Human Capital, Higher Education Institutions, and Quality of Life

Winters, John V

Auburn University Montgomery

28 January 2011

Human Capital, Higher Education Institutions, and Quality of Life

John V. Winters*

January 2011

Abstract

This paper considers the effects of the local human capital level and the presence of higher education institutions on the quality of life in U.S. metropolitan areas. The local human capital level is measured by the share of adults with a college degree, and the relative importance of higher education institutions is measured by the share of the population enrolled in college. This paper finds that quality of life is positively affected by both the local human capital level and the relative importance of higher education institutions. Furthermore, these effects persist when these two measures are considered simultaneously, even though the two are highly correlated. That is the human capital stock and higher education institutions have a shared effect and also separate effects on quality of life.

JEL Classification: R13, R23, J31

Keywords: human capital; higher education; college towns; quality of life; amenities

*Department of Economics, Auburn University Montgomery, PO Box 244023, Montgomery, AL 36124-4023, Phone (334) 244-3471, E-mail jwinter3@aum.edu

The author thanks Dan McMillen, Barry Hirsch, David Albouy, two anonymous referees and participants at the 2010 Southern Economic Association Annual Meetings for helpful comments. The usual caveat applies.

1. Introduction

A number of researchers have suggested that the local human capital level has external effects on others nearby, with much of this literature focusing on the external effects of average education levels on productivity and wages.[1] Rauch (1993), Moretti (2004b), Dalmazzo and Blasio (2007a,b) and others offer support for the existence of human capital externalities by showing that the local level of human capital is positively correlated with wages even after controlling for individual worker characteristics.[2] However, because workers are mobile, the external effects of human capital on wages will not be the end of the story. Higher productivity in an area will attract new workers and cause the area to grow in population (Glaeser, Scheinkman and Shleifer 1995; Simon 1998, 2004; Simon and Nardinelli 2002; Glaeser and Saiz 2004).[3] Berry and Glaeser (2005) and Waldorf (2009) also suggest that the existing stock of human capital is especially important in attracting educated in-migrants. Furthermore, as new workers move in, they compete with existing residents for housing and bid up housing prices (Rauch 1993; Shapiro 2006; Dalmazzo and Blasio 2007a). Shapiro (2006) suggests that the local human capital level increases the implicit value of an area's consumption amenities; i.e., the stock of human capital makes an area a more desirable place to live and increases the quality of life. Shapiro (2006) estimates that 40 percent of the growth effects of human capital are due to increased quality of life.

Because the local human capital stock appears to make an area better in so many ways, it is important to understand why areas differ in aggregate human capital levels. One of the most important determinants of the local human capital level is the presence of colleges and

---

[1] Critical reviews of the literature on human capital externalities are provided by Moretti (2004a), Lange and Topel (2006), and Henderson (2007).
[2] Alternatively, Florida, Mellander and Stolarick (2008) argue for the primary importance of a "creative class" of artists and workers employed in creative occupations.
[3] Elvery (2010) also suggests that skill intensity is greater in large cities.

universities in the area, and many of the most highly educated areas are home to major state universities (Winters 2011). Higher education institutions increase the local human capital stock in at least two ways: 1) they increase access to higher education for local residents and make it more likely that local high school graduates will pursue post-secondary education (Card 1995; Alm and Winters 2009); and 2) they bring in students from outside the area seeking an education and some of these student in-migrants end up staying in the area after their education is complete (Blackwell, Cobb and Weinberg 2002; Huffman and Quigley 2002; Groen 2004; Groen and White 2004; Hickman 2009).[4] Winters (2011) suggests that most of the differential in-migration to high human capital cities is due to students moving to pursue higher education and that most of the growth of so-called "smart cities" is due to recent student in-migrants staying in an area after finishing their education. These students stay in the area because it gives them greater utility than other areas. Importantly, some students might stay in the area where they moved for higher education because it offers a high quality of life.[5] Colleges and universities, therefore, affect their surrounding areas in several important ways.

