

Accounting for the Recent Divergence in Regional Wage Differentials

by Randall W. Eberts

Randall W. Eberts is an assistant vice president and economist at the Federal Reserve Bank of Cleveland. Comments and suggestions by Brian Cromwell, Erica Groshen, and Sharon Smith, and computer assistance by Ralph Day and John Swinton, are gratefully acknowledged.

Introduction

Convergence of regional income differentials is commonly perceived as the natural result of the gradual development and maturation of regional economies. One expects that factors such as improved transportation and communication, enhanced mobility of capital and labor, and the shift away from resource-based activities would lead regions, and their incomes, to look more and more alike. Indeed, since the 1880s, the general trend has been toward convergence of regional per capita income in the United States.

Recently, this trend appears to be reversing. Browne (1989) shows that since 1979, regional disparities in per capita personal income have been on the rise. Furthermore, she concludes, "...the key to both the converging per capita incomes of the 1970s and the diverging incomes of the 1980s was changes in industry earnings" (p. 38).

According to Nourse (1968), regional income divergence has happened only once in the last century, between 1920 and 1940. After 1940, regional incomes returned to their longer-run path of convergence. Easterlin (1958) concluded from that 20-year disturbance in the longer-run

trend that "...it is by no means certain that convergence of regional income levels is an inevitable outcome of the process of development. For while migration and trade do appear to exert significant pressure towards convergence, they operate within such a rapidly changing environment that dynamic factors may possibly offset their influence" (p. 325). It appears that the conclusion Easterlin drew 30 years ago may be relevant in today's situation.

This recent deviation from the general tendency toward convergence raises several questions. Why the relatively sudden shift in the direction of regional income differentials after so many years of convergence? What are the sources of this change in regional per capita income? Have the fundamental forces that shape the nation's economy changed direction during the 1980s, or is this merely a temporary digression from the longer-run trend of convergence?

This paper begins with the observation by Browne that earnings account for most of the shift from income convergence to income divergence among regions. We identify two basic sources of regional wage differentials and examine which of them is more responsible for the shift in wage patterns. The two sources are 1) regional differences in the return on various

worker attributes and the wage differentials among industries and occupations, and 2) regional differences in the level of worker attributes and the distribution of workers among industries and occupations.

These two sources can be distinguished by asking whether earnings per worker differ among regions because of differences in the attributes of workers, or because of differences in the value of worker attributes as determined by the regional labor markets. Explaining convergence or divergence of regional wages, therefore, rests with the ability to explain convergence or divergence of characteristic prices, levels of characteristics, or both.

Several studies have explored the relative size of these two components of wage differentials between regions, primarily in an attempt to explain the difference in wages between the South and other regions of the country. Sahling and Smith (1983) were among the first to look at the wages and attributes of individual workers to examine regional wage differentials over time. They compared the South with four other regions in the country: the Northeast, the North Central, the New York metropolitan area, and the West. They estimated separate real and nominal wage equations using a sample of residents from 29 of the largest standard metropolitan statistical areas (SMSAs) found in these five regions. The worker-attribute variables included 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 Current Population Surveys, they concluded that much of the variation in wages between the South and the other regions examined is a result of substantial variation in the real and nominal rates of return to worker characteristics.

Farber and Newman (1987) extended Sahling and Smith's analysis to look explicitly at changes in characteristic prices over time. In addition to looking at regional wage differentials in two different years, 1973 and 1979, they estimated the changes in the differentials between the two years for various pairs of regions. They found that more than half of the predicted changes in South/non-South wage ratios can be accounted for by changing relative returns to worker characteristics between the two areas (p. 223).

Other studies, using similar techniques and micro-level data, do not necessarily agree with the conclusion that characteristic prices account for regional wage differentials. Bellante (1979) and Gerking and Weirick (1983) find that regional wage differences are due primarily to differences in the levels of worker characteristics.

These results leave open the possibility that both prices and levels are likely sources of regional wage differentials.¹

This paper extends Farber and Newman's work in two directions. First, it includes three time periods in order to examine the sources of the switch in wage patterns that apparently occurred at the beginning of the 1980s. Each time period is constructed by pooling three years of data: the first period includes the years 1973-75, the second includes 1979-81, and the third includes 1985-87. The interval between the first and second periods is characterized by regional wage convergence, as documented by Farber and Newman (1987) and Browne (1989). The interval between the second and third periods exhibits regional wage divergence, as shown by Browne. The second direction is to look at all nine U.S. regions as defined by the U.S. Bureau of the Census, relative to the national average, instead of comparing pairs of selected regions.

However, unlike the studies by Sahling and Smith and Farber and Newman, which were concerned with comparing wage differentials across different regions, our purpose is to see whether the structure that caused a particular region to converge toward the national average during the early periods can also account for the divergence of wages in that same region during the latter periods. Therefore, it appears that using nominal wages is sufficient for an initial look at the sources of the shift in wage patterns.*

1. Explanations of Regional Wage Differentials

One of the longstanding tenets of economics is that efficient markets result in equal prices across regions. Indeed, economists have observed for decades the slow convergence of average wages among the regions of the United States, where goods and factors can flow freely. How, then, can one explain the apparent divergence of wages in recent years?

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

■ 2 Work by Roback (1982) and Beeson and Eberls (1989) shows that considering nominal wages can be viewed as only a partial-equilibrium analysis. Household spatial equilibrium includes not only wages, but also the price of housing and nontraded local goods. Therefore, focusing only on nominal wages may introduce estimation bias, especially in the prices of worker characteristics, for regions in which housing and other local-goods prices have changed significantly from the national trend.

