

Examining the Determinants of Earnings Differentials Across Major Metropolitan Areas

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It is widely reported that incomes differ across various states and cities. This paper explores the determinants of earnings of full-time workers across major metropolitan areas (this avoids the impact of the number of earners in a household or number of hours worked, which affects other measures of income). The relevant factors are discussed based on theory and a review of the literature. It was found that various forms of human capital as well as the industrial composition of the area helped to explain earnings differentials. Differences in the cost of living, using new data from the Bureau of Economic Analysis, was found to have some impact, though it was not fully incorporated into differences in nominal regional earnings.

INTRODUCTION

Most reports of income in the popular press tend to pertain to median household income. For example, the most recent report from the Census indicated that median household income in the United States in 2013, adjusted for inflation, was about 8% below the level that existed prior to the recession (Census, 2014). When one looks at changes in state-level data median household income from 2000 and 2012, even more dynamic changes are evident such as North Dakota rising from number 42 to number 17 while Delaware fell from number 7 to number 31.¹ In addition to changes across states over time, income differed significantly between states with median household income in Maryland being nearly twice as high as in Mississippi. Similarly, there is great variation across metropolitan areas. This raises several questions including is median household income the best gauge of income? Why are there such large differences in income in different parts of the country?

Though in some ways it may seem obvious that wages differ across metropolitan areas, in some cases this is not fully appreciated. For example, income thresholds for various government programs are uniform across the nation. Similarly, though some states have their own minimum wage, much of the debate centers on a single minimum wage for the nation as a whole. On the flip side, some point to high-wage areas and low-wage areas without adequately taking into account how differences in the cost of living impact the standard of living. Meanwhile, many local government officials explore policies that are intended to help create and/or attract high-wage jobs. This begs the question, why do some cities have relatively high average earnings while others tend to lag?

Understanding the various causes underlying geographic differences in income and earnings can have significant policy implications. Cities that are seeking to enhance the local standard of living through enhanced earnings potential would benefit from understanding the relative importance of alternative factors. For example, is the best way to increase the average income of the local population by

strengthening education or attracting high-paying industries? How much are differences in area incomes due to differences in the cost of living? Identifying the relative importance of each factor provides local policymakers useful information when formulating economic development policies.

LITERATURE REVIEW

Previous studies have explored various aspects of regional differences in income and earnings. DuMond, Hirsch, and Macpherson (1999) considered the role of differences in the cost of living in explaining interarea wage differentials by examining individual data from the Current Population survey. They find that nominal wages increase less than proportionately with the cost of living. They hypothesize that differences in the cost of living across metro areas partially reflects differences in the utility that people perceive they attain from living in a particular location. For example, people will pay more for housing to live in a desirable area; this will be reflected in the cost of living. In addition, they find that wages in large urban areas significantly exceed those in smaller urban areas. Their study also shows minor effects of various socioeconomic and demographic factors.

Carlino (1986) cites various factors when explaining differences in average wages in different regions including differences in the cost of living and industrial mix. He states that the average wage in a region may be relatively high if its industrial structure is dominated by relatively high-paying industries. Browne (1984) concurs, pointing out that differences in wages across industries tend to be quite high and helped explain high average wages in some Midwestern cities with large concentrations of employment in the transportation equipment industry. Johnson (1983) finds that education and experience significantly impact earnings differentials across metropolitan areas as does unionization.

Eberts (1989) show that dispersions in regional wages are sometimes due to differences in worker attributes and industrial composition across regions, but primarily result from differences in the return on such attributes. The worker attributes that played the largest role tended to be related to human capital (such as education and experience). Eberts and Schweitzer (1994) find evidence supporting the role of differences in the cost of living playing a significant role in changes in regional wage dispersion. However, they point out the differing perspectives of companies and workers. For workers, the local cost of living impacts their real wage (adjusted for local prices) and standard of living whereas for the company, the local cost of living is not that relevant. In addition, amenities, such as climate, may affect a worker's employment decision (for example, accept a somewhat lower wage to work in Florida). One implication is that differences in the cost of living may not be fully reflected in wage differentials. Winters (2009) finds that the elasticity between wages and prices is less than one unless one accounts for possible measurement error in the price level and uses rent to measure the cost of housing.

DESCRIPTIVE STATISTICS

The areas included in this study are metropolitan areas with populations in excess of one million people as of 2012 (53 cities). The source of most of the data was the American Community Survey for 2012, with the exception of the regional price parity index, which was obtained from the Bureau of Economic Analysis (2014). When it comes to data collection, the first issue to consider is which form of income to consider. In discussions of income, various data are cited including individual, household, and family income. Given that the focus of this study is the relative role of factors determining income in different locales, individual earnings is the most relevant measure of income. Since workers are paid as individuals, it is the most appropriate form of income to examine. To avoid differences due to hours worked, the data pertains to full-time workers. Earnings of individuals varied widely across metropolitan areas, ranging from a low of \$49,471 in Orlando, Florida to a high of \$87,677 in San Jose, California. The average for all metro areas considered was \$59,566 with a median of \$57,559. The standard deviation of \$8261 (almost 14% of the mean) confirms the variation of average earnings.

