for whom mean spreads ranged from 35 percent for the lowest paid category to 100 percent for the highest paid category. In contrast to the figures for private industry, State and local government median wage spreads varied as widely as the mean figures. (See chart 6, page 28.)

Do wage spreads differ when the level of *total compensation*, rather than the level of wages, is examined? Experimental tabulations using 2006 data that array wage spreads by the level of *total compensation* (wages plus the cost of benefits) showed less pronounced patterns. Overall, the private-industry figures were similar to the wage spreads presented earlier in this article. The mean wage spread was 54 percent, the median 33 percent.

Median wage spreads were lowest (22 percent) for private establishment jobs in which the costs for wages and benefits were less than \$10 per hour. There was little difference in median wage spreads among jobs with total-compensation costs of \$10 or more. The lowest spread (33 percent) was for jobs with total-compensation costs of \$19 per hour to under \$30 per hour, and the highest (38 percent) was found in jobs with costs of \$14 per hour to

Chart 3. Wage spread by work level, private industry, 2004

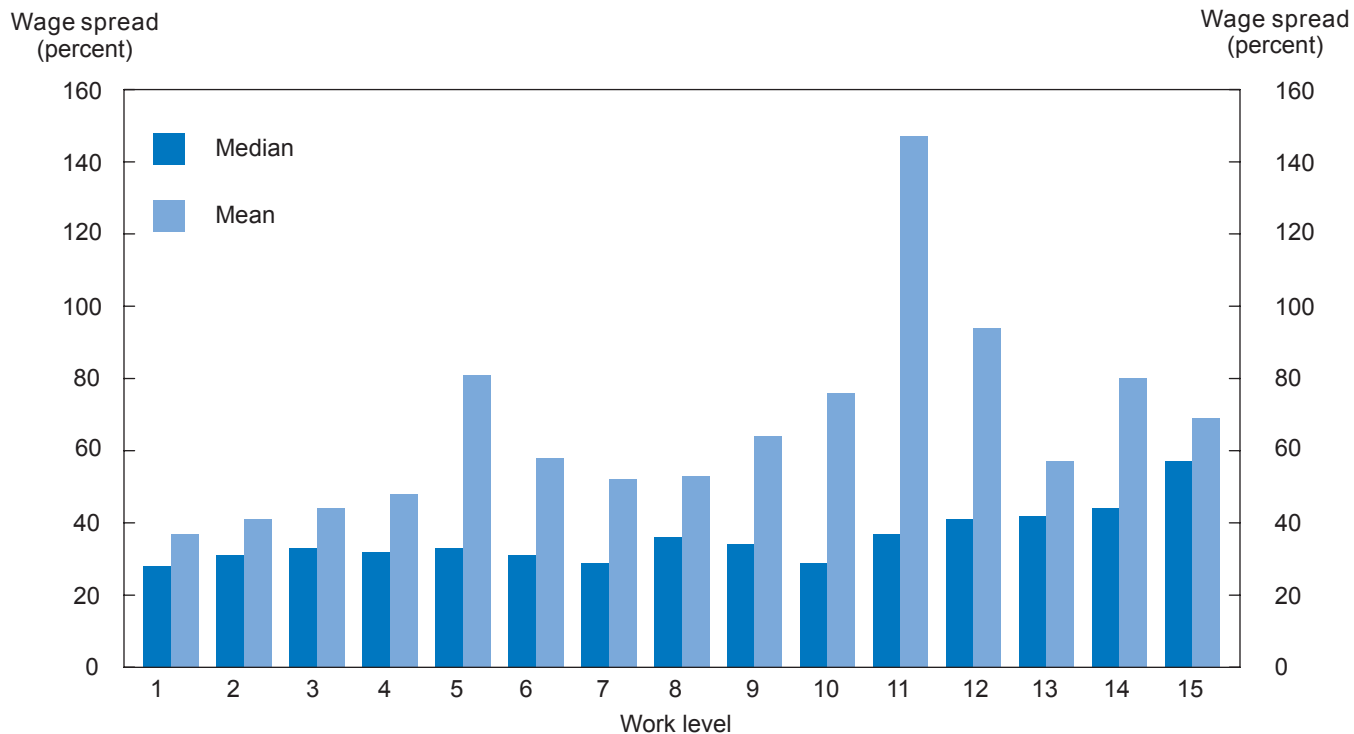


Chart 4. Wage spread by work level, State and local governments, 2004

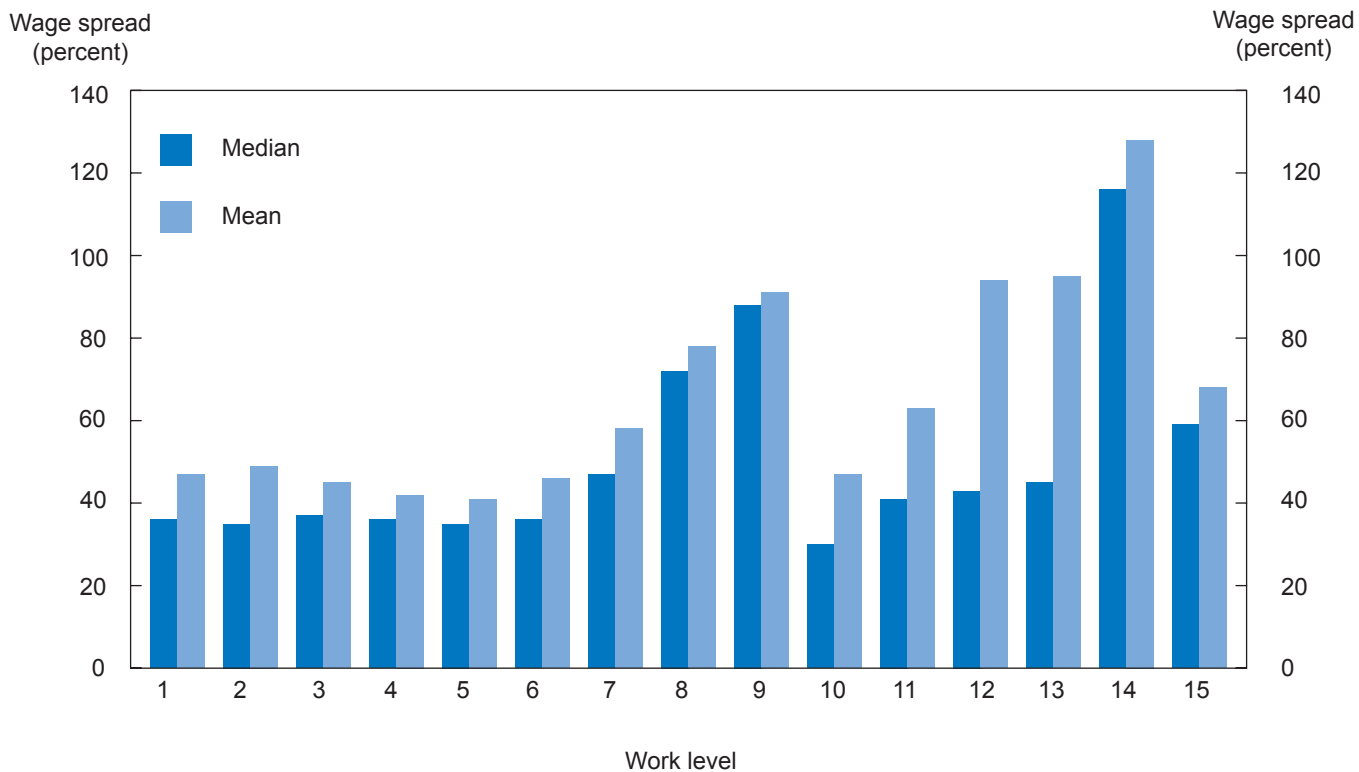


Chart 5. Wage spread by wage level, private industry, 2004

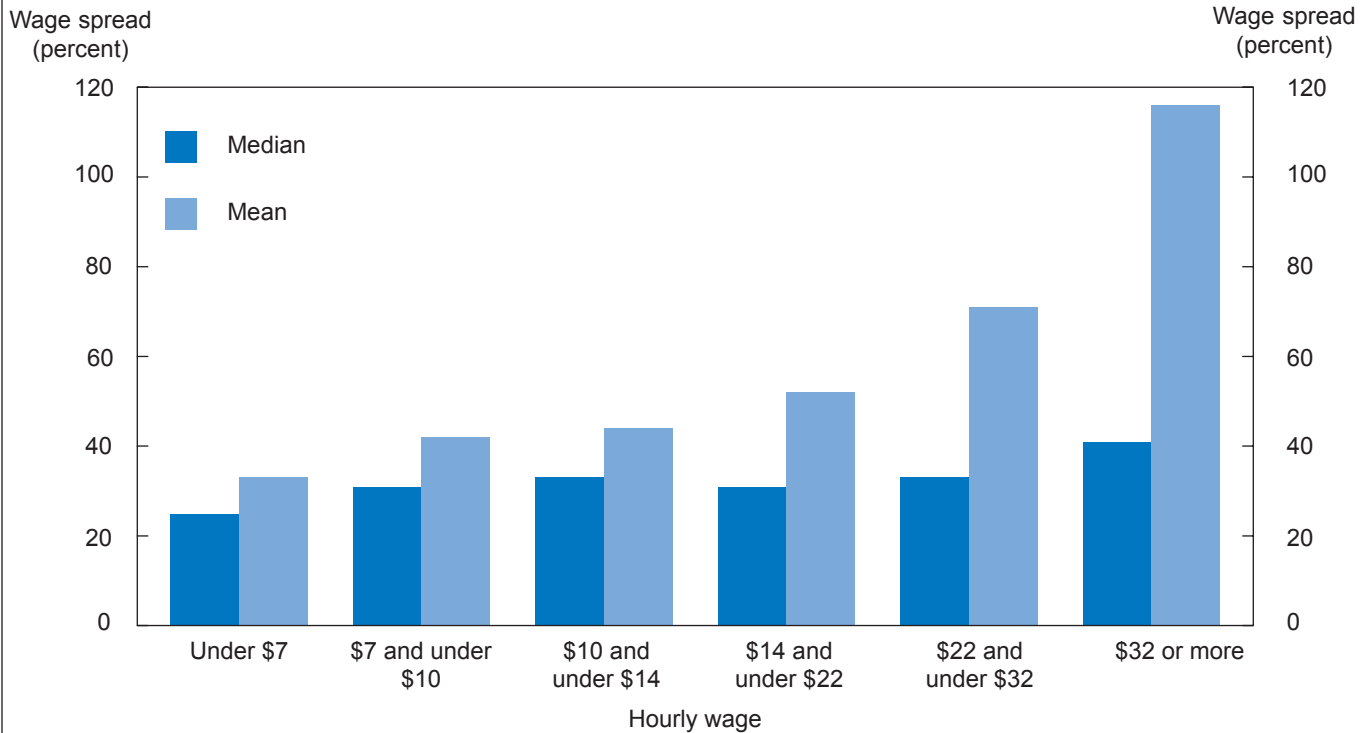
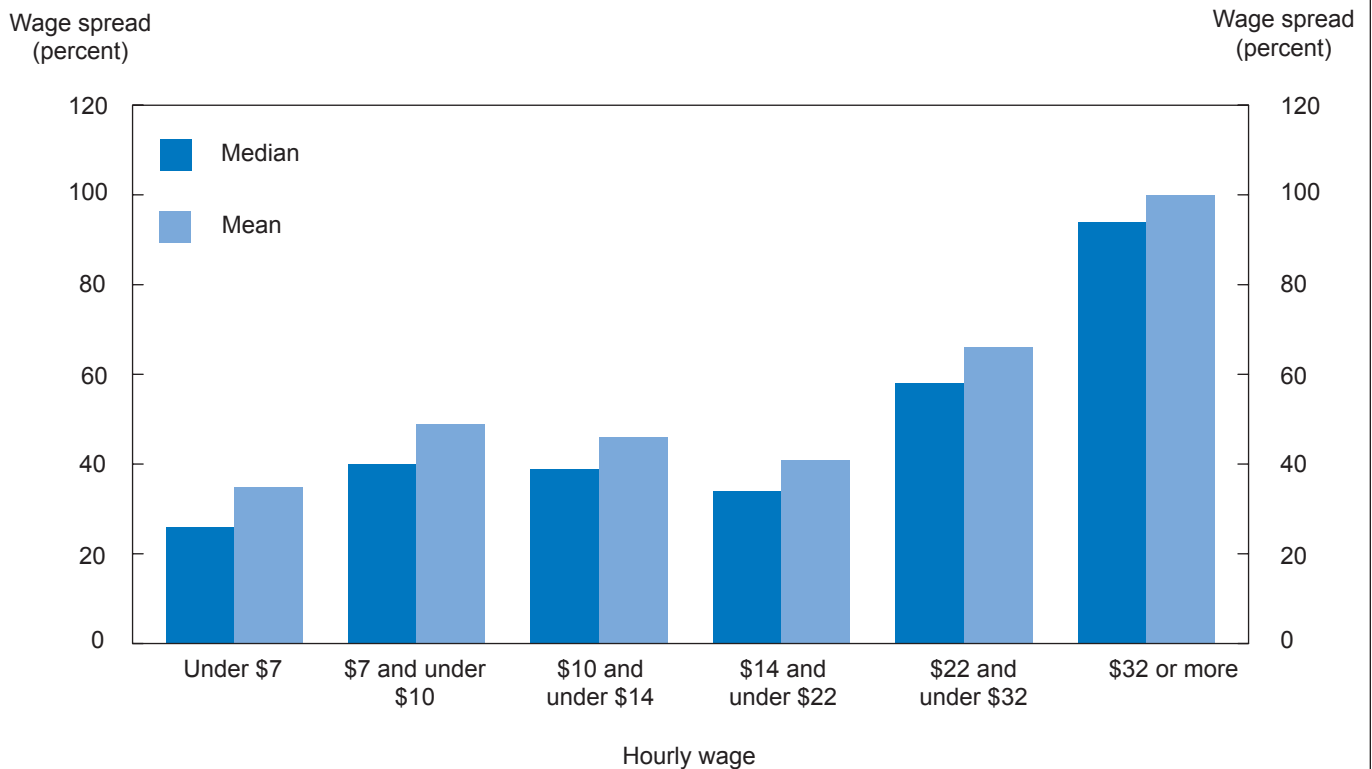


