Metropolitan vs. Non-Metropolitan Trends in Earnings Inequality and Education Returns in the 8th District: 1970-2000

Christopher H. Wheeler*
Research Division
Federal Reserve Bank of St. Louis
411 Locust Street
St. Louis, MO 63102

christopher.h.wheeler@stls.frb.org

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Abstract: This paper documents evidence that the rise in wage inequality observed in the states of the Federal Reserve's 8th District between 1970 and 2000 had a strong metropolitan component. During this time frame, the earnings gaps between workers belonging to different educational attainment groups and between those belonging to the same groups widened more extensively within the District's metropolitan areas than within smaller local labor markets. Some possible explanations, including changes in industrial composition and increases in the demand for highly educated workers are discussed.

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I. Introduction

One of the most salient features of the aggregate U.S. labor market in recent decades has been a large increase in the degree of earnings disparity across workers. Just focusing on white males between the ages of 18 and 65, for instance, the 90th percentile of the weekly wage distribution was 3.7 times as much as the 10th percentile in 1970. By 2000, this ratio had risen to 5.5.[1]

A similar trend, not surprisingly, has been witnessed in the seven states of the Federal Reserve's 8th District where the 90-10 wage percentile ratio increased from a factor of 3.7 to approximately 5.2 over the same 30-year period. As shown in Table 1, this increase - much of which took place during the 1980s - has been characterized by both a rising gap between the top and middle of the weekly wage distribution (i.e. the ratio of the 90th percentile to the 50th) and increasing disparity between the middle and bottom (i.e. the ratio of the 50th to the 10th).

Table 1: Wage Inequality – 8th District

Year	90-10 Ratio	90-50 Ratio	50-10 Ratio
1970	3.71	1.79	2.1
1980	3.94	1.79	2.18
1990	5.05	2.03	2.48
2000	5.21	2.23	2.34

Source: Author's calculations using Census public use samples (see Appendix).

In part, this rise in wage dispersion can be linked to changing patterns of skill prices, particularly the returns to educational attainment. Between 1970 and 2000, the gaps between the average weekly wages of workers with different levels of education increased markedly. This result can be seen from Table 2 which reports the estimated premia received by workers belonging to each of four educational categories – no high school (0 to 8 years), some high school (9 to 11 years), some college (13 to 15 years), and college (16 or more years) – relative to those with a high school degree only, based on regressions of log weekly wages on indicators for these four educational attainment levels.[2]

While in 1970, high school graduates earned approximately 32 percent (28 "log points") more than workers with no high school completed, by 2000, they earned 39 percent (33 log points) more.[3] Even more striking, however, is the premium paid to

[1] Throughout, the analysis focuses on white males between the ages of 18 and 65, who worked at least 14 weeks in the past year, and earned at least 67 dollars per week (in 1982 dollars). This is done to remove any influence of race or gender and to eliminate the effects of workers without a strong attachment to the labor force, whose contribution to the calculations may vary dramatically with the business cycle (and thus not represent a long run trend).

[2] More precisely, these estimates are derived from regressions (estimated by ordinary least squares) of log weekly wages on four educational attainment indicators as well as eight experience indicators for the groups 6-10 years, 11-15 years, 16-20 years, 21-25 years, 26-30 years, 31-35 years, 36-40 years, 41 or more years.

[3] Percentage differences are calculated by exponentiating the estimated coefficients and then subtracting 1. For small coefficients, the percentage and "log point" differences are approximately equal.

workers with a four-year college degree or more. In 1970, college graduates earned 51 percent (41 log points) more than high school graduates. In 2000, they earned 80 percent (59 log points) more.