International trade theory offers useful insights into conditions that lead to regional wage convergence and divergence. Much of the relevant literature discusses wage equalization: average wages across regions are equal if both the prices of worker characteristics and the composition of worker characteristics are the same. If the first condition holds, then wages of identical workers will be the same across regions. However, unless the second condition also holds, the average wages of regions will be unequal.

Within a regional context, conditions for equalization of characteristic prices are less stringent than those for equalization of characteristic levels.³ A well-known theorem in trade theory, the factor-equalization theorem, states that trade in commodities and factor movements are substitutes. According to this theorem, free trade of goods leads to equal factor prices among regions, even when factors of production are immobile. Therefore, within the United States, which does not limit trade between regions, one would expect the unimpeded flow of goods to tend to equalize wages. It has been this line of thinking, based on the notion that regions trade because of differences in factor endowments, that has led to expectations of regional wage convergence.

Several assumptions, which may or may not be met, are necessary to reach this conclusion, however:

- a) relative factor endowments are not identical across regions,
- b) regions have identical technologies,
- c) regions have identical homothetic demand,
- d) production is characterized by constant returns to scale,
- e) production is characterized by perfect competition, and
- f) there are no domestic distortions in either region.

Markusen (1983) demonstrates that the relationship between commodity trade and factor trade varies depending on the specific assumptions that are retained. By relaxing each of the assumptions one at a time, he shows that the initial trading equilibrium is not characterized by factor-price equalization. In each case, factor prices cannot be equalized between regions until at least one region is specialized. He concludes that the notion that trade in goods and factors are substitutes may be a rather special result, which is generally true only when differences in relative factor endowments are the basis for trade and when no market imperfections exist.

□ 3 Dickie and Gerking (1988) use trade theory to provide a comprehensive assessment of the necessary and sufficient conditions for regional wage equalization.

Regions may trade goods for reasons other than initial differences in factor endowments. Markusen considers various other bases for trade between regions in which the initial trade equilibrium is not characterized by factor-price equalization. These conditions include

- a) differences in production technologies,
- b) production taxes,
- c) monopolies,
- d) external economies of scale (increasing returns to scale), and
- e) factor-market distortions.

If these characteristics hold for regions, then factor prices will not be equalized, even though goods may still flow freely among regions. It is easy to envision regional differences in technology, taxes, market share, agglomeration economies, and unions—all of which would satisfy one or more of the above conditions.

Factor-price equalization can be achieved in these less-specialized cases if factors are mobile. Factors will flow to the region with the higher price, until interregional price differentials disappear. When trade is based on factors such as those listed above, factor prices will differ in such a way that the price will be higher for the factor that is used intensively in the production of the export good of that region. Consequently, the region will be relatively well endowed with the factor that is more intensively used in the production of the region's export good. However, factor flows, particularly labor migration, are impeded by imperfect information, by moving costs (both monetary and psychic) and, in the case of labor, by imperfect matches between labor skills and job requirements.

What does this mean for the second component of wage changes—the level or composition of factors? When trade is based on differences in factor endowments, there will be no migration based on wage differentials, for the simple reason that wages will not differ between regions because of interregional trade in goods.⁴ When trade is based on differences in production technologies, taxes, or factor-market distortions, factor-price differentials lead to factor flows, but these flows will result in different proportions of factors. Therefore, these models suggest that average wage levels are very unlikely to be the same across regions.⁵ Even though interregional

■ 4 Of course, individuals may find regions to be attractive for reasons other than higher wages. Site-specific amenities may also influence an individual's preferences.

■ 5 Wages will also differ across regions because of compensating differentials for site-specific characteristics, as discussed by Beeson and Eberts (1989).

prices may be equal, as predicted by both models, it is most likely that the composition of the characteristics will differ among regions.

Dickie and Gerking (1988) summarize the outcomes of trade theory as they pertain to interregional wage differentials. First, equalization of labor-characteristic prices does not depend on geographic mobility of the entire labor force. Rather, equalization occurs if enough markets for goods and factors exist and if those markets are allowed to clear. Second, when a combination of commodity trade and factor mobility guarantees factor-price equalization, then relative factor supplies end up unequal and regions tend not to become homogeneous in factor composition. Third, when labor is heterogeneous, economic efficiency, as evidenced by equal factor prices, does not lead to interregional equality of average wages (pp. 10-11).⁶

Therefore, it appears that a systematic change in characteristic prices is a likely source of the switch from regional wage convergence before 1980 to regional wage divergence after 1980. The subsequent analysis estimates the two basic components of regional wage changes and examines which of them contributes more to these observed changes.

II. Accounting for Regional Wage Differentials

Consider the standard hedonic wage equation in which the wage (W_{ij}) of individual i living in region j is a function of the individual's attributes (H_{ij}) and job or workplace characteristics (C_{ij}):

$$(1) \quad W_{ij} = w(H_{it}, C_{ij})$$

Assuming perfectly operating labor markets, prices of each attribute are determined by supply and demand conditions. Under the assumptions of perfect information, costless spatial labor mobility, and zero transactions costs, characteristic prices will be the same across regions. Consequently, workers with the same characteristics will be paid the same wage regardless of location.

