Pay relatives for metropolitan areas in the NCS

Using data from the National Compensation Survey, calculations of pay which take into account the composition of employment across localities indicate that measures of interarea pay differentials which do not control for employment composition can be misleading

Maury B. Gittleman

When workers and firms make decisions on where to locate, a number of factors come into play. One important consideration is how compensation differs across areas. Workers will tend to be attracted to cities where the compensation is higher, provided, of course, that the benefits of more generous pay are not completely offset by a steeper cost of living or by undesirable characteristics of the better paying city, such as higher levels of crime and pollution or an inferior climate. Firms, by contrast, have an incentive to relocate to cities in which labor is cheaper, all else being equal. Besides being an input for location decisions, information on interarea variation in compensation is relevant to a host of other purposes, including wage and salary administration, collective bargaining, and the analysis of any number of economic issues wherein geography is a consideration.

Under its National Compensation Survey (NCS) program, the Bureau of Labor Statistics regularly publishes data on wage levels in metropolitan areas.[1] Large differences across areas are evident in mean hourly earnings for the local economies as a whole.[2] While these data provide valuable information for many purposes, they are not generally appropriate for cases in which the data user wishes to know how compensation differs among areas for any given job. Metropolitan areas vary greatly in terms of the types of jobs that are available to the local labor force, with one area having, say, a high concentration of professional workers, while another has an above-average share of blue-collar employment. Thus, one cannot tell from an examination of overall mean wage rates whether one metropolitan area pays better than another because it tends to have higher pay for any given job or because jobs in that area are more concentrated among positions that tend to have higher rates of pay in all localities. A second, more technical, reason comparisons of overall mean levels may be somewhat misleading is that, even for surveys from the same year, areas will differ from each other in terms of when the data were collected. Thus, one area may have wage data referring primarily to the beginning of the year, another to the end of the year, when wages everywhere will tend to be higher because of inflation and other secular trends.

This article presents calculations of the pay in metropolitan areas relative to that in the Nation as a whole which take account of both interarea differences in the composition of jobs and the fact that surveys occur at different times of the year. Pay relatives are presented for all jobs that are covered by the survey and by nine major occupation groups.

Maury B. Gittleman is a research economist in the Office of Compensation and Working Conditions, Bureau of Labor Statistics. E-mail: gittleman.maury@bls.gov

Why do wages differ across areas?

Before presenting the methods employed to produce these pay relatives, it is useful to discuss briefly why wages differ across areas in the first place.[3] As just noted, pay may differ because the

composition of jobs differs from city to city. But, as will be demonstrated subsequently, even after taking account of interarea differences in employment composition, one still finds much variation in wages across localities. In simple models of interarea wages, economic theory suggests that wage rates should adjust so that individuals will be indifferent between living in one location as opposed to another. This adjustment does not mean, however, that wages themselves will be identical across areas, even in the simplest models. Areas differ in price levels, so if, for instance, the price of housing is particularly high in one area, workers would need higher wage rates to be willing to live in that area. Besides differing in price levels, cities vary in the amenities they offer. Thus, if an area is particularly attractive because of a desirable climate, a rich cultural life, or low levels of crime, then, all else being equal, wages will not have to be as high for that area to attract and maintain a workforce. Similar considerations apply to firms. That is, wages should adjust so that firms, too, are indifferent between locating in one city compared with another. According to these economic models, firms will be willing to locate in high-wage cities if the higher labor costs are offset by lower costs of production in other ways, such as cheaper rents for office space.

Another explanation for why wages differ across localities relates to the process of adjustment, which, in theory, eventually leads to indifference among both workers and firms with respect to location decisions. As an example, suppose an area produces manufactured goods for export. Then an increase in the price of the dollar relative to other currencies will make it harder for the area to compete in world markets, applying downward pressure on wages in the area. This reduction in wages will provide an incentive for workers to migrate to other cities, and, over time, the declining pool of workers available in that area will begin to apply upward pressure on wages. This process of adjustment may occur over a long time in areas all across the Nation, or it may be incomplete, resulting in an ongoing presence of interarea wage differentials that are not offset by differences in the cost of living or the level of amenities.

Methodology

There are a number of different ways to calculate interarea pay differences that take into account the variation in employment composition across localities. One approach is to gather information for each area on a fixed set of jobs. This approach is the one that was used by the BLS Occupational Compensation Survey (OCS) program.[4] A list of jobs was established in which a job was defined by occupation and the level of work in that occupation, and, for each establishment in the sample, wage data were collected for all jobs on the list. Then, with employment composition fixed to be the same across areas through the use of employment weights for the Nation as a whole, a mean wage was calculated for each area and compared with the average for the Nation. Such an approach is no longer feasible, however, under the NCS, the survey that replaced the OCS. Instead of gathering wage data on a preselected list of jobs for all localities, as the OCS did, the NCS randomly selects jobs in each establishment in the sample, with the intention of representing more fully the employment patterns and occupational mix of each locality.