This paper considers the separate effects of the local human capital level and the relative importance of higher education institutions on the quality of life in U.S. metropolitan areas. Building on Rosen (1979) and Roback (1982) this paper measures quality of life by differences in "real wages" across areas, i.e., wages adjusted for differences in cost of living and worker characteristics (Winters 2009, 2010). A brief discussion of the theoretical model is presented in Appendix A. Following previous literature, we measure the local human capital level by the share of adults (age 25 and older) with at least a four-year college degree. Notable examples of

[4] Drucker and Goldstein (2007) survey the literature on the impacts of universities on their surrounding areas including student migration.
[5] Rappaport (2007, 2009) and others show that population growth and migration flows are strongly affected by amenities and quality of life.

high human capital stock cities include San Francisco, CA, Portland, OR, Boston, MA and Washington, DC. We measure the relative importance of higher education institutions by the share of an area's population enrolled in higher education. While there are other criteria by which we could measure the relative importance of higher education (see for example, Gumprecht 2003), this measure is quite intuitive. Areas for which colleges and universities are relatively important will have a large share of their population enrolled in higher education. It is worth emphasizing that this is a relative measure. Most large metropolitan areas have at least one college or university, but a single higher education institution in a highly populated area may not have much of a relative effect. Quite often the areas in which higher education has the greatest relative importance are small to mid-size metropolitan areas home to large flagship state universities, i.e., what we sometimes think of as "college towns." Examples include State College, PA, College Station, TX, Madison, WI and Athens, GA.[6]

The local human capital level and the relative importance of higher education institutions are expected to improve the quality of life in an area for a number of reasons. First, highly educated residents may be more likely to support local public goods such as museums, parks, symphonies, and theaters. Similarly, educated residents might facilitate the density and diversity of consumer services such as restaurants, coffee shops, and bars that consumers find desirable (Glaeser, Kolko, and Saiz 2001; Waldfogel 2008). Educated persons are also more likely to be politically active (Milligan, Moretti and Oreopoulos 2004) and may elect better government officials and help build clean cities with low pollution and low crime. They are also less likely to commit crimes (Lochner and Moretti 2004), and more likely to be tolerant of others different from themselves (Florida 2002).

[6]Examples of cities with both average human capital levels and average higher education importance include Cleveland, OH, Memphis, TN, San Antonio, TX and Jacksonville, FL.

A strong relative importance of one or more higher education institutions in an area may also be an important amenity. First, the presence of higher education institutions increases the local human capital level, which increases quality of life as discussed above. However, the effects of colleges and universities on quality of life go beyond the effect of increasing the local human capital level. Many college towns provide consumption opportunities not readily available elsewhere. One of the most obvious examples is live collegiate sports. Many diehard fans want to watch their teams in person and living near their schools makes this more convenient. Other examples of college town amenities include college bars and local music scenes, which are often considerably more abundant in areas with a strong college or university presence. A number of other consumer services are also likely to be more abundant in college towns including bookstores, record stores, bicycle shops, health food stores, pizzerias, and ethnic restaurants (Gumprecht 2003). The local human capital level and the relative importance of higher education institutions, therefore, are both likely to affect quality of life in important ways.

In this paper we find that the quality of life in an area is positively affected by both the local human capital level and the relative importance of higher education institutions. Furthermore, these effects persist when these two measures are considered simultaneously, even though these two variables are highly correlated. That is, the human capital stock and the relative importance of higher education institutions have a shared effect and also separate effects on quality of life. Controlling for the share of the population enrolled in college, a 0.10 increase in the share of adults with a college degree increases the quality of life in an area and causes workers to accept roughly 0.9 percent lower real wages. Controlling for the share of adults with a college degree, a 0.10 increase in the share of the population enrolled in college increases quality of life sufficiently so that workers are willing to accept 2.9 percent lower real wages.