Table 2: Estimated Education Premia (relative to HS) – 8th District

Variable	1970	1980	1990	2000
No HS	-0.28 (0.006)	-0.32 (0.007)	-0.36 (0.01)	-0.33 (0.006)
Some HS	-0.12 (0.006)	-0.16 (0.006)	-0.22 (0.008)	-0.2 (0.004)
Some College	0.12 (0.007)	0.1 (0.006)	0.17 (0.006)	0.18 (0.002)
College	0.41 (0.007)	0.35 (0.006)	0.54 (0.006)	0.59 (0.003)
Metro Dummy	0.22 (0.004)	0.17 (0.004)	0.17 (0.004)	0.17 (0.002)

Source: Author's calculations using Census public use samples (see Appendix). Standard errors appear in parentheses.

Given such large increases in the wage gaps between educational attainment groups, it is not surprising that the overall distribution of wages has grown more disperse over time. Indeed, the results from Table 1 follow naturally from those in Table 2, at least in a qualitative sense.

II. Inequality Trends by Metro Status

Underlying these widely-documented aggregate patterns, however, is less well-known feature: namely, a large difference between the experiences of metropolitan areas and non-metropolitan areas.[4] Taking the same data used to compute the inequality figures reported above in Table 1, dividing the sample into workers residing in metropolitan areas and those living outside of metropolitan areas, and repeating the inequality calculations separately for these two groups produces the results shown in Table 3.

Table 3: Wage Inequality by Metro Status – 8th District

Year	90-10 Ratio		90-50 Ratio		50-10 Ratio	
	Metro	Non-metro	Metro	Non-metro	Metro	Non-metro
1970	3.25	3.6	1.75	1.72	1.86	2.1
1980	3.9	3.94	1.79	1.9	2.18	2.08
1990	4.95	4.48	2.01	2.03	2.48	2.2
2000	5.37	4.3	2.2	1.99	2.44	2.14

Source: Author's calculations using Census public use samples (see Appendix).

[4] Metropolitan areas are defined by the U.S. Office of Management and Bugdet as core areas containing substantial population nuclei (50,000 or more inhabitants) along with adjacent communities having strong economic and social integration with those nuclei. Metro areas, therefore, should be viewed as particularly large urban agglomerations rather than any non-rural area.

While it is apparent that, within *both* metropolitan and non-metropolitan labor markets, there has been an increase in all three wage gaps, the increases have been much larger within metro areas.

Consider, again, the ratio of the 90th percentile to the 10th. In 1970, this ratio was actually higher outside of metropolitan areas than inside of them: 3.6 as opposed to 3.25. By 2000, the situation had been reversed as the metropolitan 90-10 ratio reached 5.37 – representing a 65.2 percent increase - whereas the non-metropolitan figure had only grown 19 percent to 4.3.

This result, it should be added, is not simply the product of metropolitan areas in some states leaving those in other states behind (i.e. growing inequality between the metro area dwellers in different states, say Illinois vs. Arkansas). In fact, a remarkably similar pattern holds when each of the seven states of the 8th District is considered individually.[5]

Table 4 shows 90-10 wage ratios by state and metro status. Although the extent of the difference between metropolitan and non-metropolitan inequality differs by state, the same fundamental pattern belongs to just about all. Metropolitan labor markets witnessed a more extensive widening of the earnings distribution than non-metropolitan markets.

Table 4: 90-10 Wage Ratios by State and Metro Status

State	Area	1970	1980	1990	2000
Arkansas	Metro	3.63	4.14	4.48	5.1
	Non-metro	3.46	3.71	4.48	4.57
Illinois	Metro	3.32	3.74	5.05	5.58
	Non-metro	3.16	3.63	4.39	4.22
Indiana	Metro	2.97	3.56	4.57	4.81
	Non-metro	2.97	3.39	4.35	4.06
Kentucky	Metro	3.19	3.82	5.26	5.47
	Non-metro	4.39	4.39	5.16	4.71
Mississippi	Metro	4.71	4.44	4.81	4.85
	Non-metro	3.78	4.01	4.71	4.48
Missouri	Metro	3.16	3.78	4.81	4.95
	Non-metro	3.82	4.06	4.18	4.22
Tennessee	Metro	3.56	4.31	5.37	5.31
	Non-metro	3.6	3.71	4.18	4.31

Source: Author's calculations using Census public use samples (see Appendix).

