Components of City-Size Wage Differentials, 1973–1988

by Patricia E. Beeson and Erica L. Groshen

Patricia E. Beeson is an associate professor of economics at the University of Pittsburgh, and Erica L. Groshen is an economist at the Federal Reserve Bank of Cleveland.
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Introduction

The United States is predominantly, and increasingly, an urban society. Although the pace of urbanization stalled during the 1970s, it picked up steam again in the 1980s. Final 1990 census figures show that 77 percent of all U.S. residents live in cities, with 50 percent residing in metropolitan areas of more than 1 million inhabitants (up from just 41 percent in 1970).[1] Recognition of this trend has spawned a wide variety of research into the factors that draw us to live in cities, and also into the impact of cities on many aspects of our lives.

This paper examines one important issue associated with city dwelling — why wages increase with metropolitan area size. Explanations of this phenomenon must address both sides of the market: Why do workers in small cities accept lower wages instead of moving, and how can big-city employers compete successfully against lower-wage employers in small cities? On the workers' side, reasons proposed for the earnings disparity include compensation for higher skill levels, higher costs of living, and lower quality of life (such as exposure to crime and congestion) in large cities. On the employers' side of the market, the steeper wage bills faced by big-city firms are posited to be offset by higher productivity stemming from at least four possible sources: differences in immobile site characteristics, agglomeration economies, external economies related to city size, or differences in the quality of workers in large and small cities.

To explain the city-size wage gap, we need to know more precisely how wages differ among cities. Do large cities have higher-quality workers, for example, or does something about these cities make firms there more productive? As this question suggests, the city-size wage differential can be decomposed into two parts, both of which merit further investigation. One portion, arising from intercity disparities in *income-earning characteristics of the work force*, raises the question of why workers with divergent skills tend to locate in different-size cities. The second portion, which stems from intercity disparities in *wage structures*, invites inquiry into why workers with similar skills receive different pay in large versus small cities.

Such price differences imply that the magnitude of the city-size wage gap varies among workers. This in turn suggests that the importance of

1 U.S. Department of Commerce, Bureau of the Census, press release CB91-66, February 21, 1991.

any given explanation for the gap may differ by type of worker. The results have major implications for understanding the efficiency of interregional labor markets. When do these markets produce a single price for labor, and under what circumstances do variations occur? Although equality of equilibrium factor prices across areas can be expected under many circumstances, it is by no means guaranteed.[2]

To begin answering some of these questions, we decompose city-size wage differentials reported in the U.S. Bureau of Labor Statistics' (BLS) Current Population Surveys (CPS) from 1973 to 1988 into the two portions outlined above: one arising from differences in worker characteristics across cities, and another resulting from intercity differences in the wage premia associated with these characteristics. This approach allows us to identify which work-force characteristics and which aspects of the wage structure account for most city-size wage differences. We then examine the changing importance of these factors over time.

Our results confirm that wages increase with city size. We also find that most of this effect is due to city-size-related differences in the prices of worker attributes. Strongest among these are the higher premia earned by skills (education and experience) in larger cities. Indeed, the driving force behind the shrinkage and expansion that we document in city-size wage differentials over time is changing returns to education.

Thus, the purpose of this study is to document in a novel way the patterns and trends of wage differentials related to city size. We leave to future research both the attempt to integrate these results into estimates of how wages reflect compensation to workers (or firms) for differences in specific area characteristics, and the effort to determine the importance of those area characteristics affecting firm productivity relative to those affecting worker utility.

I. Some Stylized Facts about the City-Size Wage Differential

Previous Studies

People have long observed that workers in large cities earn higher money wages than those in smaller cities and rural areas.[3] Most previous research on the city-size wage differential focuses solely on the total average wage gap, without investigating exactly which skills are priced differently.[4] These studies are based on cross-sectional wage regressions with controls for worker characteristics, where the only aspect of the wage structure allowed to vary between large and small cities is the intercept. City characteristics are then incorporated into the analysis to estimate the extent to which employees with similar skills may receive higher money wages in large cities because workplace or quality-of-life characteristics equalize compensation for workers and firms in small cities.

Previous research relating to the household point of view suggests that city-size-related differences in money wages either are largely offset by cost-of-living disparities, or compensate for differences in the quality of life across cities.[5] Addressing the issue from the firm's perspective, how can employers in large cities afford to pay higher wages than their smaller-city counterparts for workers with the same observed skills? Research on the four possible sources of posited higher productivity in larger cities — immobile site characteristics, agglomeration economies, external economies, or unobserved worker quality — is inconclusive.[6] Alternatively, city-size wage differentials may reflect institutional differences between large and small cities, such as unionization or the size or efficiency of the public sector.

Wages and City Size, 1973–1988

To illustrate some of the stylized facts discussed above and to motivate our study, the rest of this section uses data from the CPS to characterize the relationship between wages and city size over time. Figure 1 shows that average money wages increased consistently with city size for all size classes considered, from nonmetropolitan areas to metropolitan statistical areas (MSAs)

■ 2 See Dickie and Gerking (1987) for a discussion of the conditions under which these characteristic prices will be equalized across regions, and Beeson (1991) for an examination of equilibrium differences in factor prices.

■ 3 For early empirical studies of the relationship between wages and city size, see Fuchs (1967), Hoch (1972), and Rosen (1979).

■ 4 See Dickie and Gerking (1988) for a comprehensive review of this literature.

■ 5 See Hoch (1972), Hoch and Drake (1974), Izraeli (1977), Rosen (1979), and Cropper and Arriga-Salinas (1980).

■ 6 See Segal (1976), Sveikauskas (1975), Carlino (1978), Moomaw (1981), and Henderson (1988) for discussions of the relationship between productivity and city size.