2. Empirical Approach and Data

The geographical unit of analysis in this study is the Combined Statistical Area (CSA) where one exists and the Core Based Statistical Area (CBSA) for metropolitan areas not part of a CSA. For ease of discussion, we usually just refer to CSA/CBSAs as metropolitan areas. This paper measures differences in the quality of life across 289 metropolitan areas by logarithmic differences in real wages similarly to Winters (2010).[7] Logarithmic differences in nominal wages and housing prices (measured by rental payments) across metropolitan areas are computed using microdata from the 2007 American Community Survey (ACS) available from the IPUMS (Ruggles et al. 2008). Housing prices from the ACS are combined with non-housing prices from the ACCRA *Cost of Living Index* to measure logarithmic differences in the cost of living across areas. See the data appendix for further details.

After using logarithmic differences in real wages to construct quality of life estimates for metropolitan areas, we next wish to estimate the consumption value of several important amenities including the local human capital level and the relative importance of higher education institutions. We do so by regressing the metropolitan area quality of life estimates on these and a number of additional amenities via Ordinary Least Squares (OLS). Regressions are weighted by metro area population, but the main results are qualitatively robust to unweighted regression. We measure the local human capital level by the share of adults (age 25 and older) with at least a four-year college degree, a common measure used in previous literature. We measure the relative importance of higher education institutions by the share of an area's population that is

[7] See Stover and Leven (1992), Gyourko, Kahn and Tracy (1999) and Winters (2009, 2010) for more detailed discussions of several issues with estimating quality of life differences.

enrolled in college.[8] Areas in which a large percentage of the population is enrolled in college are likely to be heavily affected by one or more local colleges and universities. We also explore the robustness of the results to measuring the relative importance of higher education institutions by three alternative measures: 1) the share of an area's in-migrants ages 18-24; 2) the share of an area's in-migrants enrolled in college; and 3) the presence of a land-grant higher education institution in the metropolitan area. All except the land-grant variable are constructed from the 2007 ACS.

Unfortunately, the share of adults with a college degree might be endogenous to quality of life. Highly educated individuals are on average more mobile than their less educated counterparts, and Whisler et al. (2008) suggest that areas with nice amenities differentially attract educated persons. If so, causality might flow from high quality of life to a highly educated population. Alternatively, Chen and Rosenthal (2008) suggest that young college-educated workers are more attracted by an area's quality of business environment than its quality of life. We also control for several observable amenities such as climate and topography that might attract educated persons, and these controls should reduce concerns about endogeneity. Other researchers have often tried to address the potential endogeneity of the human capital stock using instrumental variables, often using some measure of the presence of higher education institutions as an instrument. However, the present study suggests that higher education institutions might have an effect on the quality of life that is separate from their effect on the local human capital level. Consequently, the presence of colleges and universities should not be used as an instrument for the local human capital stock in a quality of life regression. We treat the human capital stock measure as exogenous, but suggest caution in interpreting its effect as causal. We

[8] Note that the ACS instructs respondents that students away at college are to be counted as residents of the place where they attend college and not their parents' residence. However, there may still be some misreporting of student residences that leads to noise in our measure.

are primarily interested in the effect of higher education institutions on quality of life and the share of the population enrolled in college could also be endogenous to quality of life if college students' location decisions respond differently to amenities than those of the general population. However, most major colleges and universities were founded many years ago and have had a lasting effect on enrollment patterns today, so we feel somewhat confident treating the share of the local population enrolled in college as exogenous to quality of life, especially after controlling for the additional amenities discussed below. The three alternative measures of the relative importance of higher education also help establish a robust relationship.[9]

The additional amenities include the mean January temperature in degrees Fahrenheit, mean July temperature, mean hours of sunlight in January, mean July relative humidity, the percent of land area covered by water, five dummy variables for topography that range from very flat to mountainous, dummy variables for coastal location on the Atlantic Ocean, Pacific Ocean and Gulf of Mexico, average inches of precipitation per year, average inches of snow per year, the logs of population and population density in the area, the violent crime rate, the property crime rate, the level of particulate matter (2.5) air pollution, the level of ozone air pollution, the mean commute time for those who commute to work, and the mean student-teacher ratio in the area's public schools. The coastal dummies are constructed by consulting maps. Precipitation, snow, and crime rates come from *Cities Ranked and Rated, 2nd Edition*. Log population comes from the U.S. Census Bureau population estimates, and land area to construct population density comes from the USA Counties website.[10] Particulate matter and ozone are computed using the

---

[9] In results not shown we also explored measuring the human capital stock and the importance of higher education institutions using lagged values (from the 2000 Census) of the share of adults with college degrees and the share of the population enrolled in college. The results are qualitatively similar to using the contemporaneous values for 2007. We also found similar results when we instrumented the contemporaneous values using the lagged values.

