News

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OCCUPATIONAL PAY RELATIVES, 2004

The Bureau of Labor Statistics (BLS) of the U.S. Department of Labor has produced occupational "pay relatives" to facilitate comparisons of occupational pay between metropolitan areas and the United States as a whole. BLS periodically has issued occupational pay relatives using data from the National Compensation Survey (NCS) and its predecessor surveys, and now plans to publish them annually. Using data for 2004 from the NCS, pay relatives have been prepared for each of 9 major occupational groups within 78 Metropolitan Statistical Areas (MSAs), as well as averaged across all occupations for each area. Pay relatives averaged across all occupations were significantly different statistically from the national average in 66 of the 78 areas.

The pay relative in 2004 for workers in construction and extraction occupations in the San Francisco MSA was 127, meaning the pay in San Francisco in that occupational group averaged 27 percent more than the national average pay for workers in that occupational group (table 1). The pay relative averaged across all occupations for workers in the San Francisco MSA was 117, meaning that pay on average was 17 percent more in that area than for the nation as a whole. By contrast, the pay relative for workers in construction and extraction occupations in the Brownsville, TX MSA, was 70, meaning pay for workers in those occupations averaged 30 percent less than the national average. Pay averaged across all occupations in the Brownsville MSA was 19 percent below the national average. The pay relatives averaged for workers in all occupations in San Francisco and Brownsville were, respectively, the highest and lowest among the 78 areas. In addition to these examples of area-to-national comparisons, area-to-area comparisons can be derived using these pay relatives.

The National Compensation Survey (NCS), introduced in 1997, collects earnings and other data on employee compensation covering over 820 detailed occupations in 152 metropolitan and non-metropolitan areas. Average occupational earnings from the NCS are published annually for more than 80 metropolitan areas and for the United States as a whole.

What is a pay relative?

A pay relative is a calculation of pay—wages, salaries, commissions, and production bonuses—for a given metropolitan area relative to the nation as a whole. The calculation controls for differences among areas

in occupational composition, establishment and occupational characteristics, and the fact that data are collected for areas at different times during the year.

Metropolitan areas differ greatly in the types of occupations that are available to the local workforce. For example, the proportion of San Francisco's workers who are employed as computer programmers is approximately 48 percent greater than the national average.[1] Similarly, the composition of establishment and occupational characteristics—such as whether an establishment is for profit or not-for-profit or whether an occupation is union or nonunion—varies by area. In addition to these factors, the NCS collects compensation data for metropolitan areas at different times during the year. Payroll reference dates differ between areas which makes direct comparisons between areas difficult.

The pay relative approach controls for these differences to isolate the geographic effect on wage determination. To illustrate the importance of controlling for these effects, consider the following example. The average pay for professional workers in San Francisco is $38.66 and the average pay for professional workers in the entire US is $29.40.[2] A simple pay comparison can be calculated from the ratio of the two average pay levels, multiplied by 100 to express the comparison as a percentage. The pay comparison in the example is calculated as:

$$(\$38.66 \div \$29.40) \times 100 \cong 131$$

However, this comparison does not control for the interarea difference in occupational composition. Some of the 31 percent pay premium in San Francisco relative to the nation as a whole is due to the higher concentration of highly compensated professional workers—such as computer programmers—in San Francisco. A more accurate estimate of the geographic effect on wage determination in San Francisco can be obtained by taking into account this and other differences. Controlling for the differences in occupation composition, establishment and occupational characteristics, and the payroll reference date in San Francisco relative to the nation as the whole, the pay relative for professional occupations in San Francisco is equal to 118.

Using multivariate regression analysis

A statistical technique called multivariate regression analysis controls for interarea differences. It controls for the following ten characteristics:

- Occupational type
- Industry type
- Work level
- Full-time / part-time status
- Time / incentive status
- Union / nonunion status
- Ownership type
- Profit / non-profit status
- Establishment employment
- Payroll reference date

Even accounting for these characteristics, there is still significant wage variation across the areas. The variation is due to differences in wage determinants that were not included in the model. Examples of these determinants include price levels, environmental amenities such as a pleasant climate, and cultural amenities.

