I Z A Institute of Labor Economics

Initiated by Deutsche Post Foundation

DISCUSSION PAPER SERIES

IZA DP No. 13970

Problem on the Plains: College Earnings Premiums in Small Metropolitan Areas

John V. Winters

DECEMBER 2020

I Z A Institute
of Labor Economics
Initiated by Deutsche Post Foundation

DISCUSSION PAPER SERIES

IZA DP No. 13970

Problem on the Plains: College Earnings Premiums in Small Metropolitan Areas

John V. Winters
Iowa State University, CARD, PSMME and IZA

DECEMBER 2020

ISSN: 2365-9793

IZA – Institute of Labor Economics

Schaumburg-Lippe-Straße 5–9
53113 Bonn, Germany
Phone: +49-228-3894-0
Email: publications@iza.org
www.iza.org

ABSTRACT

Problem on the Plains: College Earnings Premiums in Small Metropolitan Areas*

I use the American Community Survey to examine how college earnings premiums differ across small metropolitan statistical areas (MSAs) in the U.S. I document that the West North Central Division (Plains Region) has especially low average college earnings premiums. Controlling for observable MSA characteristics via regression explains some of the difference between the Plains and other regions, but large and important differences remain. The low return to education for small MSAs in the Plains suggests that they will face special challenges building and retaining human capital in the near future. These areas may especially struggle to attract college-educated in-migrants.

JEL Classification: J20, J30, R10

Keywords: college earnings premiums, college graduates, human capital, returns to education

Corresponding author:
John V. Winters
Iowa State University
Department of Economics
460B Heady Hall
518 Farm House Lane
Ames, Iowa 50011-1054
USA

E-mail: winters1@iastate.edu

* The author thanks the Editor, two anonymous reviewers, and session participants at the North American Meetings of the Regional Science Association International for helpful comments on an earlier draft. The author thanks Seung Jin Cho and Jun Yeong Lee for excellent research assistance. The author received funding related to this project from the Thomas B. Fordham Institute and the Lumina Foundation. All findings, interpretations, and opinions are solely attributable to the author.

1. Introduction

Human capital plays an important role in labor market outcomes. Despite some notable criticisms and limitations, higher education is still viewed as an important path for an individual to achieve a higher income (Card 1999; Psacharopoulos and Patrinos 2004; Winters 2015; Webber 2016). However, the earnings premium accruing to college-educated workers depends on where they live (Black et al. 2009; Moretti 2013; Farrokhi and Jenkins 2019; Winters 2020). The financial returns to higher education have also increased over time and spatial differences in college premiums have intensified (Diamond 2016; Murphy and Topel 2016; Autor 2019). In particular, the college premium is greater in large and densely populated metropolitan areas, consistent with knowledge and skills being especially complementary with urban agglomeration (Glaeser and Mare 2001; Berry and Glaeser 2005; Glaeser and Resseger 2010; Abel et al. 2012; Abel and Deitz 2019; Davis and Dingel 2019). While big cities receive the bulk of the academic attention in this literature, there are also important but largely overlooked differences in college earnings premiums in less populous areas.

The current study examines regional differences in college earnings premiums across small metropolitan statistical areas (MSAs). I define small MSAs as those with a 2010 Census population of less than 500,000. Small MSAs are important to study for several reasons. First, more than 70 percent of MSAs in the U.S. have population less than 500,000, and small MSAs collectively include more than 56,000,000 people. Second, small MSAs differ from their larger counterparts in many important ways, especially related to human capital levels and incomes. There are important concerns that less populous areas are struggling to attract skilled workers, and these difficulties may increase over time. Finally, small MSAs are often overlooked and understudied, and there is a critical gap in the research literature on how college earnings premiums differ across small MSAs.

I use data from the 2014-2018 American Community Survey (ACS) to define the college earnings premium in each MSA as the ratio of mean earnings for college graduates and high school graduates. I define regions based on divisions from the U.S. Census Bureau. I first document that the college earnings premium in small MSAs is uniquely low in the West North Central division, which includes the states of Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, and South Dakota. The West North Central is also referred to as the Plains Region by the Bureau of Economic Analysis (BEA), and I use these terms interchangeably. To my knowledge, this particularly low college earnings premium for small MSAs in the Plains states has not been well documented or well known.

The Plains Region differs from others in some important ways that may influence college earnings premiums in small MSAs. First, the Plains Region is in the interior of the U.S. and especially far away from the Atlantic and Pacific coasts. The industrial structure also differs somewhat, with Plains MSAs having greater connection to agriculture, which may especially benefit high school graduates. Somewhat unexpectedly, the Plains Region MSAs also have relatively high employment concentrations in finance, higher percentages of college graduates, and lower mean population among small MSAs.

I also use multivariate regression analysis to examine the roles that various local characteristics play in the especially low college earnings premium for small MSAs in the Plains Region. MSA population size, geographical remoteness, natural amenities, workforce demographics, industrial structure, occupation structure, human capital levels, and local housing rents collectively explain less than half of the college earnings premium differential between small MSAs in the Plains and the rest of the U.S. The bulk of the difference remains unexplained.

The low college earnings premium has important implications for small MSAs in the Plains Region. Individuals are expected to be responsive to earnings opportunities when making educational decisions and migration decisions. The low earnings premiums for college graduates may deter some young people from investing in higher education if they want to reside in these areas. Perhaps more troubling, the higher college earnings premiums elsewhere may make it especially difficult for small MSAs in the Plains Region to attract and retain workers with a college education (Wozniak 2010; Winters 2017).

2. Conceptual Background

Before examining the data, I first provide background on the role of education in worker incomes. In modern labor markets, workers are paid primarily based on their productivity. Workers who are more productive contribute more value to their employers per unit of time because they have greater knowledge, skills, and abilities. Because productive workers are valuable to employers, the employers will compete for them in labor markets and bid up wages and salaries. The more productive that a worker is, the more firms will be willing to pay them and the higher their incomes will be in competitive labor markets.