Chart 6. Wage spread by wage level, State and local governments, 2004



under \$19 per hour. These results may stem from the way data are reported in the NCS. Unlike wage data, which are collected separately for each employee, NCS benefit cost data are collected for the establishment job as a whole. Thus, the total-compensation categories used in these experimental tabulations combine individual (and varying) wage rates with average hourly benefit costs.³⁰

The experimental figures for State and local governments were not as close to the 2004 statistics reported earlier in this article: the mean wage spread was 52 percent, the median 41 percent. The lowest median spread (30 percent) was in jobs with total-compensation costs of \$10 to under \$14 per hour, and the highest (66 percent) was found in jobs with costs of \$44 per hour or more. There was no apparent pattern to the median spreads for the other hourly cost ranges tabulated.

Industry. Cross-economy studies have found that industry is an important factor in accounting for overall wage dispersion. The narrower look at wage spreads within establishment jobs that this article presents, though conducted only at the major industry level, showed mixed results. In private industry, there was little difference in median wage spreads among the five industry divisions studied. As with other characteristics examined, however, mean spreads ranged more widely, from 41 percent in manufacturing to 105 percent in finance, insurance, and real estate, an industry that includes several of the sales occupations with the highest mean spreads.³¹ (See chart 7, page 30.) In his 1985 study, Buckley found that mean wage spreads were generally smaller in manufacturing than in nonmanufacturing industries.

Among the three State and local government major industries tabulated, mean wage spreads were similar for public administration (39 percent) and health services (43 percent). By contrast, the average spread was 80 percent for education services, in which teachers compose a large share of employment.³² Median figures again showed more variation than in the private sector, ranging from 33 percent in public administration to 70 percent in education. (See chart 8, page 30.)

Size of establishment. Some theorists have suggested that wage dispersion is more pronounced in smaller establishments than in larger establishments, because smaller firms are apt to have less structured pay policies and a less predictable flow of funds to share with employees.³³ In contrast, the focus presented here on individual jobs within establishments may call for a different explanation. Larger establishments, for example, are more apt to have

formal pay systems with broad rate ranges.³⁴ Charts 9 and 10 (page 31) show that wage spreads did not vary greatly by the size of the establishment (measured by the number of workers employed there), although the picture is somewhat mixed: on the one hand, it is difficult to discern clear patterns among private-industry establishments, while, on the other, for governments, the smallest establishments (those with fewer than 100 employees) had the lowest wage spreads (with a 36 percent mean and a 28 percent median). In contrast to private industry, government showed a gradual increase in wage spreads as the size of the establishment increased, except that there was no difference in median spreads for the two largest categories of establishments. (The data for State and local governments excluded establishments with fewer than 50 workers; the private-industry data included all establishments, even those with just 1 worker.)

In 1985, Buckley found that, while average spreads were higher for white-collar jobs in private establishments employing 500 or more workers than in smaller establishments, a mixed pattern emerged for blue-collar jobs. The 2004 results for managerial jobs also were mixed, but in the clerical and professional categories, which contain the jobs most similar to those studied by Buckley, the larger establishments (those with 500 or more workers) tended to have higher mean and median spreads than establishments with fewer employees. Among service jobs in establishments with 500 or more employees, the 2004 trend was also generally toward higher spreads. However, the opposite was true for craftworkers. Table 3 (page 32) summarizes the results by establishment size for each major occupational group.

Incentive workers have a great impact on the wage spreads for different-size establishments in private industry. When these workers are removed from the tabulations, a much smoother progression from small to large establishments emerges:

<i>Size of establishment (private industry)</i>	<i>Wage spread, percent (time-based workers)</i>	
	<i>Mean</i>	<i>Median</i>
1–99 employees	33	25
100–499 employees	45	34
500–999 employees.....	48	35
1,000–2,499 employees.....	47	35
2,500 or more employees.....	56	42

Union status. Union membership has declined in the years since the earlier BLS studies were published. In 2004, 12.5 percent of wage and salary workers belonged to unions, down from 20.1 percent in 1983. By 2004, State