Up until recently, in order to assess differences in the cost of living at the local level, one had to rely on a variety of estimates by organizations such as the *Places Rated Almanac* or *Livability.com*. Beginning

in 2012, the Bureau of Economic Analysis (BEA) began to release spatial price indexes that account for price level differences across regions, known as *regional price parities*. The cost of living, as measured by the regional price parity (RPP), differed significantly across the country. With 1.00 being the benchmark for the United States as a whole, the RPP ranged from a low of 0.89 in Cleveland, Ohio to a high of 1.22 in San Jose, California. Both the mean and median were approximately one (as expected) while the standard deviation was 0.09.

Given data on nominal earnings and regional price level differences, one can estimate real earnings at the local level. After adjusting for the local price level, real average earnings still differed, but not nearly as much as nominal earnings, resulting in a standard deviation of \$5260 (compared to \$8261 for nominal earnings). The lowest average real earnings was in Riverside, California (\$48,387) while the highest was in San Jose, California (\$71,867).

A variety of factors, such as education, age, and industrial structure, may help explain differences in earnings. As is widely reported, college graduates earn considerably more than those without college degrees. For example, an analysis of Census data by JP Morgan indicated that college graduates earned 84% more than high school graduates in 2012 (cited in Weisenthal 2014). The percent of adults 25 and over with college degrees ranged from a low of 19.6% in Riverside, California to a high of 48.2% in Washington, D.C. The overall average was 32.5% with a median of 31.8% and standard deviation of 5.8%.

Earnings also tend to rise with age. According to the Bureau of Labor Statistics (BLS),² as of the second quarter of 2014, median weekly earnings of full-time workers rise with age as those aged 35-44 earn considerably more than those 25-34 while those 45-54 earn more than those 35-44. Average age had a mean of 37.0 years with a median of 36.6 and standard deviation of 2.3 years. The city with the youngest population was Salt Lake City (31.4 years) while the city with the oldest population was Pittsburgh, Pennsylvania (42.8 years). The most likely explanation for the positive relationship between age and earnings is that age serves as a proxy for experience.

Local average earnings may also differ due to differences in industrial structure since some industries tend to pay more than others. For example, according to the Bureau of Labor Statistics, hourly pay in professional and business services was more than double that of leisure and hospitality as of summer 2014.³ The industrial mix is measured by percentage of employment in relatively low-paying sectors, including retail trade and leisure/hospitality. Most cities had less than a quarter of their labor force in relatively low-paying industries with the exception of Las Vegas (42.5%) and Orlando (32.6%). New Orleans and Riverside were slightly above 25%. Cities with the smallest portion of employment in low-paying industries were Washington, DC (17.4%) and Hartford (17.8%). The average percent of employment in low-paying industries was 22.4% with a median of 21.8% (standard deviation was 3.6%).

TABLE 1
DESCRIPTIVE STATISTICS

	Mean	Median	Standard Deviation	Minimum	Maximum
Earnings	\$59,566	\$57,559	\$8261	\$49,471	\$87,677
Real Earnings	\$59,186	\$59,962	\$5260	\$48,387	\$71,867
College	32.5%	31.8%	5.8%	19.6%	48.2%
RPP	1.01	0.99	0.09	0.89	1.22
Industrial Mix	22.4%	21.8%	3.6%	17.4%	42.5%
Age	37.0	36.6	2.3	31.4	42.8

EMPIRICAL MODEL

What are the major determinants of wages? Human capital theory points to education and experience. Those with higher levels of education earn more than those with less education, being compensated for

higher levels of productivity. Given the wage premium earned by those with college degrees, the percent of the population aged 25 and over with college degrees was used to represent education. Similarly, those with more experience tend to earn more than those with more limited experience. Though it's difficult to gauge the average amount of experience in different regions, one can proxy it using the average age (i.e., a location with a higher average age is likely to have workers with more experience).

As pointed out in the literature review, the industrial composition of the local area is expected to have a noticeable impact; an area with a high proportion of higher-paying industries are likely to also have higher average wages. Though cost of living has been shown to have some effect on wage differentials, official data has been lacking. Recently, the Bureau of Economic Analysis has developed regional price parities (RPPs) for most metropolitan areas.⁴ As such, official data are now available to assess price differentials across metropolitan areas. A higher cost of living is expected to result in a higher local wage, but, as noted in the review of the literature, the relationship is likely to be less than one-for-one (i.e., local wages are unlikely to fully compensate for a higher local cost of living).

$$\text{Log (average earnings)} = B_0 + B_1 \text{ industrial composition} + B_2 \text{ college} + B_3 \text{ log(price)} + B_4 \text{ log(age)} + e \quad (1)$$