An additional feature of this type of analysis is the ability to perform statistical significance tests. An asterisk (*) in the table indicates that the pay relative is statistically significant (i.e., the pay for the given occupation in that area is too different from the national average to be accounted for by the randomness of the survey's sample).

For more detailed information on the pay relative methodology, see Maury B. Gittleman, "Pay Relatives for Metropolitan Areas in the U.S.," *Monthly Labor Review*, March 2005, pp. 46-53.

Results

Table 1 presents July 2004 pay relatives averaged across all occupations covered by the NCS survey and nine occupational groups in 78 metropolitan areas. This table represents the first presentation of NCS wage data using the 2000 Standard Occupational Classification System (SOC). For more detailed information on SOC, see the BLS website: http://www.bls.gov/soc/home.htm.

The occupational groups are:

(1) management, business, and financial occupations
(2) professional and related occupations
(3) service occupations
(4) sales and related occupations
(5) office and administrative support occupations
(6) construction and extraction occupations
(7) installation, maintenance, and repair occupations
(8) production occupations
(9) transportation and material movement occupations

Comparisons between areas

The pay relatives presented in Table 1 are area-to-national comparisons. However, it is easy to derive area-to-area comparisons from them. To do so, divide the pay relative for the occupational group and area in question by the pay relative for the same occupational group in the area to which the first is being compared. Then multiply the result by 100 so that the comparison is expressed as a percentage.

For example, the pay relative for professional occupations in San Francisco is 118 and the pay relative for professional occupations in Los Angeles is 111. The San Francisco-to-Los Angeles pay relative for professional occupations is calculated as:

$$(118 \div 111) \times 100 \cong 106$$

In the example, there is approximately a 6 percent pay premium for professional occupations in San Francisco relative to the same occupational group in Los Angeles. However, there is no statistical significance test for area-to-area comparisons calculated this way, and therefore the difference in average pay between San Francisco and Los Angeles in the example may or may not be statistically significant.

Differences between the 2004 pay relatives and historical pay relatives

Historical pay relative data are available for 2002[3], 1998[4], and 1992–1996.[5] There are several differences between the 2004 pay relatives and the historical pay relatives, including different industry and occupation classification systems, varying methodology, and different survey designs. These differences limit comparability.

The 2004 pay relatives use the 2002 North American Industry Classification System (NAICS) to define industry type. Occupation type and the occupational groups presented in Table 1 are defined using the Standard Occupational Classification System (SOC). The 2002 and 1992–1996 pay relatives defined industry type using the Standard Industry Classification (SIC) system. Occupation type and occupational groups for the 2002, 1998, and 1992–1996 pay relatives were defined using the Occupational Classification System (OCS).

The 2004 and 2002 pay relatives used a similar multivariate regression technique methodology to calculate pay relatives. The 1998 and 1992–1996 pay relatives were calculated using a weighted cell means methodology. The methodology controlled for fewer characteristics:

- Occupational type
- Work level
- Payroll reference date

The 2004, 2002, and 1998 pay relatives were derived from the National Compensation Survey (NCS). The 1992–1996 pay relatives were derived from the Occupational Compensation Survey (OCS). The NCS and OCS have significantly different sample designs. For example, the OCS collected wage data for sampled establishments with 50 or more employees. The NCS collects data for all sampled establishments. Additionally, the OCS collected wage data for a fixed list of jobs. The NCS collects wage data for randomly selected jobs.

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[1] The proportion of computer programmers in San Francisco relative to the nation as a whole was calculated using total employment estimates found in the November 2004 Metropolitan Area Occupational Employment and Wage Estimates publication, http://www.bls.gov/oes/current/oessrcma.htm.

[2] Average pay for professional workers in San Francisco and for the United States are based on wage estimates published in the San Francisco–Oakland–San Jose, CA National Compensation Survey, April 2004 and the National Compensation Survey: Occupational Wages in the United States, July 2004, http://www.bls.gov/ncs/ocs/compub.htm.