FIGURE 1

City-Size Wage Premia Relative to Non-MSAs

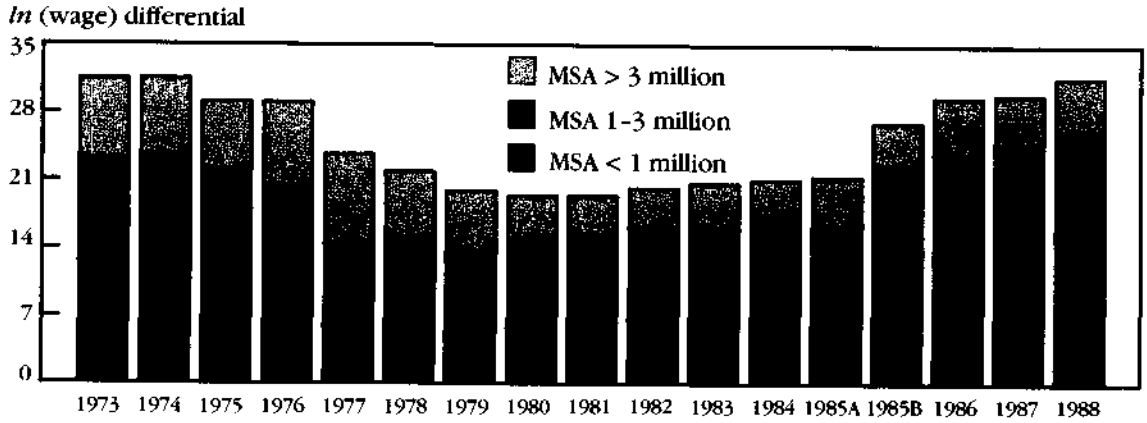
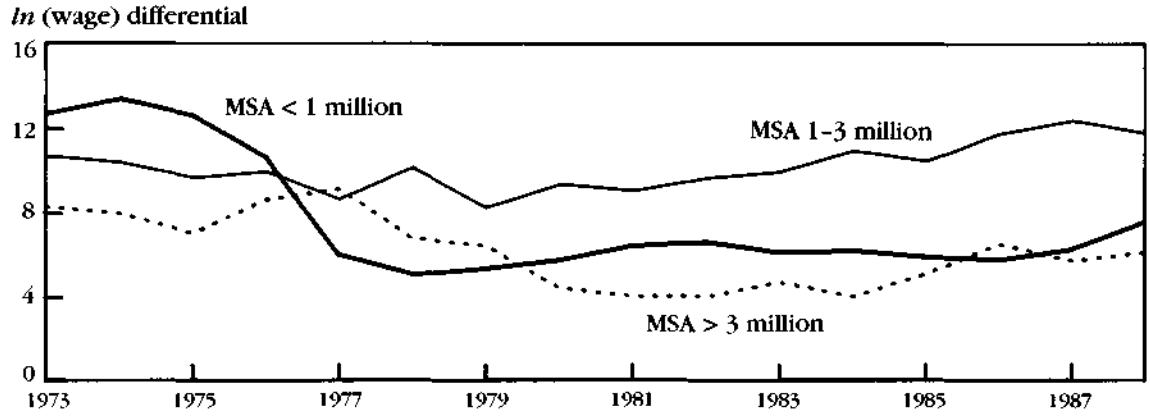


FIGURE 2

City-Size Wage Premia Relative to Next Smallest Size Class



SOURCE: Based on authors' calculations from CPS data.

with more than 3 million people.[7] However, the magnitude of the city-size wage premium varied over time.

Converting from the log wage differentials shown in figure 1 to percentage differences, we find that in 1973 and 1974, average wages in the largest MSAs were about 37 percent (32 log points) higher than in nonmetropolitan areas.[8] This differential then declined rapidly, falling to about 22 percent (20 log points) by 1980. After that, the wage gap widened slowly, adding a total of two percentage points between 1980 and 1985 and another five points between 1985 and 1988. Using the post–1985 MSA definitions, wages in large MSAs averaged 36 percent (31 log points) higher than those in non-MSAs in 1988.

Figure 1 also breaks down the difference between average wages in the largest MSAs and the non-MSAs by city size class. More than 50

■ 7 The two different results for 1985 (1985A and 1985B) are displayed because of a discontinuity in the data, which is discussed later.

■ 8 In figure 1 and throughout this paper, all wage differentials are expressed as log-point wage differences from the mean, which closely approximate percentage differences from the mean (particularly for differentials of less than 10 log points). In this section, we report some differentials in both log points and percentages to give the reader an idea of the magnitude of the larger differentials in percentage terms.

percent of the decline in the wage premium paid in large MSAs relative to non-MSAs during the 1970s was accounted for by a halving of the differential between small MSAs and non-MSAs.

Figure 2 shows more clearly how the gaps between each size class and the next smaller one changed over time. The differential between large and medium MSAs was fairly constant in the early 1970s, but shrank by half during the latter part of the decade, accounting for about 30 percent of the drop in the overall wage premium. These changes produced a more compressed distribution of wages across cities of different sizes in 1980 than existed in 1973. After 1980, the wage difference between large MSAs and non-MSAs started to expand, and this increase appears to have been spread more evenly among size classes than was the decline in the 1970s.

Shrinking city-size wage differentials during the 1970s and expanding differentials during the 1980s are consistent with evidence suggesting that economic activity fell off in metropolitan areas during the earlier decade. The 1970s saw a widespread, widely documented increase in population growth both in rural areas relative to urban ones and in small cities relative to large ones.[9] The most recent U.S. census indicates that this pattern was reversed during the 1980s.

The convergence/divergence of city-size wage gaps over the last two decades also bears some resemblance to wage patterns across census regions. Eberts (1989) and Browne (1989) find that after decades of convergence, wages and per capita regional personal income, respectively, began to move apart during the 1980s. This pattern also is evident in the 1990 census count.

II. Accounting for Wage Differentials and Their Changes

City-Size Wage Differentials

The technique we use to decompose the city-size wage differential into its components was introduced by Oaxaca (1973) to examine the male/female pay gap. This approach has also been applied to regional wage differentials and their changes over time by Sahling and Smith (1983), Farber and Newman (1987), and others.

The percentage difference in wages between a large city (City B) and a smaller one (City S) can be decomposed into worker skill and wage structure components as follows. Individuals' wages are based on the skills they possess and on the price that each skill receives in the market, or, in log-linear form:

$$(1) \qquad ln w_{jit} = \beta_{it} X_{jit},$$

where $ln w_{jit}$ is the natural logarithm of the wage of worker j in city size i during year t, vector β_{it} represents prices for specific skills (which can vary across city sizes and over time), and vector X_{jit} represents worker j's skills.

At any time, the portion of the wage differential stemming from differences in skills can be determined by comparing estimates of the average wages that would exist in City B and City S if prices of skills were the same in both. Similarly, the portion due to differences in the prices of specific skills can be determined by comparing estimates of average wages if skills were the same in both cities, but were alternatively priced in accordance with City B's and City S's wage structures. Based on these comparisons, the overall percentage differences in wages between the two cities can be expressed as follows:

$$(2) \qquad ln w_B - ln w_S = \beta(X_B - X_S) + (\beta_B - \beta_S) X,$$

where B and S indicate City B and City S, respectively.