[10] Available at http://censtats.census.gov/usa/usa.shtml.

EPA AirData database.[11] Mean commute time is constructed from the 2007 ACS, and the student-teacher ratio is computed from the National Center for Education Statistics (NCES) Common Core of Data (CCD). The rest of the variables are from the USDA Economic Research Service (ERS) natural amenities scale. Other unobserved amenities likely affect quality of life as well and if any of these unobserved amenities are correlated with the observed amenities, the amenity value estimates could be biased and inconsistent. Table 1 reports summary statistics.

3. Empirical Results

This section discusses results from regressing metro area quality of life values on various amenities. Since quality of life values are computed as the negative of logarithmic differences in real wages, it is also interesting to consider how the various amenities affect log wages and log prices, and these results are reported as well. Because the share of adults with college degrees and the share of the population enrolled in college are highly correlated with a correlation coefficient of 0.56, we first estimate the regression equations with each of these variables separately and then estimate the regressions with the two variables included simultaneously. We also estimate regressions both with and without controlling for the additional amenity variables discussed above and examine the robustness to alternative measures of higher education importance and an alternative measure of quality of life.

[11] Pollution data are unavailable for several small metro areas and were imputed based on average values by Census division and metro area size. Particulate matter was imputed in this manner for 48 metros, and ozone was imputed for 67 metros. We examine the potential effects of this imputation by estimating the regressions without pollution variables and estimating the regressions with pollution variables but only for metro areas that had unimputed pollution levels. The main results of the paper are qualitatively robust to these changes and do not appear to be affected by the imputation of pollution values for these small metro areas.

3.1 Effects of Human Capital and Higher Education Importance on Quality of Life

Table 2 reports the main results of this paper. Panel A reports results without the additional amenities and Panel B reports results with the additional amenities. For brevity, we focus on the results in Panel B. The first three columns of Table 2 report results for the human capital stock variable when the higher education importance variable is excluded. The results in the first column suggest that the share of adults with college degrees has a statistically significant positive effect on log wages with a coefficient of 0.409, a result that is qualitatively consistent with Moretti (2004b), Iranzo and Peri (2009) and others. The interpretation is that increasing the share of college educated adults by 0.10 increases wages in the area by roughly 4.1 percent. The second column reports that the share of adults with a college degree also has a significantly positive effect on the log price index with a coefficient of 0.572. This echoes previous findings by Rauch (1993), Shapiro (2006), and Dalmazzo and Blasio (2007a) that the local human capital level increases the cost of living in an area. The effect of the human capital stock on quality of life is equal to the effect on log prices minus the effect on log wages. In the third column, we see that this effect is positive and significant with a coefficient of 0.163. This result suggests that a .10 increase in the share of college graduates increases the quality of life in an area and causes real wages to fall by roughly 1.6 percent to offset the greater quality of life and keep individual utility equal across areas.

The fourth, fifth, and six columns of Table 2 report regression results that include the relative importance of higher education institutions variable but not the local human capital stock measure. Again focusing on Panel B, the results in the fourth column report that the share of the population enrolled in college has a statistically significant positive effect on log wages with a coefficient of 0.285. The fifth column reports that the share of the population enrolled in college also has a significantly positive effect on log prices with a coefficient of 0.677. In the sixth column we see that the share enrolled in college also results in increased quality of life with a statistically significant coefficient of 0.392.