The technique used to account for the two sources of wage differentials follows the approach of Oaxaca (1973), with modifications made by

Sahling and Smith (1983) and Farber and Newman (1987). Writing equation (1) in log-linear form, dropping the individual subscript, and adding a time subscript yields

$$(2) \quad \ln w_{jt} = b_{jt} X_{jt},$$

where $j = 1, \dots, R$ regions, and $t = 1, \dots, T$ time periods.

The parameter vector b_{jt} represents the characteristic price and vector X_t represents the levels of characteristics, both of which can differ among regions and over time. Using y for $\ln w$, we can write the percentage change in wages between two regions (S and N) during one time period as

$$(3) \quad (y_{St} - y_{Nt}) = (b_{St} - b_{Nt})X_{St} + (X_{St} - X_{Nt})b_{Nt}, \quad t = 1, \dots, T.$$

The first term on the right-hand side accounts for the change in characteristic prices between regions S and N . For our purposes, N denotes the national average. The second term denotes the change in levels of worker characteristics between the two regions? It is clear from equation (3) that wage differences between regions result either from differences in prices or from differences in levels. One can use this framework to assess which of the two components accounts for the larger share of the regional wage difference.*

The issue of wage convergence or divergence requires examining how these regional wage differences change over time. For wages to converge toward the national average, the distance between the regional and national wage level must narrow over time. Consequently, if the region starts out with a wage above the national average, convergence requires that the difference, $(y_{St} - y_{Nt}) - (y_{St-1} - y_{Nt-1})$, must be greater than zero. The same relationship must be negative if the region starts out with a wage below the national average. The condition for divergence,

■ **7** A residual term, $(b_S - b_N)(X_S - X_N)$, is omitted for simplicity. Furthermore, there is an index problem associated with this technique. Changing the base to one region or the other will change the values of the components. Some studies, such as Sahling and Smith (1983), have attempted to avoid the problem by using averages of the two region's characteristic levels or prices. We instead choose to follow the technique of Farber and Newman (1987), which chooses one region as the base. In this way, we are better able to compare our results with theirs.

■ **6** Dickie and Gerking also stress a fourth and important point: if data do not adequately distinguish between workers with particular characteristics, then estimated returns will be averages and tests of the interregional wage equality hypothesis would be biased toward rejection.

□ **8** As Farber and Newman point out, the accounting framework relies on the unbiasedness and consistency properties of OLS estimators, and has avoided the pie-test biases of imposing implicit restrictions on coefficients found to be statistically insignificant (p. 219).

obviously, would require the opposite signs?

The relative change over time in regional wage differentials can be divided into several components using a variation of the same accounting scheme adopted in equation (3) for the static case. Following Farber and Newman, one can specify equation (3) for two different time periods (in this case, periods 1 and 2) and then subtract one from the other. This technique yields the following accounting framework:

$$\begin{aligned}
 (4) \quad & (Y_{S2} - Y_{N2}) - (Y_{S1} - Y_{N1}) = \\
 & [(X_{S2} - X_{N2}) \\
 & \quad - (X_{S1} - X_{N1})] b_{N2} \\
 & + (X_{S2} - X_{S1})(b_{N2} - b_{S2}) \\
 & + (X_{S1} - X_{N1})(b_{N2} - b_{N1}) \\
 & + X_{S1}[(b_{S2} - b_{N2}) \\
 & \quad - (b_{S1} - b_{N1})].
 \end{aligned}$$

The four components can be interpreted in the following way. The first term, referred to as the main effect, reflects how much of the change in the wage differential is due to changes in the differences of wage-determining characteristics between the two regions, evaluated at the national average characteristic prices. Notice that this term may be zero even when characteristic levels differ between region S and the national average in each time period, as long as these differences are not the same in each time period. The second term is the price-interaction term and reflects the effects of absolute changes in characteristics of workers in region S over time. The third term is the price-interaction effect, which allows for characteristic prices to change over time. The last component, the region-time interaction effect, represents the possibility that the characteristic prices in the two regions may change over time at different rates.

These four components of regional wage changes provide the basis for identifying the relative contributions of intertemporal changes in characteristic prices and levels to the regional

wage differentials. To construct these wage-change components, separate hedonic wage equations are estimated for each region in each time period. For nine census regions and three time periods, this requires 27 separate regressions. The coefficient estimates and the means of the levels of characteristics are then combined according to equation (4).¹⁰

Comparing changes in regional wages relative to the national average partially adjusts for the general nominal wage increases observed over the 15-year period between 1973 and 1987. However, any deviations of regional price trends from the national average will be imbedded in the various components, particularly in those related to differences in characteristic prices. Instead of relying on the national trends to capture regional price differentials, it would be ideal to adjust regional wages for differences in the cost of living. Unfortunately, regional indexes are available only for metropolitan areas, and even then, there are no current indexes that can be used to compare cost-of-living differences across metropolitan areas.

III. Empirical Results

Data

The data used to estimate the wage differentials are obtained for various years from the Current Population Surveys (CPS) compiled by the U.S. Department of Labor, Bureau of Labor Statistics. The CPS surveys individual workers periodically regarding hours worked, earnings, worker characteristics, employment status, and so forth. Each time period considered in the analysis consists of a pooled sample of three years." The first

□ **10** One drawback of this approach, as discussed by Dickie and Gerking (1988), is the lack of a confidence interval estimate around these various components, leaving it unclear how the results generalize to the population.