Individuals can invest time, energy, and financial resources to improve their knowledge, skills, and abilities; these investments represent human capital and formal education is the most prominent example (Card 1999). Early education is compulsory, and the great majority of young people in the U.S. complete education through high school. However, only about one-third of young people complete a bachelor's degree or higher education (Winters 2018). Many more begin college but leave without earning a degree. Higher education is associated with higher productivity and higher incomes. Higher education has also been suggested to provide other benefits including better health, higher life satisfaction, and better marriage outcomes (Ma et al. 2016). Of course, the observed relationship between education and earnings is likely at least partially affected by ability signaling (Spence 1973).

The supply, demand, and equilibrium wages for workers of a particular education level differ across areas because of access to complementary inputs and agglomeration economies (Davis and Dingel 2019). In particular, large and dense urban areas are expected to facilitate knowledge exchange that especially benefits high-skilled workers in knowledge-intensive industries. This results in college earnings premiums that increase with labor market size and density (Autor 2019; Winters 2020). For example, Winters (2020) reports that the average earnings premium for bachelor's degree holders relative to high school graduates is 55.8 percent in MSAs with population less than 0.5 million but 93.8 percent in MSAs with population greater than four million.

Differences in college earnings premiums also likely exist even among relatively small metropolitan areas, but there is relatively little known about these. Location shapes the industrial structure of an area, and demand for labor varies with industry in ways that can increase or decrease the income gap between workers with and without higher education. For example, local access to oil and gas resources is expected to especially increase demand for manual skills and lower college earnings premiums. Additionally, Farrokhi and Jinkins (2019) find that more geographically isolated MSAs have reduced demand for skilled labor and lower college earnings premiums. Black et al. (2009) suggest that non-homothetic preferences for housing and non-housing consumption lead to lower earnings gaps between high skilled and low skilled workers in high-amenity locations. Moretti (2013) argues that local areas with high percentages of highly skilled and highly educated workers facilitate human capital externalities that increase wages for all local workers but especially benefit less educated workers, which narrows the college earnings premium in highly educated MSAs. Other locational factors may also differentially affect the earnings of workers with different education levels and alter college earnings premiums.

3. Data and Regional Patterns

This study uses data from the 2014-2018 American Community Survey (ACS). The ACS is an annual survey of one percent of the U.S. population that includes information on employment, earnings, education, and demographics. I pool five years of data to increase estimate precision. I compute real mean earnings (adjusted for national inflation and converted to January 2019 dollars using the Consumer Price Index for All Urban Consumers (CPI-U) from the Bureau of Labor Statistics) for college graduates and high school graduates by metropolitan area and then define the earnings ratio for college relative to high school graduates; I often refer to this earnings ratio as the college earnings premium. Admittedly, education decisions are potentially endogenous, so the current study does not claim to estimate causal effects. I define college graduates as individuals whose highest education completed is a bachelor’s degree; I exclude persons with graduate degrees to increase consistency. I define high school graduates as persons whose highest education level is a high school diploma; I exclude persons with some college and persons with a GED to increase consistency. I also limit the analytical sample to persons born in the U.S. who were ages 25-59, worked 40+ hours per week for 50+ weeks during the previous year, and resided in the contiguous U.S.[1] The microdata were extracted via IPUMS (Ruggles et al. 2019).

Metropolitan statistical areas (MSAs) are not perfectly identifiable in the ACS microdata. Instead, the U.S. Census Bureau creates public use microdata areas (PUMAs) that can include part of a county, a single county, or multiple adjacent counties. To protect respondent confidentiality, PUMAs are defined to have a population of at least 100,000 people. Some PUMAs include both a metropolitan and non-metropolitan portion. I assign a PUMA to an MSA if more than half of the PUMA population lives in the MSA. This results in some assignment error, but the overall error percentage is relatively small.[2] I define an MSA as small if its 2010 Census population is less than 500,000. All MSAs must have an urban core population of at least 50,000. My sample includes 266 small MSAs.

This study focuses on average differences across U.S. Census Bureau divisions. Division boundaries are illustrated in Figure 1; states are referenced by two-letter abbreviations. A full list of states with their Census divisions is provided in Appendix Table A1. Most MSAs are fully within a single Census division. For the few MSAs that cross divisional boundaries, I assign them to the division in which the majority of the MSA population resides.

Table 1 reports real mean earnings for small MSAs by Census division for college graduates and high school graduates along with the earnings ratio for college relative to high

[1] The ACS only reports weeks worked the previous year in somewhat broad intervals for part-year workers, which prevents me from computing hourly earnings for part-year workers. Younger and older workers may have limited attachment to the labor market, with young workers still in school and some older workers semi-retired. The returns to education for immigrants likely depend on where they completed their education and how long they have been in the U.S. Thus, I limit the sample to full-time, full-year workers in primary working ages who were born in the U.S. Workers residing outside the contiguous U.S. are excluded because of their unique location and lack of data on the natural amenities included as control variables below.

[2] Of the 382 MSAs in 2010, nine small MSAs are unmatched because no PUMA is assigned to them. Of the other 373 MSAs, the average match error is less than 15 percent. The average match error is slightly higher for small MSAs but still less than 20 percent. The main results below are qualitatively robust to excluding MSAs with very high match error rates.

school. Table 1 shows that mean earnings in small MSAs are particularly high in the New England and Pacific divisions for both college graduates and high school graduates. Mean earnings for college graduates are lowest in the West North Central, East South Central, and South Atlantic. Mean earnings for high school graduates are lowest in the East South Central and South Atlantic. I do not adjust earnings for spatial cost of living differences because of the numerous complications including capitalization of local amenities. Furthermore, earnings levels are not the primary focus. Instead, I focus on the earnings ratio between college and high school graduates.[3]

The bachelor's to high school graduate earnings ratio for small MSAs varies across Census divisions with the highest ratios in the Pacific (1.608), South Atlantic (1.599) and East South Central (1.596). The lowest earnings ratio is in the West North Central (1.400). The second lowest earnings ratio is for the West South Central (1.521). Thus, the gap between the lowest two divisions is larger than the gap between the second lowest and the highest division. The West North Central is clearly an outlier compared to other divisions with an especially low earnings ratio between college and high school graduates in small MSAs. The West North Central also differs markedly from the neighboring East North Central, which has a much higher college earnings premium (1.559), higher mean earnings for college graduates, and lower mean earnings for high school graduates.

