Regional Wage Convergence and Divergence: Adjusting Wages for Cost-of-Living Differences

by Randall W. Eberts and Mark E. Schweitzer

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Introduction

One of the basic tenets of economics is that the mobility of labor and capital tends to equalize prices across markets. This tendency toward price convergence is particularly notable across regional markets in the United States. For as long as regional income data have been collected, per capita income and wage rates have generally become more alike.[1]

In light of this long-run trend, a surprising reversal has occurred in several regional price measures. Since the early 1980s, the regional dispersion of wages, housing prices, and the general cost-of-living indexes has been on the rise. Browne (1989) provides evidence that regional disparities in per capita income have been widening, while Eberts (1989) finds an increase in regional wage dispersion. In addition, we demonstrate below that housing costs and regional price indexes have been following a similar pattern. Curiously, however, wages adjusted for regional cost-of-living differences (which for brevity we refer to as *locally adjusted* wages) have continued to converge.

Temporary deviations from the tendency toward convergence are not unexpected, as localized shocks can result in significant adjustments to regional prices. Eberts and Stone (1992) and Blanchard and Katz (1992) show that negative localized employment shocks to a metropolitan area can depress wages there by as much as 40 percent of their original level for up to six years before equilibrium returns. Even so, a significant period of increasing dispersion, as observed in the 1980s, is rare. In the last century, regional per capita income diverged only one other time, between 1920 and 1940.

This paper focuses on the details of regional convergence or divergence in goods prices, nationally adjusted wages (wages deflated according to the national price level), and locally adjusted wages. Our goal is to identify and describe these obviously related phenomena. The characterization of this relationship follows Roback's (1982) model of equilibrium in local labor and land markets in the presence of local quality-of-life and production differences.

The dispersion in locally adjusted wages depends on the dispersion of its components: nationally adjusted wages and local prices. We

■ 1 Eberts (1989) demonstrates this trend. Unfortunately, the regional wage series is relatively short, beginning only in the 1950s. However, the same general pattern is found in regional per capita income, which is largely composed of wages and which extends well into the 1800s.

demonstrate the linkage between wages and prices by showing how the comovements of nationally adjusted wages and regional prices affect locally adjusted wages. Given that the two components of locally adjusted wage variation have followed similar paths, it is the growing covariance of these measures that results in continued convergence of locally adjusted wages between census regions.

We also show that trends in the two wage dispersion series primarily reflect regional differences in market valuations of worker characteristics rather than shifts in the levels of workforce characteristics. We modify the decomposition used by Eberts (1989) in examining the U-turn in nominal wage dispersion. He identifies two factors: 1) regional differences in the return on various worker attributes and in wage differentials among industries and occupations, and 2) regional differences in the level of worker attributes and in the distribution of workers among industries and occupations. Basically, these two factors distinguish between wage dispersion caused by regional markets placing different values on identical attributes, and dispersion caused by regions having different compositions of attributes, even though regional markets value these attributes similarly.

The analysis supports previous studies showing that changes in regional wage differentials over time result from varying valuations of worker attributes, not from shifts in the regional composition of the workforce. The additional insight offered by this paper is that market forces produce different patterns of regional dispersion of nationally and locally adjusted wages. While not directly explained here, these differences are consistent with the view that workers and businesses pursue separate objectives or place unequal weights on local prices and amenities.

I. Explaining Regional Wage and Price Differentials

The key to understanding potentially permanent regional wage differentials is to recognize that not all factors are mobile across regions. Workers and firms interact in regional labor markets, determining wages and prices. Although firms and their employees may respond quickly to changes in local market conditions, some factors that are unique to a region, such as geographic and climatic characteristics, remain the same. Even for those areas that share common features, the quality and quantity of site-specific characteristics may differ. Therefore, firms and households may be willing to pay or accept different levels of compensation depending on the value they place on those attributes. These immobile, site-specific features are referred to here as amenities: consumptive amenities apply to households and productive amenities apply to firms.

A few examples of potential sources of consumptive and productive amenities indicate their conceptual breadth and complexity. The prototypical consumptive amenity is a weather advantage. California and Florida attract people who prefer a warm climate and who are willing to accept the higher costs of living there. Other potential consumptive amenities include familial or historical ties to an area, region-specific recreational activities (skiing or surfing, for example), community spirit, and the quality and age of the housing stock. Despite the positive connotation of the term amenities, in our usage it also encompasses the negative features of an area, such as high crime rates or a combination of high local taxes and poor local government services.[2]

Port facilities are an excellent example of a productive amenity, since they can lower transportation costs for firms located nearby. Productive amenities also include low-cost distribution channels, informational advantages provided by firms' proximity to other similar producers or suppliers, and state or local government protections or restrictions pertaining to local businesses.

Interpreting Wage and Price Dispersion

Interpreting regional wage and price convergence in this framework is difficult. Households and businesses can and will move to locations where they can better prosper. If both labor and capital are mobile, factor prices could converge or diverge in response to shifts in either firms' and workers' valuation of local amenities or changes in the availability of amenities in various locales.