Since the regressions in the first six columns of Table 2 examine the effects of the human capital stock and the relative importance of higher education institutions separately, it is possible that the two do not have unique effects. It could be the case that only one of the two variables actually affects quality of life and the other picks up an effect when the former is unobserved. For example, it could be that higher education institutions only affect quality of life through their effect on increasing the share of adults who are college educated. Or it could be the case that the share of adults with a college degree does not affect quality of life but the relative importance of higher education institutions does. Because these two variables are highly correlated, omitting one may cause the other to pick up an effect from the omitted variable. The obvious way to test for this is to include both variables in the quality of life regression and see if they both continue to have a positive and statistically significant effect. The results of this investigation are provided in the last three columns of Table 2. Again we focus on the regression results that also include the additional amenity variables in Panel B.

In the seventh column of Table 2 we see that the share of adults with a college degree continues to have a significantly positive effect on log wages even when we also include the share of the population enrolled in college; the coefficient of 0.481 is slightly larger than the corresponding estimate in the first column. The share of adults with a college degree also continues to have a significantly positive effect on log prices with a coefficient of 0.568. In the last column the share of adults with a college degree again has a positive effect on quality of life with a coefficient of 0.087 that is statistically significant at the 10 percent level. This is a 47 percent reduction from the effect on quality of life reported in the third column, but the effect is still meaningful. This result supports findings in Shapiro (2006) that an educated populace is associated with increased quality of life. Furthermore, this effect is not simply due to college towns that simultaneously increase the stock of human capital and offer higher quality of life.

More importantly for this paper, the results also shed additional light on how higher education institutions affect quality of life in an area. In the seventh column of Table 2 we see that after controlling for the share of adults with a college degree, the share of the population enrolled in college has a significantly negative effect on log wages with a coefficient of -0.274. In the eighth column the share of the population enrolled in college has a statistically insignificant effect on log prices. In the final column the share of the population enrolled in college again has a statistically significant positive effect on quality of life even though the share of adults with a college degree is simultaneously controlled for. The estimated coefficient of 0.291 is about 26 percent lower than the corresponding estimate in the sixth column without the human capital stock variable. The interpretation is that colleges and universities improve the quality of life in their local areas and about 26 percent of this effect comes from increasing the local human capital stock. The rest comes from the additional consumption amenities that colleges and universities facilitate. Furthermore, because we find statistically significant effects on wages and quality of life for both the share of adults with a college degree and the share of the population enrolled in college when the two are simultaneously considered, we suggest caution in using information on the presence of colleges and universities as instruments for the local human capital level. If colleges and universities have an effect on outcomes variables separate from their effect on increasing the local human capital stock, then they are not a valid instrument.

3.2 Effects of Additional Amenities on Quality of Life

Though not the main focus of this paper, we might also be interested in the results for the additional amenity variables. Table 3 reports the results for the additional amenity variables for regressions that include both the human capital stock measure and the relative importance of higher education measure, i.e. the last three columns of Table 2. Consistent with previous literature (e.g., Rappaport 2007) and expectations, higher January temperatures increase the quality of life with a statistically significant coefficient of 0.0012. Similarly, higher July temperatures decrease quality of life with a significant coefficient of -0.0024. January sun also increases quality of life with a significant coefficient of 0.0003, and July relative humidity has a negative coefficient but is statistically insignificant. The percentage of land area covered by water also increases the quality of life with a significant coefficient of 0.0012. Topography also plays an important role in quality of life differences and all four topography dummies have effects that are statistically different from the omitted group, the flattest topography classification. Furthermore, the effect on quality of life is by far the largest for the most mountainous topography indicator which has a coefficient of 0.0592. The results also suggest that location on the Atlantic Coast significantly increases quality of life with a coefficient of 0.0314; the Pacific Coast has a positive coefficient that is marginally insignificant (p-value = 0.11); and the Gulf Coast has an insignificant negative coefficient. Precipitation has a statistically significant effect on quality of life with a coefficient of 0.0014, but snow has an insignificant effect. Log population and log population density both have statistically significant negative effects on quality of life with coefficients of -0.0131 and -0.0147, respectively, results that contrast with the findings in Albouy (2008) and seem to suggest that big and congested cities are often not very desirable places to live.[12] The results for crime are mixed, with property crime significantly lowering quality of life with a coefficient of -0.0009 but violent crime having an unexpected significantly positive coefficient of 0.0017. The results for crime are also qualitatively similar if we include only one of the crime measures at a time (not shown); property crime has a negative effect and violent crime has a positive effect. Particulate matter reduces quality of life with a significant coefficient of -0.0045, but ozone does not significantly affect quality of life. Mean commute time has an unexpected statistically significant positive coefficient of 0.0025. The student-teacher ratio has a small and insignificant coefficient, consistent with Brasington and Haurin (2009) who find that traditional school inputs do not influence housing values.