Given that the set of jobs the NCS surveys is no longer identical across localities, a different approach to calculating pay relatives is required. The technique used here is based on multivariate regression analysis, which allows one to control for the influence of job characteristics related to the pay level, so that one can make comparisons of like jobs.[5] A simple example affords some intuition into how the regression technique works. Suppose that there are two areas, *A* and *B*, each of which has only two types of jobs, represented by occupations *X* and *Y*. Suppose also that (1) *Y* is the higher paying occupation, (2) 75 percent of all jobs in area *A* are in occupation *Y*, and (3) 25 percent of the jobs in area *B* are in occupation *Y*. Then, if the mean wage in each of the occupations is the same in both localities, overall mean wages will be higher in area *A* simply because that area has the greater proportion of employment in occupation *Y*. But if, instead, one compared the mean wages for occupation *X* across the two areas and the mean wages for occupation *Y* across the two areas, then, taking account of the employment composition in each of the two areas, one would arrive at the conclusion that the two areas pay equally well. Loosely speaking, this comparison of jobs in one area with their counterparts in another is what a regression model does.

In practice, there are, of course, many different occupations and many other dimensions along which jobs differ. For example, some jobs are unionized while others are not, and some jobs are full time while others are part time. But the idea is the same as when there are only two types of jobs: the regression model will compare the pay for an employee in one area who, say, is working full time, is a member of a union, and is in a given occupation with the pay for workers in jobs with the same kind of attributes in other areas. All jobs are considered simultaneously, and the end result is an estimate of how pay differs, on average, across areas for any given job.

In the NCS, besides area, the factors that influence the pay level can be divided into two categories: job attributes and establishment characteristics.[6] Variables representing each of these categories are included in the regression model as controls. Perhaps the most important job attribute is the occupation, in light of the large differences in pay across occupations. As noted, one does not want to consider an area high paying just because it has a large share of occupations that pay above-average wages everywhere. The NCS also has information on what is known as the *work level*, wherein each job is rated on a scale from 1 to 15, with the higher numbers cor-

responding to higher levels of skills and responsibilities.[7] Because of the strong relationship between work level and pay, work level is an important explanatory variable in the regression model.

A third job attribute is whether a position is covered by a collective bargaining agreement (the union status of the job). Because pay tends to be higher for jobs covered by a collective bargaining agreement than for those not so covered,[8] controlling for union status avoids judging an area higher paying merely because it has a higher proportion of unionized jobs. Two other job attributes that are associated with wages are whether the job is full time or part time (full-time jobs tend to pay more than their part-time equivalents[9]) and whether incentive pay accounts for a portion of wages.

As regards establishment characteristics, a large body of research has noted the presence of interindustry wage differentials—that is, the payment of higher wages in some industries than others, even after controlling for differences in the characteristics of workers.[10] Thus, it is important to include industry affiliation as an explanatory variable. It also is well known that pay tends to increase with establishment size, indicating that one should include a control for this factor as well.[11] In addition, rates of pay tend to differ by the ownership of the establishment (that is, whether it is operated by the private sector or by a State or local government) and whether the establishment is for profit or nonprofit.

Finally, because the collection of data for a given year occurs over a time span long enough for wages to change because of inflation, business cycle fluctuations, and other trends, it is important to control for the time when the data for a given job were collected.

A regression model for interarea comparisons that includes all of the foregoing job attributes and establishment characteristics can be written as

$$\ln(\text{WAGE}_j) = a_1 + \sum_{a=2}^{A} a_{2a}\text{AREA}_{aj} + \sum_{o=2}^{O} a_{3o}\text{OCC}_{oj} + \sum_{w=2}^{15} a_{4w}\text{WORKLEVEL} + a_5\text{UNION}_j + a_6\text{FT}_j + a_7\text{INCENTIVE}_j + \sum_{i=2}^{I} a_{8i}\text{IND}_{ij} + a_9\text{LESTABSIZE}_j + a_{10}\text{STATE}_j + a_{11}\text{LOCAL}_j + a_{12}\text{PROFIT}_j + \sum_{q=2}^{Q} a_{13q}\text{QUARTER} + e_j, \quad (1)$$

where j is an index for a job in a given establishment, lnWAGE is the logarithm of the average of the hourly wage for all workers holding a given job, and AREA, OCC, IND, WORKLEVEL, and QUARTER are vectors of dummy variables for area (metropolitan areas plus nonmetropolitan areas, grouped into Census divisions), (three-digit) occupation, (two-digit) industry, work level, and calendar quarter, respectively. Also, A, O, I, and Q denote the number of areas, occupations, industries, and quarters, respectively. Finally, FT indicates whether the job is full time or part time, STATE and LOCAL whether the job is located at a government establishment, PROFIT whether the establishment is in the for-profit sector, UNION whether the job is covered by a collective bargaining agreement, and INCENTIVE whether some part of compensation is based on incentives, and LESTABSIZE designates the logarithm of establishment size.