Chart 7. Wage spread by industry, private industry, 2004

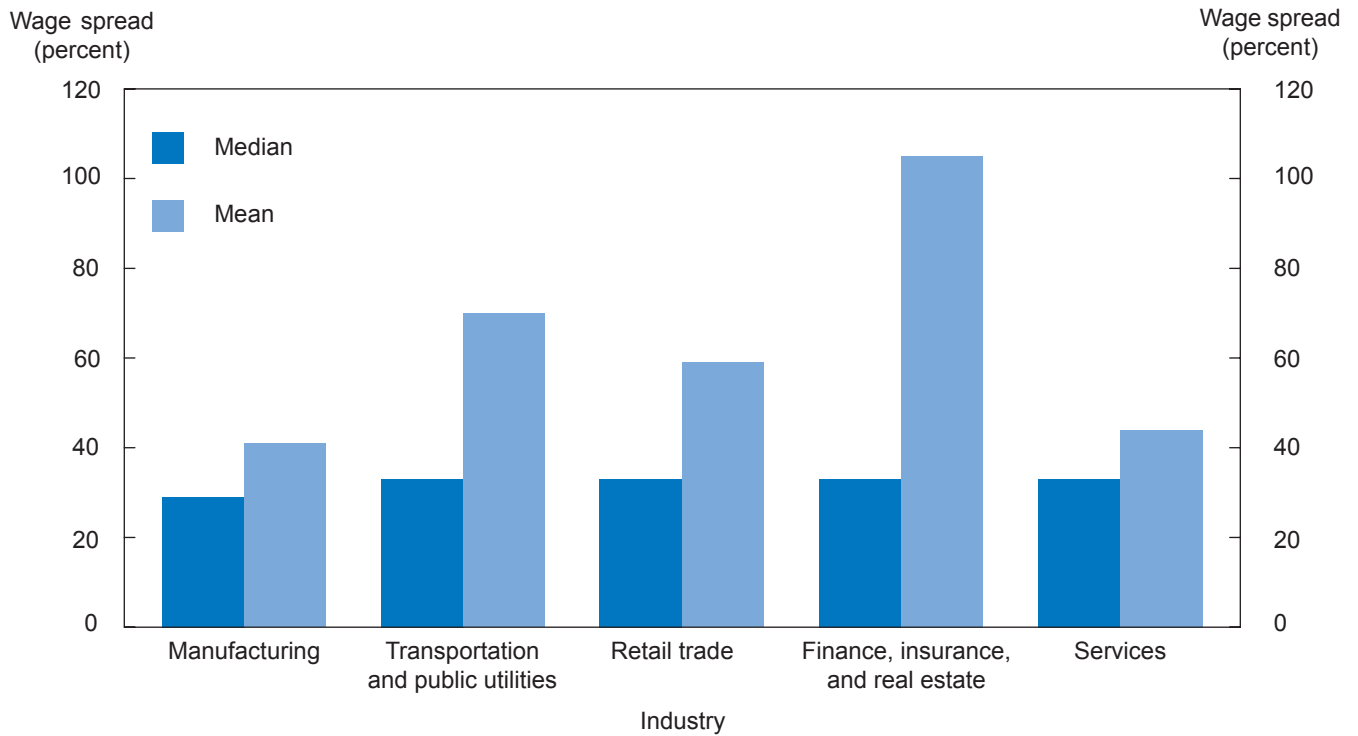


Chart 8. Wage spread by industry, State and local governments, 2004

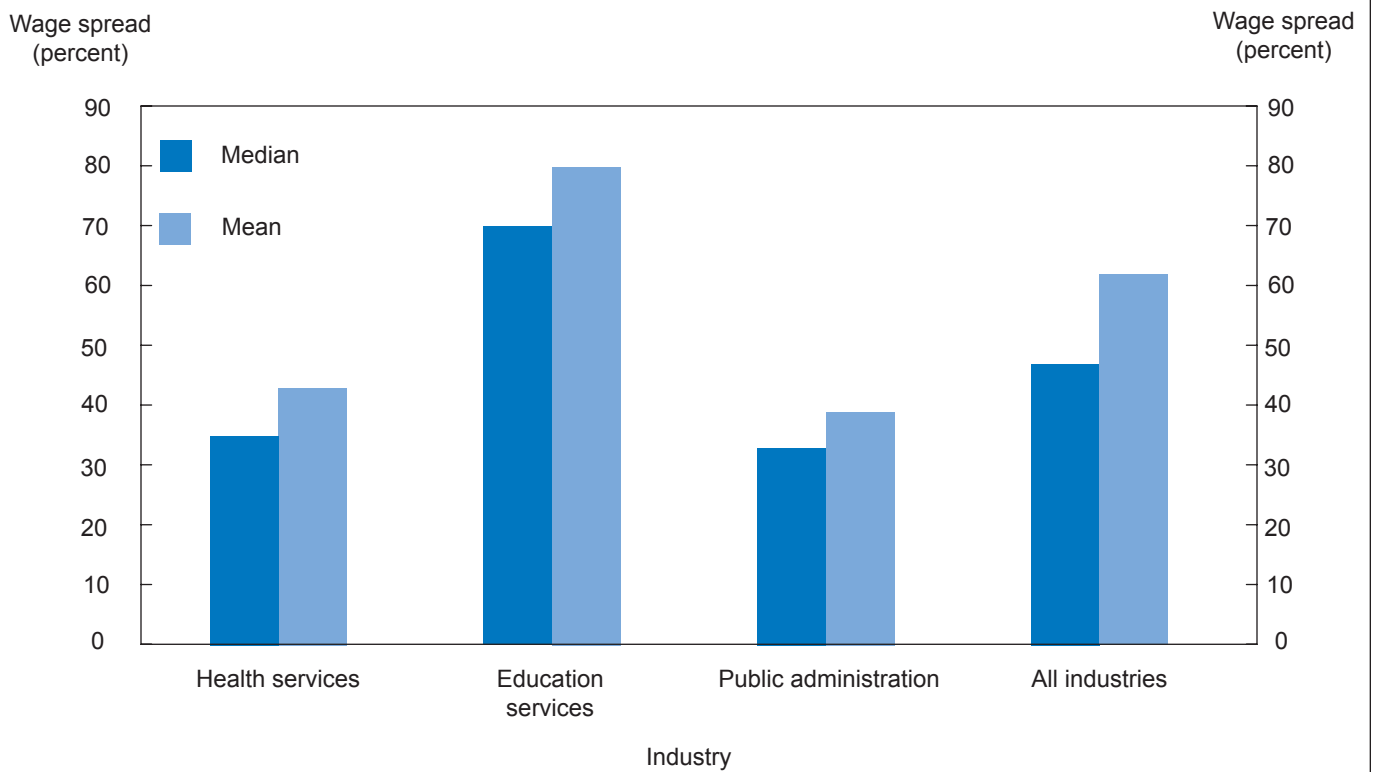


Chart 9. Wage spread by size of establishment, private industry, 2004

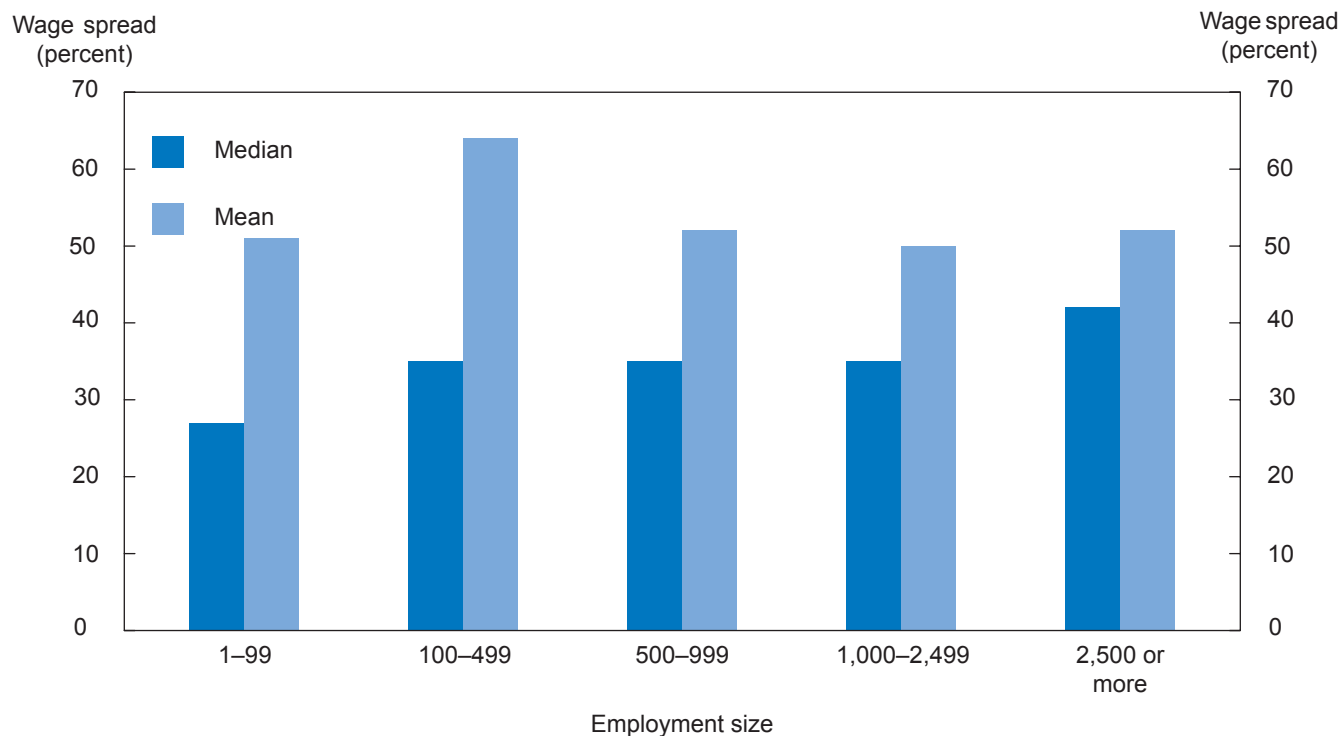


Chart 10. Wage spread by size of establishment, State and local governments, 2004

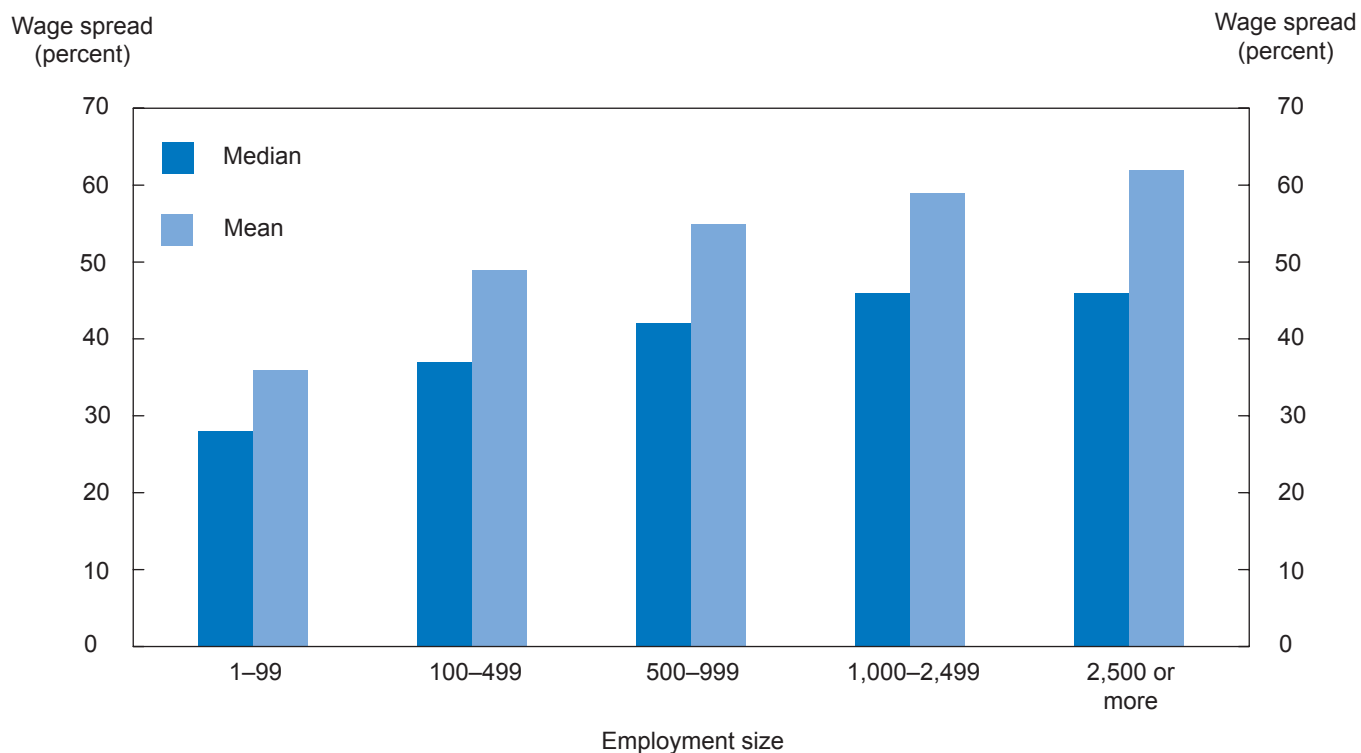


Table 3. Mean and median wage spreads for major occupational groups, by establishment size, private industry, 2004

[In percent]

Major occupational group	Under 100		100–499		500–999		1,000–2,499		2,500 or more	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Professional	40	29	46	31	42	35	43	37	57	45
Managerial	121	30	44	31	40	27	39	27	48	39
Sales	122	29	178	64	126	75	141	48	62	40
Clerical	30	24	41	30	44	33	41	35	49	43
Craft	42	31	46	30	30	21	36	25	31	26
Machine operators	38	31	41	29	34	28	50	35	37	33
Transportation..	37	25	90	31	59	40	76	42	52	51
Helpers and laborers	36	29	41	32	47	36	57	41	54	42
Service	32	24	46	36	68	46	54	33	64	48

and local government workers composed four-tenths of union members outside the Federal Government. The difference between private industry and State and local government was marked: about 7.9 percent of private-industry workers were union members, compared with 36.4 percent of State and local government workers.³⁵

In Buckley's 1985 study, results were mixed: spreads were narrower for union workers in blue-collar jobs, but often broader in white-collar jobs. The study presented herein shows, as other studies of overall dispersion have demonstrated, that private-industry workers in unionized occupations had a slightly lower average wage dispersion than their nonunion counterparts.³⁶ The mean wage spread for union workers was 47 percent, compared with 53 percent for workers in nonunion jobs. The median spreads were 30 percent and 32 percent, respectively. (See chart 11.) Table 4 (page 34) shows comparative spreads for blue-collar workers, among whom the concentration of union workers was highest.

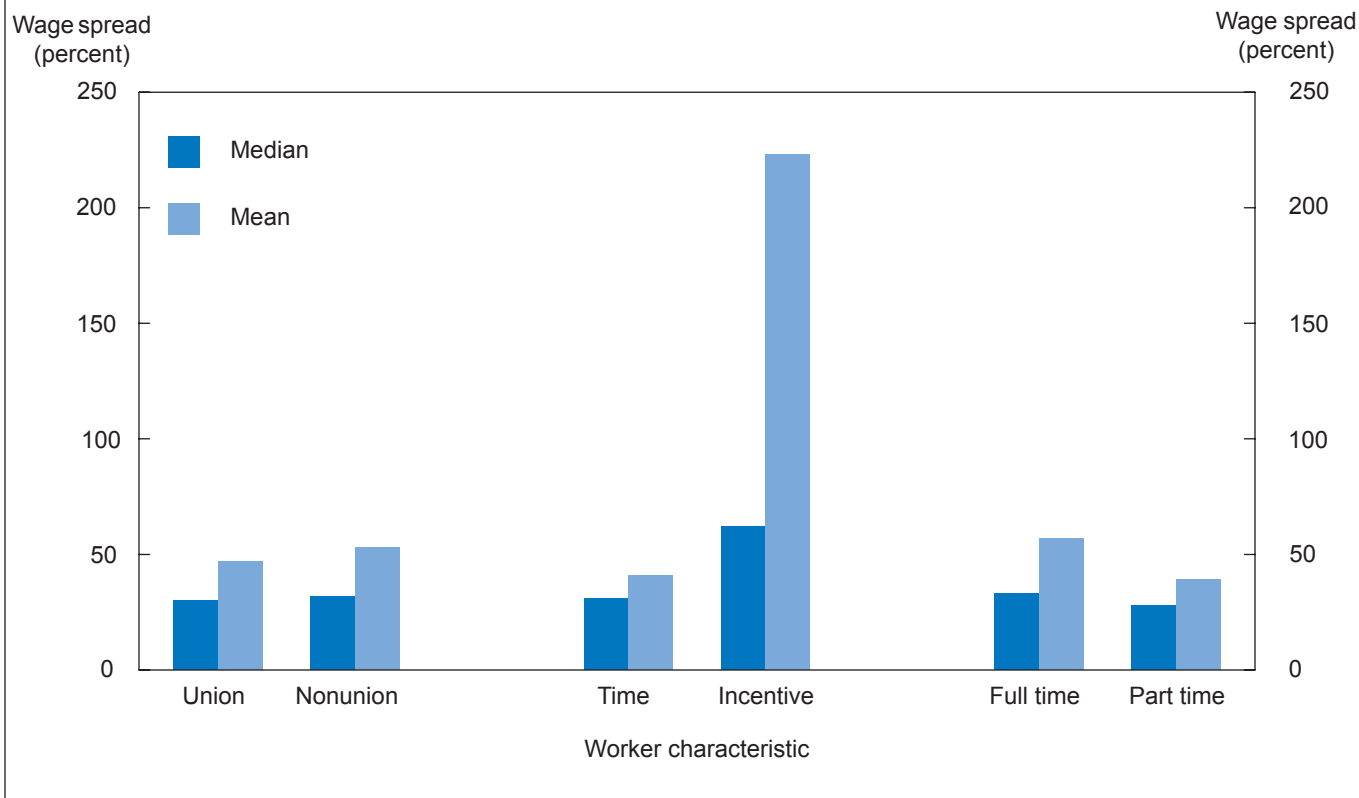
A different pattern emerged for the more highly unionized State and local government sector. The mean wage spread for unionized government workers (64 percent) was slightly higher than that for nonunion jobs (60 percent). (The median spreads were 48 percent and 45 percent, respectively.) This apparently counterintuitive result stems largely from the influence of the relatively populous professional workers major occupational group, among whom unionized employees had a mean spread of 93 percent, compared with 81 percent for nonunion employees. Public school teachers account for a sizable portion of professional workers and have high rates of unionization together

with widely varying pay rates. Table 5 (page 35) shows dispersion measures for six public teaching occupations. Except for substitute teachers, each occupation has a high wage spread and a much lower than average across-establishment variability. Wage spreads were higher for union workers in 5 of the 6 teaching jobs. The exception was prekindergarten and kindergarten teachers, an occupation for which the spreads were similar.