Another source of apparent convergence or divergence in regional wages and prices is the economy's constant adjustment to a stream of shocks. The demand for and supply of labor in

■ **2** Local taxes are potential negative amenities to the extent that they are not included in prices. However, property taxes are essentially incorporated into the Consumer Price Index under the "rental equivalence measure" of housing costs.

an area may be radically altered by technological changes or shifts in consumption preferences. Although households and businesses are mobile, adjustment delays may result in temporary periods of divergence. Studies by Eberts and Stone (1992) and Blanchard and Katz (1992) suggest that the adjustment period to a local labor-market shock may be as long as 10 years.

Since housing and locally produced goods and services represent a major portion of a household's budget, these prices become an important component of household utility and thus of household decisions. If local goods accounted for the entire household budget, then consumption would equal household wages deflated by local prices. On this basis, we assume that given a stable value for local amenities, locally adjusted wages represent the primary motivator of household mobility.

By contrast, the price of local goods and services, including land, plays a smaller role in business decisions. Wages are generally a larger fraction of most firms' costs than are local goods. Furthermore, for producers of local goods, an increase in local prices would affect both revenues and costs. The marginal firm most likely to relocate would be a producer of national goods for whom any rise in local wages (or prices) relative to those faced by its competitors would immediately lower profits. For these firms, local wages (nationally adjusted), with little regard for local prices, should be the determining factor in their location once amenities and previous capital investments have been accounted for.

It is important to compare observationally equivalent workers if we are to measure regional wage differentials accurately. Firms consider the skill level of their workforce as well as the size of their payrolls when making location decisions. Similarly, workers must evaluate the marketability of their skills in various regions when comparing locally adjusted wages. Therefore, regional shifts in factors associated with worker productivity, such as average educational attainment or workforce experience, should be controlled for in any analysis of factor-price adjustments. Shifting patterns of employment by industry or occupation, which may be related to compensating differentials associated with features of those jobs, should also be considered.

II. Wage and Price Trends

Wages

Wages of individual workers are obtained from the March *Current Population Survey's* (CPS) wage supplements for the years 1973 through 1991. The March survey reports annual wage and salary data and weeks worked from the previous year. Dividing annual earnings by weeks worked yields average weekly earnings for the years 1972 and 1990. For purposes of the respondents' confidentiality, these data are coded by the Bureau of Labor Statistics (BLS) with a maximum salary for individuals whose pay exceeds the top-code value (for example, $199,998 after 1989). Average weekly earnings are computed after correcting for top-coding by assigning these individuals the mean of the appropriate Pareto distribution.[3] The sample is limited to full-time workers who were employed all year or who, if unemployed for part of the year, spent that time actively seeking work. Because only full-time workers are included, average weekly wages closely approximate average hourly wages.

Two definitions of regions are used in this paper: Metropolitan Statistical Areas (MSAs) and census regions. Since cost-of-living indexes are available only for metropolitan areas, the basic unit of analysis is the MSA. The CPS identifies 44 MSAs, but the limited availability of price data for some of them reduces the usable number to 21. The small number of respondents in most MSAs lowers the efficiency of estimation for that section of the analysis dealing with the sources of wage convergence and divergence. To increase the number of individuals sampled in a given period, we pool together three years of individual responses for each MSA, resulting in a much broader coverage of worker characteristics and wages. Each of our six periods is identified by the middle year of the pooled three-year sample.[4] For example, the first period, which consists of earnings in 1972, 1973, and 1974, is referenced as 1973 in the figures and tables.

To provide another means of increasing the sample size for geographic comparisons, as

■ 3 See Shryock and Siegel (1971) for details on how a Pareto distribution may be applied to truncated wage data. The Pareto distribution assumes an exponential decline in the number of individuals with incomes above a certain amount, which is a reasonable characterization of higher income levels.

■ 4 The final period covers 1987 to 1990.