The model in equation (1) can be estimated with the statistical technique known as weighted least squares, where the weights are used to make the sample representative of hours worked within the part of the national economy that is in the scope of the survey. The specification of the dependent variable, hourly wage, in logarithmic form follows standard practice in labor economics. With such a specification, a coefficient will approximate the percentage increase in hourly wages that is associated with a one-unit increase in the corresponding explanatory variable.[12]

The first step in making interarea wage comparisons is to calculate pay relatives for each of the nine major occupation groups, a task that is done by estimating the model of equation (1) separately by major occupation group. The coefficients that are of primary interest from the equations for each of these groups are those for each area: the a_{2a}'s. Each of these coefficients measures, for a particular major occupation group, the pay in a given area relative to an area—known as the *omitted area*—that, for technical reasons, is not represented by any variable in the regression. What is of consequence, however, is not how wages in a given area compare with those in the omitted area, but how they compare with those in the Nation as a whole. To obtain an estimate of this measure, it is necessary to transform the coefficients with the use of the formula

$$\text{PAYREL}_b = 100\exp\left(a_{2b} - \sum_{a=2}^{A} p_a a_{2a}\right), \quad (2)$$

where PAYREL_b is the pay for area b relative to that in the Nation as whole for the major occupation group under study, a_{2b} is the coefficient for that area, and p_a is the proportion of hours worked in area a. As noted, the a_{2b} coefficient measures the differential in area b relative to the omitted area. In order to get a measure of how wages in area b compare with those in the rest of the Nation, it is necessary to normalize this coefficient, by subtracting a weighted average of all the area differentials. This weighted average is the second term in the argument of the exponential function. Exponentiation yields the ratio of wages in area b to those for the rest of the Nation. Finally, multiplying by 100 sets the base—the pay in the Nation—to 100.

Once one obtains pay relatives for each of the major occupation groups, it becomes possible to calculate pay relatives for the economy as a whole. Loosely speaking, this is done by taking, for each area, a weighted average of the pay relatives for each of the major occupation groups, where the weights are the share of employment in each such group for the Nation as a whole. An alternative method of calculation would be to use as weights the share of employment in each major occupation group for each locality. This approach would have the disadvantage, however, of allowing interarea differences in the

Table 1. Pay relatives for metropolitan areas, July 2002

Metropolitan area	With controls		Without controls	
	Relative	Rank	Relative	Rank
United States	100	...	100	...
Amarillo, TX	[1]91	70	[1]79	78
Anchorage, AK	[1]109	7	[1]107	25
Atlanta, GA	[1]103	21	110	18
Augusta-Aiken, GA-SC	[1]94	62	[1]96	53
Austin-San Marcos, TX	100	34	[1]102	37
Birmingham, AL	[1]93	63	[1]85	71
Bloomington, IN	[1]92	68	[1]90	62
Bloomington-Normal, IL	[1]104	18	[1]106	28
Boston-Worcester-Lawrence, MA-NH-ME-CT	[1]111	3	[1]121	3
Brownsville-Harlingen-San Benito, TX	[1]84	81	[1]67	81
Buffalo-Niagara Falls, NY	[1]101	28	[1]109	19
Charleston-North Charleston, SC	[1]95	58	[1]96	54
Charlotte-Gastonia-Rock Hill, NC-SC	99	43	105	30
Chicago-Gary-Kenosha, IL-IN-WI	[1]106	14	[1]109	21
Cincinnati-Hamilton, OH-KY-IN	100	38	[1]106	26
Cleveland-Akron, OH	100	31	102	38
Columbus, OH	99	41	101	41
Corpus Christi, TX	[1]89	78	[1]82	76
Dallas-Fort Worth, TX	100	37	[1]106	27
Dayton-Springfield, OH	99	45	104	31
Denver-Boulder-Greeley, CO	[1]103	19	[1]111	16
Detroit-Ann Arbor-Flint, MI	[1]107	11	[1]112	12
Elkhart-Goshen, IN	[1]96	54	[1]88	67
Fort Collins-Loveland, CO	[1]98	49	[1]97	51
Grand Rapids-Muskegon-Holland, MI	[1]102	24	100	43
Great Falls, MT	[1]89	79	[1]82	77
Greensboro-Winston Salem-High Point, NC	[1]99	44	[1]91	61
Greenville-Spartanburg-Anderson, SC	[1]97	51	[1]92	59
Hartford, CT	[1]113	2	[1]124	2
Hickory-Morganton-Lenoir, NC	99	42	[1]84	75
Honolulu, HI	[1]105	17	99	46
Houston-Galveston-Brazoria, TX	99	40	99	47
Huntsville, AL	[1]97	52	[1]114	10
Indianapolis, IN	[1]102	25	103	34
Iowa City, IA	[1]98	47	[1]109	20
Johnstown, PA	[1]87	80	[1]84	73
Kalamazoo-Battle Creek, MI	99	39	[1]101	42
Kansas City, MO-KS	98	48	[1]108	23
Knoxville, TN	[1]93	64	[1]92	60
Lincoln, NE	[1]91	72	[1]90	64
Los Angeles-Riverside-Orange County, CA	[1]106	15	[1]109	22
Louisville, KY-IN	100	30	[1]101	40
Melbourne-Titusville-Palm Bay, FL	[1]90	73	[1]112	13
Memphis, TN-AR-MS	[1]99	46	[1]98	48
Miami-Fort Lauderdale, FL	[1]94	61	[1]92	58
Milwaukee-Racine, WI	102	27	[1]113	11
Minneapolis-St. Paul, MN-WI	[1]109	6	[1]118	8
Mobile, AL	[1]90	75	[1]88	68
New Orleans, LA	[1]93	65	[1]90	65
New York-Northern New Jersey-Long Island, NY-NJ-CT-PA	[1]111	4	[1]118	4
Norfolk-Virginia Beach-Newport News, VA-NC	[1]92	67	[1]90	63
Ocala, FL	[1]90	77	[1]77	80
Oklahoma City, OK	[1]92	69	[1]85	72
Orlando, FL	[1]91	71	[1]78	79
Philadelphia-Wilmington-Atlantic City, PA-NJ-DE-MD	[1]108	10	[1]116	9
Phoenix-Mesa, AZ	101	29	100	44
Pittsburgh, PA	[1]96	56	97	52
Portland-Salem, OR-WA	[1]103	22	[1]111	14
Providence-Fall River-Warwick, RI-MA	[1]108	9	[1]93	57
Raleigh-Durham-Chapel Hill, NC	100	32	[1]118	6
Reading, PA	[1]102	26	[1]101	39
Reno, NV	100	36	[1]88	66
Richland-Kennewick-Pasco, WA	[1]102	23	[1]104	32
Richmond-Petersburg, VA	[1]98	50	102	35
Rochester, NY	100	35	[1]111	15
Rockford, IL	100	33	[1]97	50