While the current analysis does not focus on larger MSAs (those with a population above 500,000), I did examine them briefly in results not shown and found that the college earnings premium for larger MSAs in the Plains Region is very close to the national average for larger

[3] In the regression analysis discussed below, I control for natural amenities such as climate and topography and mean housing rents.

MSAs. Thus, the especially low college earnings premium for small MSAs in the Plains Region is unique to small MSAs.

A number of factors are possible explanations for the particularly low college earnings premium for small MSAs in the Plains Region. Notice that the especially low college earnings premium for the West North Central in Table 1 is mechanically due to both 1) having the lowest mean earnings for college graduates and 2) having the fifth highest (out of nine) mean earnings for high school graduates. The relatively high earnings for high school graduates may reflect an industrial structure that is especially tied to natural resource development including agriculture and mining and involves a greater demand for manual skills that increases earnings for high school graduates more than college graduates. It may also reflect greater geographic remoteness, agglomeration economies, human capital levels, and numerous other factors that may differ between small MSAs in the West North Central and other divisions. The next section outlines the multivariate regression framework used to test various hypotheses.

4. Regression Framework

I estimate linear regressions of the form:

$$EarningsRatio_m = \alpha WestNorthCentral_m + \beta X_m + \varepsilon_m \quad (1)$$

, where $EarningsRatio_m$ is the earnings ratio between college and high school graduates in MSA m. $WestNorthCentral_m$ is an indicator variable equal to one for MSAs in the West North Central division, X_m is a vector of MSA characteristics, and ε_m is a mean zero error term. I weight regressions via the sum of ACS survey weights for college and high school graduates in the microdata analytic sample. I report standard errors that are heteroscedasticity robust.

The coefficient on the $WestNorthCentral_m$ dummy variable in equation (1), α, measures differences between the region of interest and the rest of the U.S. I start with a model with no MSA controls and then add increasingly dense MSA controls to examine how they affect α. I first control for the log of MSA population in 2010 and the log of population-weighted geographic remoteness. Even among small MSAs, population differences may explain some of the regional differences in the college earnings premium, with greater population expected to increase the earnings ratio. I measure geographic remoteness similarly to Farrokhi and Jinkins (2019). Specifically, I compute a generalized weighted mean of distance between metropolitan area m and all other areas indexed by j:

$$Remoteness_m = \left(\sum_j \omega_j d_{mj}^{1-\sigma}\right)^{\frac{1}{1-\sigma}} \quad (2)$$

, where ω_j is the weight for area j and d_{mj} is the physical distance between m and j. I use year 2010 county population for ω_j and set $\sigma = 4$ following Farrokhi and Jinkins (2019). Greater remoteness is expected to lower the college earnings premium.

I next add a set of controls for demographic characteristics of the high school and college graduate workforce in each MSA. Specifically, I add variables for the mean age and the percentages that are female, Black, Native American, Asian, Hispanic and Other Non-White among the analytic sample; these are constructed separately for high school and college graduates. I include controls for six natural amenity variables measuring January temperature, January sunlight, July temperature, July humidity, topography, and area covered by water; these were obtained from the United States Department of Agriculture (USDA) Economic Research Service (ERS) and described in McGranahan (1999). I control for the local industrial structure by combining industries into 14 groups and adding education-group specific variables for the percentage of workers employed in each industry. I control for the occupational structure of the

MSA via education-group specific percentages of workers in seven broad occupation groups. I control for the percentage of the local workforce who are college graduates and the percentages of college graduates educated in seven broad college major groups.[4] Finally, I control for the log of mean housing rents in the MSA. Some of these control variables involve particularly strong concerns about endogeneity, so I estimate various regressions with increasingly dense controls and include the occupation, education, and housing variables last.

To help consider the potential importance of MSA characteristics for explaining the especially low college earnings premium for the West North Central (WNC) Division in Table 1, Table 2 reports explanatory variable means for small MSAs in the WNC and other divisions for variables with statistically significant differences in means between the two. Local characteristic variables with insignificant differences between the WNC and other divisions are excluded to conserve space. Some of the differences in Table 2 are modest, but many are quite pronounced and potentially important. In particular, the West North Central small MSAs have lower mean log MSA population, higher mean log remoteness, and lower mean log housing rents; these are all factors that could potentially help explain the especially low college earnings premium. WNC small MSAs also have lower mean January temperatures, higher mean January sunlight, lower mean July relative humidity, and lower mean percentage water area; however, the expected effects of these natural amenities on the college earnings premium is unclear *a priori*. The WNC has a higher percentage of college graduates, but a lower share of STEM graduates

[4] The l4 industries are agriculture, mining, construction, manufacturing, transportation and utilities, wholesale, retail, finance, business services, personal services, recreation services, professional services, public services, and military; professional services is the excluded industry category for the analysis. The seven occupation groups are 1) managerial and related; 2) professional specialty; 3) technical, sales, and administrative support; 4) personal, protective, and related services; 5) farming related; 6) skilled trades, mechanics, and repairers; and 7) machine operators and laborers; the last group is the excluded occupation. The seven college major groups are 1) science, technology, engineering, and mathematics (STEM); 2) business; 3) education; 4) health; 5) liberal arts; 6) social sciences; and 7) all other; education is the excluded college major variable.