FIGURE 1

Variance of Regional Log Wage Differentials: Single vs. Grouped Years

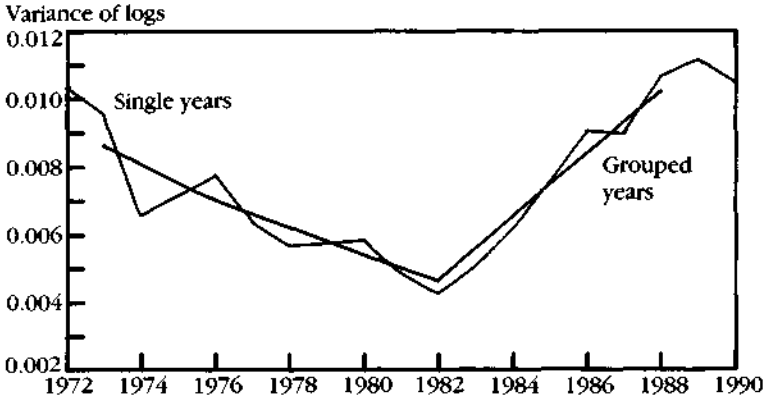


FIGURE 2

Variance of Regional Log Wage Differentials: Regions vs. Weighted MSAs

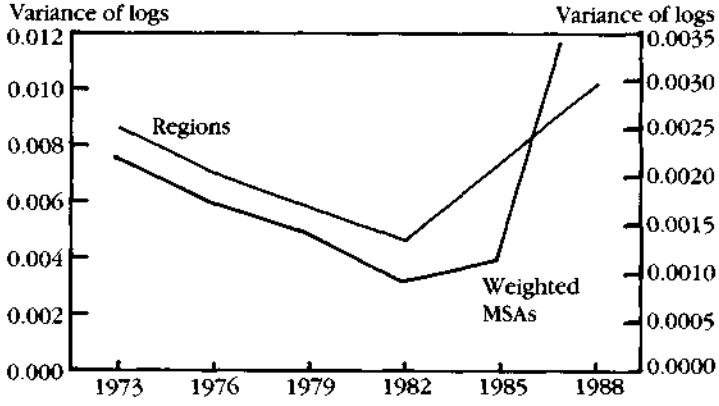
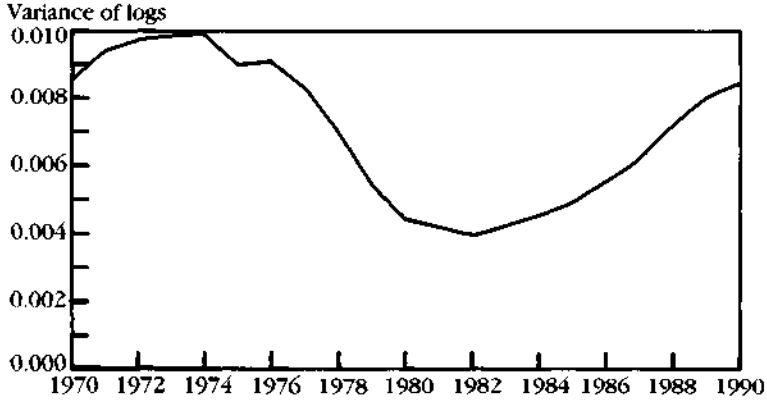


FIGURE 3

Variance of Local Price Indexes



SOURCE: Authors' calculations.

well as to be consistent with earlier work by Eberts (1989) and Browne (1989), MSAs are aggregated by proportional population weighting to represent the nine census regions. Each of these regions contains at least one of the 21 MSAs, except for the East South Central states (Kentucky, Tennessee, Alabama, and Mississippi). As shown below, the patterns of wage and price dispersion for MSAs and the constructed census regions are quite similar. To adjust for the effects of inflation, wages are deflated to 1982 levels by the GDP implicit price deflator.

Wage variance across regions exhibits a marked U-shaped pattern between 1972 and 1990, with wages converging during the first half of the period and then diverging thereafter (figure 1). From 1972 to the trough, the variance of wages is cut roughly in half. By the end of the period, the variance surpasses the level at which it started in the early 1970s. This convergence and subsequent divergence is apparent for single and grouped years.

The same basic pattern of wage dispersion is found in the MSAs aggregated to simulate the census regions (figure 2). The level is generally lower for the weighted MSA results because metropolitan wages are more alike across regions — even though major MSA wages generally reflect their region's differential. The differences between the two variances, shown in figure 2, reflect the degree to which regional wage differentials are altered by including smaller MSAs and rural areas. These patterns are generally consistent with the convergence/divergence phenomenon reported by Eberts (1989) using the May CPS, and by Browne (1989) using per capita income (of which wages account for a large portion).

Prices

Indexes that measure regional cost-of-living differences as well as price changes over an extended period are not readily available. The BLS releases a Consumer Price Index for selected MSAs that records price changes for each area over time. However, the index is constructed to ignore price differences across these MSAs by benchmarking the series to 100 on the basis of 1982 to 1984 prices within each area. In order to include this component in a regional price index, we rebenchmarked these indexes using the relative metropolitan cost-of-living index from the 1981 BLS Report on Family Budgets. (The report has not been updated because funding for the project was eliminated.) The