Full-time status. Full-time workers had higher wage dispersion rates than their part-time counterparts in both sectors. (See charts 11 and 12 (the latter, page 36).) In private industry, there are substantial numbers of both full- and part-time salesworkers, but full-time salesworkers had a mean spread of 170 percent, compared with 43 percent for part-timers. (The respective median figures were 48 percent and 33 percent.) In the other major occupational groups with a significant portion of part-time workers, the patterns were mixed. For example, spreads were moderately higher for full-time service workers, but not for part-time laborers.

Differences were somewhat larger for governments. Overall, the mean wage spread was 64 percent for full-time workers (the median was 49 percent), compared with a mean of 45 percent (with a median of 29 percent) for part-time workers. Spreads were higher for full-time workers in each major occupational group with substantial numbers of part-time employees, except that part-time transportation workers had a higher wage spread (mean, 55 percent; median, 44 percent) than full-time workers (mean, 39 percent; median, 33 percent). Busdrivers com-

Chart 11. Wage spread by worker characteristics, private industry, 2004



pose a large portion of transportation workers in governments, and the occupation is evenly split between full and part-time employees, both of whom have a relatively high mean wage spread (51 percent and 55 percent, respectively) within the major occupational group.

Incentive pay. As expected, the most dramatic differences in wage dispersion occurred between time-based and incentive-based workers. In private industry, workers in incentive-paid jobs had a mean wage spread of 223 percent, compared with 41 percent for workers in jobs paid strictly on the basis of the amount of time worked. (See chart 11.) The median spread for incentive workers, 62 percent, was double the 31 percent for time-based workers. (There were too few incentive-paid workers in governments to make meaningful comparisons.)

The salesworkers group had the greatest proportion of incentive workers, mainly sales workers working for commission. Among salesworkers, those paid on an incentive basis had mean wage spreads of 404 percent (the median was 110 percent), compared with 45 percent (the median was 33 percent) for time-based workers.

Transportation workers had the second-highest inci-

dence of incentive workers. In this group, incentive-paid workers had a mean spread of 136 percent, compared with 37 percent for time-rated workers; the respective median wage spreads were 49 percent and 25 percent. Two occupations that accounted for a large proportion of transportation workers had significant portions of incentive workers along with wide differences in wage spreads. Truckdrivers paid incentive rates had a mean wage spread of 148 percent, while the mean for time-rated drivers was 35 percent. (The respective medians were 46 percent and 25 percent.) The other occupation was driver-salesworkers, who deliver, sell, and display merchandise over established routes. Many of these employees work for commissions, and those paid commissions or other incentives had a mean wage spread of 104 percent, compared with 28 percent for time-rated drivers. The respective median spreads were 83 percent and 23 percent.³⁷

Profit and nonprofit establishments in private industry. Although the median wage spreads were identical (32 percent), mean spreads were higher in for-profit establishments (55 percent) than in nonprofit establishments (39 percent). (See table 6, page 37.) Of the nine major occupational groups,

Table 4. Mean and median wage spreads for blue-collar workers in private industry, 2004

[In percent]						
Major occupational group	Mean wage spread, all workers	Median wage spread, all workers	Mean wage spread, union workers	Median wage spread, union workers	Mean wage spread, nonunion workers	Median wage spread, nonunion workers
Craft	40	29	31	16	42	31
Machine operators	39	30	36	25	40	31
Transportation	50	28	60	34	48	26
Laborers	40	31	43	27	40	32

professional workers composed the largest proportion of employees in nonprofit establishments. Among professional workers, wage spreads were similar in both types of establishment. In the other major occupational groups with substantial numbers of nonprofit employees, mean wage spreads tended to be higher in for-profit establishments, while median spreads were similar for the two types of establishment.

Within the professional group, many workers are employed in nonprofit education and health services establishments. For example, a large portion of registered nurses are employed in nonprofit workplaces. Nurses in nonprofit establishments have a mean wage spread of 45 percent, compared with 37 percent for nurses in for-profit facilities. (The respective medians are 43 percent and 31 percent.) Also, private secondary school teachers and many college teaching occupations are found mainly in nonprofit institutions and have higher-than-average wage spreads.³⁸

Geographic location. Private industry wages were more disperse in metropolitan areas, with a mean wage spread of 55 percent, than in nonmetropolitan areas, with a 35-percent spread. (The medians were 33 percent and 27 percent, respectively.) Differences among most of the nine Census divisions were not marked, with the mean spread ranging only from 46 percent to 55 percent in seven of the divisions. The low was 41 percent, in the East North Central States, and the high was 64 percent, in the Pacific States. As expected, the median spreads were even narrower, ranging only from 29 percent in the New England States to 36 percent in the Middle Atlantic States.³⁹

As mentioned earlier, these broad patterns conceal many differences among occupations.

A look at individual occupations

Jobs with the highest wage spreads. Table 7 (page 38) lists the 10 occupations with the highest median wage spreads. As noted earlier, sample errors are not calculated for these wage spread data. The table is limited to occupations with 50,000 or more workers, because the data for lightly encumbered occupations are more likely to be affected by relatively large sampling errors. The median was chosen to be the main statistic because it is less affected by extreme values than the average or mean.

The top two jobs on the list are sales occupations. Nearly all *salesworkers of motor vehicles and boats* work for commission, and so do slightly more than half of the workers in *advertising and related sales occupations*. Advertising workers paid on an incentive basis had a median spread of 775 percent and a mean spread of 615 percent. (Were occupations listed in order of mean wage spread regardless of employment, half of the top 10 occupations, including the top 4, would have been sales occupations.)

Two of the jobs on the list, *airplane pilots and navigators* and *public transportation attendants*, were transportation occupations. Both of these jobs are dominated by airline industry employees, whose pay can vary widely according to the type of aircraft they fly and whether they are commercial or private pilots. Two other private-sector occupations appeared on the list: *hairdressers and cosmetologists* and *material recording, scheduling, and distributing clerks, not elsewhere classified*. About two-thirds of hairdressers were paid incentive rates (commissions), and for these workers, the wage spreads were 105 percent (median) and 143 percent (mean).⁴⁰

There is no simple explanation for the high wage spreads prevailing among material recording, scheduling,

Table 5. Wage dispersion measures for selected public school teaching occupations, 2004

[In percent]

Occupation	Mean wage spread, all workers	Median wage spread, all workers	Mean wage spread, union workers	Median wage spread, union workers	Mean wage spread, nonunion workers	Median wage spread, nonunion workers	Coefficient of variation, all workers	Proportion of across-establishment variation, all workers	Index of wage dispersion, all workers
Elementary school teachers.....	106	98	113	102	94	88	32	56	45
Secondary school teachers.....	104	100	111	106	95	89	31	53	43
Prekindergarten and kindergarten teachers.....	76	73	75	77	77	73	33	64	42
Special education teachers.....	93	88	99	96	75	65	33	59	48
Teachers, except college and university, not elsewhere classified.....	127	112	132	113	112	77	37	63	51
Substitute teachers.....	66	33	108	109	52	17	41	83	61

and distributing clerks, not elsewhere classified. The answer may lie in the nature of the job. This occupation is one of several in the pre-2006 occupational classification system that was used to categorize workers in various jobs that did not fit into other, more specific occupations. A search of establishment job titles revealed that the types of jobs included in the occupation were disparate. In addition, about half of the employees were in jobs for which it was not possible to assign a specific work level; among these jobs, the median wage spread was 109 percent. Survey data do not provide a clear answer, but it is possible that the high wage spreads result from workers performing a wide range of duties within those jobs and being paid different rates corresponding to their duties. (A look at the other establishment and employee characteristics did not reveal any clear patterns.)

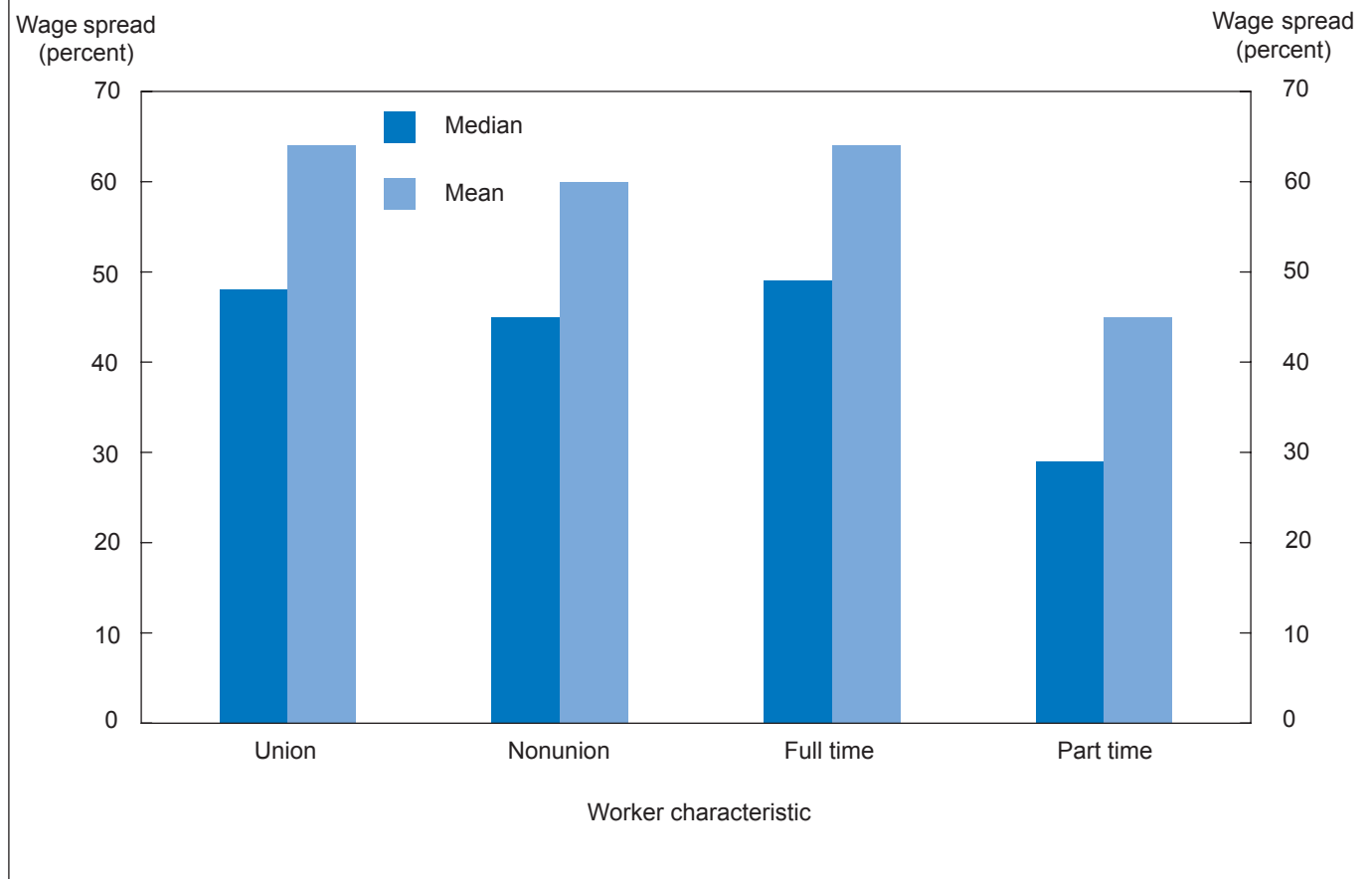
Four State and local government teaching occupations complete the list. This is no surprise, given the typically high wage spreads found among public teaching occupations.