and higher shares of education majors (and the all other college majors group); STEM graduates are typically much more highly paid than education majors. There is also previous research suggesting that STEM graduates generate human capital externalities that increase local productivity and wages for other workers in the same area (Winters 2014). The WNC has a higher percentage of white workers among both college graduates and high school graduates. WNC small MSAs have higher agriculture employment shares among both college and high school graduates, but the overall employment shares in agriculture are relatively small in both groups of MSAs, so this is unlikely to be a major factor explaining differences in college earnings premiums. The most pronounced industry difference is that WNC college graduates have higher employment shares in finance; however, finance is a relatively high-paying industry so this seems unlikely to explain the low college earnings premium for the WNC. The WNC also has a lower share of college graduates employed in professional specialty occupations, which are typically high-paying and often tied to STEM, and could explain some of the difference in college earnings premiums. The remaining industry and occupation differences in Table 2 are less noteworthy.

To further explore differences between the West North Central and other divisions, I also estimate additional regressions of the form:

$$EarningsRatio_m = \gamma DivisionDummies_m + \beta X_m + \varepsilon_m \qquad (3)$$

, where $DivisionDummies_m$ is a vector of eight division dummies for the Census divisions excluding the West North Central. By making the West North Central the excluded category, equation (3) compares each Census division to the West North Central. Thus, it provides a closer look at how the West North Central differs from each other division.

5. Regression Results

Results for equation (1) are presented in Table 3. The West North Central (WNC) indicator variable is statistically significant in all four columns, which include progressively more controls. With no control variables in Column (1), the WNC indicator variable has a coefficient of -0.165, which means that the college-to-high school earnings ratio is 16.5 percentage points lower in small MSAs in the Plains states than the average for small MSAs in the rest of the U.S. Adding controls for log MSA population and log remoteness reduces the WNC coefficient magnitude to -0.120 in Column (2). Adding natural amenity, demographic, and industry controls in Column (3) further reduces the coefficient magnitude to -0.113. Further adding controls for occupation, education, and log mean housing rents yields a WNC coefficient of -0.091 in Column (4). Thus, the control variables explain less than half of the difference in college earnings ratios between small MSAs in the West North Central and the rest of the U.S.

Table 4 presents results for equation (3) in which the West North Central division is the omitted category and eight indicators for the other Census divisions are included. With no controls in Column (1), all of the division dummy coefficients are large and statistically significant. The largest coefficient estimate is 0.210 for the South Atlantic followed by a 0.178 coefficient for the East South Central. Adding control variables typically reduces the division indicator coefficients relative to Column (1). In Column (4), the division coefficient estimates are all positive, but only four of the eight are statistically significant: East North Central, South Atlantic, East South Central, and West South Central. Thus, the control variables explain some of the differences in earnings ratios between the West North Central and other divisions, but not all; much of the difference remains, especially relative to other interior parts of the country.

For the control variables, log population has a consistently significantly positive coefficient, indicating that larger MSAs offer higher college earnings premiums even among small MSAs. The coefficient estimate for log remoteness is consistently negative as expected, but it is not statistically significant in the densest specifications. Log mean housing rent coefficients are small and not statistically significant. Results for additional control variables are reported in Table 5 and confirm that at least some of the demographic, natural amenity, industry, occupation, and education control variables have significant relationships with the college earnings premium in small MSAs. Among these control variables, especially notable results include the positive coefficients on the percentage of college graduates educated in STEM majors and the percentage of college graduates employed in professional specialty occupations. As indicated in Table 2, the WNC has low means for these two variables, and these low means for the WNC combined with the positive regression coefficients implies that these variables explain some of the raw difference in college earnings premiums. However, it should be reiterated that adding the full set of occupation and education controls only moderately reduces the WNC coefficient in Column (4) of Table 3. Thus, differences in occupation and college major distributions are contributing factors but not the driving forces behind the gap in college earnings premiums between the WNC and other divisions.

The preferred measure of the college earnings premium is the ratio of mean earnings for college graduates and high school graduates. The mean earnings ratio provides a single inclusive summary measure of differences throughout the earnings distribution. However, there is also some interest in looking at the ratio of median earnings for college graduates relative to high school graduates. Table 6 reports regression results similar to Table 3, but the dependent variable is instead the ratio of median earnings for college relative to high school.[5] The main results are largely similar whether we use mean earnings or median earnings for the college earnings premium. The West North Central coefficient is slightly smaller for median earnings, but it is still negative and statistically significant in all columns of Table 6, going from -0.135 in Column (1) to -0.074 in Column 4. Thus, even focusing exclusively on the median, the college earnings premium is much lower in the West North Central small MSAs.

6. Conclusion

Educational decisions are critically important for individuals and society. Higher education is on average a good investment, but there is substantial variation in the financial return to higher education across geographic areas. This paper examines regional differences in college earnings premiums across small metropolitan areas in the U.S. I measure the college earnings premium in each MSA as the ratio of mean earnings for college graduates and high school graduates. I document important differences across Census divisions with the West North Central having an especially low average college earnings premium in small MSAs. I then use regression analysis to control for a number of important factors including population, remoteness, demographic characteristics, natural amenities, industrial structure, occupation mix, human capital levels, and housing rents. The control variables combine to explain some of the difference between the West North Central and other divisions, but large and important differences remain unexplained. Small MSAs in the West North Central have especially low college earnings premiums across a range of specifications.

[5] I also report median earnings by division and education level in Appendix Table A2; median earnings are lower than mean earnings for all groups. The median earnings ratio is again the lowest for the West North Central.