FIGURE 4

Locally Adjusted Wage Variation

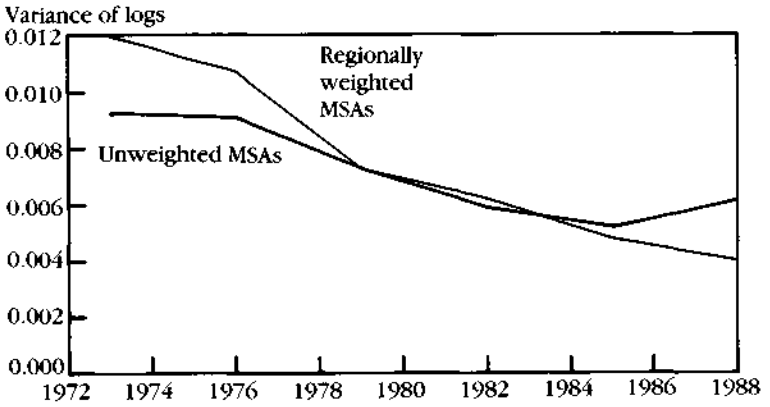
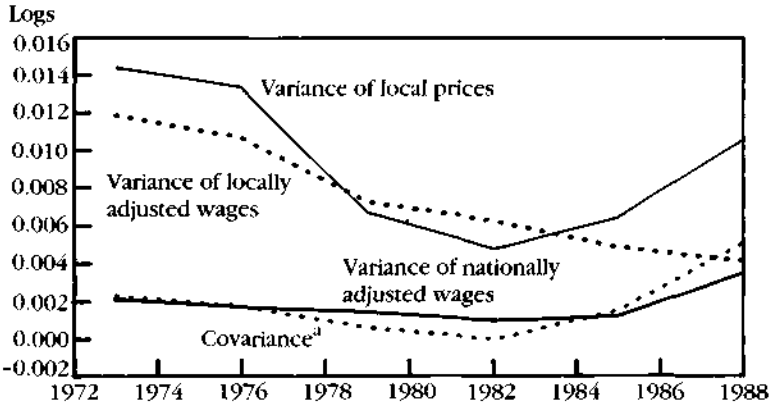


FIGURE 5

Factors in the Convergence of Locally Adjusted Wages



a. Covariance of nationally adjusted wages, local prices.
SOURCE: Authors' calculations.

metropolitan cost-of-living differences are based on a consumption basket appropriate for a four-person family with an intermediate income. The index that we construct identifies metropolitan price differences over time, which we use as our deflator instead of relying on a national price deflator.[5]

Figure 3 tracks the variance in the log of the metropolitan price index over the same period as wages. We use the log form to be consistent with the use of log wages to measure wage dispersion. Note that the dispersion of local prices follows a similar U-shaped path, declining during the first half of the period, reaching its nadir in the early 1980s, and then returning to previous levels. The dispersion of prices aggregated to the nine census regions exhibits a similar pattern.

The largest component of the regional price index — and the one that accounts for most of the difference in prices across MSAs — is the cost of housing services. This measure is closely linked to the general price index, as indicated by correlations between the MSAs' relative prices and housing costs of greater than 0.95 in each period. Thus, locally adjusted wages can be viewed as wages adjusted for local housing prices.

Locally Adjusted Wages

Locally adjusted wages refer to wages divided by local prices (including cost-of-living differences between localities). For comparisons between census regions, these wages are aggregated in the same fashion as regional wages and prices. Locally adjusted wages do not conform to the marked pattern of regional convergence/divergence found in nationally adjusted wages and prices. Rather, the measure generally converges throughout the entire period. This is most pronounced for MSAs aggregated to the nine census regions, as shown in figure 4. From peak to trough, the variance of locally adjusted wages declines by almost 50 percent. This tendency toward convergence is confirmed at the metropolitan level for locally adjusted wages, except for a slight increase in the last period. In order to be consistent with the previous literature, we focus on census regions below.

III. The Relationship between Wages, Prices, and Locally Adjusted Wages

Figure 5 offers a complete picture of locally adjusted wages and its two components. As discussed earlier, the variance of the log of nationally adjusted wages is considerably smaller than both the variance of log prices and the variance of the log of locally adjusted wages. The covariance of the log of nationally adjusted wages and prices is positive, but smaller than the individual variances. This positive but weak covariance suggests that MSAs with above-average rents also pay above-average wages, which is consistent with Gabriel, Shack-Marquez, and Wascher's (1988) finding that higher rents are only weakly associated with higher wages. The relationship of the dispersion of wages, prices, and locally

■ 5 As already noted, wages are deflated by the GDP implicit price deflator to eliminate the effects of inflation.

adjusted wages can be seen by decomposing the variance of the log of locally adjusted wages.

$$(1)\quad var[\ln(w_r/p_r)] = var[\ln(w_r)] + var[\ln(p_r)] - 2\,cov[\ln(w_r), \ln(p_r)],$$

where r refers to the region, w_r is the average wage in region r, and p_r is the relative price level in region r. The variances are calculated independently for each year. Thus, the change in the variance of price-adjusted wages between two time periods (0 and 1) can be decomposed for each region as follows, dropping the redundant r subscripts:

$$\begin{aligned}(2)\quad & var[\ln(w_1/p_1)] - var[\ln(w_0/p_0)] \\ &= \{var[\ln(w_1)] - var[\ln(w_0)]\} \\ &+ \{var[\ln(p_1)] - var[\ln(p_0)]\} \\ &- 2\{cov[\ln(w_1), \ln(p_1)] \\ &- cov[\ln(w_0), \ln(p_0)]\}.\end{aligned}$$

Note that price-adjusted wages can converge, while nominal wages and prices diverge only if the difference in the covariances is at least half the magnitude of the two differences in variances. Local amenities, whether the benefits are accrued by firms or workers, provide a link between wages and prices. Thus, there are substantial grounds for the existence of non-negligible covariances between relative wages and prices. Figure 5 does identify a significant covariance, the rise of which is coincident with the increase in wage variation among regions.