In calculating the portion of the wage differential resulting from differences in worker skills, it is necessary to approximate β, the wage structure that would exist if there were no differences across city sizes. To deal with this problem, some authors use the wage structure in one of the regions (or in one group of workers). Others use either the wage structure based on the pooled sample (Eberts [1989]), or an average of the wage components based on the wage structure of the individual regions (Sahling and Smith [1983]). In our discussion, we emphasize the results based on the wage structure in large MSAs:

$$(2a) \qquad ln w_B - ln w_S = \beta_B(X_B - X_S) + (\beta_B - \beta_S) X_S.$$

For purposes of comparison, however, we also present alternative decompositions based on the wage structure in non-MSAs and on the average of the two components.

Changes in City-Size Wage Differentials over Time

Using equation (2), we can account for differences in wages in large and small cities at any

9 See Beale (1977), McCarthy and Morrison (1977), Carlino (1985), Moomaw (1986), and Beeson (1990).

point in time. We are also interested in explaining changes in *relative* wages in large and small cities over time. Following Farber and Newman (1987), equation (2) is estimated for each of two time periods. Differencing these estimates yields

$$
\begin{aligned}
(3)\quad & (lnw_B - lnw_S)_t - (lnw_B - lnw_S)_{t-1} \\
&= \beta\,[(X_B - X_S)_t - (X_B - X_S)_{t-1}] \\
&+ X[(\beta_B - \beta_S)_t - (\beta_B - \beta_S)_{t-1}] \\
&+ (\beta_{B,t} - \beta_{B,t-1})(X_B - X_S) \\
&+ (\beta_B - \beta_S)(X_{S,t} - X_{S,t-1}),
\end{aligned}
$$

where t and $t-1$ indicate different time periods.

This decomposition identifies four separate components of the change in relative wages between cities. The first identifies the portion of the change attributable to variations over time in the mean characteristics of workers in City B relative to those in City S, assuming the wage structure (β) is the same across areas and over time. Ceteris paribus, if workers in large and small cities become more alike over time, the wage gap will become smaller. If there are no changes in mean characteristics in City B relative to City S, this component will equal zero.

The second component of equation (3) identifies the portion of the change in the wage gap attributable to changes over time in the wage structure of City B relative to City S, assuming no differences in worker characteristics. Ceteris paribus, if the difference between large and small cities in the returns to specific worker characteristics decreases over time, the wage gap will narrow. If no change occurs in the relative wage structure, this component will equal zero.

Even if there are no changes in relative characteristics of the work force across cities or in relative pay for worker characteristics (that is, if the first two components of equation [3] equal zero), wages in big cities relative to small ones may change. For example, suppose that workers in large cities have more years of schooling on average than those in smaller cities. If the price paid for each additional year of schooling declines, average wages of big-city workers will fall by more than that of their small-city counterparts, even if the price paid for each additional year of schooling is the same in both areas in both time periods. The contribution to the overall change in relative wages of this sort of "universal change" in the price of worker characteristics, given the initially unequal distribution of worker skills, is identified by the third component of equation (3).

Similarly, if a universal increase occurs in the mean level of a particular skill (for example, if average years of schooling increases everywhere), the difference in average wages across cities will change if that skill is rewarded unequally in large and small cities. If the reward is higher in large cities, the wage gap will increase. This portion of the change in the wage differential is identified by the fourth and final component of equation (3).

As was the case with the decomposition of the wage gap between large and small cities at any point in time (equation [2]), the measurement of each component of equation (3) is sensitive to the bases chosen for both the wage structure and the mean values of worker characteristics that would exist if there were no differences across areas. The number of potential combinations is large, and the use of alternative bases has little effect on the relative sizes of the components. Thus, we present the sizes of the components using the following wage structures and mean values:

$$
\begin{aligned}
(3a)\quad & (lnw_B - lnw_S)_t - (lnw_B - lnw_S)_{t-1} \\
&= \beta_B[(X_B - X_S)_t - (X_B - X_S)_{t-1}] \\
&+ X_S[(\beta_B - \beta_S)_t - (\beta_B - \beta_S)_{t-1}] \\
&+ (\beta_{B,t} - \beta_{B,t-1})(X_B - X_S)_{t-1} \\
&+ (\beta_B - \beta_S)_t (X_{S,t} - X_{S,t-1}).
\end{aligned}
$$

This formulation is consistent with the components estimated using equation (2a).

III. The Data

Sources and Inconsistencies

We use data from the CPS to compare wages for workers in different-size cities over the 1973–1988 period. The dependent variable in our analysis is hourly wage, measured as the logarithm of usual weekly earnings/average weekly hours.[10]

The CPS has three important advantages. First, it provides not only workers' earnings, but significant determinants of those earnings, such as age, education, and occupation. Second, it reports whether individuals live in an MSA, and if so, gives the area's size. Finally, the CPS is a broad survey whose design has remained fairly consistent over an extended period.

10 Weekly earnings reported in the CPS do not include fringe benefits. Because the proportion of compensation received as fringes rises with total compensation, this omission probably understates the effects investigated here.

One disadvantage of the CPS is that worker characteristics are not as detailed as in some other data sets. Studies of wage differences across broad regions by Gerking and Weirick (1983) and Dickie and Gerking (1987) indicate that omitting detailed worker information biases the estimation toward rejection of the hypothesis of equal wages, and tends to increase the portion of the wage differential attributed to wage structure. Although more information on worker characteristics would be desirable, we note that even after controlling for detailed traits, Gerking and Weirick still find a significant relationship between city size and wage differentials.

A second problem is that changes in the way the BLS collects and reports CPS data over the sample period complicate the construction of a consistent time series on wages by city size. First, in 1985, metropolitan area definitions were completely revised as follows:

- Through June 1985, identification is based on the 1973 standard metropolitan statistical area (SMSA) definitions.
- Since October 1985, identification is based on the 1983 MSA definitions.
- From July through September 1985, no metropolitan area information is provided.

Due to the extent of these changes, it is impossible to map the pre–1985 definitions to the post–1985 definitions. As a result, a discontinuity exists in our data series. When classifying metropolitan areas based on population size, we use the SMSA definitions prior to October 1985 and the primary metropolitan statistical area definitions thereafter.

These changes over time in the way metropolitan area population is reported limit us to four MSA size categories: more than 3 million people (large MSAs), between 1 million and 3 million people (medium MSAs), less than 1 million people (small MSAs), and nonmetropolitan areas (non-MSAs).[11] Prior to 1979, size classifications are based on 1970 population; afterward, they are based on 1980 population.