Mean wage spreads for these 10 occupations ranged from 83 percent for material recording, scheduling, and distributing clerks, not elsewhere classified, to 481 percent

for salesworkers of motor vehicles and boats. Overall wage variation was relatively high for most of these jobs, as measured by the coefficient of variation. However, as might be expected in cases where wages varied so greatly among workers within jobs in the same establishment, the share of total wage variation attributable to differences across establishments was generally much smaller than that for private industry or State and local governments overall.

Jobs with the lowest wage spreads. A very different set of jobs appears on the list of jobs with the lowest median wage spreads. Table 8 (page 39), which, like table 7, is limited to occupations with 50,000 or more workers, shows these jobs. Eleven of the 12 occupations listed are in private industry.⁴¹ These jobs are so varied that it is difficult to summarize them. They appear to share only one of the characteristics explored in this article: very few workers in them receive incentive pay.

The 11 private-industry occupations include three supervisory jobs, two skilled-craft jobs (tool and die makers; miscellaneous plant and system operators), two jobs from the laundry and drycleaning industry (pressing machine operators and laundering and drycleaning machine operators),

Chart 12. Wage spread by worker characteristics, State and local governments, 2004

two health services jobs (dental hygienists and pharmacists), one transportation job (motor transportation occupations, not elsewhere classified), and a personal service job (welfare service aides). The sole government job on the list (supervisors of police and detectives) is a supervisory job.

The two skilled-craft jobs had the largest proportion of union workers of any private-sector nonsupervisory jobs listed in the table. Unionized *tool and die makers* had a median wage spread of 8 percent, compared with 17 percent for their nonunion counterparts; the comparable figures for *miscellaneous plant and systems operators* were 4 percent and 32 percent, respectively.⁴²

Although wage spreads were lower for unionized workers in the two laundry industry jobs, the main factor behind the low wage spreads appeared to be that most workers were employed at lower work levels with relatively small wage spreads. A large portion of *laundering and drycleaning machine workers* was employed in level 1 jobs, for which the median wage spread was 12 percent. Similarly, most *pressing machine operators* were in level 1

and level 2 jobs, for which the median spreads were 14 percent and 7 percent, respectively.

A similar dynamic appeared to affect *motor transportation occupations, not elsewhere classified*: three-quarters of the employees were classified in level 1 and level 2 jobs, for which the median wage spreads were 13 percent and 15 percent, respectively. In addition, this occupation had the highest proportion of part-time workers of any occupation listed in table 8. Median wage spreads were 14 percent for part-timers and 33 percent for full-time workers.

Welfare service aides had the second-highest proportion of part-time workers listed in the table. The median wage spread for part-timers in this occupation was 13 percent, compared with 18 percent for full-time workers. The occupation is a relatively low-paid one. In 2004, the average hourly wage was \$9.24 per hour and the median was \$8.88. The median wage spread for workers paid less than \$7.00 per hour was 13 percent; for those paid \$7 to under \$10 per hour, it was 14 percent.

It is more difficult to discern patterns underlying low

Table 6. Mean and median wage spreads for selected major occupational groups, profit and nonprofit private establishments, 2004

[In percent]

Major occupational group	Mean wage spread, all establishments	Median wage spread, all establishments	Mean wage spread, for-profit establishments	Median wage spread, for-profit establishments	Mean wage spread, nonprofit establishments	Median wage spread, nonprofit establishments
All groups	53	32	55	32	39	32
Professional	48	35	50	34	45	37
Managerial	60	32	63	32	38	28
Clerical	38	29	39	30	33	29
Service	43	30	45	30	34	29

wage spreads for the two health care jobs. *Dental hygienists* were evenly split between full- and part-time workers, but median wage spreads were small for both types of work schedule, as well as for work levels and pay rates. However, most workers were employed in establishments with fewer than 100 workers, for which the median wage spread was 11 percent. *Pharmacists* were employed in large numbers in retail establishments (where the median spread was 7 percent) and services establishments (with a 12-percent median spread). Median spreads were similar among all sizes of establishments, in both profit (an 8-percent median spread) and nonprofit (13 percent) establishments, and by the work level of the occupation. Most pharmacists earned \$32 an hour or more; the median wage spread for workers at this earning level was 10 percent.

Patterns are even more difficult to find in the three private-sector supervisory occupations shown in the table. *Supervisors of electricians and power transmission installers* had a significant portion of union workers, but the median wage spread was higher for union workers (60 percent) than for nonunion workers (14 percent). By industry, the median spread was lower in transportation and public utilities (7 percent) than in the services (14 percent) or goods-producing industries (20 percent).⁴³ Median spreads were noticeably lower in the smallest establishments (14 percent) than in larger establishments. The occupation *supervisors of cleaners and building services* is mainly a services industries job, for which the median wage spread was 5 percent. Median spreads also showed no obvious pattern when sizes of establishments, profit or nonprofit status, work levels, or pay rates were examined. Nearly all *supervisors of personal service occupation workers* were employed in services industries. Here, too, median spreads showed no obvious pattern when sizes of estab-

lishments, work levels, or pay levels were examined. The large majority of supervisors was employed in for-profit establishments, where the median wage spread was 13 percent. The minority employed in nonprofit establishments had a median wage spread of 24 percent.

The sole public-sector job on the list in table 8 is *supervisors of police and detectives*. The majority of employees in this occupation were in union jobs, where the median wage spread was 13 percent, compared with 24 percent for nonunion workers.

Fifty-six selected occupations. It would be impractical in this article to present details for all 400 occupations, and multiple work levels within each occupation, included in the pre-2006 NCS classification system. To help focus on a smaller number, table 9 (pages 40–43) presents summary statistics for 56 selected occupations, chosen in two ways: (1) the three most populous private-sector occupations in each major occupational group were chosen, and (2) three other occupations in each major occupational group were chosen randomly.⁴⁴ For this sample, a list of occupations, with corresponding employment counts, from the 1990 Census of Population was used. (The 1990 census system was the foundation for the occupational classifications used in the 2004 NCS.) When data were also published by NCS for State and local governments, those data were included in the table. The goal was to show the most common occupations in the United States, plus a few of the many diverse, but less common, occupations in the U.S. economy.

It is difficult to draw a common theme by looking at individual occupations, because the patterns shown in one occupation differ from those appearing in another. Some occupations follow the broad trends shown in overall private-industry or government data, while oth-

Table 7. The 10 occupations¹ with the highest wage spreads, 2004

[In percent]

Occupation	Sector	Wage spread						Coefficient of variation	Percent of across-establishment variation	Index of wage dispersion
		Mean	Percentile							
			10th	25th	Median	75th	90th			
Salesworkers, motor vehicles and boats.....	Private	481	99	183	275	488	977	75	40	100
Advertising and related sales occupations.....	Private	443	13	41	197	955	955	87	33	87
Public transportation attendants.....	Private	209	72	91	124	208	536	44	32	42
Teachers, except college and university, not elsewhere classified.....	Public	127	31	70	112	167	238	37	63	51
Postsecondary teachers, subject not specified....	Public	160	25	53	108	218	398	41	56	51
Secondary school teachers.....	Public	104	58	76	100	126	160	31	53	43
Elementary school teachers.....	Public	106	55	78	98	121	156	32	56	45
Airplane pilots and navigators.	Private	190	7	45	97	449	530	56	82	83
Hairdressers and cosmetologists.	Private	124	8	26	90	211	295	56	50	60
Material recording, scheduling, and distribution clerks, not elsewhere classified.....	Private	83	17	45	90	113	139	39	76	48

¹ Occupations with 50,000 or more incumbents.

ers run counter to these broader patterns. For example, as noted earlier, the wage spread for all workers was slightly higher for governments than for private industry. The NCS published data on both private industry and governments for 45 of the 56 occupations selected. Of these 45 occupations, 36 had substantial differences (20 percent or more) in the median wage spreads between sectors. Judged by this standard, 18 occupations had higher private-industry wage spreads, while 18 had higher spreads in governments.⁴⁵ It is clear, however, that the within-job wage dispersion varies considerably by occupation, even within families of similar occupations. This finding is not

surprising, because experience shows that wage rates vary considerably among occupations when they are viewed in terms of the characteristics examined in this article.⁴⁶

Among the 56 occupations selected, private-industry median wage spreads ranged from 12 percent for dental hygienists and hand cutting and trimming occupations to 90 percent for hairdressers and cosmetologists. These occupations generally show the same patterns of wage dispersion that overall trends would lead one to expect. Private-industry sales occupations tend to have the highest wage spreads, followed by managerial and professional jobs. Within the major occupational group machine op-

Table 8. The 12 occupations¹ with the lowest median wage spreads, 2004

[In percent]

Occupation	Sector	Wage spread						Coefficient of variation	Percent of across-establishment variation	Index of wage dispersion
		Mean	Percentile							
			10th	25th	Median	75th	90th			
Miscellaneous plant and systems operators, not elsewhere classified.....	Private	15	4	4	5	23	45	26	97	36
Supervisors, cleaning and building service workers.....	Private	19	5	5	5	21	48	34	91	41
Pharmacists.....	Private	16	2	5	11	21	35	18	89	11
Dental hygienists.....	Private	12	3	7	12	19	19	22	99	30
Supervisors, personal service occupation workers.....	Private	24	6	13	13	39	44	31	88	42
Tool and die makers.....	Private	17	3	8	13	24	32	22	97	36
Supervisors, police and detectives.....	Public	17	4	7	13	24	37	29	97	42
Motor transportation occupations, not elsewhere classified.....	Private	22	4	8	14	29	57	46	91	43
Welfare service aides.....	Private	25	3	8	14	33	71	29	86	43
Laundering and drycleaning machine operators.....	Private	23	5	5	14	31	46	24	87	24
Supervisors, electricians and power transmission installers.....	Private	21	3	11	14	22	60	25	97	44
Pressing machine operators.....	Private	24	7	7	14	25	62	22	84	22

¹ Occupations with 50,000 or more incumbents.

erators, for example, textile sewing machine operators had the highest incidence of incentive-paid employees and the highest wage spreads. Similarly, among skilled craftworkers, automobile mechanics had the greatest proportion of workers under incentive rates and the highest median wage spread.

Changes in wage dispersion over time

The data discussed so far have shown that wages vary considerably among workers in the same job within both private industry and State and local government establishments. But is this within-job variation increasing over time? The conventional wisdom suggests that it is. Factors

Table 9. Wage dispersion measures for 56 selected occupations, 2004

[In percent]

Occupation	Sector	Reason chosen	Mean wage spread	Median wage spread	Coefficient of variation	Percent of across-establishment variation	Index of wage dispersion
Professional							
Registered nurses	Private	Populous	43	40	29	84	34
Registered nurses	Public	Populous	43	42	26	80	36
Law teachers	Private	Random	56	41	40	77	60
Law teachers	Public	Random	39	16	49	(¹)	149
Elementary school teachers.....	Private	Populous	60	56	34	82	49
Elementary school teachers.....	Public	Populous	106	98	32	56	45
Lawyers.....	Private	Populous	76	55	47	81	69
Lawyers.....	Public	Populous	62	32	38	78	53
Computer programmers	Private	Populous	46	37	43	88	50
Computer programmers	Public	Populous	38	31	30	85	43
Technical							
Clinical laboratory technologists and technicians	Private	Random	33	33	34	83	49
Clinical laboratory technologists and technicians	Public	Random	38	39	32	81	35
Dental hygienists	Private	Random	12	12	22	99	30
Dental hygienists	Public	Random	2	1	9	98	19
Licensed practical nurses	Private	Populous	31	28	20	82	27
Licensed practical nurses	Public	Populous	34	32	24	81	29
Tool programmers, numerical control.....	Private	Random	26	14	26	85	24
Technical and related occupations, not elsewhere classified	Private	Populous	38	30	49	84	67
Technical and related occupations, not elsewhere classified	Public	Populous	41	37	35	86	58
Executive, Administrative, and Management							
Financial managers	Private	Random	50	32	55	94	66
Financial managers	Public	Random	32	40	36	94	86
Personnel and labor relations managers.....	Private	Random	35	28	51	96	61
Personnel and labor relations managers.....	Public	Random	33	41	30	97	49
Managers, food service and lodging establishments	Private	Populous	45	41	53	97	48
Managers, food service and lodging establishments.....	Public	Populous	26	25	34	60	52
Managers and administrators, not elsewhere classified	Private	Populous	49	36	134	100	64
Managers and administrators, not elsewhere classified	Public	Populous	54	25	40	92	59
Accountants and auditors.....	Private	Populous	37	25	32	89	40
Accountants and auditors.....	Public	Populous	33	35	27	87	44
Sales							
Supervisors, sales occupations	Private	Populous	41	32	58	94	64

See footnote at end of table.