III. Education Returns by Metro Status

In light of the results shown above regarding skill returns, growing gaps between workers of different educational attainment levels seems a likely candidate as an

[5] There is one outlier, Mississippi, which experienced a larger increase in its non-metropolitan wage inequality over this time frame. Nonetheless, the degree of inequality in the metro areas of the state remained higher in each of the years than what was observed in non-metro areas.

explanation for the differential changes in metro and non-metro earnings inequality. Modifying the analysis performed above to account for differences in the educational attainment premia between metropolitan and non-metropolitan workers does indeed reveal significant differences between the two. The estimated coefficients from regressions of log weekly wages on four educational attainment indicators and their interactions with a metropolitan-area dummy appear in Table 5.[6]

Two features are particularly notable. First, the urban wage premium – that is, the wage boost received by metropolitan area residents relative to their (observationally equivalent) non-metropolitan area counterparts – has not been constant across education groups in any of the years considered.

Table 5: Estimated Education Premia (relative HS) by Metro Status – 8th District

Variable	1970	1980	1990	2000
No HS	-0.33 (0.01)	-0.33 (0.01)	-0.33 (0.02)	-0.29 (0.01)
Some HS	-0.15 (0.01)	-0.17 (0.01)	-0.22 (0.01)	-0.2 (0.01)
Some College	0.11 (0.01)	0.09 (0.01)	0.16 (0.01)	0.16 (0.005)
College	0.4 (0.01)	0.33 (0.01)	0.46 (0.01)	0.47 (0.006)
Metro Dummy	0.1 (0.01)	0.06 (0.01)	0.05 (0.02)	0.04 (0.01)
Metro-No HS	0.09 (0.01)	0.03 (0.01)	-0.05 (0.02)	-0.06 (0.01)
Metro-Some HS	0.04 (0.01)	0.02 (0.01)	-0.003 (0.02)	-0.007 (0.01)
Metro-Some College	0.02 (0.02)	0.01 (0.01)	0.02 (0.01)	0.03 (0.006)
Metro-College	0.02 (0.02)	0.04 (0.01)	0.12 (0.01)	0.15 (0.006)

Source: Author's calculations using Census public use samples (see Appendix). Standard errors appear in parentheses.

In 1970, for instance, these urban wage premia - which can be calculated as the sum of the metro dummy and its interactions with the educational attainment indicators - range from 12 percent for workers with at least some education at the college level to 19 percent for workers with only 0 to 8 years of schooling.[7] Thus, at the beginning of this sample time frame, workers with low levels of education actually experienced the largest boost from metropolitan area residence.

By the end of this 30 year period, however, the situation had changed drastically. In 2000, the premium earned by college graduates in metro areas relative to college graduates in non-metro areas had reached 19 percent while that received by workers with no high school education had dropped to -2 percent.

The second notable feature follows from this first observation. Over time, the returns to education have evolved very differently when comparing these two types of labor markets. The estimated education premia for non-metro workers – again, relative to a worker with a high school degree only – follow rather simply as the coefficients on

[6] As before, a set of work experience indicators is included in the regression. Here, the interactions of these experience dummies with the metropolitan residence dummy are also added to the list of regressors.

[7] For high school graduates, the urban wage premium is simply given by the estimated coefficient on the metro dummy.

the educational attainment indicators which appear in the first four rows of Table 5. The premia for workers residing in metro areas are then given by the sum of these non-metro premia and the interaction terms appearing in the last four rows of Table 5.

Table 6: Implied Metro and Non-metro Premia (relative to HS) – 8th District

Level	Area	1970	1980	1990	2000
No HS	Metro	-0.24	-0.3	-0.38	-0.35
	Non-metro	-0.33	-0.33	-0.33	-0.29
Some HS	Metro	-0.11	-0.15	-0.22	-0.21
	Non-metro	-0.15	-0.17	-0.22	-0.2
Some College	Metro	0.13	0.1	0.18	0.19
	Non-metro	0.11	0.09	0.16	0.16
College	Metro	0.42	0.37	0.58	0.62
	Non-metro	0.4	0.33	0.46	0.47

Source: Author's calculations using Census public use samples (see Appendix).