Table 1. Continued—Pay relatives for metropolitan areas, July 2002

Metropolitan area	With controls		Without controls	
	Relative	Rank	Relative	Rank
Sacramento-Yolo, CA	[1]108	8	[1]118	5
Salinas, CA	[1]111	5	[1]107	24
San Antonio, TX	[1]94	60	100	45
San Diego, CA	[1]106	13	105	29
San Francisco-Oakland-San Jose, CA	[1]118	1	[1]130	1
Seattle-Tacoma-Bremerton, WA	[1]107	12	[1]118	7
Springfield, MA	[1]106	16	[1]87	70
Springfield, MO	[1]90	74	[1]87	69
St. Louis, MO-IL	[1]96	55	104	33
Tallahassee, FL	[1]90	76	[1]94	56
Tampa-St. Petersburg-Clearwater, FL	[1]93	66	[1]84	74
Visalia-Tulare-Porterville, CA	[1]97	53	[1]95	55
Washington-Baltimore, DC-MD-VA-WV	[1]103	20	[1]111	17
York, PA	[1]96	57	[1]98	49
Youngstown-Warren, OH	[1]95	59	[1]102	36

[1] Significantly different from Nation at 10-percent level.

distribution of employment by major occupation group to affect the estimates. In practice, though, the two methods yield similar results.

Before presenting the estimates of the pay relatives, it may be useful to briefly discuss their reliability. It is obviously too costly to collect wage data for the entire population—that is, for every job in every establishment in every area. Instead, a random sample of jobs is selected which is designed to be representative of the portion of each locality's economy that is within the scope of the survey. As is always the case when a sample is used instead of a census, sampling error is present, which merely means that if new samples were chosen at random and wage data collected, estimates derived from each of these samples will differ from each other. It is important to measure the sampling error associated with each estimate in order to assess whether the difference between an estimate of average pay for a given area and that for the Nation is likely to be the result of sampling error or of true differences in pay levels.

To perform this assessment—known as conducting a test of statistical significance—the first step is to form a *confidence interval* for the normalized coefficient for each area. The confidence interval indicates the range into which a given normalized coefficient will fall if any difference between pay in a given area and that of the Nation is attributable solely to sampling error. This confidence interval can be of different sizes. What is used here is a 90-percent confidence interval. If there is truly no difference between area and national pay, and if one could estimate the normalized coefficients from all possible samples of the population, then a confidence interval of this size indicates the range into which the normalized coefficients should fall 90 percent of the time. If the actual estimate falls outside of the confidence interval, then the difference is said to be statistically significant at the 10-percent level, allowing one to say with some assurance that there truly is a difference between the average area wage and that for the Nation as a whole. The estimates of pay relatives provided in the next section indicate whether the difference between area and national wages is statistically significant.

A second type of comparison which is of interest is that between two areas. For each pairwise comparison, one can calculate a 90-percent confidence in terval and determine whether the difference in pay between two areas is statistically significant. Unfortunately, limitations of space preclude the results of such tests from being presented in this article: there simply are too many pairwise comparisons.

Estimates of pay relatives

The actual estimates of the pay relatives, obtained by the methods described in the previous section, make use of the NCS Occupational Wages 2002 data for the Nation as a whole.[13] In this survey, data are collected from 154 areas, chosen at random to represent the United States. Some 81 of these localities—those in larger urban areas—are defined by the Office of Management and Budget as either Metropolitan Statistical Areas (MSA's) or Consolidated Metropolitan Statistical Areas (CMSA's). Areas that are not part of an MSA or a CMSA—individual counties or parishes—are considered nonmetropolitan areas. Pay relatives are presented only for the metropolitan areas, because the sample sizes for the nonmetropolitan areas tend to be too small to obtain reliable estimates.