Table 9. Continued—Wage dispersion measures for 56 selected occupations, 2004

[In percent]

Occupation	Sector	Reason chosen	Mean wage spread	Median wage spread	Coefficient of variation	Percent of across-establishment variation	Index of wage dispersion
Supervisors, sales occupations	Public	Populous	9	8	27	98	23
Sales occupations, other business services	Private	Random	132	61	92	65	81
Sales occupations, other business services	Public	Random	39	39	20	(')	(')
Salesworkers, other commodities	Private	Populous	77	45	69	62	61
Salesworkers, other commodities	Public	Populous	56	71	40	40	73
Cashiers	Private	Populous	41	33	32	82	38
Cashiers	Public	Populous	37	28	38	87	58
Street and door-to-door salesworkers	Private	Random	36	20	62	84	176
Demonstrators, promoters, and models, sales	Private	Random	37	25	29	37	43
Clerical							
Secretaries	Private	Populous	40	34	31	87	43
Secretaries	Public	Populous	50	43	28	83	40
Bookkeepers, accounting and auditing clerks	Private	Populous	29	24	33	94	38
Bookkeepers, accounting and auditing clerks	Public	Random	36	32	27	84	34
Payroll and timekeeping clerks	Private	Random	28	18	30	95	41
Payroll and timekeeping clerks	Public	Random	21	22	21	93	24
Messengers	Private	Random	25	26	24	90	38
Messengers	Public	Random	35	39	34	77	76
Meter readers	Private	Random	34	28	32	91	61
Meter readers	Public	Random	21	12	36	95	43
General office clerks	Private	Populous	39	30	32	86	44
General office clerks	Public	Populous	45	39	28	81	37
Craft and precision production							
Automobile mechanics	Private	Populous	74	44	34	61	39
Automobile mechanics	Public	Populous	21	21	28	95	59
Aircraft engine mechanics	Private	Random	25	19	25	90	37
Machinery maintenance occupations	Private	Random	34	29	33	94	50
Machinery maintenance occupations	Public	Random	125	40	30	59	38
Telephone line installers and repairers	Private	Random	26	24	20	93	10
Carpenters	Private	Populous	37	34	33	89	48
Carpenters	Public	Populous	18	12	32	97	52
Supervisors, production occupations	Private	Populous	29	23	31	91	45
Supervisors, production occupations	Public	Populous	22	28	39	97	50
Machine operators							
Printing press operators	Private	Random	34	28	28	81	43
Printing press operators	Public	Random	10	11	13	98	4
Textile sewing machine operators	Private	Populous	62	63	32	76	32

See footnote at end of table.

Table 9. Continued—Wage dispersion measures for 56 selected occupations, 2004

[In percent]

Occupation	Sector	Reason chosen	Mean wage spread	Median wage spread	Coefficient of variation	Percent of across-establishment variation	Index of wage dispersion
Miscellaneous machine operators, not elsewhere classified.....	Private	Populous	32	24	34	94	52
Miscellaneous machine operators, not elsewhere classified.....	Public	Populous	32	33	42	96	77
Assemblers.....	Private	Populous	47	39	46	94	70
Hand cutting and trimming occupations.....	Private	Random	35	12	32	84	35
Transportation and material moving							
Truckdrivers.....	Private	Populous	59	29	36	84	57
Truckdrivers.....	Public	Populous	27	21	34	95	53
Busdrivers.....	Private	Populous	29	26	30	92	33
Busdrivers.....	Public	Populous	53	47	27	76	42
Motor transport occupations, not elsewhere classified.....	Private	Random	22	14	46	91	43
Motor transport occupations, not elsewhere classified.....	Public	Random	29	33	29	91	51
Operating engineers.....	Private	Random	36	18	30	94	33
Operating engineers.....	Public	Random	22	14	37	95	49
Industrial truck and tractor equipment operators.....	Private	Populous	33	28	31	93	43
Industrial truck and tractor equipment operators.....	Public	Populous	46	49	18	45	25
Miscellaneous material moving equipment operators, not elsewhere classified.....	Private	Random	45	38	36	94	60
Miscellaneous material moving equipment operators, not elsewhere classified.....	Public	Random	37	43	28	77	53
Laborers and helpers							
Supervisors, handlers, equipment cleaners, and laborers, not elsewhere classified.....	Private	Random	48	58	37	86	35
Supervisors, handlers, equipment cleaners, and laborers, not elsewhere classified.....	Public	Random	34	39	30	91	37
Construction laborers.....	Private	Populous	40	30	42	93	64
Construction laborers.....	Public	Populous	30	20	32	90	52
Stock handlers and baggers.....	Private	Populous	37	30	38	89	52
Stock handlers and baggers.....	Public	Populous	20	14	31	96	34
Garage and service station occupations.....	Private	Random	27	22	33	80	32
Garage and service station occupations.....	Public	Random	53	28	16	1	10
Hand packers and packagers.....	Private	Random	37	29	36	90	45
Laborers, except construction, not elsewhere classified.....	Private	Populous	47	39	39	87	50

See footnote at end of table.

Table 9. Continued—Wage dispersion measures for 56 selected occupations, 2004

[In percent]

Occupation	Sector	Reason chosen	Mean wage spread	Median wage spread	Coefficient of variation	Percent of across-establishment variation	Index of wage dispersion
Laborers, except construction, not elsewhere classified	Public	Populous	37	29	38	92	62
Service							
Crossing guards.....	Public	Random	52	28	28	89	37
Guards and police, except public service	Private	Random	91	55	34	68	32
Guards and police, except public service	Public	Random	26	22	34	86	41
Cooks.....	Private	Populous	32	26	31	82	42
Cooks.....	Public	Populous	31	24	24	86	35
Nursing aides, orderlies, and attendants.....	Private	Populous	35	30	26	84	29
Nursing aides, orderlies, and attendants.....	Public	Populous	38	34	29	80	38
Janitors and cleaners	Private	Populous	50	38	37	90	47
Janitors and cleaners	Public	Populous	46	39	31	85	47
Hairdressers and cosmetologists	Private	Random	124	90	56	50	60

¹ Less than 0.5 percent.

such as the movement toward variable-pay systems, the adoption of broad-banded methods for defining jobs and setting pay scales, and the decline in the proportion of the workforce that is unionized all would tend to increase within-job wage dispersion.

The BLS studies of the 1980s provide a benchmark to assess the 2004 data. However, the comparison is not a simple one, because of differences in the underlying surveys, differences in the way jobs are defined, and the lack of sample error data for the wage spread statistics. Thus, any comparisons can only be approximate.

Buckley's 1985 article affords the best basis for comparison, because the occupations he studied are the easiest to compare with the occupations defined for the 2004 NCS. Buckley analyzed data from the 1983 BLS Area Wage Surveys (AWS's), which were composed of a sample of cities drawn to represent the metropolitan areas of the United States, except for Alaska and Hawaii. In all but the 13 largest metropolitan areas, the AWS program covered private-industry establishments with 50 or more workers in manufacturing; transportation, communications, and public utilities; retail trade; wholesale trade; and selected services industries. In the 13 largest areas, only establish-

ments with 100 or more employees were surveyed in manufacturing; transportation, communications, and public utilities; and retail trade.

In contrast, the NCS data used in this article include State and local government establishments with 50 or more employees. The NCS also includes private establishments in all industries with 1 or more employees, except for agriculture and private households. In addition, the NCS includes Alaska and Hawaii. To facilitate comparisons, the NCS data used in the comparisons that follow have been limited to private industry; however, note that the NCS data do encompass a broader array of industries than do the AWS's, as well as smaller establishments and outlets in nonmetropolitan areas. It was not feasible to restrict the NCS data to the same subset of the economy that Buckley examined, but cases in which survey coverage differences may have substantially affected the comparisons were excluded from the analysis as much as possible.

Table 10 (page 44) looks broadly at families of occupations in aligning the 1983 and 2004 results. Because the AWS program surveyed only selected cross-industry jobs, the AWS entries show the highest and lowest spreads re-

Table 10. Wage spread measures, families of occupations, 1983 and 2004

[In percent]

Family of occupations	1983 wage spread, BLS Area Wage Survey (AWS's)				2004 wage spread, National Compensation Survey			
	Mean	25th percentile	Median	75th percentile	Mean	25th percentile	Median	75th percentile
Clerical (20 occupations/levels in AWS's).....	19–35	9–18	16–34	27–51	38	15	29	51
Professional and technical (20 occupations/levels in AWS's).....	17–42	7–20	16–35	23–60	48	18	35	56
Skilled craft (12 occupations in AWS's).....	7–21	2–5	3–14	7–34	40	13	29	51
Transportation equipment operators (6 occupations in AWS's).....	13–26	1–10	5–22	16–41	50	13	28	49
Laborers (7 occupations in AWS's).....	19–30	5–7	14–22	26–50	40	17	31	56
Service (3 occupations/levels in AWS's).....	38–45	14–19	33–40	58–65	43	15	30	52

ported by Buckley for individual occupations. For example, 20 occupations or occupational levels compose the AWS results for clerical workers; in contrast, the NCS results represent workers at all work levels in all clerical jobs. Because of the different survey bases, comparisons of the 1983 and 2004 data must be viewed only as rough indicators of changes in wage dispersion. For instance, the AWS job list included only three transportation occupations: truck-drivers (classified by four different types of truck), forklift operators, and operators of other types of industrial trucks. In contrast, the NCS includes all types of transportation jobs—from jobs involving all kinds of motor vehicles, to railroad transportation, water transportation, and jobs involving all types of material-moving equipment. Thus, the NCS data are formed from a broad array of jobs, while the AWS data are drawn from a few select jobs.

The comparisons made in table 10, though imprecise and fraught with limitations, reveal that wage spreads appear to have increased somewhat for white- and blue-collar workers, but remained about the same for service workers. Differences are greatest for skilled-craft and transportation jobs, and smallest for clerical jobs. Service occupation wage spreads were about the same in 1983 as in 2004, but the AWS data included only two jobs—guards (two levels) and janitors—that had the most diverse pay patterns of any of the jobs in the Buckley study, except for electronics technicians.

To refine the comparisons further, individual occupations and work levels within occupations were examined next. The occupational differences between the two studies are as daunting as the differences in survey coverage. As is noted shortly, nearly all employees are covered by the list of occupations used in the NCS, and the NCS job descriptions were taken from the 1990 census' occupational system, whereas the AWS's included only a selection of cross-industry jobs and used job definitions developed by the BLS for the 1983 surveys.

The comparisons of individual occupations were restricted to those occupations which appear to be reasonably similar between the two surveys.⁴⁷ In some cases, an overall occupation was deemed comparable; in other cases, only a work level or work levels within an occupation were compared. In general, the AWS job descriptions tend to focus on narrower jobs than the NCS job descriptions do; thus, an NCS job is likely to include a wider set of employees than its AWS counterpart. Consequently, NCS wages may tend to vary more because of the broader spectrum of workers included, and this greater variation may bias NCS jobs toward showing a greater degree of dispersion than AWS jobs exhibit.⁴⁸

The 68 jobs that Buckley examined were primarily cross-industry, "benchmark" jobs defined by customized job descriptions prepared by the BLS.⁴⁹ The AWS jobs included only full-time workers, so comparisons,

when possible, are limited to full-time workers. In a few cases, another subset of NCS data was used when a different kind of adjustment seemed appropriate. For example, the NCS data on order clerks (a clerical job) were limited to full-time, time-based workers, because the AWS job definition excluded commission-paid workers.