The BLS revisions affect cities of all sizes. However, the impact is most apparent in the wage differential between small MSAs and non-MSAs, which jumps from an estimated 5.9 log points based on the January–June 1985 data to 13.5 log points based on the October–December data. The change in the average wage differential between medium and small MSAs fell from 10.5 log points in early 1985 to 9.1 points in late 1985, while the differential between large and medium MSAs dropped from 5.2 to 4.4 log points over the same period.

A second factor that affects the continuity of our data series is the 1983 change in the BLS occupation codes. Again, these are extensive revisions that limit our ability to analyze changes in the city-size wage premium during the early 1980s.

Finally, in 1979, the BLS began collecting and reporting information each month on wages and characteristics of one-quarter of all workers surveyed. Prior to that time, this information was gathered only in May. As a result, our sample is much larger for years since 1979 than before, and the post–1979 sample is less seasonal. Experiments with monthly zero-one dummy variables indicate that this change does not seriously affect our estimates of city-size wage gaps. In addition, we do not adjust these data for top-coding of high-income individuals, a problem that has grown more severe in the CPS over time.

The pattern of wages observed and the data limitations lead us to focus on two distinct periods: 1973 to 1980, when the wage premium associated with city size was falling, and 1985 (post–October) to 1988, when the premium was increasing and no significant changes in variable definitions were instituted.

Mean Values by City Size and Year

This section describes patterns in the mean values of the data used in the analysis below. Means for the variables analyzed are reported by city size for the first and last years of the two time spans examined (see table 1).

Looking across city size categories, one can see a number of differences in worker characteristics that could contribute to the observed wage disparity. For example, workers in large cities have more years of schooling, are more likely to be full-time employees, and are more likely to be male. Racial composition varies by city size, and "potential experience" (age minus years of schooling minus six) is low in larger cities.

Changes can also be seen in work-force composition over time. Average years of schooling increased everywhere, but less so in large MSAs. In 1973, workers in large MSAs averaged 1.5 more years of schooling than their non-MSA counterparts. This difference fell to 0.6 years by 1980 and then rose to just over 0.7 years by 1988. Note also that average potential experi-

11 Every year, the CPS reports a categorical measure of metropolitan area size. Unfortunately, we found this variable to be of little use because (1) the ranges of the categories changed from year to year and (2) for some years, there are inconsistencies between the categorical measure and other reported variables. Therefore, we used the metropolitan area status and name (in those cases where this information is provided) to classify MSAs.

TABLE 1

Mean Value of Worker Characteristics by City Size

	1973				1980				1985 (Oct.-Dec.)				1988			
	Non-MSA	Small MSA	Medium MSA	Large MSA	Non-MSA	Small MSA	Medium MSA	Large MSA	Non-MSA	Small MSA	Medium MSA	Large MSA	Non-MSA	Small MSA	Medium MSA	Large MSA
Sex (female = 1)	.420	.415	.414	.410	.456	.458	.452	.466	.486	.478	.475	.462	.491	.486	.484	.487
Race (nonwhite = 1)	.073	.096	.112	.137	.087	.114	.114	.232	.092	.102	.127	.225	.093	.112	.131	.245
Years of schooling	11.36	11.86	12.20	12.98	12.15	12.54	12.76	12.76	12.46	12.93	13.21	13.19	12.53	12.99	13.30	13.25
Full-time worker	.800	.807	.811	.818	.800	.809	.810	.825	.774	.799	.805	.833	.786	.806	.816	.836
Potential experience (age – school – 6)	19.72	18.78	17.97	19.50	18.12	17.74	17.34	18.21	18.26	17.24	17.33	17.68	18.77	17.51	17.39	17.85
White collar	.388	.469	.524	.533	.437	.512	.547	.574	.468	.571	.624	.626	.469	.577	.634	.633
Blue collar	.452	.386	.333	.325	.396	.324	.292	.262	.365	.283	.246	.238	.362	.277	.236	.229
Service occupations	.160	.145	.142	.143	.156	.148	.139	.146	.167	.145	.130	.137	.169	.146	.131	.138
ln (wage)	1.064	1.189	1.295	1.377	1.658	1.715	1.808	1.853	1.860	1.994	2.086	2.130	1.932	2.083	2.187	2.241
Number of observations	12,048	12,163	8,979	7,057	52,097	45,911	38,126	28,478	10,160	17,805	9,093	7,190	40,221	71,395	33,135	23,090

NOTE: Non-MSAs are nonmetropolitan areas; small MSAs are metropolitan areas with population less than 1 million; medium MSAs are metropolitan areas with population between 1 million and 3 million; large MSAs are metropolitan areas with population greater than 3 million.
SOURCE: Based on authors' calculations from CPS data.

ence dropped off overall between 1973 and the end of the decade, when it rebounded in non-MSAs but continued to decline or remained unchanged in the metropolitan areas.

In 1973, full-time workers constituted more of the labor force as city size increased, and this association grew stronger over time. Although women's presence in the labor force rose everywhere, there is no clear relationship between this change and city size. Minority representation also increased everywhere over the sample period, particularly in large MSAs between 1973 and 1980.

We also consider an individual's occupation by incorporating more than 40 nonagricultural job classifications in our analysis. For brevity, table 1 aggregates these classifications into three categories: blue collar, white collar, and service occupations. In all years, the concentration of white-collar jobs generally rises with city size, while the opposite usually holds for blue-collar and service occupations. In 1973, white-collar workers accounted for 53 percent of total employment in large MSAs, but only 39 percent in non-MSAs. By contrast, blue-collar workers accounted for less than 33 percent of employment in large MSAs, compared to 45 percent in non-MSAs. Over time, blue-collar workers' share of jobs declined, that of white-collar workers increased, and service jobs remained fairly stable. Despite the changing composition of occupations over time, the relative distribution of employment across city sizes held constant.