3.3 Robustness Checks

We next examine the robustness of the main results to using alternative measures of higher education importance and an alternative measure of quality of life. Table 4 presents the results from using three alternative measures of higher education importance. The first alternative measure is the share of in-migrants to an area who are ages 18-24. Plane and Heins (2003) use this measure to classify areas as college towns since these are the peak college-going years for most people. If most of an area's in-migrants are in their peak college-going years, the area likely has a strong higher education presence. The second alternative measure which is closely related to the first is the share of an area's in-migrants who are enrolled in college. Higher education institutions are expected to be relatively important for areas in which a high

[12] The two variables also both continue to be negative and significant when the other is excluded. Part of the difference between the results for population in this paper and those in Albouy (2008) is attributable to the measurement of housing prices. Albouy (2008) uses a combination of housing values and rental payments, but this paper uses only rental payments because housing values are often a poor approximation of the user cost of housing. However, a few other amenity variables in this paper such as violent crime and mean commute time have unexpected effects, so the effects of population in this paper should likely be interpreted with caution.

percentage of the in-migrants are enrolled in college. As one might expect, these two alternative measures of the relative importance of higher education institutions are very highly correlated with each other and with the share of the population enrolled in college. Our third alternative measure is the presence of a land-grant higher education institution in the metropolitan area. Land-grant institutions were established in the late 19th century and may be an exogenous source of higher education institutions. However, land-grant institutions are in some ways different than other institutions, and we choose to include the land-grant indicator directly in the regression rather than using it to instrument for one of the other measures of higher education importance.

Panel A of Table 4 reports results using the share of in-migrants ages 18-24, Panel B uses the share of in-migrants enrolled in college, and Panel C uses the land-grant indicator variable. The results using the alternative measures are largely similar to the main results in Table 2. The share of adults with a college degree continues to have a significantly positive effect on log wages, log prices, and quality of life, and the effect on quality of life is actually larger than in the last column of Table 2 in all three panels. The first two alternative measures of higher education importance both have insignificant effects on both log wages and log prices. However, they both have significantly positive effects on quality of life with coefficients of 0.067 and 0.070, respectively. In Panel C the land-grant indicator has significantly positive effects on both log wages and log prices, with coefficients of 0.020 and 0.037, respectively. The presence of a land-grant institution also increases the quality of life in an area with a significant coefficient of 0.017. Though the magnitudes are somewhat reduced relative to Table 2, the results in Table 4 reaffirm that higher education institutions play an important role in increasing the local quality of life and that this effect does not just result from higher education institutions increasing the local stock of educated workers.

As an additional robustness check we also examine the effects of including additional education variables. In Table 5 we measure the human capital stock with three variables instead of one. These include the share of the adult population with a high school diploma but less than a bachelor's degree, the share with a bachelor's degree but no graduate degree, and the share with a graduate degree. As seen in Table 5, the share completing high school but no bachelor's has an insignificant effect on both wages and prices but a positive and significant effect on quality of life with a coefficient of 0.159. Similarly, the share with only a bachelor's degree has an insignificant effect on wages and prices but a significantly positive effect on quality of life with a coefficient of 0.318. Somewhat surprisingly, though, the share with a graduate degree has a significantly positive effect on both wages and prices but a small and insignificant coefficient for quality of life. However, the share with graduate degrees is highly correlated with the share with only a bachelor's degree and the share enrolled in college, so we are hesitant to say that persons with graduate degrees do not affect quality of life. The share of the population enrolled in college again has a significantly negative effect on wages and an insignificant effect on prices. More importantly, the share enrolled in college continues to have a significantly positive effect on quality of life with a coefficient of 0.374, an increase from the last column of Table 2.