The findings in this study strongly suggest that small MSAs in the Plains states reward higher education differently than in the rest of the country. This has major implications for education and migration decisions. The current study does not provide any specific policy recommendations. Instead, it argues that human capital policy is likely to be an especially important issue for the Plains states in the coming years and decades, even more so than for other regions, especially if the production complementarity between skills and urban agglomeration continues to strengthen. Policymakers and researchers should invest more in understanding the efficacy of various human capital policy levers for the Plains Region, in particular, and other regions more generally. While there is some useful literature on brain drain and brain gain for U.S. regions, the topic as a whole is underdeveloped and understudied relative to its importance for regional economic development.

The fact that many college graduates choose to reside in the Plains small MSAs despite the low college earnings premium suggests that they value other things about these areas, perhaps including their lifestyle, social networks, local community, low density, and quality public services. However, these factors may be more influential for persons with prior exposure to these positive attributes than for persons unfamiliar with these areas who are conducting national job searches. Individual workers likely have heterogeneous preferences for local amenities and these preferences may depend on prior experiences (Krupka 2009). For example, ice fishing, snowmobiling, and sledding are popular winter activities in the Plains states, but they are likely not as highly valued among persons who have only lived in regions with milder winters. Similarly, potential migrants likely have limited information about many attributes that affect the quality of life in a local area. Some attributes can be easily measured and researched, such as climate and proximity to mountains and beaches; the Plains Region does not rank especially well based on some of these metrics. Other local attributes are much more difficult to measure without experiencing them including the friendliness of potential neighbors, the lifestyle, and the quality of consumption amenities and public services. The Plains Region's local amenities may be relatively skewed toward quality of life attributes that are hard to measure. Thus, Plains Region small MSAs may especially struggle to attract newcomers, limiting the inflow of new people and new ideas. These areas can still thrive, but they will likely have to follow different economic paths than areas elsewhere that can easily attract skilled in-migrants.

References

Abel, J.R. and Deitz, R., 2019. Why are some places so much more unequal than others? Federal Reserve Bank of New York Economic Policy Review, 25(1), 58-75.

Abel, J.R., Dey, I. and Gabe, T.M., 2012. Productivity and the density of human capital. Journal of Regional Science, 52(4), 562-586.

Autor, D., 2019. Work of the past, work of the future. AEA Papers and Proceedings, 109, 1–32.

Berry, C.R. and Glaeser, E.L., 2005. The divergence of human capital levels across cities. Papers in Regional Science, 84(3), 407-444.

Black, D., Kolesnikova, N. and Taylor, L., 2009. Earnings functions when wages and prices vary by location. Journal of Labor Economics, 27(1), 21-47.

Card, D., 1999. The causal effect of education on earnings. In: Ashenfelter, O., Card, D. (Eds.), Handbook of Labor Economics, Vol. 3. Elsevier, pp. 1801-1863.

Davis, D.R. and Dingel, J.I., 2019. A spatial knowledge economy. American Economic Review, 109(1), 153-70.

Diamond, R., 2016. The determinants and welfare implications of us workers' diverging location choices by skill: 1980-2000. American Economic Review, 106(3), 479-524.

Farrokhi, F. and Jinkins, D., 2019. Wage inequality and the location of cities. Journal of Urban Economics, 111, 76-92.

Glaeser, E.L. and Mare, D.C., 2001. Cities and skills. Journal of Labor Economics, 19(2), 316-342.

Glaeser, E.L. and Resseger, M.G., 2010. The complementarity between cities and skills. Journal of Regional Science, 50(1), 221-244.

Krupka, D.J., 2009. Location-specific human capital, location choice and amenity demand. Journal of Regional Science, 49(5), 833-854.

Ma, J., Pender, M. and Welch, M., 2016. Education pays 2016: The benefits of higher education for individuals and society. *Trends in Higher Education Series*. College Board. https://research.collegeboard.org/pdf/education-pays-2016-full-report.pdf

McGranahan D.A.. 1999. Natural amenities drive rural population change. Agricultural Economic Report No. (AER-781). United States Department of Agriculture, Economic Research Service.

Moretti, E., 2013. Real wage inequality. American Economic Journal: Applied Economics, 5(1), 65-103.

Murphy, K.M. and Topel, R.H., 2016. Human capital investment, inequality, and economic growth. Journal of Labor Economics, 34(S2), S99-S127.

Psacharopoulos, G. and Patrinos, H.A., 2004. Returns to investment in education: A further update. Education Economics, 12(2), 111-134.

Ruggles, S., Flood, S., Goeken, R., Grover, J., Meyer, E., Pacas, J., and Sobek, M., 2019. Integrated Public Use Microdata Series USA: Version 9.0 [dataset]. Minneapolis, MN: IPUMS. https://doi.org/10.18128/D010.V9.0.

Spence, M. 1973. Job market signaling. The Quarterly Journal of Economics 87(3), 355-374.

Winters, J.V., 2014. STEM graduates, human capital externalities, and wages in the US. Regional Science and Urban Economics, 48, 190-198.

Winters, J.V., 2015. Estimating the returns to schooling using cohort-level maternal education as an instrument. Economics Letters, 126, 25-27.

Winters, J.V., 2017. Do earnings by college major affect graduate migration? The Annals of Regional Science, 59(3), 629-649.

Winters, J.V., 2018. Do higher college graduation rates increase local education levels? Papers in Regional Science, 97(3), 617-638.

Winters, J.V., 2020. What You Make Depends on Where You Live: College Earnings across States and Metropolitan Areas. Thomas B. Fordham Institute: Washington, DC. https://fordhaminstitute.org/national/research/what-you-make-depends-on-where-you-live

Wozniak, A., 2010. Are college graduates more responsive to distant labor market opportunities? Journal of Human Resources, 45(4), 944-970.