■ **11** Various features of the CPS files have changed over the years covered in this analysis, which introduces several problems when using these data to derive a consistent time series of regional wages. First, the method of collecting wage and worker characteristics has changed. For the years 1973-78, questions regarding worker wages and characteristics were asked only in the month of May. This poses two problems. First, the sample contains only those individuals who were in the second rotation, which, in addition to being less representative, reduces the number of respondents. Second, annual wage estimates will reflect wages obtained for only one month of the year.

Starting in 1979, the wage questions were asked of one-quarter of the individuals in each of the 12 monthly surveys conducted each year. Because of the difference in the way in which information is gathered, the total number of workers with sufficiently complete records for analysis is much smaller before 1979 than afterward. Pooling the individual years will ameliorate these problems to some extent

■ **9** We have chosen to compare each region with the national average, which we feel provides the most clarity when so many regions are being compared. This approach may introduce two sources of bias, however. The first is because the national sample is not a region separate from the others, but is made up of individuals in each region. The second source arises from the finding that the characteristic prices of each region are significantly different. Consequently, the characteristic prices estimated for the nation may not represent prices for the national market, but rather the average of prices from each distinctly different regional market.

T A B L E 1

Regression Estimates for the National
Sample of Workers

Variables	1973-75		1979-81		1985-87	
	Mean	Coefficient	Mean	Coefficient	Mean	Coefficient
Full-time (= 1)	.80	.101	.81	.141	.80	.187
Race (nonwhite = 1)	.10	-.040	.12	-.032	.13	-.048
Sex (female = 1)	.42	-.192	.46	-.168	.48	-.133
Experience	18.72	.026	17.76	.026	17.59	.029
Experience squared	570.60	-.0004	521.57	-.0004	488.80	-.0004
Schooling	1.82	.130	1.98	.131	2.09	.162
Schooling squared	4.03	.007	4.57	.002	5.00	-.001
(exp) x (sex)	7.77	-.004	7.90	-.004	8.32	-.005
Non-SMSA (= 1)	.30	-.159	.42	-.083	.27	-.133
(13 occupation dummy variables)						
(12 industry dummy variables)						
Dependent variable:						
log (earnings/hours)		1.29		1.74		2.02
R ²		.91		.95		.96
Number of observations		116,298		554,864		491,510

NOTE: All coefficients are statistically significant at the 99 percent level.

SOURCE: Estimates are derived from the Current Population Surveys. See text for details.

period combines the responses from the May survey for the years 1973, 1974, and 1975. The second period pools responses from one-quarter of the individuals in each of the 12 monthly surveys for the years 1979, 1980, and 1981. The third period is derived similarly, except that it includes the years 1985, 1986, and 1987.

These time periods were chosen because they correspond to the switch from regional wage convergence to regional wage divergence as documented by Browne (1989). In addition, years were pooled in order that each region contained enough workers to ensure reliable estimates. The size of the samples ranges from 7,203 workers for the New England census region in 1973-75 to 84,641 workers for the East North Central region in 1979-81.

Following the human-capital specification of Hanooh (1967) and Mincer (1974), individual wages (expressed in logarithms) are specified as a function of various worker attributes. We include education level (entered as a quadratic), potential experience (age, minus years of education, minus six, also entered as a quadratic), and the interaction between experience and female. We also include binary dummy variables indicating whether or not the worker is a full-time employee, female, and nonwhite. Dummy variables

are also used to denote a worker's occupation, the industry in which he or she is employed, and whether the worker resides in an SMSA. Hourly earnings were computed by dividing average weekly earnings by average weekly hours.¹²

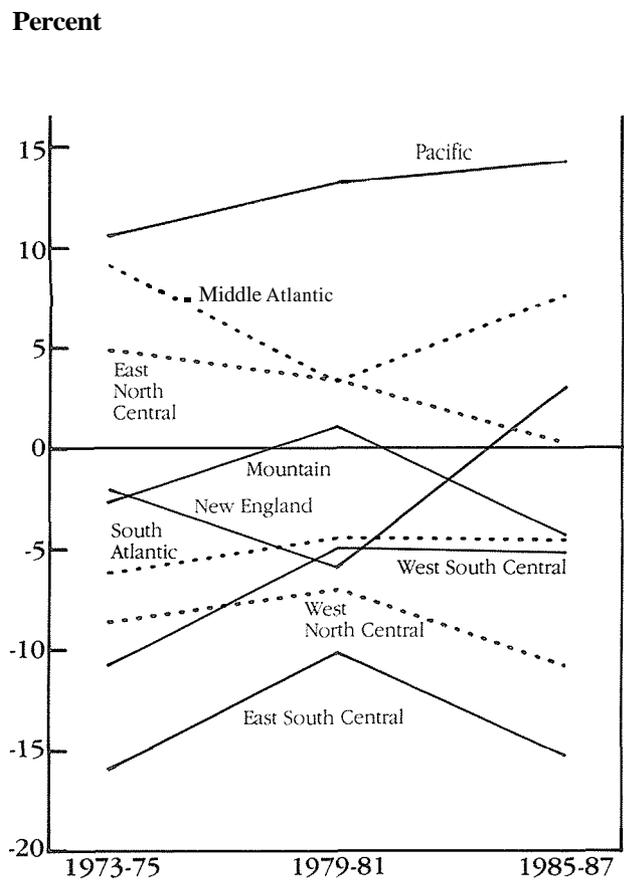
Including the industry-dummy variables is somewhat inconsistent with the notion that the human-capital specification captures supply-side aspects of the labor market. These variables are included, as they have been in other studies, to test the popular notion that industrial restructuring is a primary source of regional wage changes. The changing composition of union membership has also been offered as an explanation for regional wage changes.¹³ Unfortunately, the CPS did not ask about union affiliation in the 1979-81 surveys.