Table 1 presents pay relatives for the economy as a whole for the 81 areas, showing the index of the rate of pay for each area relative to that of the rate of pay for the United States, as well as the rank of each area. In addition, the table indicates whether the difference between the pay in a given area and that in the Nation as a whole is statistically significant (at the 10-percent level). Pay is highest in San Francisco, whose index of 118

Table 2. Pay relatives for metropolitan areas, by major occupation group and with controls, July 2002

Metropolitan area	Total	PST	Exec	Sales	Admin	Prec prod	Mach oper	Transp	Hand	Serv
United States	100	100	100	100	100	100	100	100	100	100
Amarillo, TX	[1]91	[1]94	[1]87	[1]97	[1]91	[1]85	[1]107	[1]90	[1]89	[1]87
Anchorage, AK	[1]109	[1]113	[1]113	98	[1]110	[1]90	96	[1]116	[1]111	[1]125
Atlanta, GA	[1]103	100	106	[1]111	[1]104	[1]107	104	[1]106	101	[1]96
Augusta-Aiken, GA-SC	[1]94	98	[1]88	[1]90	[1]94	[1]97	99	[1]93	[1]89	[1]92
Austin-San Marcos, TX	100	[1]98	[1]98	[1]106	[1]97	[1]90	[1]93	[1]107	97	[1]109
Birmingham, AL	[1]93	[1]93	[1]90	101	97	[1]91	98	97	[1]85	[1]91
Bloomington, IN	[1]92	[1]87	[1]96	[1]95	[1]88	[1]86	98	[1]107	[1]95	[1]92
Bloomington-Normal, IL	[1]104	[1]95	100	102	[1]89	[1]114	[1]127	100	[1]133	[1]106
Boston-Worcester-Lawrence, MA-NH-ME-CT	[1]111	[1]109	104	103	[1]115	[1]113	[1]107	[1]118	[1]114	[1]113
Brownsville-Harlingen-San Benito, TX	[1]84	[1]96	[1]82	[1]91	[1]90	[1]75	[1]77	[1]80	[1]74	[1]79
Buffalo-Niagara Falls, NY	[1]101	[1]99	100	[1]94	[1]102	[1]102	[1]107	[1]105	[1]102	[1]104
Charleston-North Charleston, SC	[1]95	99	[1]92	[1]110	[1]97	[1]91	[1]93	101	99	[1]85
Charlotte-Gastonia-Rock Hill, NC-SC	99	[1]94	107	105	101	99	96	101	[1]105	96
Chicago-Gary-Kenosha, IL-IN-WI	[1]106	[1]104	[1]106	100	[1]108	[1]113	[1]105	[1]109	[1]108	[1]103
Cincinnati-Hamilton, OH-KY-IN	100	[1]93	97	99	101	[1]94	[1]108	[1]105	101	[1]104
Cleveland-Akron, OH	100	96	100	104	98	103	[1]106	104	[1]109	97
Columbus, OH	99	99	[1]92	94	102	106	103	100	104	96
Corpus Christi, TX	[1]89	[1]92	[1]105	[1]96	[1]88	[1]81	[1]93	[1]85	[1]84	[1]84
Dallas-Fort Worth, TX	100	99	105	99	102	100	97	104	96	[1]97
Dayton-Springfield, OH	99	[1]96	[1]87	96	[1]96	[1]105	[1]107	102	105	100
Denver-Boulder-Greeley, CO	[1]103	102	105	108	103	102	103	103	102	102
Detroit-Ann Arbor-Flint, MI	[1]107	[1]110	100	100	[1]105	[1]110	[1]118	[1]115	[1]115	103
Elkhart-Goshen, IN	[1]96	100	98	[1]94	[1]97	[1]97	[1]97	98	[1]103	[1]91
Fort Collins-Loveland, CO	[1]98	[1]94	[1]95	99	[1]95	102	[1]108	[1]97	[1]97	[1]98
Grand Rapids-Muskegon-Holland, MI	[1]102	[1]104	99	102	[1]99	[1]102	[1]104	100	[1]109	[1]104
Great Falls, MT	[1]89	[1]82	101	[1]88	[1]80	[1]95	[1]92	[1]85	[1]85	99
Greensboro-Winston Salem-High Point, NC	[1]99	[1]98	[1]96	[1]88	[1]105	101	102	102	99	[1]97
Greenville-Spartanburg-Anderson, SC	[1]97	[1]95	[1]93	[1]108	[1]98	100	100	[1]94	[1]97	[1]93
Hartford, CT	[1]113	[1]112	[1]117	101	[1]111	[1]112	[1]110	[1]109	[1]115	[1]123