Figure 1: Census Division Boundaries

Table 1: Mean Earnings for College and High School Graduates in Small MSAs by Division

Census Division	College Graduates	High School Graduates	Earnings Ratio
New England	81,022	52,166	1.553
Middle Atlantic	76,444	48,253	1.584
East North Central	72,663	46,598	1.559
West North Central	66,831	47,736	1.400
South Atlantic	69,339	43,370	1.599
East South Central	69,315	43,420	1.596
West South Central	71,353	46,924	1.521
Mountain	74,418	48,200	1.544
Pacific	82,353	51,218	1.608

Notes: Mean values are in January 2019 dollars and based on author computations using the 2014-2018 American Community Survey. High school graduates are persons whose highest education completed is a traditional high school diploma and excludes GEDs. College graduates are persons whose highest education is a bachelor's degree. The analysis is limited to workers ages 25-59 who were born in the U.S., work 40+ hours per week and 50+ weeks per year, and reside in the contiguous U.S. Small MSAs include the 266 metropolitan areas with 2010 Census population less than 500,000.

Table 2: Significantly Different Characteristics for the West North Central and Other Divisions

	WNC Mean	Other Mean	Difference
Log MSA Population	12.148	12.344	-0.196
Log Remoteness	-0.835	-1.177	0.342
Log Mean Housing Rents	6.740	6.833	-0.093
Mean January Temperature	21.011	36.846	-15.835
Mean January Sunlight	154.992	146.344	8.648
Mean July Relative Humidity	55.865	58.995	-3.130
Percentage of Area That Is Water	1.431	7.770	-6.339
Percent College Graduates	0.385	0.332	0.053
Percent BA Graduates STEM Majors	0.205	0.223	-0.018
Percent BA Graduates Education Majors	0.112	0.096	0.016
Percent BA Graduates "Other" Majors	0.062	0.049	0.013
Mean Age BA Grads	40.369	40.942	-0.573
% White BA Grads	0.949	0.850	0.099
% Black BA Grads	0.017	0.072	-0.055
% Asian BA Grads	0.004	0.008	-0.004
% Hispanic BA Grads	0.016	0.053	-0.037
% Other Non-White BA Grads	0.011	0.015	-0.004
% in Agriculture Industry BA Grads	0.023	0.015	0.008
% in Mining Industry BA Grads	0.003	0.008	-0.005
% in Construction Industry BA Grads	0.038	0.034	0.004
% in Finance Industry BA Grads	0.124	0.090	0.034
% in Personal Services Industry BA Grads	0.012	0.015	-0.003
% in Military Industry BA Grads	0.007	0.015	-0.008
% in Professional Specialty Occupations BA Grads	0.289	0.313	-0.024
% in Tech., Sales, and Admin. Occupations BA Grads	0.280	0.258	0.022
% in Farming Related Occupations BA Grads	0.019	0.012	0.007
Mean Age HS Grads	43.955	43.210	0.745
% Female HS Grads	0.334	0.345	-0.011
% White HS Grads	0.917	0.765	0.152
% Black HS Grads	0.034	0.126	-0.092
% Hispanic HS Grads	0.028	0.088	-0.060
% in Agriculture Industry HS Grads	0.047	0.026	0.021
% in Mining Industry HS Grads	0.009	0.016	-0.007
% in Construction Industry HS Grads	0.129	0.111	0.018
% in Wholesale Industry HS Grads	0.048	0.038	0.010
% in Retail Industry HS Grads	0.154	0.169	-0.015
% in Personal Services Industry HS Grads	0.019	0.025	-0.006
% in Recreation Services Industry HS Grads	0.007	0.010	-0.003
% in Services Occupations HS Grads	0.125	0.144	-0.019
% in Farming Related Occupations HS Grads	0.045	0.027	0.018

Notes: The sample is limited to Small MSAs. "Other Mean" refers to the mean for divisions other than the West North Central (WNC). Variables with insignificant differences between WNC and other divisions are excluded to conserve space.

Table 3: Regression Results of Earnings Ratio on WNC Dummy Relative to the Rest of the U.S.

	(1)	(2)	(3)	(4)
West North Central	-0.165***	-0.120***	-0.113***	-0.091***
	(0.022)	(0.025)	(0.034)	(0.033)
Log MSA Population		0.083***	0.054***	0.041**
		(0.021)	(0.018)	(0.020)
Log Remoteness		-0.083***	-0.043	-0.030
		(0.031)	(0.031)	(0.034)
Log Mean Housing Rents				0.002
				(0.094)
Natural Amenity Controls	No	No	Yes	Yes
Demographic Controls	No	No	Yes	Yes
Industry Controls	No	No	Yes	Yes
Occupation Controls	No	No	No	Yes
Education Controls	No	No	No	Yes
R-squared	0.09	0.19	0.63	0.70

Notes: The sample includes the 266 (small) metropolitan areas with 2010 Census population less than 500,000. The dependent variable is the earnings ratio between college graduates and high school graduates. Column (4) results for Natural Amenity, Demographic, Industry, Occupation, and Education controls are reported in Table 5. Heteroscedasticity robust standard errors are in parentheses.