IV. Does Regional Wage Convergence/ Divergence Represent Shifting Incentives?

In order to explore regional wage differences, observationally equivalent workers must be compared. The role of regional workforce differences in the relative wages of regions should be isolated from pay differentials that comparable workers would receive in other regions. We account for most sources of wage disparity by evaluating the typical differences in returns associated with worker characteristics, including education levels, experience, industry, race, and sex. The dispersion of regional wage differentials over time is decomposed into two components: changes in worker characteristics and changes in labor market implicit valuations of worker characteristics (as measured by regression coefficients). Because we are not the first to attempt to account for workforce differences, we start by reviewing the existing literature.

Previous Studies

Previous studies examining the relative size of the two components of wage differentials have focused primarily on explaining differences between the South and other regions of the United States. Sahling and Smith (1983), for example, compare the southern states with four other regions of the country: the Northeast, the West, the North Central states, and the New York metropolitan area. They estimate separate price-adjusted and nominal wage equations using a sample of residents from 29 of the largest MSAs in these five regions. Worker-attribute variables include measures of schooling, experience, race, occupation, sex, industry, job status, and union membership. Using two cross sections of data from the May 1973 and May 1978 CPS, the authors conclude that cost-of-living adjustments dramatically increased the wages of southern workers relative to their counterparts across the United States.

Farber and Newman (1987) extend Sahling and Smith's analysis to look explicitly at changes in characteristic prices over time. In addition to analyzing regional wage differentials in two separate years (1973 and 1979), they estimate the changes in differentials between the two years for various pairs of regions. Their results show that more than half of the predicted shifts in South/non-South wage ratios can be accounted for by changing relative returns to worker characteristics.

Using the same framework adopted in the current paper, Eberts (1989) examines the sources of nominal regional wage convergence and divergence on a full sample of workers from the May CPS. He finds that differences in the returns to worker characteristics account for both the convergence in regional wages from 1973 until 1982 and the divergence thereafter.

Other studies, using similar techniques but more detailed data, do not necessarily agree with the conclusion that characteristic prices explain regional wage differentials. Bellante (1979) and Gerking and Weirick (1983), for example, find that regional wage differences result primarily

from variations in the level of worker characteristics. These findings leave open the possibility that both characteristic prices and levels are likely sources of regional wage differentials.[6]

Defining Sources of Wage Differentials

Following the human capital specification of Hanoch (1967) and Mincer (1974), we specify the logarithm of individual wages — expressed in either nominal or price-adjusted terms — as a function of various worker attributes, including education level (entered as dummy variables for the completion of four levels of schooling, from high school to graduate studies), and potential experience (age, minus years of education, minus six, entered as a quadratic). Dummy variables indicating race, gender, occupation, and industry are also included as recognized factors in individual earnings. Time dummies are incorporated to account for aggregate fluctuations, including the business cycle, within each of the pooled three-year periods.[7]

We estimate hedonic wage equations separately for each period and for each of the 21 MSAs. Prior to the estimation, individual wages are deflated by either the national or local price index, as described previously. We weight regional wages and estimated wage components by their respective population shares in order to construct a regional measure. The East South Central region is excluded from the analysis because no metropolitan area price data were available for cities in these states. We then compare the regional wage estimates to national estimates based on the same regression and the sample of workers from all 21 MSAs.

The technique used to account for the two sources of wage differentials follows the approach of Oaxaca (1973), with modifications by Sahling and Smith (1983). The decomposition assumes that y, the logarithm of wages, can be appropriately described as a function of the worker and industry characteristics discussed earlier (X_i) and the hedonic labor market valuation of each characteristic (b):

$$(3) \quad y = bX_i + u_i .$$

Estimating a well-specified earnings equation for each region accounts for the value associated with regional concentrations of particular workforce traits by identifying the average valuation of these traits in the region ($\hat{b}_{St}$ for region S at time t). Using y for $\ln(w)$, we can decompose the percentage difference in wages between the regions during one time period as follows:

$$(4) \quad (\overline{y_{St}} - \overline{y_{Nt}}) = (\hat{b}_{St} - \hat{b}_{Nt})\,\overline{X_{Nt}} + (\overline{X_{St}} - \overline{X_{Nt}})\,\hat{b}_{Nt} + (\hat{b}_{St} - \hat{b}_{Nt})(\overline{X_{St}} - \overline{X_{Nt}}).$$

The first term on the right side accounts for the difference in labor market valuations of worker attributes between a region and the base. The second term denotes the difference in levels of worker and industry characteristics. The third term, a remainder, is generally assumed to be small and in fact proved trivial in our analysis. Below, we examine the relative contribution of the first two right-side components of equation (4) over time for both wage series.