Hickory-Morganton-Lenoir, NC	99	[1]90	[1]111	[1]96	[1]104	[1]96	[1]103	[1]108	[1]105	[1]97
Honolulu, HI	[1]105	[1]106	[1]105	[1]108	[1]105	102	99	99	[1]105	[1]111
Houston-Galveston-Brazoria, TX	99	[1]107	[1]109	98	101	[1]92	101	97	[1]93	95
Huntsville, AL	[1]97	101	[1]108	94	[1]96	[1]95	[1]113	93	[1]91	[1]89
Indianapolis, IN	[1]102	99	98	107	[1]106	101	[1]107	[1]106	[1]107	96
Iowa City, IA	[1]98	[1]92	[1]94	[1]90	[1]105	101	99	[1]112	[1]97	101
Johnstown, PA	[1]87	[1]86	[1]92	[1]77	[1]86	[1]87	[1]84	[1]92	[1]83	[1]91
Kalamazoo-Battle Creek, MI	99	[1]104	[1]93	[1]85	[1]98	[1]105	100	[1]114	101	101
Kansas City, MO-KS	98	[1]95	[1]91	100	97	101	102	101	[1]113	[1]95
Knoxville, TN	[1]93	[1]95	101	[1]93	[1]93	[1]87	[1]92	[1]96	[1]96	[1]91
Lincoln, NE	[1]91	[1]89	[1]90	[1]95	[1]86	[1]89	[1]93	[1]97	[1]91	[1]93
Los Angeles-Riverside-Orange County, CA	[1]106	[1]110	[1]106	[1]110	[1]105	[1]106	[1]92	102	101	[1]108
Louisville, KY-IN	100	[1]105	102	[1]105	[1]96	[1]95	99	102	[1]93	[1]103
Melbourne-Titusville-Palm Bay, FL	[1]90	[1]89	[1]83	100	[1]90	[1]87	99	[1]84	[1]83	[1]92
Memphis, TN-AR-MS	[1]99	[1]95	101	[1]110	[1]98	98	[1]103	98	[1]98	[1]94
Miami-Fort Lauderdale, FL	[1]94	[1]96	100	96	[1]95	[1]91	[1]90	[1]87	98	[1]90
Milwaukee-Racine, WI	102	[1]91	98	103	101	[1]112	[1]109	104	[1]115	100
Minneapolis-St. Paul, MN-WI	[1]109	103	101	[1]107	[1]108	[1]110	[1]112	[1]114	[1]116	[1]115
Mobile, AL	[1]90	[1]87	100	[1]91	[1]90	[1]92	[1]93	[1]89	[1]89	[1]86
New Orleans, LA	[1]93	[1]96	[1]102	[1]106	[1]89	[1]90	[1]90	[1]107	[1]92	[1]84
New York-Northern New Jersey-Long Island, NY-NJ-CT-PA	[1]111	[1]115	[1]112	[1]108	[1]114	[1]117	96	[1]108	103	111
Norfolk-Virginia Beach-Newport News, VA-NC	[1]92	[1]93	[1]92	[1]92	[1]92	[1]87	[1]93	[1]88	[1]92	[1]97
Ocala, FL	[1]90	[1]89	98	[1]94	[1]90	[1]94	[1]82	[1]93	[1]94	[1]83
Oklahoma City, OK	[1]92	[1]88	[1]90	[1]84	[1]91	[1]90	[1]103	98	[1]91	[1]95
Orlando, FL	[1]91	[1]92	99	93	[1]93	[1]91	97	97	89	[1]80
Philadelphia-Wilmington-Atlantic City, PA-NJ-DE-MD	[1]108	[1]108	103	[1]110	[1]108	103	[1]106	[1]111	[1]122	[1]105
Phoenix-Mesa, AZ	101	100	105	107	103	103	[1]90	[1]106	98	97
Pittsburgh, PA	[1]96	97	[1]87	96	96	97	96	99	99	99
Portland-Salem, OR-WA	[1]103	[1]95	100	106	101	[1]106	101	103	104	[1]110
Providence-Fall River-Warwick, RI-MA	[1]108	[1]111	[1]104	[1]108	[1]105	[1]106	[1]98	[1]105	[1]107	[1]115
Raleigh-Durham-Chapel Hill, NC	100	101	97	96	102	96	106	104	106	[1]97
Reading, PA	[1]102	[1]105	[1]102	[1]92	[1]103	[1]94	[1]106	102	[1]109	101
Reno, NV	100	[1]95	99	98	[1]98	[1]102	100	[1]107	100	[1]103
Richland-Kennewick-Pasco, WA	[1]102	102	[1]91	[1]104	[1]103	[1]105	[1]85	[1]91	96	[1]122
Richmond-Petersburg, VA	[1]98	97	[1]95	104	98	[1]90	97	99	102	99
Rochester, NY	100	[1]96	[1]105	99	[1]95	[1]97	[1]97	102	100	[1]108
Rockford, IL	100	[1]102	[1]90	[1]96	[1]94	[1]109	[1]112	[1]109	[1]103	[1]96

Table 2. Continued—Pay relatives for metropolitan areas, by major occupation group and with controls, July 2002