The implied figures are summarized in Table 6. Quite clearly, while both metro and non-metro labor markets have seen the wage gaps between workers with different levels of education increase, those gaps have grown larger within metropolitan areas. The premium earned by a worker with a high school degree only relative to a high school dropout in 1970, for instance, was 11 percent in metropolitan areas, 15 percent outside of them. In 2000, it had risen to 21 percent in metro areas, 20 percent in non-metro areas.[8]

Even greater is the difference at the top end of the educational attainment distribution. Consider the college-high school gap which, in 1970, was essentially the same between the two: 52 percent (42 log points) in metro areas, 49 percent (40 log points) in non-metro areas. After a decline during the 1970s – a result which is often attributed to a large increase in the supply of college graduates relative to the demand from employers – the premium rose to 60 percent (47 log points) outside of metropolitan areas, but 86 percent (62 log points) within them.

A qualitatively similar pattern emerges when the college-high school gap is estimated separately for each of the states in the 8th District. Although there is somewhat greater statistical noise in these estimates than those for the District as a whole due to smaller sample sizes – particularly for small states in 1970 (e.g. Arkansas and Mississippi) – the results, which appear in Table 7, show a remarkably consistent pattern, particularly after 1980. In each state, the gap between workers with a college degree and those with only a high school degree widened more extensively in metropolitan regions than beyond their borders.

[8] Recall, for these relatively small coefficients, the log point and percentage differences are roughly equal.

Table 7: Implied Metro and Non-Metro College-HS Premia by State

State	Area	1970	1980	1990	2000
Arkansas	Metro	0.48	0.43	0.76	0.67
	Non-metro	0.5	0.38	0.52	0.51
Illinois	Metro	0.42	0.36	0.58	0.63
	Non-metro	0.37	0.24	0.35	0.43
Indiana	Metro	0.38	0.31	0.49	0.54
	Non-metro	0.48	0.27	0.41	0.43
Kentucky	Metro	0.4	0.39	0.52	0.64
	Non-metro	0.34	0.31	0.46	0.51
Mississippi	Metro	0.58	0.34	0.49	0.56
	Non-metro	0.35	0.4	0.53	0.46
Missouri	Metro	0.43	0.35	0.54	0.58
	Non-metro	0.33	0.4	0.46	0.44
Tennessee	Metro	0.43	0.42	0.64	0.65
	Non-metro	0.46	0.38	0.53	0.54

Source: Author's calculations using Census public use samples (see Appendix).

IV. Some Possible Explanations

What might account for these patterns? Although by no means exhaustive, there are three prominent features of the 8th District states that may have contributed significantly to these trends.

First, the industrial composition of the District has experienced a large shift away from manufacturing, moving increasingly toward business, repair, and professional services (e.g. accounting, medical and legal services, education). This shift, as it turns out, has been particularly pronounced within metropolitan areas. Table 8 shows how the fraction of total employment in each of these two industry categories has changed in the metro and non-metro parts of the 8th District states.

While between 1970 and 2000 manufacturing's share declined from 33.1 percent to 25.4 percent of non-metropolitan employment, it fell from 30.7 percent to 17 percent of metropolitan employment. These decreases were essentially offset by increases in the shares of workers employed in services.

Such industrial restructuring may be relevant for understanding changing inequality and education returns because it represents a movement away from a sector in which less educated workers have traditionally found employment to one in which employees tend to be more highly educated. In 1970, for instance, roughly three quarters of the employees in manufacturing had no more than a high school degree. Among workers in the business, repair, and professional services, the figure was less than half: 44 percent. As both types of local economies, but particularly metropolitan ones, have changed over time, employment opportunities have decreased for workers with less education while growing rapidly for the college educated.