TABLE 2

Wage Equation Estimates by City Size

	1973				1980				1985 (Oct.-Dec.)				1988			
	Non-MSA	Small MSA	Med. MSA	Large MSA	Non-MSA	Small MSA	Med. MSA	Large MSA	Non-MSA	Small MSA	Med. MSA	Large MSA	Non-MSA	Small MSA	Med. MSA	Large MSA
Sex (female = 1)																
	−.226[a]	−.193	−.195	−.173[a]	−.204[a]	−.201	−.166[a]	−.138[a]	−.147[a]	−.139	−.099[a]	−.101[a]	−.135[a]	−.109[a]	−.098[a]	−.077[a]
	(.015)	(.014)	(.016)	(.018)	(.006)	(.006)	(.007)	(.003)	(.015)	(.034)	(.015)	(.017)	(.008)	(.005)	(.008)	(.010)
Race (nonwhite = 1)																
	−.128[a]	−.058	.004[a]	−.004[a]	−.049[a]	−.044	−.051	−.068[a]	−.059[a]	−.062	−.061	−.073	−.063[a]	−.055	−.077[a]	−.063
	(.016)	(.013)	(.015)	(.014)	(.006)	(.006)	(.006)	(.006)	(.014)	(.010)	(.013)	(.012)	(.007)	(.005)	(.007)	(.006)
Years of schooling																
	.044[a]	.044	.048[a]	.050[a]	.043[a]	.042	.046[a]	.046[a]	.052[a]	.049	.051[a]	.051[a]	.046[a]	.050[a]	.050[a]	.054[a]
	(.002)	(.002)	(.002)	(.002)	(.001)	(.001)	(.001)	(.001)	(.002)	(.002)	(.002)	(.002)	(.001)	(.001)	(.001)	(.001)
Full-time worker																
	.097[a]	.148[a]	.164[a]	.198[a]	.147[a]	.171[a]	.179[a]	.210[a]	.166[a]	.211[a]	.214[a]	.194[a]	.181[a]	.206[a]	.211[a]	.216[a]
	(.012)	(.011)	(.013)	(.014)	(.005)	(.005)	(.006)	(.007)	(.011)	(.009)	(.012)	(.015)	(.006)	(.004)	(.007)	(.008)
Potential experience (age − school − 6)																
	.028[a]	.030	.030[a]	.029	.025[a]	.028[a]	.031[a]	.028	.028[a]	.030[a]	.032[a]	.031[a]	.029[a]	.032[a]	.031[a]	.031[a]
	(.001)	(.001)	(.001)	(.001)	(.000)	(.001)	(.001)	(.001)	(.001)	(.001)	(.001)	(.001)	(.001)	(.000)	(.001)	(.001)
Experience sq. ÷ 100																
	−.043[a]	−.042	−.046	−.041	−.038[a]	−.043[a]	−.047[a]	−.040	−.037[a]	−.043[a]	−.045[a]	−.043[a]	−.041[a]	−.045[a]	−.045[a]	−.044[a]
	(.002)	(.002)	(.002)	(.002)	(.001)	(.001)	(.001)	(.001)	(.002)	(.002)	(.002)	(.003)	(.001)	(.001)	(.001)	(.001)
Sex • Experience																
	−.008[a]	−.006[a]	−.005	−.004	−.004[a]	−.004	−.006[a]	−.004[a]	−.005[a]	−.005	−.007[a]	−.006	−.005[a]	−.006[a]	−.006[a]	−.005
	(.001)	(.001)	(.001)	(.001)	(.000)	(.000)	(.000)	(.000)	(.001)	(.000)	(.001)	(.001)	(.000)	(.000)	(.000)	(.000)
Intercept																
	.805[a]	.822	.773	.736	1.281[a]	1.264	1.220[a]	1.231[a]	1.346[a]	1.422	1.429	1.406	1.460[a]	1.473[a]	1.486	1.458
	(.057)	(.044)	(.049)	(.054)	(.022)	(.021)	(.021)	(.025)	(.058)	(.034)	(.045)	(.052)	(.028)	(.017)	(.024)	(.029)
$\bar{R}^2$																
	.448	.466	.490	.488	.453	.485	.503	.480	.468	.503	.521	.481	.471	.504	.502	.493

a. For non-MSAs, indicates that coefficient is significantly different from zero; for other groups, indicates that coefficient is significantly different from non-MSA coefficient at the 10 percent confidence level.

NOTE: See table 1 for MSA size definitions. All regressions include 40 occupational dummies. Engineer is the omitted occupation. Standard errors are in parentheses.

SOURCE: Based on authors' calculations from CPS data.

IV. Decomposition of City-Size Wage Differentials and Changes

Estimates of Wage Structure by City Size

Estimates of returns to worker characteristics are obtained from separate ordinary least squares wage regressions for each city size group in each year on two measures of human capital: years of schooling and potential experience (the latter entered as a quadratic). Because women move into and out of the labor market more than do men, potential experience tends to overestimate true experience more for women. Therefore, we include an interaction between female and experience in order to allow pay for experience to differ between the sexes. In addition, we include dummy variables indicating whether a worker is a full-time employee, female, nonwhite, and in any of 40 occupations.

Parameter estimates by city size and year are reported in table 2. Consistent with previous research, we find that for all size classes, white men are paid more than women and minorities, while more experience, more schooling, and full-time status are all associated with higher

earnings. These effects are still present after controlling for the 40 occupations.

Beyond these similarities, estimates of returns to worker characteristics often differ significantly by city size, indicating higher returns in larger cities for the usual measures of skill. For every year, F-tests reject the hypothesis of identical wage structures across city size groups at the 1 percent confidence level. These tests also reject the hypotheses of identical intercepts and identical slopes given different intercepts at the 1 percent level. Furthermore, t-tests reject the hypothesis of equal coefficients for a large number of pairwise comparisons between city size groups in all years, particularly for the coefficients on full-time status, sex, and years of schooling.

In 1973, the wage premium received by full-time workers was almost 20 log points in large MSAs, but less than 10 points in non-MSAs. Over time, this premium increased everywhere, but particularly in the non-MSAs, where it doubled to 18 log points. In large cities, the premium rose by just under two points between 1973 and 1988.

After controlling for other observed characteristics, we find that women's pay tends to increase with city size: The differential between large MSAs and non-MSAs ranges from 4.5 percent to 6.5 percent. While minority workers in non-MSAs earned 12 percent less than their urban counterparts in 1973, this differential disappeared by 1980.[12]

These estimates also reveal sizable differences in returns to schooling across city size groups. The estimated increase in wages associated with each additional year of schooling was 0.5 percentage points higher in large MSAs than in non-MSAs in 1973. This implies that the estimated wage of a high school graduate (12 years of schooling) was 6 percent higher, ceteris paribus, in large cities than in non-MSAs.

The well-documented decline in returns to schooling during the 1970s and the subsequent increase during the 1980s is also evident from our estimates. However, because we control for occupation, the pattern is not very strong.[13] In the 1970s, the economic returns to schooling fell most severely in large MSAs. During the following decade, these returns rose in all city size groups, although not in lockstep. By 1988, returns to education had clearly risen most in large MSAs, where a worker with a high school degree earned about 10 percent more than his or her rural counterpart.