Metropolitan area	Total	PST	Exec	Sales	Admin	Prec prod	Mach oper	Transp	Hand	Serv
Sacramento-Yolo, CA	[1]108	[1]112	102	[1]110	[1]106	[1]107	104	[1]109	[1]111	[1]110
Salinas, CA	[1]111	[1]119	[1]105	[1]122	[1]109	[1]117	[1]96	[1]111	[1]104	[1]108
San Antonio, TX	[1]94	99	99	98	[1]95	[1]89	101	[1]95	[1]88	[1]89
San Diego, CA	[1]106	[1]111	100	[1]111	[1]104	105	96	100	[1]107	[1]110
San Francisco-Oakland-San Jose, CA	[1]118	[1]120	[1]109	[1]119	[1]121	[1]117	108	[1]110	[1]111	[1]125
Seattle-Tacoma-Bremerton, WA	[1]107	99	97	107	[1]106	[1]114	[1]107	101	[1]108	[1]116
Springfield, MA	[1]106	[1]109	[1]104	[1]110	[1]106	[1]106	[1]116	[1]70	[1]123	101
Springfield, MO	[1]90	[1]87	[1]92	[1]94	[1]84	[1]91	[1]95	[1]93	[1]87	[1]92
St. Louis, MO-IL	[1]96	[1]90	[1]91	105	[1]95	100	101	97	102	[1]96
Tallahassee, FL	[1]90	[1]89	[1]76	[1]111	[1]82	[1]91	[1]86	102	[1]96	[1]91
Tampa-St. Petersburg-Clearwater, FL	[1]93	[1]90	103	100	[1]95	[1]89	[1]85	94	[1]95	[1]90
Visalia-Tulare-Porterville, CA	[1]97	[1]107	[1]90	[1]92	[1]98	[1]88	[1]96	[1]92	[1]91	101
Washington-Baltimore, DC-MD-VA-WV	[1]103	[1]104	98	103	[1]107	98	101	98	[1]105	[1]105
York, PA	[1]96	[1]98	[1]93	[1]93	[1]95	[1]95	[1]92	101	[1]90	100
Youngstown-Warren, OH	[1]95	[1]94	[1]83	[1]104	[1]89	100	[1]114	[1]104	[1]107	[1]86

[1] Significantly different from Nation at 10-percent level.

NOTE: Major occupation groups are abbreviated as follows: PST, professional specialty and technical; Exec, executive, administrative, and managerial; Admin, administrative support, including clerical; Prec prod, precision production, craft, and repair; Mach oper, machine operators, assemblers, and inspectors; Transp, transportation and material-moving occupations; Hand, handlers, equipment cleaners, helpers, and laborers; Serv, service occupations, except private household.

indicates that pay is 18 percent higher than it is for the Nation as a whole, and lowest in Brownsville, Texas, which has an index of 84, 16 percent lower than that for the Nation.

For purposes of comparison, the table also shows "raw" pay relatives—that is, pay relatives calculated without taking into account interarea differences in employment composition.[14] Using raw differentials can be misleading, because there are important differences between the pay relatives with and without controls for employment composition. First, there is a lot more dispersion in the raw pay relatives. For instance, San Francisco, while still the highest-paying area, has a raw index of 130, compared with 117 with controls; and Brownsville, while still the lowest- paying area, has a raw index of 67, 33 percent lower than that of the rest of the Nation, as opposed to 16 percent lower with controls. It is evident from these examples, and from the fact that pay relatives are less dispersed with controls than they are without, that high-paying areas tend to have a disproportionate share of jobs that are high paying in all areas, and the reverse is true for low-paying areas. The result is that the raw differentials tend to exaggerate interarea differences.

Second, while the ranks of metropolitan areas using both types of pay differentials tend to be quite similar, that is not always the case. To take the most extreme examples, Melbourne, Florida, is one of the lowest paid (73rd) areas when employment composition is taken into account, but one of the highest (13th) when raw differentials are used. This locality has an above-average share of employment in the high-paying major occupation group made up of professional specialty and technical occupations and a below-average share in low-paying service occupations. By contrast, Providence, Rhode Island is high paying (9th) when controls are used, but low paying (57th) when they are not. Providence has a greater-than-average concentration of workers in low-paying service occupations.

Up to now, the focus of this article has been on pay relatives for the economy as a whole. Table 2 presents pay relatives, all of which control for interarea differences in employment composition, for nine major occupation groups. One question that can be addressed with reference to this table is whether an area that is high paying for one major occupation group is high paying for others. A glance at the table suggests that this is generally the case, but that there are exceptions. In fact, for more than three-quarters of the areas, pay is above average in at least one major occupation group and below average in another. One glaring example of this discrepancy across major occupation groups is Springfield, Massachusetts, which, for the economy as a whole, has a rate of pay that is about average. Yet, Springfield's pay rate for transportation and material-moving occupations is 30 percent lower than that for the Nation as a whole, while the area's pay rate for handlers, equipment cleaners, helpers, and laborers is 23 percent higher.