** Significantly different from zero at the 5% level; *** Significant at 1% level.

Table 4: Regression Results of Earnings Ratio for Other Division Dummies Relative to WNC

	(1)	(2)	(3)	(4)
New England	0.137***	0.074*	0.058	0.055
	(0.042)	(0.040)	(0.054)	(0.058)
Middle Atlantic	0.154***	0.083**	0.119**	0.064
	(0.041)	(0.042)	(0.048)	(0.050)
East North Central	0.158***	0.096***	0.118***	0.085**
	(0.027)	(0.034)	(0.041)	(0.040)
South Atlantic	0.210***	0.162***	0.146***	0.110***
	(0.028)	(0.032)	(0.040)	(0.042)
East South Central	0.178***	0.129***	0.139***	0.110**
	(0.040)	(0.040)	(0.047)	(0.049)
West South Central	0.130***	0.100**	0.123**	0.112**
	(0.048)	(0.045)	(0.053)	(0.054)
Mountain	0.114**	0.119***	0.068	0.073
	(0.053)	(0.044)	(0.063)	(0.065)
Pacific	0.172***	0.113***	0.108	0.069
	(0.036)	(0.038)	(0.071)	(0.076)
Log MSA Population		0.082***	0.051***	0.039*
		(0.020)	(0.018)	(0.021)
Log Remoteness		-0.093**	-0.045	-0.041
		(0.036)	(0.034)	(0.036)
Log Mean Housing Rents				0.014
				(0.097)
Natural Amenity Controls	No	No	Yes	Yes
Demographic Controls	No	No	Yes	Yes
Industry Controls	No	No	Yes	Yes
Occupation Controls	No	No	No	Yes
Education Controls	No	No	No	Yes
R-squared	0.12	0.21	0.63	0.70

Notes: The sample includes the 266 (small) metropolitan areas with 2010 Census population less than 500,000. The dependent variable is the earnings ratio between college graduates and high school graduates. Column (4) results for Natural Amenity, Demographic, Industry, Occupation, and Education controls are reported in Table 5. Heteroscedasticity robust standard errors are in parentheses.

* Significantly different from zero at the 10% level; ** Significant at 5% level; *** Significant at 1% level.

Table 5: Results for Demographic, Amenity, Industry, Occupation and Education Controls in Full Models

	Table 3 Specification		Table 4 Specification	
	Coefficient	St. Err.	Coefficient	St. Err.
Mean Age HS Grads	-0.025**	(0.010)	-0.023**	(0.011)
Mean Age BA Grads	0.028***	(0.008)	0.027***	(0.008)
% Female HS Grads	0.453	(0.326)	0.465	(0.333)
% Female BA Grads	-0.627**	(0.248)	-0.664**	(0.258)
% Black HS Grads	0.446***	(0.168)	0.430**	(0.175)
% Native American HS Grads	-0.290	(0.395)	-0.323	(0.396)
% Asian HS Grads	-1.022	(1.483)	-1.175	(1.566)
% Hispanic HS Grads	-0.019	(0.154)	-0.026	(0.158)
% Other Non-White HS Grads	-2.129*	(1.259)	-2.101	(1.338)
% Black BA Grads	-0.912***	(0.247)	-0.895***	(0.255)
% Native American BA Grads	2.014	(1.488)	2.045	(1.569)
% Asian BA Grads	0.141	(1.068)	0.221	(1.141)
% Hispanic BA Grads	-0.057	(0.226)	-0.028	(0.231)
% Other Non-White BA Grads	-0.127	(0.952)	-0.047	(0.970)
Mean January Temperature	0.001	(0.001)	0.000	(0.002)
Mean January Sunlight	0.001**	0.0000	0.001*	0.0000
Mean July Temperature	0.004	(0.003)	0.003	(0.004)
Mean July Relative Humidity	0.0000	(0.001)	-0.001	(0.001)
Topography Score	0.001	(0.002)	0.001	(0.002)
Percentage of Area That Is Water	0.000	(0.001)	0.000	(0.001)
% in Agriculture Industry HS Grads	0.654	(1.175)	0.721	(1.239)
% in Mining Industry HS Grads	-1.846***	(0.572)	-1.807***	(0.619)
% in Construction Industry HS Grads	-0.672	(0.557)	-0.695	(0.566)
% in Manufacturing Industry HS Grads	-0.648*	(0.375)	-0.652*	(0.388)
% in Transport/Utilities Industry HS Grads	-0.794	(0.510)	-0.744	(0.512)
% in Wholesale Industry HS Grads	-1.921**	(0.781)	-1.938**	(0.781)
% in Retail Industry HS Grads	-0.426	(0.438)	-0.404	(0.461)
% in Finance Industry HS Grads	-0.498	(0.565)	-0.483	(0.574)
% in Business Services Industry HS Grads	-0.771	(0.593)	-0.696	(0.654)
% in Personal Services Industry HS Grads	-0.020	(0.703)	-0.001	(0.719)
% in Recreation Services Industry HS Grads	-0.790	(0.838)	-0.625	(0.898)
% in Public Services Industry HS Grads	-0.967*	(0.523)	-0.906*	(0.540)
% in Military Industry HS Grads	-1.451	(0.907)	-1.350	(0.999)
% in Agriculture Industry BA Grads	-1.457	(1.262)	-1.097	(1.348)
% in Mining Industry BA Grads	0.924**	(0.441)	0.874*	(0.468)
% in Construction Industry BA Grads	-1.083	(0.704)	-1.115	(0.707)
% in Manufacturing Industry BA Grads	0.305	(0.260)	0.322	(0.264)
% in Transport/Utilities Industry BA Grads	-0.023	(0.453)	0.017	(0.458)
% in Wholesale Industry BA Grads	0.205	(0.723)	0.230	(0.727)
% in Retail Industry BA Grads	0.288	(0.423)	0.301	(0.434)
% in Finance Industry BA Grads	-0.371	(0.299)	-0.331	(0.299)
% in Business Services Industry BA Grads	0.308	(0.468)	0.311	(0.480)
% in Personal Services Industry BA Grads	0.370	(0.968)	0.322	(0.967)
% in Recreation Services Industry BA Grads	1.219	(1.172)	1.199	(1.212)
% in Public Services Industry BA Grads	-0.195	(0.283)	-0.230	(0.313)
% in Military Industry BA Grads	2.037**	(0.864)	1.972**	(0.945)
% in Managerial and Related Occ. HS Grads	-0.873*	-0.456	-0.895*	-0.471
% in Professional Specialty Occ. HS Grads	-1.545*	-0.81	-1.639*	-0.835