Decomposing the Variance of Regional Wages

Having decomposed the regional wage differentials into separate factors, a number of variance decompositions are possible. The traditional decomposition focuses on the variance of the first two terms of equation (4), neglecting the third term (the interaction term):

$$(5) \quad var(\overline{y_{St}} - \overline{y_{Nt}}) = var[(\hat{b}_{St} - \hat{b}_{Nt})\,\overline{X_{Nt}}] + var[(\overline{X_{St}} - \overline{X_{Nt}})\,\hat{b}_{Nt}] + 2\,cov[(\hat{b}_{St} - \hat{b}_{Nt})\,\overline{X_{Nt}}, (\overline{X_{St}} - \overline{X_{Nt}})\,\hat{b}_{Nt}] + \text{interaction term}.$$

This approach generally yields the correct interpretation of the sources, although it is incomplete due to exclusion of the interaction term. If the covariance is significant but is not reported, then the decomposition is even less complete. We report the results of this decomposition for purposes of comparison with the existing literature.

The focus of our paper, however, is on regional wage differences when local prices are factored in, so it is valuable to consider how

■ 6 Dickie and Gerking (1988) provide a comprehensive and insightful critique of the literature.

■ 7 If business cycle fluctuations alter general earning levels, then ignoring that variation would result in inconsistent estimates. Dummy variables account for the mean aggregate differences between the two periods.

price-level corrections affect the variance decompositions. The adjustment for local prices is applied to individual earnings as follows:

$$(6) \quad y^*_{it} = y_{it} / p_{St},$$

where p_{St} is constant within the locality at time t and y^*_{it} and y_{it} are the vectors of individual-level wage observations for region S at time t. Given that each MSA's wage equation is estimated independently for every three-year block of time, we can expect that the transformation of the dependent variable will adjust the $\hat{b}_{St}$ estimates proportionally. This follows from the normal equations for annual estimates:

$$(7) \quad \hat{b}^*_{St} = (X'X)^{-1} X' \frac{Y}{p_{St}} = \frac{1}{p_{St}} \hat{b}_{St}.$$

With pooling over three years of data, the adjustment would be a weighted average of the relevant p_{St}'s. Thus, in terms of the decomposition of regional wage differentials shown in equation (4), only the price term $[(\hat{b}_{St} - \hat{b}_{Nt}) X_{Nt}]$ and the interaction term reflect the adjustment of wages for the local cost of living.

Consequently, only the valuation component of the variance decomposition (equation [5]) would be altered, perhaps indicating that cost-of-living adjustments affect the variance of regional wages through the valuation of skills alone. These variance terms, however, are not a complete decomposition of the sources of regional wage differentials unless the covariance between the valuation and workforce characteristic terms is zero. The covariance term represents the correlations between regional concentrations of labor skills (or other characteristics) and differentials paid to those skills. A simple supply and demand model without perfectly elastic or inelastic demand or supply would predict non-zero correlations. The covariance would then be reduced to the extent that labor or firm mobility eliminated either regional skill concentrations or the wage differentials paid to specific skills. However, regional production and consumption amenities should ensure that this covariance is non-zero.

The problems with the commonly applied decomposition in this context suggest the need for an alternative decomposition that accounts for the covariance term in a meaningful way. A more complete decomposition that satisfies this requirement is provided by the covariances between the dependent variable and the additive factors.[8] To simplify the notation of the price and quantity equation (4), let $\tilde{y}$ be regional differentials, $\tilde{b}$ be the valuation term, $\tilde{x}$ be the workforce characteristics term, and $\tilde{i}$ be the interaction term. The interaction term, which we still expect to be small, is included so that the definition of the decomposition is complete. In place of equation (5), applying a covariance decomposition to the factors shown in equation (4) results in

$$(8) \quad var(\tilde{y}) = cov(\tilde{y},\tilde{b}) + cov(\tilde{y},\tilde{x}) + cov(\tilde{y},\tilde{i}).$$

The three decomposition terms in equation (8) are easily interpreted as the effect of a factor on the dependent variable after covariances with all other factors have been accounted for. The first term represents the effect of labor market valuations, the second represents the effect of labor force differences, and the third is the effect of the small interaction term. Factors can be either positive or negative, depending on whether they augment or offset the sum of the other factors contributing to the variation. If the factors are fully independent, then the decomposition simplifies to the basic variance decomposition for the independent variables shown in equation (5), with a covariance equal to zero.

Splitting the parenthetical terms in equation (8) distinguishes the components of the three terms. Equation (9) shows that each term of this decomposition includes an expression for the relationship between valuations and workforce characteristics.