Table 8: Selected Characteristics by Metro Status – 8th District

Variable	Area	1970	1980	1990	2000
% Manufacturing	Metro	30.7	26	19.7	17
	Non-metro	33.1	30.4	27.5	25.4
%Business-Repair-Professional Services	Metro	19.7	23.7	27.5	32.7
	Non-metro	18.7	20.3	22.9	26.7
% College Degree	Metro	12.3	17.9	23.6	27.7
	Non-metro	8.9	10.8	12.7	14.6

Source: Author's calculations using Census public use samples (see Appendix).

Second, in addition to the shift toward industries with more educated workers, there has been a general increase in the extent to which *all* industries have employed college educated workers. The average change in the fraction of total employment taken across 30 industry groups (including nearly all two-digit manufacturing in addition to all other industries at an approximate one-digit level – see the Appendix for a list) between 1970 and 2000 was 13 percentage points within the metropolitan areas of the 8th District, 5 percentage points in the non-metro areas.

Evidently, there has been an increase in the demand for college-educated workers *within* most industries which, itself, was particularly pronounced in metropolitan areas. Some have speculated that this additional boost in the demand for the highly educated relative to the less educated has been driven by the increased use of information technology in the workplace.[9]

Whatever the true cause, rising demand would certainly help to explain why, as shown in Table 8, the fraction of total employment accounted for by college educated workers has increased so dramatically in metro areas – 12.3 percent in 1970 to nearly 28 percent in 2000. The fact that, in spite of this especially large increase in the supply of highly educated workers in metropolitan labor markets, the metro-college premium remains higher than the non-metro college premium is suggestive of a particularly large demand shift for these workers in the District's largest urban agglomerations.

Third, union activity has shown a gradual decline in the 8th District as well as in the U.S. as a whole. Between 1970 and 2000, each of the District's seven states saw a decline in the fraction of its employed (non-farm) labor force belonging to a union: 0.157 to 0.059 for Arkansas, 0.332 to 0.187 for Illinois, 0.399 to 0.157 for Indiana, 0.254 to 0.122 for Kentucky, 0.15 to 0.061 for Mississippi, 0.255 to 0.133 for Missouri, 0.238 to 0.089 in Tennessee.[10]

Because prior research has shown that union activity tends to equalize labor earnings across workers, thereby compressing the distribution of wages, a decrease in

[9] See, for example, Daron Acemoglu, "Technical Change, Inequality, and the Labor Market," *Journal of Economic Literature*, Volume 40, March 2002.

[10] Calculation of these figures is described by Barry T. Hirsch, David A. Macpherson, and Wayne G. Vroman in "Estimates of Union Density by State," *Monthly Labor Review*, Volume 124, Number 7, July 2001. The statistics are reported at www.unionstats.com.

unionization is likely to contribute to greater dispersion in the earnings distribution.[11] Of course, whether there has been a significant difference in how union activity has changed within metro areas as opposed to non-metro areas is uncertain. Data from the Current Population Survey indicates that, between 1983 and 2000, metropolitan declines in unionization were larger than non-metropolitan declines in only three of the seven 8th District states (Arkansas, Mississippi, and Missouri). Given the nearly uniform trends with respect to metro vs. non-metro inequality, this finding casts some doubt on unionization as an important explanation.[12]

V. Within-Group Inequality Patterns

Although rising inequality is certainly related to changing education premia, there is an additional component that many studies have suggested is even more important.[13] Suppose one were to look at the degree of wage dispersion across workers belonging to the same educational attainment level, possessing the same amount of work experience, and working in the same occupation and industry – that is, the degree of inequality *within groups*.

Statistically, this is accomplished by means of a regression of log wages on education, experience, occupation and industry indicators, and then looking at the distribution of what remains unexplained – the residuals. Performing this exercise produces the results given in Table 9 which reports 90-10, 90-50, and 50-10 ratios using the 90th, 50th, and 10th percentiles of the distribution of residual wages.