% in Tech., Sales, and Admin. Occ. HS Grads	-0.022	-0.363	-0.004	-0.374
% in Services Occupations HS Grads	-0.238	-0.485	-0.201	-0.495
% in Farming Related Occ. HS Grads	-0.125	-1.237	-0.176	-1.268
% in Skilled Trades and Related Occ. HS Grads	-0.421	-0.358	-0.391	-0.373
% in Managerial and Related Occ. BA Grads	1.783***	-0.662	1.785***	-0.67
% in Professional Specialty Occ. BA Grads	1.242*	-0.706	1.263*	-0.747
% in Tech., Sales, and Admin. Occ. BA Grads	0.94	-0.72	0.959	-0.736
% in Services Occupations BA Grads	0.694	-0.847	0.681	-0.853
% in Farming Related Occ. BA Grads	0.961	-1.662	0.707	-1.743
% in Skilled Trades and Related Occ. BA Grads	0.132	-0.984	0.182	-1.035
Percent College Graduates	-0.004	-0.176	-0.042	-0.193
Percent BA Graduates STEM Majors	0.720**	-0.326	0.781**	-0.352
Percent BA Graduates Business Majors	0.983***	-0.346	0.999***	-0.366
Percent BA Graduates Health Majors	0.034	-0.476	0.105	-0.507
Percent BA Graduates Lib. Arts Majors	0.502	-0.369	0.556	-0.396
Percent BA Graduates Soc. Sci. Majors	0.779*	-0.408	0.903*	-0.46
Percent BA Graduates "Other" Majors	0.918*	-0.502	0.957*	-0.519

Notes: The specifications correspond to Column 4 of Tables 3 and 4. Professional services is the omitted industry group, machine operators and laborers is the omitted occupation group, and education majors is the omitted college major group. Heteroscedasticity robust standard errors are in parentheses.
* Significantly different from zero at the 10% level; ** Significant at 5% level; *** Significant at 1% level.

Table 6: Regression Results of Median Earnings Ratio on WNC Dummy

	(1)	(2)	(3)	(4)
West North Central	-0.135***	-0.108***	-0.087***	-0.074**
	(0.021)	(0.025)	(0.033)	(0.036)
Log MSA Population		0.076***	0.050***	0.045**
		(0.023)	(0.019)	(0.019)
Log Remoteness		-0.034	-0.032	-0.042
		(0.030)	(0.033)	(0.033)
Log Mean Housing Rents				-0.020
				(0.098)
Natural Amenity Controls	No	No	Yes	Yes
Demographic Controls	No	No	Yes	Yes
Industry Controls	No	No	Yes	Yes
Occupation Controls	No	No	No	Yes
Education Controls	No	No	No	Yes
R-squared	0.07	0.13	0.58	0.66

Notes: The sample includes the 266 (small) metropolitan areas with 2010 Census population less than 500,000. The dependent variable is the ratio of median earnings for college graduates relative to median earnings of high school graduates. Heteroscedasticity robust standard errors are in parentheses.

** Significantly different from zero at the 5% level; *** Significant at 1% level.

Table A1: List of States and Census Divisions

State	State Abbreviation	Census Division
Alabama	AL	East South Central
Alaska	AK	Pacific
Arizona	AZ	Mountain
Arkansas	AR	West South Central
California	CA	Pacific
Colorado	CO	Mountain
Connecticut	CT	New England
Delaware	DE	South Atlantic
District of Columbia	DC	South Atlantic
Florida	FL	South Atlantic
Georgia	GA	South Atlantic
Hawaii	HI	Pacific
Idaho	ID	Mountain
Illinois	IL	East North Central
Indiana	IN	East North Central
Iowa	IA	West North Central
Kansas	KS	West North Central
Kentucky	KY	East South Central
Louisiana	LA	West South Central
Maine	ME	New England
Maryland	MD	South Atlantic
Massachusetts	MA	New England
Michigan	MI	East North Central
Minnesota	MN	West North Central
Mississippi	MS	East South Central
Missouri	MO	West North Central
Montana	MT	Mountain
Nebraska	NE	West North Central
Nevada	NV	Mountain
New Hampshire	NH	New England
New Jersey	NJ	Middle Atlantic
New Mexico	NM	Mountain
New York	NY	Middle Atlantic
North Carolina	NC	South Atlantic
North Dakota	ND	West North Central
Ohio	OH	East North Central
Oklahoma	OK	West South Central
Oregon	OR	Pacific
Pennsylvania	PA	Middle Atlantic
Rhode Island	RI	New England
South Carolina	SC	South Atlantic
South Dakota	SD	West North Central
Tennessee	TN	East South Central
Texas	TX	West South Central
Utah	UT	Mountain
Vermont	VT	New England
Virginia	VA	South Atlantic
Washington	WA	Pacific
West Virginia	WV	South Atlantic
Wisconsin	WI	East North Central
Wyoming	WY	Mountain

Table A2: Median Earnings for College and High School Graduates in Small MSAs by Division

Census Division	College Graduates	High School Graduates	Earnings Ratio
New England	63,796	45,108	1.414
Middle Atlantic	61,614	41,951	1.469
East North Central	58,731	40,356	1.455
West North Central	53,163	39,853	1.334
South Atlantic	53,100	36,108	1.471
East South Central	53,398	36,087	1.480
West South Central	54,130	37,089	1.459
Mountain	57,682	39,341	1.466
Pacific	66,748	42,480	1.571

Notes: Median values are in January 2019 dollars and based on author computations using the 2014-2018 American Community Survey. High school graduates are persons whose highest education completed is a traditional high school diploma and excludes GEDs. College graduates are persons whose highest education is a bachelor's degree. The analysis is limited to workers ages 25-59 who were born in the U.S., work 40+ hours per week and 50+ weeks per year, and reside in the contiguous U.S. Small MSAs include the 266 metropolitan areas with 2010 Census population less than 500,000.