Over the last 20 years, even occupations that appear comparable from the survey job descriptions may not in fact be comparable because of changes in the content of the job. For example, in 1983, a computer programmer may have been writing programs for a mainframe computer or a minicomputer, using a language such as Fortran or COBOL and the “top-down” methodology prevalent at the time. By 2004, the same programmer may have been writing programs to run on personal computers and servers linked together in a network (on the Internet or on an intranet), using a radically different language, such as Java or HTML, and “object-oriented” methodology. No attempt was made to screen out or adjust for these kinds of changes in job content. Instead, the analysis presented here compares 45 of the 68 occupations and levels that Buckley analyzed in 1983 with NCS occupations and levels in 2004: 18 clerical occupations; 15 professional and technical occupations; 6 skilled craft and maintenance occupations; 4 transportation and material movement, and laborers and material handlers, occupations; and 2 service occupations.⁵⁰

Summary results are displayed in table 11.⁵¹

With the differences in survey coverage, occupational definition, and occupational content, the information contained in table 11 should be interpreted with caution and viewed only as a rough barometer of changes in wage spreads. Overall, about 3 out of 4 occupations or work levels that were compared showed a higher median wage spread in 2004 than in 1983. In 24 of the 45 comparisons, the 2004 median spread was at least 20 percent higher than the 1983 median. The results were nearly identical when the mean wage spreads were compared.

Results were mixed for clerical jobs. Nine jobs had a higher median wage spread in 2004, but eight had a higher spread in 1983. For the other types of jobs, the comparisons showed generally higher median and mean wage spreads in 2004.

The many limitations inherent in comparing two such disparate data sets, as well as the small fraction of the workforce included in the 45 occupations and work levels examined, preclude drawing any definite conclusions about private-industry workers overall. For the cross-industry occupations compared, however, there does appear to be some evidence in support of those who have argued that developments in the economy, in compensation policies, and in the administration of compensation have tended to increase pay differences among workers in the same job within the same establishment over the last 20 years. □

Table 11. Mean and median wage spread differences, 1983 and 2004

Occupational group	Higher in 1983		Higher in 2004		At least 20 percent higher in 1983		At least 20 percent higher in 2004	
	Median	Mean	Median	Mean	Median	Mean	Median	Mean
Clerical ¹	8	7	9	10	5	2	4	5
Professional and technical ²	3	2	11	13	3	2	9	10
Skilled maintenance.....	0	0	6	6	0	0	6	5
Transportation and material movement, and laborers and material handlers.....	0	0	4	4	0	0	4	4
Service.....	0	0	2	2	0	0	1	1
All occupations ³	11	9	32	35	8	4	24	25

¹ One clerical occupation had the same mean wage spread in both years, and one had the same median spread.

² One technical occupation had the same median wage spread

in both years.

³ See notes 1 and 2.

Notes

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¹ For a summary of these factors, see Richard I. Henderson, *Compensation Management in a Knowledge-Based World*, 7th ed. (Upper Saddle River, NJ, Prentice Hall, 1997), pp. 28–35.

² *National Compensation Survey: Occupational Wages in the United States, July 2004, Supplementary Tables* (Bureau of Labor Statistics, August 2005), p. 3; on the Internet at www.bls.gov/ncs/ocs/sp/ncbl0728.pdf (visited Sept. 26, 2006). For a review of pay diversity among occupations, see John E. Buckley, “Rankings of Full-Time Occupations, by Annual Earnings, July 2004,” *Compensation and Working Conditions Online* (Bureau of Labor Statistics, Nov. 30, 2005), on the Internet at www.bls.gov/opub/cwc/cm20051121ar01p1.htm (visited Oct. 5, 2006).

³ For information on variable pay, see H. N. Altmansberger, “Variable Pay: An Overview,” in Lance A. Berger and Dorothy R. Berger, eds., *The Compensation Handbook*, 4th ed. (New York, McGraw-Hill, 2000), pp. 199–207; and Jeffrey L. Schildkraut, “NCS Reviews the Effectiveness of Variable Pay Collection,” *Compensation and Working Conditions Online* (Bureau of Labor Statistics, Apr. 16, 2003), on the Internet at www.bls.gov/opub/cwc/cm20030324ar01p1.htm (visited Sept. 26, 2006).

⁴ For more information on broadbanding, see Howard Risher and Robert J. Butler, “Salary Banding: An Alternative Salary-Management Concept,” *ACA Journal*, winter 1993/4, pp. 48–57. For a discussion of the impact of new methods of defining jobs on compensation policies, see Charles Fay, Howard Risher, and Douglas Mahony, “Survey Results of the Impact of New Job Design on Compensation,” *ACA Journal*, winter 1997, pp. 29–44.

⁵ John E. Buckley, “Wage differences among workers in the same job and establishment,” *Monthly Labor Review*, March 1985, pp. 11–16; on the Internet at www.bls.gov/opub/mlr/1985/03/art2full.pdf (visited Sept. 26, 2006).

⁶ Carl B. Barsky and Martin E. Personick, “Measuring wage dispersion: pay ranges reflect industry traits,” *Monthly Labor Review*, April 1981, pp. 35–41; on the Internet at www.bls.gov/opub/mlr/1981/04/art5full.pdf (visited Sept. 26, 2006).

⁷ Range-of-rate systems are formal plans that specify the minimum and maximum pay rates for a particular job. Personick’s study included most private industries, but had limited coverage in services, and also generally included establishments with at least 100 or 250 employees, depending upon the industry. About 80 percent of establishments in his study had such formal systems. (See Martin E. Personick, “White-collar pay determination under range-of-rate systems,” *Monthly Labor Review*, December 1984, pp. 25–30; on the Internet at www.bls.gov/opub/mlr/1984/12/art4full.pdf (visited Sept. 26, 2006).

⁸ H. M. Douty, “Sources of Occupational Wage and Salary Rate Dispersion within Labor Markets,” *Industrial and Labor Relations Review*, October 1961, pp. 67–74.

⁹ H. M. Douty, “Some Aspects of Wage Statistics and Wage Theory,” in *Proceedings of the Eleventh Annual Meeting: Industrial Relations Research Association* (Madison, WI, Industrial Relations Research Association, 1958).

¹⁰ Erica L. Groshen, “Sources of Intra-Industry Wage Dispersion: How Much Do Employers Matter?” *Quarterly Journal of Economics*, August 1991, pp. 869–84.

¹¹ Julia I. Lane, Laurie A. Salmon, and James R. Spletzer, “Establishment wage differentials,” *Monthly Labor Review*, April 2007, pp. 3–17; on the Internet at www.bls.gov/opub/mlr/2007/04/art1full.pdf (visited Aug. 17, 2007).

¹² Matt Bloom, “The Performance Effects of Pay Dispersion on Individuals and Organizations,” *Academy of Management Journal*, February 1999, pp. 25–40; and Jeffrey Pfeffer and Nancy Langton, “The Effect of Wage Dispersion on Satisfaction, Productivity, and Working Collaboratively: Evidence from College and University Faculty,” *Administrative Science Quarterly*, September 1993, pp. 382–407.

¹³ Thus, the term “establishment” is not synonymous with “firm” or “government.”

¹⁴ For information about the sample used in the 2004 survey, see Kenneth J. Hoffmann, “New Areas Selected for BLS National Compensation Survey Program,” *Compensation and Working Conditions*, spring 1997, pp. 27–31; on the Internet at www.bls.gov/opub/cwc/archive/spring1997art4.pdf (visited Oct. 5, 2006).

¹⁵ For establishments with fewer than 50 workers, 4 jobs are selected (unless the establishment has only 1, 2, or 3 employees, in which case all employees are selected). Six jobs are selected in establishments with 50 to 249 employees, and 8 jobs in establishments with 250 or more employees.

¹⁶ In 2006, the NCS wage-level publications switched to the 2000 Standard Occupational Classification (SOC) system.

¹⁷ It is also possible that full- and part-time workers could be selected separately as distinct jobs to survey.

¹⁸ As explained later, to determine job levels, the NCS uses a point factor system based upon the Federal Government’s 15 levels for white-collar workers. For a description of the approach used in the 2004 survey, see Kenneth J. Hoffmann, “New Approach to Measuring Occupational Wages,” *Compensation and Working Conditions* (Bureau of Labor Statistics, December 1996), pp. 4–8; on the Internet at www.bls.gov/opub/cwc/archive/winter1996art1.pdf (visited Apr. 13, 2007). For details about the current method, see *NCS: Guide for Evaluating Your Firm’s Jobs and Pay* (Bureau of Labor Statistics, October 2003); on the Internet at www.bls.gov/ncs/ocs/sp/ncbr0004.pdf (visited Apr. 13, 2007).

¹⁹ Deadhead pay is pay for an employee who is assigned to ride on a vehicle as a passenger. (For a fuller definition, see the glossary.)

²⁰ The costs of these items are included among the costs of benefits as reported in the Employment Cost Index and the Employer Costs for Employee Compensation. (For definitions of terms, see the glossary.)

²¹ It should be noted, however, that this study does not treat a number of factors that affect pay and that do vary within the job, such as age, schooling, tenure, effort, and managerial talent. Variations among these factors might help explain some of the findings presented in this article. For example, differences in managerial skills might contribute to higher-than-average wage spreads for managerial occupations.

²² Because occupations are the main focus of this article, these statistical measures are described as occupational statistics. The same calculations, however, have been used both for broader aggregations, such as all professional workers or all incentive-paid workers, and for narrower aggregations, such as registered nurses, work level 9.

²³ The statistics on spread presented in this article use a calculation method different from that used for the published NCS wage statistics. Weights are applied to the survey data in order to represent all establishments and employees. The published NCS wage statistics combine several weighting factors, including geographic area and establishment weights, with a measure of employee hours. By contrast, the wage spread statistics presented in what follows use the area and establishment weights, but do not include employee hours in the calculation. The exclusion of employee hours makes the 2004 wage spread calculations more comparable to those made in the earlier BLS studies. A comparison with hours-weighted tabulations shows that, in most instances, the differences in wage spreads between the two weighting methods are small. Larger differences, however, do occur in some occupations or worker groups, such as those with a large proportion of part-time workers.

²⁴ For a more extensive discussion of these two measures, see Barsky and Personick, "Measuring wage dispersion," pp. 36–37.

²⁵ At the 90th percentile, 90 percent of the workers had a wage spread the same as or lower than the figure cited and 10 percent had a wage spread the same as or higher than the figure cited.

²⁶ Lane, Salmon, and Spletzer, "Establishment wage differentials"; and Groshen, "Sources of Intra-Industry Wage Dispersion."

²⁷ Removing teachers from the tabulation reduces the mean for professional workers to 45 percent and the median to 34 percent.

²⁸ See Douty, "Some Aspects of Wage Statistics and Wage Theory."

²⁹ Earnings intervals are rounded numbers corresponding to 2004 NCS wage distribution statistics. The 10th-percentile hourly pay rate for all workers was \$7.40, the 25th-percentile rate was \$10.00, the 50th-percentile (median) rate was \$14.48, the 75th-percentile rate was \$22.44, and the 90th-percentile rate was \$32.45. (See *National Compensation Survey: Occupational Wages in the United States, July 2004 Supplementary Tables* (Bureau of Labor Statistics, August 2005)), p. 1; on the Internet at www.bls.gov/ncs/ocs/sp/ncbl0728.pdf (visited Apr. 13, 2007).

³⁰ The experimental data are developed from the sample used to produce the December 2006 Employer Costs for Employee Compensation (ECEC) estimates. Only a subset of the ECEC sample was used in this article, so the figures presented are not comparable to the ECEC published estimates.

³¹ Removing incentive-paid workers from the tabulation reduces the mean spread for finance, insurance, and real estate to 40 percent and the median to 30 percent.

³² Removing teachers from the tabulation reduces the mean spread in education services to 51 percent and the median spread to 40 percent.