TO ANSWER THE QUESTION OF HOW PAY DIFFERS across metropolitan areas for the same job, it is necessary to use a methodology that takes account of the variation in employment composition across localities. This article has presented pay relative estimates from one method of doing so, relying on regression-based techniques and using National Compensation Survey data for 2002. The results suggest that it can be misleading to measure interarea pay differentials with mean hourly wage levels by area that do not control for the fact that the characteristics of jobs differ from one area to the next. □

Notes

[1] For details on the NCS, see the appendix.

[2] To be more precise, the locality surveys do not actually cover all employees. Workers in agriculture, private households, and the Federal Government are excluded, as are those in private establishments or State and local governments with fewer than 50 employees.

[3] Technically, this discussion should be in terms of the full compensation package—that is, wages plus fringe benefits. But the NCS wages data set does not contain information on nonwage compensation, so all calculations will refer to wages only. In addition, it is beyond the scope of this article to assess the extent to which interarea wage differentials are offset by differences in cost of living or in amenities. For an examination of interarea compensation and prices, see *Report on the American Workforce* (U.S. Department of Labor, 1997), chapter 2, "Interarea comparisons of compensation and prices."

[4] For details, see *Occupational Compensation Survey: National Summary, 1996*, bulletin 2497 (Bureau of Labor Statistics, March 1998).

[5] An alternative technique for calculating pay relatives with NCS data is presented in Parastou Karen Shahpoori, "Pay Relatives for Major Metropolitan Areas," *Compensation and Working Conditions Online*, posted April 28, 2003.

[6] For further details, see Brooks Pierce, "Using the National Compensation Survey to Predict Wage Rates," *Compensation and Working Conditions*, winter 1999, pp. 8–16.

[7] See the appendix for a description of how the work level is assigned.

[8] See H. Gregg Lewis, "Union Relative Wage Effects," in Orley C. Ashenfelter and Richard Layard, eds., *Handbook of Labor Economics*, vol. II (Amsterdam, North-Holland, 1986), chapter 20, pp. 1139–81.

[9] See, for example, Michael K. Lettau, "Compensation in Part-Time Jobs versus Full-Time Jobs: What if the Job Is the Same?" *Economics Letters*, September 1997, pp. 101–06.

[10] See, for example, Alan B. Krueger and Lawrence H. Summers, "Efficiency Wages and the Inter-Industry Wage Structure," *Econometrica*, March 1988, pp. 259–94.

[11] See, for example, Walter Y. Oi and Todd L. Idson, "Firm Size and Wages," in Orley Ashenfelter and David Card, eds., *Handbook of Labor Economics*, vol. III (Amsterdam, North-Holland, 1999), chapter 33, pp. 2166–2214.

[12] Technically, the change in hourly wage rate associated with a one-unit increase in an explanatory variable is $\exp(b) - 1$, where b is the coefficient on the explanatory variable. But if b is close to zero, then $\exp(b) - 1$ will be approximately equal to b.

[13] For published estimates using these data, see *National Compensation Survey: Occupational Wages in the United States, July 2002*, summary 03–02 (Bureau of Labor Statistics, June 2003).

[14] Note that the raw differentials presented here are not those one would obtain by comparing the mean hourly earnings published in bulletins for individual localities. The most important difference, as noted in the appendix, is that the calculations here include workers in private establishments with fewer than 50 employees, while those made for the locality bulletins do not.

APPENDIX: The National Compensation Survey

The National Compensation Survey (NCS) program provides comprehensive measures of occupational earnings, compensation cost trends, and the incidence and detailed provisions of benefits. This article relies on data collected for the occupational earnings part of the program for the year 2002. All private industries are within the scope of the survey, with the exception of agriculture and private households. State and local governments are also within the scope, although the Federal Government is not. Published earnings estimates for the Nation as a whole are for private establishments with 1 or more workers and State and local governments with 50 or more employees. When earnings estimates are published for a specific area, only those establishments with 50 or more workers are included. The national sample is used in the calculations of pay relatives presented in the article, so workers in private establishments with 1 to 50 employees are included in these calculations.

The sample of the NCS is selected in three stages. First, geographic areas are chosen for study, and then, within each area, a representative sample of establishments is drawn. Within each establishment, information is collected on a sample of jobs, with the number of jobs varying with the size of the establishment. A job is defined as the organization's narrowest occupational classification. The Bureau of Labor Statistics then collects data on the hourly wage for each job, which is an average of the wages of all workers in that job. With the use of appropriate weights, the NCS is representative of that portion of the economy within the scope of the survey.

Assigning a work level

Each job in the 2002 NCS was rated on nine factors: knowledge, supervision received, guidelines, complexity, scope and effect of the job, personal contacts, purpose of contacts, physical demands, and work environment. These factors are drawn from the U.S. Office of Personnel Management's Factor Evaluation System, which is used to obtain a grade, and thus a rate of pay, for Federal Government white-collar employees. A number of points is associated with each level for each of the factors; summing up the points, one can assign a level ranging from 1 to 15, with a higher level indicating that a job has higher skill requirements, more responsibilities, and a correspondingly higher rate of pay.