Table 9: Residual Wage Inequality by Metro Status – 8th District

Year	90-10 Ratio		90-50 Ratio		50-10 Ratio	
	Metro	Non-metro	Metro	Non-metro	Metro	Non-metro
1970	2.56	2.86	1.57	1.62	1.63	1.77
1980	2.89	3.03	1.65	1.7	1.77	1.79
1990	3.32	3.32	1.77	1.77	1.88	1.88
2000	3.6	3.32	1.88	1.79	1.92	1.88

Source: Author's calculations using Census public use samples (see Appendix).

Two aspects of the results stand out. First, the changes in the ratios themselves are not as large as those reported using weekly wages, indicating that differences in observable characteristics such as educational attainment and industry of work explain part of the rise in inequality. Between 1970 and 2000, for example, the 90-10 within-group ratio expanded by 40.6 percent within metro areas, 16 percent in non-metro areas.

[11] For a discussion of the link between de-unionization and wage inequality, see Nicole M. Fortin and Thomas Lemieux, "Institutional Changes and Rising Wage Inequality: Is There a Linkage?" *Journal of Economic Perspectives*, Volume 11, Number 2, Spring 1997.

[12] CPS data are described in the Appendix.

[13] See, for example, Chinhui Juhn, Kevin M. Murphy, and Brooks Pierce, "Wage Inequality and the Rise in Returns to Skill," *Journal of Political Economy*, Volume 101, Number 3, 1993.

Recall, the overall 90-10 ratios discussed previously increased by 86 percent and 19 percent for metro and non-metro areas, respectively.

Second, as can be seen from these particular figures, there has been a larger increase in each ratio within metropolitan areas than outside of them. Thus, not only have metropolitan labor markets witnessed larger increases in the gaps between workers of different education levels than non-metropolitan areas, they have also seen the gulf between workers with the same observable characteristics grow faster.

VI. Conclusion

An important feature of the rise in earnings inequality in the states of the Federal Reserve's 8th District over the last three decades has been the role of metropolitan labor markets which have seen particularly large increases in the gaps both between and within educational attainment groups. When combined with the growing concentration of the District's population and employment located in metropolitan areas – a figure that has risen steadily from roughly two thirds to nearly three quarters between 1970 and 2000 – such results may signal continued increases in wage dispersion in the coming decades.

VII. Appendix

The data used in the analysis are drawn from four public use samples of the U.S. Census – the 1970 1 Percent Form 2 State Sample, the 1980 1 Percent Metro (B) Sample, the 1990 1 Percent Metro Sample, and the 2000 5 Percent State Sample – available at www.ipums.umn.edu. See S. Ruggles and M. Sobek et al., *Integrated Public Use Microdata Series: Version 3.0*, Historical Census Projects, University of Minnesota, 2003 for a description. Numbers of observations on white male workers used for the 8th District analysis are 50142 for 1970, 60596 for 1980, 62150 for 1990, 312455 for 2000.

The 30 industries examined when calculating within-industry changes in the fraction of college-educated workers employed are: (1) agriculture, forestry, fishing; (2) mining; (3) construction; (4) transportation; (5) telecommunications; (6) utilities; (7) wholesale trade; (8) retail trade; (9) finance, insurance, real estate; (10) business and repair services; (11) personal services; (12) professional services; (13) public administration; (14) wood products; (15) furniture and fixtures; (16) stone, clay, glass products; (17) metals industries; (18) machinery; (19) transportation equipment; (20) instruments; (21) miscellaneous; (22) food and kindred; (23) tobacco; (24) textiles and apparel; (25) paper; (26) printing and publishing; (27) chemicals; (28) petroleum; (29) rubber products; (30) leather products.

To compute unionization rates for 1983 and 2000, the Current Population Survey's Merged Outgoing Rotation Groups files were used. Metropolitan and non-metropolitan rates were calculated using the union membership and metropolitan area status variables.