These results are particularly striking because they are obtained while controlling for occupation. In results not reported here, the sizes of coefficients on education and experience, and their association with city size, are seen to rise when occupation dummies are excluded from the model. Thus, the role of the occupation dummies is consistent both with the interpretation of occupation as a control for human capital, and with our conclusion that big cities reward human capital more highly.

Intentionally omitted from these regressions are controls for employer characteristics, such as industry, firm size, and establishment. Although these factors are important determinants of wages (Groshen [(1991a, 1991b)], we exclude them to make our results more comparable with previous work and to restrict the focus of this paper to the role of human capital characteristics in the city-size wage gap. Investigation of the contribution of demand-side influences is left to future research.

Components of City-Size Wage Differentials

In this section, we examine how the differences in worker characteristics and in estimated characteristic prices discussed above contribute to total observed wage differences among cities of different sizes. As previously noted, we can consider the wage differential between large and small cities as being composed of two portions: one reflecting intercity differences in average worker skills, and one reflecting intercity differences in the price associated with those skills. The decomposition of the wage differential into these two components using equation (2) is reported in the top panel of table 3. For each year considered, the top row reports the total wage gap between the largest MSAs and the non-MSAs, the large and medium MSAs, the medium and small MSAs, and the small MSAs and non-MSAs.

The next three rows of the table show decompositions of the four wage gaps listed above.[14] Each row uses one of the three alternative bases for the decomposition. Note that the base used has almost no effect on our qualitative results:

■ **12** The relatively large absolute value for the coefficient on race in the 1973 non-MSA wage equation is not an aberration of the data for that particular year. This coefficient increased steadily from 1973 until 1978, when it peaked near zero. It then fell to about 5 percent, stayed there until 1988, and fluctuated between 5 percent and 7 percent through the remainder of the decade.

■ **13** See Bound and Johnson (1989).

■ **14** These decompositions are based on the coefficient estimates reported in table 2, which also gives standard errors for each coefficient. However, there is currently no method for constructing confidence intervals around the decompositions performed in table 3.

TABLE 3

Explaining the Wage Gap between Large MSAs and Non-MSAs

	1973				1980				1985 (Oct.-Dec.)				1988			
	Large-Non-MSA	Large-Med.	Med.-Small	Small-Non-MSA	Large-Non-MSA	Large-Med.	Med.-Small	Small-Non-MSA	Large-Non-MSA	Large-Med.	Med.-Small	Small-Non-MSA	Large-Non-MSA	Large-Med.	Med.-Small	Small-Non-MSA
$ln(\text{wage}_B) - ln(\text{wage}_S)$	.313	.082	.106	.125	.195	.044	.093	.058	.270	.044	.091	.134	.309	.054	.104	.151
Portion due to differences in worker skills																
$\beta_B(X_B - X_S)$	.081	.010	.023	.037	.045	–.001	.017	.021	.079	–.001	.036	.042	.080	.000	.035	.043
$\beta_S(X_B - X_S)$	.060	.010	.018	.036	.031	–.001	.015	.020	.073	.001	.034	.039	.066	–.002	.033	.038
$\beta(X_B - X_S)$	.071	.010	.020	.037	.038	–.001	.016	.021	.076	.000	.035	.041	.073	–.001	.034	.040
Portion due to differences in wage structure																
$X_B(\beta_B - \beta_S)$	.253	.072	.088	.089	.164	.046	.079	.021	.197	.043	.057	.095	.243	.055	.071	.114
$X_S(\beta_B - \beta_S)$	.232	.072	.083	.088	.150	.046	.076	.037	.191	.045	.055	.092	.230	.054	.070	.109
$X(\beta_B - \beta_S)$	.242	.072	.085	.088	.157	.046	.077	.036	.194	.044	.056	.094	.236	.054	.071	.111
Years of schooling																
Means: $\beta_B(X_B - X_S)$	.037	–.006	.016	.028	.028	.000	.010	.016	.038	–.001	.015	.023	.036	–.002	.015	.023
Returns: $X_S(\beta_B - \beta_S)$	.075	.028	.053	–.001	.036	–.003	.051	–.010	–.012	.001	.028	–.041	.061	.002	.003	.058
Other demographic variables																
Means: $\beta_B(X_B - X_S)$	.013	.018	–.002	–.001	.011	.001	–.001	–.003	.000	.002	.002	–.003	–.007	.001	.000	–.008
Returns: $X_S(\beta_B - \beta_S)$	.154	.044	.015	.097	.108	.027	.035	.046	.067	–.015	.028	.052	.078	.026	–.003	.055
Occupation mix																
Means: $\beta_B(X_B - X_S)$	.031	–.002	.009	.016	.021	–.003	.008	.008	.041	–.002	.015	.022	.050	.054	.019	.028
Returns: $X_S(\beta_B - \beta_S)$	.072	.037	.068	–.025	.056	.011	.037	.018	.076	.081	.028	.008	.093	.001	.058	–.002
Intercept	–.069	–.038	–.049	.017	–.050	.010	–.044	–.017	.060	–.024	.007	.077	–.003	–.029	.014	.013

NOTE: See table 1 for MSA size definitions. β_B is wage structure of larger MSA; β_S is wage structure of smaller MSA; X_B is mean characteristics of larger MSA; X_S is mean characteristics of smaller MSA.

SOURCE: Based on authors' calculations from CPS data.

We find that differences in wage structure (that is, the higher returns to skills in large cities reported in table 2) account for 70 to 80 percent of the gap between big-city and small-city wages, regardless of the year, the city sizes compared, or the base chosen.

Over time, the proportion of the total wage differential attributable to differences in worker characteristics remains fairly constant, ranging from 20 percent to 30 percent, while the importance of differences in worker attributes decreases as we compare progressively larger cities.

The bottom panel of table 3 reports a more-detailed decomposition of the wage gaps using a single base. These seven rows allow us to examine the extent to which schooling, other demographic variables, occupation, and the intercept contribute to the city-size wage differential.

In every year except 1985, education is the single most important human capital characteristic in explaining differences in wages between large MSAs and non-MSAs, even controlling for major occupational group. In each year, schooling accounts for approximately one-third of the wage gap between these two size categories. In general, more education in bigger cities explains about 30 percent of the gap, while higher returns to schooling there account for the other 70 percent. Although overall differences in schooling returns and means are not important between large and medium MSAs, they do come into play in the other size comparisons.