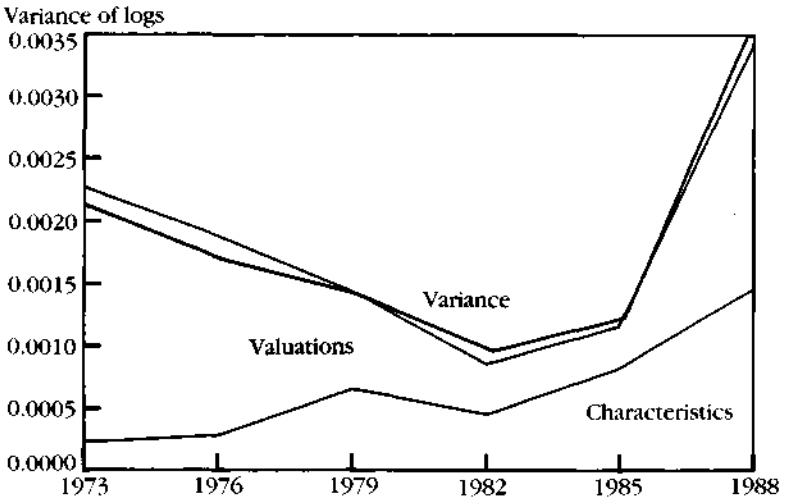
$$\begin{aligned}(9) \quad var(\tilde{y}) &= [var(\tilde{b}) + cov(\tilde{b},\tilde{x}) + cov(\tilde{b},\tilde{i})] \\ &+ [var(\tilde{x}) + cov(\tilde{b},\tilde{x}) + cov(\tilde{x},\tilde{i})] \\ &+ [var(\tilde{i}) + cov(\tilde{b},\tilde{i}) + cov(\tilde{x},\tilde{i})].\end{aligned}$$

Adjusting wages by a local deflator alters these correlations. Beyond this simple statistical relationship, factors are adjusted for the degree to which higher locally adjusted wages for skills correspond to concentrations of those skills. Regional skill concentrations are fundamentally linked to the mobility decisions of workers and firms. Locally and nationally adjusted wages should result in different decompositions due to the reactions of firms and workers to wage differentials.

■ 8 A similar decomposition is applied in Schweitzer (1993) to identify sources of earnings inequality

FIGURE 6

Decomposition of Nationally Adjusted Wage Variation



SOURCE: Authors' calculations.

TABLE 1

Decomposition of Nationally Adjusted Regional Wage Variation

	Total Variation	Characteristics	Valuations
	Covariance Decomposition		
1972 to 1974	0.0022	0.0002	0.0020
1975 to 1977	0.0017	0.0003	0.0016
1978 to 1980	0.0014	0.0007	0.0008
1981 to 1983	0.0009	0.0004	0.0004
1984 to 1986	0.0011	0.0008	0.0003
1987 to 1990	0.0034	0.0015	0.0020
	Variances of Factors		
1972 to 1974	0.0022	0.0006	0.0026
1975 to 1977	0.0017	0.0002	0.0016
1978 to 1980	0.0014	0.0006	0.0007
1981 to 1983	0.0009	0.0005	0.0005
1984 to 1986	0.0011	0.0008	0.0004
1987 to 1990	0.0034	0.0014	0.0020

SOURCE: Authors' calculations based on data from the U.S. Department of Labor, Bureau of Labor Statistics.

Sources of Nationally Adjusted Wage Differentials

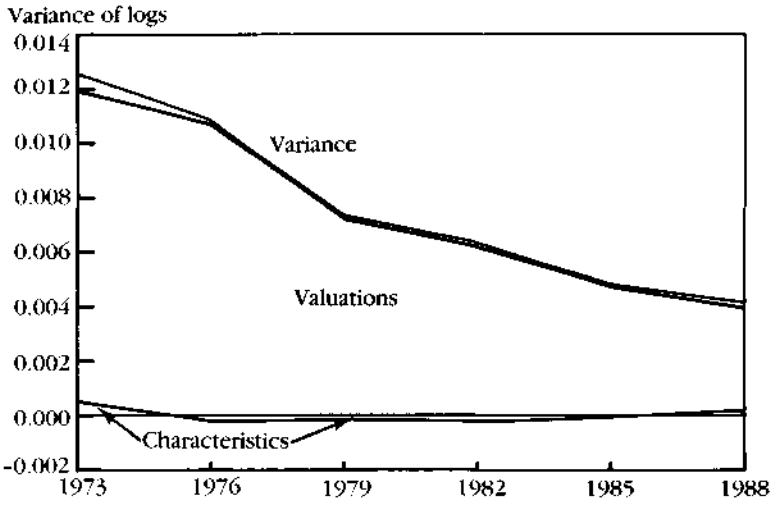
Figure 6 addresses the question of whether the convergence/divergence pattern of regional wage differences results more from variations in labor market valuations or from variations in attribute levels (for example, the decomposition of regional wage differentials in equation [7]). The shaded area under the curve represents the portion of the variance of log wages accounted for by differences in labor market valuations. The remainder of the area under the curve is the portion of the variance explained by differences in attribute levels. In some years, the covariance decomposition terms for valuations and attributes do not add up to the total variance because of the interaction term, which is not reported. It is evident from the figure that differences in valuations follow the same U-shaped pattern as total wage variance. On the other hand, differences in workforce attributes follow a generally upward trend. This suggests that the pattern of convergence and then divergence of nationally adjusted wages results more from regional labor markets' valuing attributes differently than from an increasing dissimilarity of workers within regions. Nonetheless, regional differences associated with workforce attributes have been playing a growing role in regional wage differentials.