■ **12** An interesting extension of the analysis would be to estimate separate regressions for males and females and for whites and nonwhites. Sahling and Smith (1983) found differences in wages between males and females in the South compared with other regions. Changing norms for women and minorities in the workplace may lead to regional differences in the characteristic prices of these groups.

■ **13** However, Farber and Newman (1987) conclude that while unionization is an important contributor to the change in the wage differential attributable to changes in regional differences in worker characteristics, it is not an important variable in explaining changes in wage ratios between regions (p. 222).

F I G U R E 1

Regional Nominal Wage Differentials Relative to the National Average



SOURCE: Author's calculations from Current Population Surveys.

Regression Estimates

Separate estimates were obtained for each of the nine census regions for each time period using ordinary least squares. F-tests were performed to test the null hypothesis that the coefficients for each region are equal to the coefficients for the national sample. The null hypothesis was rejected at the 1 percent confidence level for each time period. Even though coefficients differ among regions, estimates from the national sample are displayed and discussed in order to provide an overall perspective of the results. As shown in table 1, all worker-characteristic variables are statistically significant at the 1 percent level and enter with the expected signs. Full-time workers (who work 35 hours or more a week) receive higher wages than part-time workers,

everything else being the same. The full-time wage premium has risen from 10 percent in the first period to 19 percent in the most recent period. This fairly sizable increase has occurred even though the percentage of full-time workers in the sample has remained constant.

The nonwhite wage gap appears to have narrowed slightly from 4 percent in 1973-75 to 3.2 percent in 1979-81. However, since that time, the gap has widened, increasing to 4.8 percent in 1985-87. The female wage gap, on the other hand, has steadily narrowed, from 19.2 percent in the first period to 13.3 percent in the most recent period. The wage premium placed on additional hours of work experience has risen steadily for both men and women over the three time periods. Taking into account the interaction terms and evaluating at the mean level of experience, the elasticity of wages with respect to experience for men, for example, rose from 20.6 percent in 1973-75 to 26.4 percent in 1985-87. The net effect of schooling on wages fell between the first two periods and then rose in the third period.

Patterns of Regional Wage Differentials

Nominal earnings estimates, using the CPS sample of workers within nine census regions, reveal a pattern of regional wage convergence followed by divergence, similar to that found by Browne. Figure 1 shows the pattern of regional nominal wage changes relative to the national average. Nominal wages in all regions, except the New England and the Pacific regions, converged toward the national average between 1973-75 and 1979-81.

The standard deviation of the relative wage differentials fell from 0.086 to 0.068 during this period. Wages of workers in the Pacific region increased 2.6 percentage points faster than the national average between the first two periods, which raised the region's wage premium to 13.3 percent. New England, on the other hand, started out below the national average in 1973-75 and continued to lose even more ground by 1979-81, falling from 2.1 percent to 5.9 percent below the national average over this time span.

Between 1979-81 and 1985-87, wages in most of the regions diverged from the national average. The two exceptions were the New England and East North Central regions. Wages in the New England region jumped dramatically during this period, outpacing the national average by 9.1 percentage points. This spurt in wage growth

closed New England's wage gap from the previous period and placed its wages 3.1 percent above the national average in 1985-87. Wages in the East North Central region also came closer to the national average, but this was achieved by growing slower than the nation by 3.0 percentage points.

Of the seven regions in which wages diverged from the national average between 1979-81 and 1985-87, five were below the national average. The two regions that lost the most ground were West North Central and East South Central. Wages in the West North Central region fell from 7.0 percent below the national average in 1979-81 to 10.9 percent below in 1985-87. Wages in the East South Central region, which in the first two periods were the lowest in the country, fell even further, to 15.2 percent below the national average.

Wages in the Pacific and Middle Atlantic regions, on the other hand, increased relative to the national average. Overall, six of the nine census regions followed the pattern of wage convergence before 1979-81 and wage divergence after that period. The relative wage gains and losses across the nine regions combined to increase the standard deviation from 0.068 in 1979-81 to 0.086 in 1985-87, which is roughly the same level of dispersion found for the first period.

Components of Regional Wage Differentials

Which of the two components accounts for the switch from convergence to divergence? One way to address this question is to consider the number of cases in which one component or the other dominated the regional wage differential for all three periods. This could be interpreted as indicating that the same "structure" that led to wage convergence also led to wage divergence.

Looking only at the cross-sectional results, as shown in table 2, provides a mixed answer. For the six regions that followed the convergence/divergence pattern, differences in characteristic prices dominated the regional/national wage differential for three regions for all three periods, differences in characteristic levels dominated one region, and the effect was split for the remaining two regions. Tallying up the total number of cases in which differences in characteristic prices dominated the regional wage differentials results in about the same percentage of cases—about 60 percent.

Another way to evaluate the Importance of each source is to determine the wage patterns generated if only one of the components varied. For

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instance, as shown in table 2, if workers were identical in all regions (or, at least, if the composition of worker attributes was the same) and only characteristic prices varied, four of the nine regions would exhibit a convergence/divergence wage pattern. These four cases are consistent with the actual wage patterns of convergence and divergence. The two regions in which price differentials did not yield the desired pattern, even though the actual wage pattern did, were the West South Central and South Atlantic regions. In both cases, differences in the characteristic levels were consistent with the actual wage patterns and were large enough to bring these patterns into line.