[3] For more information, see Maury B. Gittleman, "Pay Relatives for Metropolitan Areas in the U.S.," *Monthly Labor Review*, March 2005, pp. 46-53.

[4] For more information, see Parastou Karen Shahpoori, "Pay Relatives for Major Metropolitan Areas," *Compensation and Working Conditions*, Spring 2003.

[5] For more information, see the Occupational Compensation Survey Publications List (1992-1996), http://www.bls.gov/ncs/ocspubs.htm.

TABLE 1. **Pay relatives for major occupational groups in metropolitan areas, National Compensation Survey, July 2004**

(Average pay for all occupations nationally = 100. Average pay nationally for each occupational group shown = 100.)

Metropolitan Area[1]	All occupations	Management, business, and financial	Professional and related	Service	Sales and related	Office and administrative support	Construction and extraction	Installation, maintenance, and repair	Production	Transportation and material moving
United States	100	100	100	100	100	100	100	100	100	100
Amarillo, TX	91*	89*	87*	89*	88*	90*	89*	90*	110*	97
Anchorage, AK	111*	110*	109*	119*	101	107*	130*	108*	122*	114*
Atlanta, GA	103*	101	99	102	107*	105*	103	108*	100	103
Augusta-Aiken, GA-SC	95*	94*	97*	89*	88*	93*	88*	98	99	96
Austin-San Marcos, TX	97*	95*	95*	102*	100	102	93*	103	90*	87*
Birmingham, AL	94*	104*	97*	97*	92*	92*	76*	100	93*	94*
Bloomington, IN	93*	102	87*	93*	96*	88*	98	92*	98	101
Boston-Worcester-Lawrence, MA-NH-ME-CT	112*	110*	109*	114*	106	117*	117*	111*	109*	119*
Brownsville-Harlingen-San Benito, TX	81*	78*	95*	81*	80*	81*	70*	80*	73*	77*
Buffalo-Niagara Falls, NY	102*	92*	97*	108*	100	102*	101	101	105*	101
Charleston-North Charleston, SC	96*	105	98*	86*	93*	99	81*	89*	93*	102
Charlotte-Gastonia-Rock Hill, NC-SC	98	97	91*	94*	102	101	89*	98	104	103
Chicago-Gary-Kenosha, IL-IN-W	106*	103	103*	105*	108*	108*	123*	105*	103	109*
Cincinnati-Hamilton, OH-KY-IN	101	95*	98	104	104	100	102	98	108*	100
Cleveland-Akron, OH	101	101	101	99	97	99	96	105*	106*	105*
Columbus, OH	97*	90*	96*	96	100	99	112*	98	92*	98
Corpus Christi, TX	88*	95	93*	84*	90*	86*	80*	84*	90*	85*
Dallas-Fort Worth, TX	99	103	100	95*	101	100	96	98	94*	99
Dayton-Springfield, OH	99*	93*	96*	94*	102	96*	99	99	112*	104*
Denver-Boulder-Greeley, CO	102	101	99	101	97	101	96	106*	104	104
Detroit-Ann Arbor-Flint, MI	106*	102	107*	101	98	108*	110*	104	115*	109*
Elkhart-Goshen, IN	94*	92*	99	92*	95*	92*	99	87*	95*	94*
Fort Collins-Loveland, CO	97*	88*	95*	97*	96*	99*	99	100	96*	100
Grand Rapids-Muskegon-Holland, MI	104*	101	100	101*	106*	100	106*	101	107*	107*
Great Falls, MT	87*	85*	83*	92*	82*	81*	122*	100	101	88*
Greensboro-Winston Salem-High Point, NC	99*	95*	98*	97*	88*	100	93*	102	104*	104*
Greenville-Spartanburg-Anderson, SC	96*	93*	94*	93*	91*	99	90*	88*	103*	97*
Hartford, CT	113*	107*	109*	124*	114*	111*	138*	111	112*	110*
Hickory-Morganton-Lenoir, NC	99*	88*	93*	98*	90*	100	81*	97*	103*	111*
Honolulu, HI	104*	104	106*	107*	105	102	102	107	94	106
Houston-Galveston-Brazoria, TX	97*	107*	102	88*	98	97*	94*	95	96	93*
Huntsville, AL	97*	98	99	95	96	97	89	95	98	94
Indianapolis, IN	98	94*	98	96	82	104*	95	99	106*	104
Iowa City, IA	100	99	98	104*	91*	103*	104*	92*	99	105*
Johnstown, PA	87*	95*	84*	90*	90*	83*	84*	107*	85*	80*
Kansas City, MO-KS	98*	87*	93*	98	105	101	103	94	109*	100
Knoxville, TN	95*	105*	91*	89*	92*	99	86*	92*	93*	94*
Lincoln, NE	92*	93*	87*	95*	91*	90*	82*	96*	94*	95*
Los Angeles-Riverside-Orange County, CA	107*	108*	111*	111*	109*	107*	110*	109*	97	101
Louisville, KY-IN	100	103*	102*	105*	98	100	104*	91*	92*	99