Occupation mix also accounts for a large (and increasing) portion of the differential, a result of differences in both job mix and occupational wage structures across cities. The individual contributions of the other human capital measures are relatively small, so we aggregate them into the category "other demographic variables." Although considerable variation over time is apparent, these factors contribute to the city-size wage gap primarily through intercity differences in prices paid for these characteristics, not through differences in supply.

The differences in intercepts estimated here show no clear pattern across city size or time, which we interpret to mean that the intercepts mainly capture unsystematic omitted factors, such as overall price levels in individual cities.[15] In addition, because these differences are usually small and frequently negative, we find that the terms included in the regression are capable of explaining most or all of the city-size wage gap. This, in turn, implies that the bulk of the gap is due to higher remuneration of some worker attributes in larger cities. That is, for the lowest-skilled workers, we observe no consistent city-size wage gap at all.

In summary, we find that average wages are higher in large cities than in small ones throughout the time period examined. The most important factor behind this disparity is differences in wage structure, suggesting that skills obtained through education, experience, and occupational training are more highly rewarded in larger cities.

Changes over Time in the Components of City-Size Wage Differentials

Although wages in large cities are consistently higher than in small ones, the size of this premium varies considerably over time. As noted above, the wage gap between large MSAs and non-MSAs fell from more than 30 log points in 1973 to less than 20 log points in 1980, then widened throughout the remainder of the decade. We now turn our attention to examining the sources of these changes over time.

The four components of changes in the wage differential between large and small cities are identified in equation (3a). The contributions of each of these components to the decline in the city-size wage gap between 1973 and 1980, and to the subsequent increase between 1985 and 1988, are presented in table 4. Note that, as was true for differences at each point in time, changes in wage structure (third and fourth rows) account for a larger portion of the change in relative wages over time than changes in skills (second and fifth rows). This is true across all size comparisons for both time periods, and also when broken down by worker characteristic.

Changes over time in the relative prices paid for worker skills in large MSAs and non-MSAs account for more than 70 percent of the decline in the wage differential between 1973 and 1980, and for more than 90 percent of the increase between 1985 and 1988. A rise in the average skills of workers in non-MSAs relative to those in large MSAs, perhaps related to the migration of skilled workers from large cities, accounts for the remainder of the decline between 1973 and 1980.

Overall, the portions of the decline in the wage gap between 1973 and 1980 that can be attributed to education, occupation, or other

15 In the decompositions performed here, the intercept estimates may reflect either the earnings patterns of the reference group, or mean earnings common to all workers stemming from factors omitted from the model, which are uncorrelated with the included regressors. If the latter, these estimates indicate how well our model captures the main determinants of city-size wage gaps. As usual, the reference group is fairly uninteresting (white, male, part-time engineers with zero years of education and experience).

TABLE 4

Components of Intertemporal Changes in Wage Differentials

	1973-1980				1985-1988			
	Large-Non-MSA	Large-Med.	Med.-Small	Small-Non-MSA	Large-Non-MSA	Large-Med.	Med.-Small	Small-Non-MSA
$[ln(\text{wage}_B) - ln(\text{wage}_S)]_t - [ln(\text{wage}_B) - ln(\text{wage}_S)]_{t-1}$	-.118	-.038	-.012	-.068	.040	.010	.013	.017
Portion due to changes in worker skill differential $\beta_{B,t}[(X_B - X_S)_t - (X_B - X_S)_{t-1}]$	-.027	-.001	-.003	-.015	-.004	-.001	-.003	-.002
Portion due to changes in relative wage structure $X_{S,t-1}[(\beta_B - \beta_S)_t - (\beta_B - \beta_S)_t]$	-.086	-.029	-.010	-.050	.038	.009	.014	.015
Portion due to universal change in wage structure $(\beta_{B,t} - \beta_{B,t-1}) * (X_{B,t} - X_{S,t})$	-.009	-.002	-.003	-.001	.005	.002	.001	.002
Portion due to universal change in worker skills $(\beta_{B,t} - \beta_{S,t}) * (X_{S,t} - X_{S,t-1})$	.004	.002	.003	-.001	.001	.000	.000	.001

NOTE: See table 1 for MSA size definitions. β_B is wage structure of larger MSA; β_S is wage structure of smaller MSA; X_B is mean characteristics of larger MSA; X_S is mean characteristics of smaller MSA.

SOURCE: Based on authors' calculations from CPS data.

TABLE 5

Sources of Intertemporal Changes in Wage Differentials

	1973-1980				1985-1988			
	Large-Non-MSA	Large-Med.	Med.-Small	Small-Non-MSA	Large-Non-MSA	Large-Med.	Med.-Small	Small-Non-MSA
$[ln(\text{wage}_B) - ln(\text{wage}_S)]_t - [ln(\text{wage}_B) - ln(\text{wage}_S)]_{t-1}$	-.118	-.038	-.012	-.068	.040	.010	.013	.017
Overall contribution of:								
Years of schooling	-.048	-.026	-.008	-.015	.072	.000	-.023	.095
Other demographic variables	-.063	-.032	-.023	-.054	.004	.038	-.034	.000
Occupation mix	-.026	-.028	-.033	.034	.027	-.023	.064	-.014
Intercept	.019	.048	.005	-.034	-.062	-.005	.006	-.064

NOTE: See table 1 for MSA size definitions. β_B is wage structure of larger MSA; β_S is wage structure of smaller MSA; X_B is mean characteristics of larger MSA; X_S is mean characteristics of smaller MSA.

SOURCE: Based on authors' calculations from CPS data.

demographic categories are fairly equal (tables 5 and 6). However, there are some differences in their relative importance *across* size classes. Years of schooling, for example, accounts for a relatively large part of the decline in the wage differential between large and medium MSAs, but explains relatively little of the drop-off between the other size classes. Similarly, changes in occupation mix and occupational wage structure during the 1970s actually worked to widen the small MSA/non-MSA earnings gap, but contributed to narrowing the gap between other city size categories.

It is interesting to note that the decline in returns to schooling during the 1970s was not uniform across cities of different sizes: Our estimates indicate that the downturn was most severe in the largest MSAs, where estimated returns fell by 10 percentage points. In contrast, returns to education fell only two to five percentage points in the smaller MSAs and non-MSAs (table 2). These diminished returns to schooling in the largest MSAs relative to the non-MSAs account for more than a quarter of the total decrease in the wage differential (.031 out of a total drop of .118) and completely swamp the effect of the general decline in returns to schooling (see table 6). If returns to schooling had fallen by the same amount in non-MSAs as in the large MSAs, and if the difference in average years of schooling had remained constant, the wage gap between these two size classes would have declined only one-third of 1 percent.