Which of the worker characteristics appears to contribute most to these patterns? Three categories of variables were considered: human capital variables, industry variables, and occupation variables. The most striking result (which is not shown in the tables) is that regional differences in the wage premiums paid in various industries virtually never emerged as the dominant category. Rather, human capital dominated in most cases, being the largest contributor in 16 of the 28 cases for the price component, and in 17 of the 28 cases for the level component.

Components of Intertemporal Regional Wage Changes

The previous examination of the sources of regional wage differentials looked at three separate cross sections from different time periods. The next step is to examine how these regional wage differentials changed over time. As mentioned earlier, equation (4) provides a framework to account for the various components of this wage change.

Table 3 displays the components of nominal wage changes for each region between the three time periods. For example, the 1.6 percent reduction between the first two periods in the wages of the East North Central region relative to the national average can be attributed to primarily two effects. The first is the main effect (column 1), which is the change over time in characteristic levels for the region relative to the nation. If all other effects were zero, then these changes in worker characteristics would cause the regional wages to diverge from the national average rather than to converge, as they actually do. The positive sign for this component indicates that the difference in the characteristic levels that favored this region over the nation was greater in the second period than in the first.

T A B L E 2

**Components of Regional
Wage Differentials Relative to
the National Average**

Census Region	Year	(1) $(b^R - b^N)X^N$	(2) $(X^R - X^N)b^N$	(3) Actual Wage Difference
New England	1973-75	-.0064	-.0096*	-.0208
	1979-81	-.0469*	-.0123	-.0592
	1985-87	.0198*	.0138	.0305
Middle Atlantic	1973-75	.0547*	.0429	.0904
	1979-81	-.0005	-.0363*	.0327
	1985-87	.0221	.0504*	.0758
Fast North Central	1973-75	.0453	.0064*	.0490
	1979-81	.0117	.0133*	.0337
	1985-87	-.0010*	.0007	.0025
West North Central	1973-75	-.0289	-.0461*	-.0861
	1979-81	-.0137	-.0483*	-.0699
	1985-87	-.0447	-.0605*	-.1089
South Atlantic	1973-75	-.0332*	-.0303	-.0622
	1979-81	-.0459*	-.0027	-.0448
	1985-87	-.0396*	-.0076	-.0463
Fast South Central	1973-75	-.0861*	-.0695	-.1589
	1979-81	-.0714*	-.0264	-.1011
	1985-87	-.1047*	-.0544	-.1524
West South Central	1973-75	-.0915*	-.0176	-.1078
	1979-81	-.0496*	-.0006	-.0502
	1985-87	-.0471*	-.0020	-.0524
Mountain	1973-75	-.0316*	-.0021	-.0270
	1979-81	.0101	-.0220*	.0106
	1985-87	-.0158	-.0446*	-.0436
Pacific	1973-75	.0782*	.0495	.1063
	1979-81	.1280"	.0256	.1326
	1985-87	.1253*	.0333	.1427

NOTE: Column 1 is the effect of differences in characteristic price between the region and the nation; column 2 is the effect of differences in characteristic levels between the region and the nation. Columns 1 and 2 do not add up to column 3 because of a residual component not shown in the table. Asterisks denote the dominant component for each time period and region.

SOURCE: Author's calculations.

Offsetting the effect of changes in characteristic levels are the changes over the time periods in characteristic prices (column 4). If everything else remained the same, these changes in intertemporal prices would result in East North Central wages converging to the national average by 2.8 percent.

In determining which components contribute most to wage changes, two criteria were used. First, the signs of the components must be consistent with wage convergence between the first and second periods and with wage divergence between the second and third periods. Second,

the components should account for a large share of the total wage change.

The asterisks in table 3 indicate the pairs of components that are consistent with the convergence/divergence wage pattern. For the two components that are based on the intertemporal change in characteristic prices (columns 3 and 4), 12 of the possible 18 pairs of estimates are consistent with the convergence/divergence wage pattern. The components related to intertemporal changes in characteristic levels (columns 1 and 2) contain only five pairs. Furthermore, the components related to changes in

T A B L E 3

**Components of Intertemporal Changes
in Regional Wage Differentials**

Census Region	Time Span	Components					
		(1)	(2)	(3)	(4)	(5)	(6)
New England	2-1	.002	.002*	-.003	-.034	-.036	-.039
	3-2	.030	-.004*	-.004	.061	.082	.091
Middle Atlantic	2-1	.002	-.001	-.008*	-.052*	-.059*	-.058*
	3-2	-.003	-.005	.017*	.02j"	.034*	.044"
East North Central	2-1	.010	.0027	-.003*	-.020	-.010	-.016
	3-2	-.020	.005	.007*	-.014	-.021	-.030
West North Central	2-1	-.015	.010	.013*	.028*	.035*	.016*
	3-2	-.0003	.003	-.012*	-.023*	-.033*	-.038*
South Atlantic	2-1	.020*	-.001	.007*	-.011	.016	.017*
	3-2	-.004*	.006	-.001*	.009	.010	-.001*
Fast South Central	2-1	.023*	.005	.020*	.020*	.068*	.057*
	3-2	-.017*	.008	-.011*	-.016*	-.036*	-.050*
West South Central	2-1	.011*	.003	.006*	.043	.063	.057*
	3-2	-.001*	.002	-.0003*	.001	.001	-.001*
Mountain	2-1	-.028	-.020	.008*	.037*	-.003	.067*
	3-2	-.003	.016	-.020*	-.015*	-.022	-.053*
Pacific	2-1	-.008	-.018*	-.016*	.032	-.010*	.026
	3-2	-.001	.014*	.009*	.016	.038*	.011