See footnotes at end of table.

TABLE 1. **Pay relatives for major occupational groups in metropolitan areas, National Compensation Survey, July 2004**

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(Average pay for all occupations nationally = 100. Average pay nationally for each occupational group shown = 100.)

Metropolitan Area[1]	All occupations	Management, business, and financial	Professional and related	Service	Sales and related	Office and administrative support	Construction and extraction	Installation, maintenance, and repair	Production	Transportation and material moving
Melbourne-Titusville-Palm Bay, FL	92*	89*	86*	95*	96*	92*	90*	101	89*	100
Memphis, TN-AR-MS	96*	94*	89*	93*	94*	92*	111*	103*	94*	101
Miami-Fort Lauderdale, FL	93*	98	97	91*	94	93*	84*	93	89*	92*
Milwaukee-Racine, WI	105*	100	95*	100	120	102	105	111*	117*	107*
Minneapolis-St. Paul, MN-WI	109*	103	104*	119*	105	105*	116*	108	111*	119*
Mobile, AL	90*	90*	93*	85*	88*	92*	91*	90*	91*	98
New Orleans, LA	90*	87*	93*	83*	109*	84*	85*	89*	86*	94*
New York-Northern New Jersey-Long Island, NY-NJ-CT-PA	110*	111*	115*	110*	107*	114*	127*	100	102	113*
Norfolk-VA Beach-Newport News, VA-NC	93*	94*	93*	91*	98	96*	87*	92*	86*	93*
Ocala, FL	92*	98	88*	87*	91*	97*	81*	94*	86*	104*
Oklahoma City, OK	91*	86*	88*	88*	91*	89*	86*	93*	97*	93*
Orlando, FL	91*	91	89*	86*	100	92*	87*	104	90	92*
Philadelphia-Wilmington-Atlantic City, PA-NJ-DE-MD	107*	107*	108*	106*	112*	108*	106	107*	101	108
Phoenix-Mesa, AZ	102	98	101	94*	130*	106*	90*	106	102	100
Pittsburgh, PA	97*	96	96*	99	94*	99	91*	95*	94*	101
Portland-Salem, OR-WA	100	97	93*	109*	102	102	108	105	99	103
Providence-Fall River-Warwick, RI-MA	108*	103	110*	117*	113*	109*	98	88*	100	115*
Reading, PA	104*	108*	101	103*	103	102*	100	98	104*	108*
Reno, NV	99*	93*	95*	102*	111*	91*	101	114*	93*	100
Richland-Kennewick-Pasco, WA	100	98	99	105*	105*	92*	99	92*	104*	100
Richmond-Petersburg, VA	99*	95*	97*	99	99	98*	88*	97*	101	104*
Rochester, NY	99	101	97*	107*	96*	95*	95*	89*	102*	100
Rockford, IL	101*	84*	102*	98*	93*	93*	111*	115*	107*	103*
Sacramento-Yolo, CA	108*	106*	112*	113*	108	106*	105	112*	106	110*
Salinas, CA	110*	108*	117*	111*	119*	110*	118*	109*	100	96*
St. Louis, MO-IL	98*	95	95*	95*	105	98	112*	95	97	109*
San Antonio, TX	92*	91*	93*	87*	97*	95*	79*	83*	100	95*
San Diego, CA	108*	109*	117*	111*	111	103	108*	108*	100	102
San Francisco-Oakland-San Jose, CA	117*	117*	118*	121*	113*	120*	127*	116*	110*	113*
Seattle-Tacoma-Bremerton, WA	105*	95*	98	116*	103	105*	115*	102	108*	105*
Springfield, MA	94*	103*	107*	106*	110*	110*	107*	109*	110*	65*
Springfield, MO	89*	91*	88*	89*	88*	86*	83*	90*	95*	94*
Tallahassee, FL	86*	83*	86*	84*	99	88*	91*	79*	83*	108*
Tampa-St. Petersburg-Clearwater, FL	94*	99	90*	92	106	93*	88*	101	93*	100
Visalia-Tulare-Porterville, CA	98*	95*	105*	98*	101	96*	87*	99	93*	91*
Washington-Baltimore, DC-MD-VA-WV	105*	101	108*	105*	101	110*	103	101	102	98
York, PA	98*	106*	101	97*	102	93*	91*	100	94*	101
Youngstown-Warren, OH	98*	89*	94*	88*	101	87*	99	96*	111*	111*