Where average earnings is the mean annual earnings of full-time workers as reported in the American Community Survey for 2012.⁵ This was chosen to avoid distortions introduced by alternative measures. For example, average earnings may include both full-time and part-time workers; a metro area with a relatively high share of part-time workers will have lower average annual earnings. To remove this effect, earnings of full-time workers were used. Other measures of income, such as household and/or family income, can be distorted by the number of wage earners in the household or family (as well as the lack of distinction between full-time and part-time workers). Industrial composition is the percent of employment in relatively low-paying industries such as retail trade and leisure/hospitality; B_1 is expected to be negative since having a disproportionately large share of jobs in low-paying industries is expected adversely affect average earnings. College is the percent of the local population age 25 and over with college degrees; B_2 is expected to be positive. Age is the average age of the local population; B_3 is expected to be positive as those with more experience tend to have higher earnings, other things equal. Price is the local cost of living as estimated by the regional price parity. B_4 is expected to be positive as companies are likely to compensate for higher costs of living, at least in part. As is customary in the literature (for example, see Dumond, Hirsch, and Macpherson, 1999), both earnings and price were expressed in logarithmic form (as was age). As such, the coefficients on both price and age can be interpreted as elasticities (i.e., the percent change in mean earnings resulting from a one percent increase in the respective variable). Since the remaining variables (college and industry) are percentages, the coefficients of each can be interpreted as the percent change in mean earnings resulting from a one percentage point change in the respective variable. The model as described in equation was estimated and the results were as follows:

TABLE 2
MODEL OF EARNINGS

	Coefficient	Standard Error	Level of Significance
constant	9.832	0.439	0.00
college	0.013	0.002	0.00
industry	-0.005	0.002	0.03
Log(age)	0.239	0.115	0.04
Log(Regional price parity)	0.573	0.104	0.00

As seen in table 2, college and regional price parity were significant at the 1% level while age and industry were significant at the 5% level. The adjusted R^2 was 0.84, confirming the explanatory power of model. The results indicate that a 1% increase in the regional price parity for a particular metropolitan area results in a 0.6% increase in the mean nominal earnings. Therefore, nominal earnings do not compensate for differences in the cost of living between areas, once other factors are taken into account. Thus, a city with mean earnings of \$60,000 that experience a one percent increase in its regional price parity would see nominal earnings rise to \$60,600, though real earnings would decline by just over 0.4%.

A one percentage point increase in the number of adults with college degrees results in a 1.3% increase in mean earnings. Thus, a city like Orlando with 27.8% of adults with college degrees is predicted to experience achieve more than a 6% gain in mean earnings if it could bring the rate of adults with college degrees to the sample average of 32.5% (an increase of 4.7 percentage points). This would result in mean earnings rising from \$49,470 to \$52,493, an increase of more than \$3000. A one percentage point reduction in amount of low-paying industries would result in a 0.53% increase in mean earnings. Thus, if Orlando (a city with a relatively high proportion of employment in low-paying industries) could reduce the portion of low-paying industry jobs from 32.6% to the sample average of 22.4%, mean earnings would rise by 5.35% to \$52,119, a gain of \$2650.

SUMMARY AND CONCLUSIONS

Income and earnings vary considerably across the United States. Several factors play a role including differences in the cost of living, human capital, and industrial structure. Which factor has the largest impact? The empirical results of the model suggests that no one factor stands out. The percent of adults with college degrees plays a significant role as evidenced by a one-percentage point increase in degree holders results in a 1.3% increase in mean earnings. This helps explain why metropolitan areas with a high proportion of college grades, like Boston and Washington, D.C., also have mean earnings more than two standard deviations above the overall average while cities with low ratios of college grads, such as Las Vegas, are two standard deviations below the average earnings. Mean earnings in Las Vegas are also hurt by the disproportionate amount of jobs in low-paying industries (particularly leisure and hospitality), which was shown to significantly reduce average earnings (each one percentage point increase in employment in low-paying industries result in a 0.53% decline in mean earnings). As with education, Washington, D.C. also benefits from a small portion of low-paying industries.

Until recently, there had been no official data available for measuring local price levels for most metropolitan areas. With the introduction of regional price parities by the Bureau of Economic Analysis in 2012, one can better identify the behavior of cost of living at the local level. Similar to previous studies, it was found that differences in the local cost of living are only partially incorporated in local earnings. Each one percent increase in local prices result in a 0.57% increase in mean earnings. Two possible reasons are proposed for this phenomenon. First, some of the reasons for differences in local price levels are treated as amenities; for example, living in a particular area may be considered highly desirable, resulting in higher housing prices and thus a higher local price level. Also, while workers may consider the wage adjusted for the local cost of living, companies are seeking to reduce costs compared to elsewhere (thus, the local cost of living is not directly relevant).

ENDNOTES

1. <http://www.advisorperspectives.com/dshort/updates/Household-Incomes-by-State.php>
2. <http://www.bls.gov/news.release/wkyeng.t03.htm>
3. <http://www.bls.gov/news.release/empst.t19.htm>
4. http://www.bea.gov/newsreleases/regional/rpp/rpp_newsrelease.htm
5. <https://www.census.gov/acs/www/>

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