In brief, national trends toward increased levels of education and greater labor force participation among women and minorities had little effect on relative wages among cities, even though these attributes were rewarded differently across cities of different sizes. Similarly, national trends in the returns to specific skills contributed little to the changing differential, despite the unequal distribution of skills across cities. Changes in the relative skill mix of large and small cities, perhaps related to the selective nature of migration, accounted for a sizable portion of the decline in the wage gap during the 1970s, but contributed little to its expansion in the 1980s. The single most important factor in this decline/resurgence was the corresponding shrinkage and expansion of the city-size gap in prices paid for worker skills, a pattern driven chiefly by changes in city-size-related returns to both education and occupation.

TABLE 6

Components of Intertemporal Changes in Wage Differentials

	1973–1980				1985–1988			
	Large-Non-MSA	Large-Med.	Med.-Small	Small-Non-MSA	Large-Non-MSA	Large-Med.	Med.-Small	Small-Non-MSA
$[ln(\text{wage}_B) - ln(wage_S)]_t - [ln(\text{wage}_B) - ln(\text{wage}_S)]_{t-1}$								
	–.118	–.038	–.012	–.068	.040	.010	.013	.017
Portion due to changes in worker skill differential $\beta_{B,t}[(X_B - X_S)_t - (X_B - X_S)_{t-1}]$								
Total	–.027	–.001	–.003	–.015	–.004	–.001	–.003	–.002
Years of schooling	–.006	.005	–.006	–.005	–.001	–.001	.001	–.001
Other demographic variables	–.013	–.014	.002	–.003	–.009	–.002	–.003	–.004
Occupation mix	–.009	–.001	.001	–.007	.006	.003	–.001	.003
Portion due to changes in relative wage structure $X_{S,t-1}[(\beta_B - \beta_S)_t - (\beta_B - \beta_S)_t]$								
Total	–.086	–.029	–.010	–.050	.038	.009	.014	.015
Years of schooling	–.042	–.031	–.004	–.008	.073	.001	–.024	.095
Other demographic variables	–.046	.018	.021	–.051	.009	.039	–.031	.004
Occupation mix	–.017	–.027	–.032	.043	.018	–.026	.063	–.020
Intercept	.019	.048	.005	–.034	–.062	–.005	.006	–.064
Portion due to universal change in wage structure $(\beta_{B,t} - \beta_{B,t-1}) * (X_{B,t} - X_{S,t})$								
Total	–.009	–.002	–.003	–.001	.005	.002	.001	.002
Years of schooling	–.003	.001	–.001	–.001	–.001	.000	.000	.000
Other demographic variables	–.004	–.003	–.001	.001	.002	.001	–.001	.000
Occupation mix	–.002	.000	–.002	–.001	.003	.000	.002	.002
Portion due to universal change in worker skills $(\beta_{B,t} - \beta_{S,t}) * (X_{S,t} - X_{S,t-1})$								
Total	.004	.002	.003	–.001	.001	.000	.000	.001
Years of schooling	.002	–.026	.003	–.001	.000	.000	.000	.000
Other demographic variables	.000	.028	.000	.000	.001	.000	.000	.001
Occupation mix	.002	.000	.000	–.001	.000	.000	.001	.000

NOTE: See table 1 for MSA size definitions. β_B is wage structure of larger MSA; β_S is wage structure of smaller MSA; X_B is mean characteristics of larger MSA; X_S is mean characteristics of smaller MSA.

SOURCE: Based on authors' calculations from CPS data.

V. Summary and Conclusions

This paper examines wage differentials related to city size over the 1973–1988 period. We decompose the nominal city-size wage differentials across four size classes of cities into the portion due to differences in worker traits and the portion due to differences in wage structure. Our results show that differences in worker-attribute prices account for a larger share of city-size wage differentials than do intercity differences in the worker attributes themselves. In particular, the economic reward for attributes associated with skill, especially years of education and experience, rises with city size.

This finding suggests important structural differences among employers in cities of different sizes and is consistent with studies of regional wage differentials.[16] Different wage structures among cities also imply a new "stylized fact" about the city-size wage differential: It does not accrue uniformly to all workers in large cities. In fact, the estimates reported here suggest that it is received almost exclusively by workers with high education or experience and by those who are female or full-time employees.

Of course, we cannot be certain that all relevant differences in work forces among cities have been captured by the variables available in the CPS. If we have omitted any important determinants of workers' productivity correlated with their choice of city size, then our estimates overstate the role of price differences in the city-size wage gap. For example, Gerking and Weirick (1983) and Dickie and Gerking (1987) find that the importance of differences in worker characteristic prices may be overstated if data on these traits lack detail. Thus, examination of city-size wage differentials using either different information (for example, longitudinal or more-detailed data) or techniques to control for sample selection may be in order.

We also examine how differences in worker characteristics and in characteristic prices contribute to changes in the city-size wage gap over the sample period. Our analysis shows that movements in relative prices account for the majority of the change in the city-size wage premium over time. These findings are particularly interesting in light of the general "U-turn" path of wage inequality found by Bound and Johnson (1989) and others, and are consistent with studies of changes in regional wage differentials over time (see Farber and Newman [1987] and Eberts [1989]).

16 See Hanushek (1973, 1981), Sahling and Smith (1983), and Jackson (1986).

Furthermore, we find that a large portion of this intertemporal change is found in the human capital coefficients, particularly in returns to years of schooling. This conclusion is generally consistent with Eberts' (1989) finding that changes in broadly defined occupation coefficients account for virtually all of the change in characteristic prices across census regions. The overall similarities between the intertemporal patterns of wage differentials across broad census regions and across city size groups suggest that a more detailed exploration of the relationship between city size and regional wage differentials may yield interesting insights.

Although we do not attempt to estimate the relationship between wage structure and specific characteristics of areas, our findings have some important implications for such research. In particular, the variability we observe in worker-attribute prices over time suggests that the estimated prices of city-size-related area characteristics (pollution and congestion, for example) may be quite sensitive to the time period covered in the analysis.

Second, why is the city-size wage differential strongest among the most skilled workers? If agglomeration economies or other productivity-enhancing city attributes are the reason, then wouldn't the differentials be seen across a wide group of worker attributes? Perhaps some structural change has taken place in the larger cities, such as the concentration of more technical processes or the loss of routine jobs to rural areas.

Finally, the persistence of city-size-related wage premia suggests that it may be fruitful to examine these differentials in the context of an equilibrium location model such as the one found in Roback (1982). This type of analysis could address the relative importance of productivity and amenity differences as determinants of the city-size wage gap.

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