* The pay relative for this area is significantly different from the national average of all areas at the 10% level of significance. For additional details, see the technical memo.

[1] A metropolitan area can be a Metropolitan Statistical Area (MSA) or Consolidated Metropolitan Statistical Area (CMSA) as defined by the Office of Management and Budget, 1994.

Technical Note

Because the NCS is a sample survey, pay relatives derived from NCS are subject to sampling error. Sampling error for pay relatives are differences that occur between the pay relatives estimated from the sample and the true pay relatives derived from the population. Pay relatives estimated from different samples selected using the same sample design may differ from one another.

It is important to assess whether differences between each pay relative and the pay relative for the nation as a whole is likely to be the result of sampling error or of true differences in pay levels. Those areas whose difference is likely to be due to true differences in pay levels are denoted with an asterisk (*) in Table 1.

To perform this assessment a test of statistical significance is conducted. The test constructs a 90-percent confidence interval that assumes the given area's true pay relative is equal to the national average. The confidence interval is constructed so that there is a 90 percent probability the pay relative calculated from any one sample is contained within the confidence interval. If from a single sample a calculated pay relative falls within the confidence interval, then the pay relative is not statistically significant and the hypothesis that the true pay relative is equal to the national average is accepted. However, if the pay relative falls outside of the constructed confidence interval then the pay relative is statistically significant at the 10-percent level. The hypothesis that the given area's pay relative is equal to the pay relative for the nation is rejected and one can conclude with reasonable confidence that the true pay relative is different from the national average.

In addition to sampling error, pay relatives are subject to a variety of sources that can adversely influence the estimates. The NCS may be unable to obtain information for some establishments; there may be difficulties with survey definitions; respondents may be unable to provide correct information, or mistakes in recording or coding the data may occur. Non-sampling errors of these kinds were not specifically measured. However, they are expected to be minimal due to the extensive training of the field economists who gathered the survey data, computer edits of the data, and detailed data review.

The pay relative regression methodology introduces another type of error. Regression models are subject to specification error. The significance test does not specifically measure specification error. However, care was taken to minimize this form of error by an extensive search across specifications for the model that performs best in terms of predictive accuracy.

For more details on the statistical significance test, see Maury B. Gittleman, "Pay Relatives for Metropolitan Areas in the U.S.," *Monthly Labor Review*, March 2005, pp. 46-53.