NOTE: Time spans are denoted as 1 (1973-75), 2 (1979-81), and 3 (1985-87). The notation 2-1 represents the difference between the first two peritxls, and 3-2 represents the difference between the latter two peritxls. The components are (1) main effect, (2) interaction effects, (3) time-interaction effects, (4) regional time-interaction effects, (5) the sum of the four effects, and (6) the actual change in the regional wage differential (relative to the national average) between the two time peritxls. The asterisks indicate the components that are consistent with the convergence/divergence wage pattern.

SOURCE: Author's calculations.

prices (again columns 3 and 4) claim the largest share, on average, of the total wage changes. Consequently, it appears (as the trade theory suggests) that differences in characteristic prices account for the larger share of nominal regional wage changes over the three time periods.¹⁴

Therefore, this simple nonparametric test of counting the number of consistent results suggests that intertemporal changes in worker characteristic prices account for much of the convergence as well as the divergence of wages.

■ **14** Dickie and Gerking (1988) point out that omitted variables, particularly the lack of detailed human-capital variables, could bias the accounting method toward attributing too much importance to characteristic price differences. They find, using another data set that contained unusually detailed measures of worker and workplace characteristics, that they could not reject the hypothesis of equal coefficients across regions. This omission seems less critical for this study, since we look at the change over time in coefficients of the same set of variables within the same regions. It would seem that in order for omitted-variable bias to be significant, the relative contributions of each variable would have to vary substantially over time, which is not supported by the results from the previous section.

Consequently, basic changes in the way that worker characteristics were valued by the regional markets must have occurred around the turn of the decade. Trade theory suggests various types of market imperfections as possible candidates, including differences in production technologies and factor-market distortions. The back-to-back recessions in 1980-82 and the collapse in oil prices shortly thereafter certainly have taken their toll on regions such as the West South Central, while having little effect on others, such as the Pacific and New England regions. The relative effects of these events among regions can be partially explained by the slow adjustment of labor markets and the differential impact of oil prices between energy-using and energy-producing regions.

Considering the three categories of worker characteristics defined in the previous section offers further insight. As before, the industry variables played very little role in accounting for intertemporal changes in the regional wage differentials (these results are not shown in the

tables). However, unlike the cross-section analysis, occupation variables clearly dominated. For example, with respect to component four (differences in prices), occupation variables were the dominant category in 13 of the 18 cases.¹⁵

This result supports some of the speculation made by various authors about possible reasons why worker characteristic prices may not be equal across regions. Farber and Newman (1987) conjecture that characteristic prices may not necessarily converge because of occupation-specific demand disturbances. Topel (1986) shows that disequilibrium in local labor markets results primarily from stochastic disturbances in labor demand.

IV. Conclusion

After converging for almost half a century, nominal regional wages have diverged since 1980. This paper attempts to isolate the source of this switch in direction either as an intertemporal change in the market prices for worker attributes or as an intertemporal change in the levels of worker attributes. For nine census regions between the periods 1973-75, 1979-81, and 1985-87, results using individual workers from the CPS show that differences in characteristic prices account for a major share of the change in regional wages relative to the national average. Furthermore, virtually all of this intertemporal change in characteristic prices is found in the occupation coefficients; industry and worker characteristic variables account for very little.

Theory suggests that the prices of worker characteristics will converge in the presence of free commodity trade and in the absence of market imperfections. Various types of market imperfections were suggested as possible sources of the divergence of regional wages. For example, incomplete information, a mismatch between worker skills and job requirements, and institutional barriers to mobility can lead to incomplete adjustments to recent changes in the structural demand for labor. A recent study estimates that it takes as much as a decade for local labor markets to adjust fully to such shocks (Eberts and Stone [1989]).

Another possibility for nominal wage divergence is changes in the regional prices of housing and other nontraded goods that deviate from

the national average. Because this study did not adjust for regional cost-of-living differences, it may be possible that wage differentials simply compensate workers for higher housing costs. However, this argument runs counter to the predicted results of free trade among regions, once equilibrium has been established. If goods are freely traded, then firms would be hard pressed to pay higher wages in some regions than in others, unless employers were compensated by differences in production technologies and worker productivity. Therefore, for cost-of-living differences to explain the results, workers in areas with higher labor costs coincidentally would have to be more productive. There are no compelling reasons why high living costs and high worker productivity should exist concurrently in equilibrium.

Two exceptions to this general statement are possible: First, site-specific attributes could enhance firms' productivity. Firms would move into the more productive region, bidding up the price of land and the price of labor, everything else being equal. The second possibility is that with the slow adjustment to shocks, we are simply observing these effects in disequilibrium.

The findings that differences over time in characteristic prices account for a majority of the changes in regional wage differentials does not necessarily diminish the importance of migration in explaining differences in regional growth. Rather, the analysis suggests that these flows have not changed the composition of regional labor forces significantly enough to make them the dominant factor in explaining changes in regional wage differentials. The traditional migration patterns of South to North and East to West are less pronounced now than in the past. Formerly, the primary migration pattern was toward the West, particularly for college graduates looking for job opportunities. More recently, the South is receiving many younger persons from the West and North.