Table 1 compares the covariance decomposition results with the variances of the two significant components. In this case, the covariance between the quantity and characteristic price component is small; thus, the variances sum to approximately the total variation and are similar to the covariance decomposition terms. This confirms Eberts' (1989) results for nationally adjusted wages in a sample of the full-time metropolitan workforce.

The results in table 1 and figure 6 can be interpreted in two ways: Either incentives for firms to move toward lower-wage areas are growing, or local productive amenities are on the rise. Both conclusions hinge on our having captured the majority of worker productivity differences between regions with the worker attributes included in the wage equations. If significant productivity differences are not captured by the wage equations, and if the unobserved productivity factors have been growing nationally in value, then we could mistakenly identify productivity differentials between regions as price differences. Along these lines, Juhn, Murphy, and Pierce (1993) argue that

FIGURE 7

Decomposition of Locally Adjusted Wage Variation



SOURCE: Authors' calculations.

TABLE 2

Decomposition of Locally Adjusted Regional Wage Variation

	Total Variation	Characteristics	Valuations
	Covariance Decomposition		
1972 to 1974	0.0119	0.0005	0.0120
1975 to 1977	0.0107	−0.0002	0.0110
1978 to 1980	0.0072	−0.0001	0.0075
1981 to 1983	0.0062	−0.0002	0.0065
1984 to 1986	0.0047	0.0000	0.0048
1987 to 1990	0.0040	0.0002	0.0039
	Variances of Factors		
1972 to 1974	0.0119	0.0006	0.0129
1975 to 1977	0.0107	0.0002	0.0116
1978 to 1980	0.0072	0.0006	0.0083
1981 to 1983	0.0062	0.0005	0.0075
1984 to 1986	0.0047	0.0008	0.0058
1987 to 1990	0.0040	0.0014	0.0052

SOURCE: Authors' calculations based on data from the U.S. Department of Labor, Bureau of Labor Statistics.

higher wage payments to unobserved skills explain the rise in total earnings inequality during the 1980s. A final caveat to our results is that the analysis does not account for fringe benefit costs. Differences in these costs between regions would of course result in a different distribution of total compensation.

Sources of Locally Adjusted Wage Differentials

While firms *might* be adjusting to these wage differentials, households *should* react to wages that reflect their cost of living. The pattern in the variance of locally adjusted wages is quite different from that of nationally adjusted wages. Instead of exhibiting a U-shaped pattern, locally adjusted wages steadily converge over the sample period (figure 7). Moreover, the dispersion of locally adjusted wages is roughly five times greater than the dispersion of nationally adjusted wages. Significantly, it is differences in labor market valuations that explain most of the total wage variance. While the dispersion in labor costs relevant to firms (nationally adjusted wages) has increased in recent years, the dispersion of regional differences in workers' returns to labor has declined.

Comparing the covariance decomposition results with simple variances indicates, in this case, that accounting for covariance between factors alters our interpretation of the components of the decline in locally adjusted wage dispersion between regions. Table 2 reveals that, unlike the nationally adjusted wage case, a significant negative covariance exists between the characteristic price component of regional wage differences and the regional distribution of attributes. This is evident both in the frequently negative quantities component and in the fact that the simple variances of the components substantially overshoot the total variances of locally adjusted wages.

Evaluating these results in terms of worker location decisions, we find that the declining differences in factor returns between regions is consistent with workers' moving to equalize labor market differences. A larger impetus for mobility is indicated by the greater wage variation between regions when cost-of-living differences are factored in. The mobility of households responding to significant, but declining, consumptive amenities in the high-price MSAs could explain this reduction in locally adjusted wage differentials between MSAs. Furthermore, the differences between locally adjusted wage

differentials appear to be almost purely the result of differences in valuations of labor rather than differences in labor force characteristics. These differentials could encourage significant worker movement, which could lead to rising nationally adjusted wage differences as wages are driven up in high-price areas and down in low-price areas. But it could just as well be that firms have moved to more costly areas, driving up wages, in pursuit of an amenity that has been rising in value. The unobservability of the full set of amenities, either consumptive or productive, precludes a direct test of these explanations.

V. Conclusion

The theoretically surprising fact that regional wages appeared to diverge in the 1980s does not hold up when cost-of-living differences are taken into account. Our decompositions confirm that wage differences are driven by varying returns to worker attributes rather than by regional differences in workforce characteristics. Further, the possibility is raised that workers and firms are optimizing over different value functions (nationally versus locally adjusted wages) or different local amenities. In particular, local prices, and therefore locally adjusted wages, may be more important for workers. The difference in the patterns of nationally versus locally adjusted wage differentials is consistent with a story of competing adjustments rather than of slowing adjustments.

However, other explanations are not eliminated by these results, because neither the adjustment processes nor the values of amenities have been explicitly incorporated. These shortcomings provide an obvious direction for future research. Given the limited observability of amenities, a sensible strategy would be to estimate the adjustment processes of firms and workers. This would make more explicit the link between convergence rates and differentials in the two wage series. Although our conclusion is largely descriptive, the diverse patterns in nationally versus locally adjusted wages clearly support analyzing regional wage differentials from the perspective of both employees and firms.

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