³³ For a recent study using 2003 data from the BLS Occupational Employment Statistics program, see John Ichiro Jones, "An Investigation of Industry and Size Effects on Wage Dispersion," in *Occupational Employment and Wages: May, 2003*, Bulletin 2567 (Bureau of Labor Statistics, September, 2004), pp. 22–25; on the Internet at www.bls.gov/oes/2003/may/dispersion.pdf (visited Sept. 26, 2006).

³⁴ See Buckley, "Wage differences," p. 15.

³⁵ Union membership data for 2004 from the Current Population Survey were obtained from "Access to Historical Data for the Tables of the Union Membership News Release," on the Internet at www.bls.gov/cps/cpslutabs.htm (visited Feb. 18, 2008).

³⁶ See, for example, Dale Belman and John S. Heywood, "Union Membership, Union Organization, and the Dispersion of Wages," *Review of Economics and Statistics*, February 1990, pp. 148–53.

³⁷ For more information on workers paid incentive rates, see Antho-

ny J. Barkume and Thomas G. Moehrle, "The Role of Incentive Pay in the Volatility of the Employment Cost Index," *Compensation and Working Conditions* (Bureau of Labor Statistics, summer 2001), pp. 13–18; on the Internet at www.bls.gov/opub/cwc/archive/summer2001art2.pdf (visited Sept. 26, 2006).

³⁸ For an analysis of wages in profit and nonprofit education and health services establishments, see Karen P. Shahpoori and James Smith, "Wages in Profit and Nonprofit Hospitals and Universities," *Compensation and Working Conditions Online* (Bureau of Labor Statistics, June 29, 2005), on the Internet at www.bls.gov/opub/cwc/cm20050624ar01p1.htm (visited Sept. 26, 2006).

³⁹ The East North Central States comprise Illinois, Indiana, Michigan, Ohio, and Wisconsin. The Pacific States are Alaska, California, Hawaii, Oregon, and Washington. The New England States encompass Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont. The Middle Atlantic States are New Jersey, New York, and Pennsylvania.

⁴⁰ These wage spreads are not the result of tips. Because tips are payments from customers, rather than from the employer, they are not included in the wages reported in the NCS.

⁴¹ The reason 12 occupations appear in table 8 is that several occupations tied for the 10th-lowest median wage spread. (Although all wage spreads are rounded to the nearest whole number in this table, occupations are listed in order of their unrounded wage spread.)

⁴² Miscellaneous plant and systems operators include plant and systems operators other than water and sewage treatment plant operators, power plant operators, stationary engineers, and helpers. Examples of jobs included in the occupation called miscellaneous plant and systems operators are asphalt-plant operator, batch-plant operator, chemical-plant operator, control operator, gas-plant operator, oil refiner, and petroleum-plant operator.

⁴³ The goods-producing industries are manufacturing, construction, and mining. Separate data on the construction industry were not tabulated because the sample size was judged to be too small.

⁴⁴ According to the 1990 census, the most populous occupations employed 51 million workers altogether in 1990, and the randomly selected occupations employed 6 million workers. Data for four occupations did not meet publication criteria and are not included in the table.

⁴⁵ Comparing mean wage spreads, we see that 32 jobs had substantial differences. In 23 jobs, wage spreads were higher in private industry; in 9, spreads were higher in governments.

⁴⁶ For an illustration of the many dimensions of what might seem a simple occupation, see Laura Pfuntner, "Janitors in 2000: An Overview of NCS Data," *Compensation and Working Conditions Online* (Bureau of Labor Statistics, Nov. 24, 2003), on the Internet at www.bls.gov/opub/cwc/cm20031121ar01p1.htm (visited Sept. 29, 2006).

⁴⁷ Comparability was assessed by a two-step process. First, AWS and NCS job definitions were matched. Matching involved reading the job descriptions and making a judgment as to whether the employees covered by the two sets of descriptions performed the same job duties. Second, the AWS and NCS work levels were matched. For most of the white-collar jobs, work levels were matched in accordance with the system used by the U.S. Office of Personnel Management and the BLS in a survey used for setting Federal pay scales. The work levels are those established for the Federal General Schedule pay system and are also used by the NCS. For the 1983 white-collar work-level matches, see *National Survey of Professional, Administrative, Technical, and Clerical Pay, March 1983*, Bulletin 2181 (Bureau of Labor Statistics, September 1983), pp. 76–79. For a description of the work levels in the NCS, see *National Compensation Survey: Occupational Wages in the United States, July 2004*, Bulletin 2576

(Bureau of Labor Statistics, September 2005), pp. 165–72.

⁴⁸ This statement is a matter of the authors' judgment, rather than one that is empirically based. It could be argued, however, that the NCS occupational refinement process described earlier might yield a *narrower* set of employees than the AWS method does. For example, AWS's recorded wages for both union and nonunion workers if they existed in the same occupation, whereas the NCS selects either union or nonunion workers, but not both.

⁴⁹ Benchmark jobs are key jobs that are clearly recognizable across industries. (See Henderson, *Compensation Management*, pp. 205ff., for the role of benchmark jobs in administering compensation.)

⁵⁰ Note that comparisons, rather than occupations or work levels, are counted, because in some cases an overall NCS occupation was compared with two or more AWS occupations or work levels. This situation counts as a single comparison.

⁵¹ Table 11 was constructed according to the following rules:

1. In cases where AWS's published data for multilevel occupations,

- Where individual work levels within occupations were judged to be similar, the individual work levels were compared. The reason for this stipulation is that the AWS multilevel jobs included workers only in the work levels specified in the survey; the jobs were not intended to include

workers in levels not studied. In contrast, the 15 work levels identified in the NCS are intended to cover all, or nearly all, employees in the occupation. (This stipulation was followed for 28 job levels.)

- Where the work levels used in the two surveys were not comparable, but the overall occupation was deemed comparable, overall results for the NCS were compared with the individual work levels in the AWS's. In these cases, the overall spread for the occupation reported in the NCS was compared against the range of individual work-level spreads derived from AWS's. These comparisons are not only more complicated than those which simply compare a single level of work, but they may be less accurate as well. As noted in the previous paragraph, the AWS work levels were not intended to sum to an overall figure for an occupation. Thus, the NCS average may include figures for workers who did not fit into the AWS work levels. (This comparison was made for 3 NCS jobs that were matched to 8 AWS jobs or job levels.)
2. In cases where AWS's published data for a single-level occupation, the AWS job was compared with the overall NCS job. (This stipulation was followed for 12 NCS and 12 AWS jobs.) A similar comparison was carried out for 1 NCS occupation that matched 3 AWS occupations.

APPENDIX: Glossary

Statistical terms

Coefficient of variation. Result of dividing the *standard deviation* by the mean and then multiplying by 100.

Index of wage dispersion. The result of dividing the difference of the *75th-percentile wage* and the *25th-percentile wage* by the median (*50th-percentile*) wage and then multiplying by 100.

Mean. The average. The *mean wage spread* is computed by summing the *wage spread* for each establishment job and then dividing by the number of observations. The *mean* is also computed for *wages*.

Median. The point at which half of a designated category of workers have the same or a lower *wage spread* and half have a higher *wage spread*. Also called the *50th percentile*, the *median* is computed for *wages* as well.

Percentile. The point at which a designated percentage of workers has the same or a lower *wage spread*. For example, at the *25th percentile*, one-quarter of the workers have the same or a lower *wage spread*, and the remaining three-quarters have a higher *wage spread*. The *10th*, *50th*, *75th*, and *90th percentiles* are defined correspondingly. *Percentiles* are also computed for *wages*.

Proportion of interestablishment variation. The proportion of the *coefficient of variation* that is due to variation in wage spreads across, rather than within, establishments. Also called *interplant* and *across-establishment variation*.

Standard deviation and variance. The *standard deviation*, a measure of the variability of *wages*, is computed as follows: The *wage* for each establishment job is subtracted from the *average wage* for all establishment jobs. Each difference is then squared, and all of the squared differences are summed. The resulting sum is then divided by the number of establishment jobs, less 1, to yield the *variance*. The square root of the *variance* is the *standard deviation*.

Wage spread. The percentage by which the *wage* for the highest paid worker in an establishment job exceeds the *wage* of the lowest paid worker.

Weighted number of workers. The number of employees in each establishment job, multiplied by a factor, or “weight,” designed to reflect establishment jobs and other establishments not included in the National Compensation Survey (NCS) sample. For example, the employees studied in the 20,400 establishments selected for the 2004 NCS were weighted to represent

all establishments and all 84 million employees covered by the survey.

Compensation terms

Bonus (production and nonproduction). A *production bonus* is extra payment based on production in excess of a quota or on completion of a job in less than standard time. In the NCS, *production bonuses* are included in measures of *wages and salaries*. A *nonproduction bonus* is a cash payment that is not directly related to the output of either the employee or a group of employees. Examples include attendance, Christmas, profit-sharing, safety, and yearend bonuses. In the NCS, nonproduction bonuses are excluded from measures of *wages and salaries*; instead, they are included in the benefits component of total compensation.

Commissions. Payments to salespeople based on a predetermined formula; for example, a percentage of the value of sales or the gross margin of goods or services sold. May be paid in addition to a guaranteed salary rate or may constitute total pay.

Cost-of-living adjustment or allowance. An across-the-board wage or salary change, or a supplemental payment, reflecting changes in the cost of living.

Deadhead pay or time. Pay for time spent traveling to and from a designated point and the worksite. Such time may be paid for as portal-to-portal pay in mining, deadheading on railroads, and out-of-town work in construction.

Hazard pay. Extra pay to an individual worker or a group of workers working under dangerous or undesirable conditions.

Incentive pay. Pay that is related to the actual production of workers, individually or as a group.

On-call pay. Pay received by employees for being ready to report to work if necessary.

Overtime and overtime pay. *Overtime* is work performed in excess of the basic workday or workweek, as defined by law, a collective bargaining agreement, or company policy. Sometimes applied to work performed on Saturdays, Sundays, or holidays at premium rates. *Overtime pay* is payment at premium rates (for example, time and one-half, double time) for work defined as *overtime*.

Piece rate. A predetermined amount paid per unit of output to a worker under a piecework *incentive* plan.

Salary. For workers hired on a weekly, monthly, or annual basis (for example, clerical, technical, and managerial employees), the rate of pay normally expressed in terms of dollars per week, month, or year, as opposed to payment for an hour of work. (In this article, however, the terms *salary* and *wage* are interchangeable.)

Salary reduction plans. Plans authorized under Section 401(k) or some other section of the Internal Revenue Code that allow employees to divert a portion of their salary or wages to fund benefit plans. The money contributed to the plan is not subject to Federal income tax.

Shift differential. Additional compensation (cents per hour or a percentage of the day rate) paid to workers employed at other than regular daytime hours.

Time-based pay. Pay that is related to an hourly *wage* rate or *salary* earned by workers, not to a specific level of production.

Uniform or tool allowance. Allowance to an employee, paid by the employer, as reimbursement for the cost of clothing or tools and their upkeep.

Wage or wages. Monetary compensation paid by an employer to a worker for a given unit of worktime, normally an hour, exclusive of premium payments for overtime, shift differentials, and so forth. (In this article, however, the terms *salary* and *wages* are interchangeable.)

Occupational terms

The 2004 NCS grouped the individual 480 survey occupations into nine *major occupational groups*, which, in turn, were combined into three broad occupations. Four major occupational groups were combined to form the category *white-collar workers*, four were combined to yield *blue-collar workers*, and the broad occupation of *service workers* included the service worker major occupational group.

Blue-collar workers. Manual workers, usually those employed in production, maintenance, and related occupations and paid either by the hour or on an incentive basis. Blue-collar occupations cover the following four major occupational groups: precision production, craft, and repair; machine operators, assemblers, and inspectors; transportation and material movers; and handlers, equipment cleaners, helpers, and laborers.

Service workers. Workers in a protective service, food service, health service (such as health and dental aides), cleaning and building service, or personal service occupation.

White-collar workers. Office, clerical, administrative, sales, professional, and technical employees, as distinguished from production and maintenance employees, who usually are referred to as *blue-collar workers*. *White-collar workers* cover the following four occupational groupings: professional specialty and technical; executive, administrative, and managerial; sales; and administrative support, including clerical.

Notes to the appendix

¹ Terms in italics in the definitions are defined elsewhere in this glossary.

² Note that the *weighted* number of workers is used in all computations.