If stochastic disturbances have changed the course of regional wage differentials, then it is interesting to speculate why these shocks have had such an impact in a relatively short period of time, when for so many decades the workings of efficient markets and equalizing migration flows seemed to prevail in forcing regional wages to converge. Several possibilities come to mind: increased foreign competition, the collapse of oil prices in the early 1980s, and the severe back-to-back recessions of 1980-82.

These recessions hit some regions harder than others, producing different patterns of change in regional wage differentials. The West South Central states of Texas and Louisiana were particularly

■ 15 Farber and Newman (1987) also find that the worker characteristics that accounted for much of the cross-sectional accounting of regional wage differences were different from the worker characteristics that accounted for the majority of the intertemporal changes in regional wage differentials

hurt as the bottom dropped out of oil prices. This downturn thwarted the sizable gains that region had made in previous years in narrowing its wage gap.

The farming states of the West North Central region were also severely affected by the recession and the ensuing farm crisis of the early 1980s. After converging toward the national average throughout the 1970s, wages in this region diverged significantly, falling from 7.0 percent below the national average at the beginning of the 1980s to 10.9 percent below the average toward the end of the decade. Wages in some regions continued to grow faster than the national average in spite of the recession. For example, the Pacific region, especially California, was only mildly affected, with its regional wage differential expanding by a percentage point between 1979-81 and 1985-87.

Factors other than economic shocks could also contribute to the wage divergence. One possibility is state tax policies. The late 1970s and early 1980s saw the phasing out of substantial federal grant programs to states and municipalities. Many of these programs were designed to help equalize the fiscal burden across regions. As these funds dried up, many state and local governments found it necessary to raise tax rates to fund the existing programs, while others decided to curtail the programs. These different responses could lead to an increase in regional tax rates, which in turn could affect the location of firms and ultimately the demand for labor.

Will these factors persist? If history is any guide, the answer is no. The long-run trend of regional wage convergence has been interrupted only once in the last century. That episode lasted 20 years, embracing a postwar period and a much deeper and protracted recession than the one that greeted this decade. Consequently, it appears that shocks of this kind will eventually dissipate as the regions' economies regain a more equal footing.

However, many states and localities are not content to wait the decade or so that it takes for these forces to play themselves out. Many areas have pursued vigorous economic development efforts to help quicken the pace of adjustment. As long as these efforts attempt to remove market inefficiencies and strengthen the region's comparative advantage, they are socially desirable. One would expect that as regions continue to develop and mature—and barring further shocks of recent magnitude—the long-run trend of regional wage convergence will return.

References

- Beeson, Patricia and Eberts, Randall W., "Identifying Productivity and Amenity Effects in Interurban Wage Differentials," *Review of Economics and Statistics*, August 1989 (forthcoming).
- Bellante, Don, "The North South Differential and the Migration of Heterogeneous Labor," *American Economic Review*, March 1979, 69, 166-175
- Browne, Lynn E., "Shifting Regional Fortunes: The Wheel Turns," *New England Economic Review*, Federal Reserve Bank of Boston, May/June 1989, 27-40
- Dickie, Mark and Gerking, Shelby, "Interregional Wage Differentials in the United States: A Survey," in Alan Schlottmann, et al., eds., *Migration and Labor Market Adjustment*, Boston: Kluwer Academic Publishers, 1988.
- Easterlin, Richard A., "Long Term Regional Income Changes Some Suggested Factors," in Gerald A.P. Carrothers, ed, *Papers and Proceedings of the Regional Science Association*, 1958, 4, 313-25
- Eberts, Randall W. and Stone, Joe A., "Wage and Employment Response to Shocks in Local Labor Markets," presented at the Western Economic Association Meetings, Lake Tahoe, Nev., July 1989.
- Farber, Stephen C. and Newman, Robert J., "Accounting for South Non South Real Wage Differentials and for Changes in Those Differentials Over Time," *Review of Economics and Statistics*, May 1987, 69, 315-23
- Gerking, Shelby and Weirick, William, "Compensating Differences and Interregional Wage Differentials," *Review of Economics and Statistics*, August 1983, 65, 483-87
- Hanoch, Giora, "An Economic Analysis of Earnings and Schooling," *Journal of Human Resources*, Summer 1967, 2, 310-29
- Markusen, James R., "Factor Movements and Commodity Trade as Complements," *Journal of International Economics*, May 1983, 14, 341-56
- Mincer, Jacob, *Schooling, Experience, and Earnings*, New York: National Bureau of Economic Research, distributed by Columbia University Press, 1974
- Nourse, Hugh O., *Regional Economics: A Study in the Economic Structure, Stability, and Growth of Regions*, New York: McGraw Hill, 1968
- Oaxaca, Ronald, "Male Female Wage Differentials in Urban Labor Markets," *International Economic Review*, October 1973, 14, 693-709
- Roback, Jennifer, "Wages, Rents and Quality of Life," *Journal of Political Economy*, December 1982, 90, 1257-78
- Sahling, Leonard G. and Smith, Sharon P., "Regional Wage Differentials: Has the South Risen Again?" *Review of Economics and Statistics*, February 1983, 65, 131-35
- Topel, Robert H., "Local Labor Markets," *Journal of Political Economy*, 1986, 94, S111-43