We next examine the robustness of the main results to measuring quality of life using the adjusted quality of life values computed by Albouy (2008). Albouy uses the 2000 Census microdata to construct adjusted quality of life values that put more weight on housing prices and less weight on wages than is conventionally done. This is an alternative to the approach in this paper of incorporating non-housing prices and using after-tax wages.[13] Albouy also measures housing prices by a combination of housing values and rental payments. Table 6 reports the results of regressing wages, housing costs, and adjusted quality of life from Albouy (2008) on the human capital stock variable, the higher education importance variable, and the additional amenities.[14] Time-varying variables are now measured as of the year 2000. The results using the Albouy (2008) quality of life values in Table 6 are largely similar to the results in Table 2. The share of adults with a college degree has a positive and significant effect on wages, housing costs, and adjusted quality of life, with a coefficient on the latter of 0.198. The share of the population enrolled in college has a significantly negative effect on wages, an insignificant effect on housing costs, and a significantly positive effect on adjusted quality of life, with a coefficient of 0.130 for the latter. Though the magnitudes differ somewhat from the main results in Table 2 (the human capital stock coefficient is larger and the higher education importance coefficient is smaller for the quality of life regression), the qualitative results are quite similar. Both the human capital stock and the presence of higher education institutions make areas nicer places to live and increase the quality of life.

4. Conclusion

Researchers have suggested that the local human capital level is a vital ingredient for a number of important economic outcomes. Colleges and universities have been suggested to play an important role in increasing the local stock of human capital and likely have other important effects on nearby areas. This paper uses multivariate regression to consider the effects that the

[13] Albouy (2009) also shows that the progressivity of the federal income tax causes residents of high wage areas to pay a higher percentage of their income in federal income taxes.
[14] Albouy (2008) reports quality of life values for 241 metropolitan areas, but some of the amenity variables are unavailable for two of these leaving us with 239 metro areas.

human capital stock and the presence of higher education institutions have on the quality of life in U.S. metropolitan areas, where quality of life differences are measured by differences in real wages. We follow a large literature and measure the local human capital stock by the share of adults who have earned a four-year college degree. While there are a number of ways to measure the presence of higher education institutions, we employ a measure of the relative importance of higher education institutions in an area computed as the share of the population enrolled in college. Both of these measures could potentially be endogenous to quality of life if college students and college graduates are disproportionately attracted to high quality of life areas. We hope to minimize concerns about endogeneity by including a large number of important amenities, but the results should still be interpreted with some caution.

This paper suggests that if we can interpret the results as causal, then both the local level of human capital and higher education institutions create valuable consumption amenities that increase an area's quality of life. The human capital level and the presence of higher education institutions have a shared effect and also separate effects on quality of life. Results from regressing quality of life on the human capital level, the relative importance of higher education institutions, and several other amenities suggest that increasing the share of adults with a college degree by 0.10 would increase the quality of life in an area sufficiently so that workers would be willing to accept 0.9 percent lower real wages to live there. Similarly, increasing the share of the population enrolled in college by 0.10 would increase the quality of life by so much that workers would be willing to accept 2.9 percent lower real wages to live there. Importantly though, this estimated partial effect for the relative importance of higher education institutions likely understates the total effect of colleges and universities on quality of life because these institutions play an important role in building the local stock of human capital. Estimating the effect of higher education institutions on the quality of life without controlling for the local human capital level, we find that a 0.10 increase in the share of the population enrolled in college increases the quality of life by enough to incline workers to accept 3.9 percent lower real wages. We conclude that colleges and universities improve the quality of life in surrounding areas and about 26 percent of this effect comes through increasing the local level of human capital. The rest comes from other consumption amenities that colleges and universities facilitate.

Appendix A: Theoretical Model

This section presents a simple framework following Rosen (1979) and Roback (1982) that computes quality of life differences based on differences in real wages. Firms produce two goods, X_1 and X_2, using constant returns to scale production with labor (N), capital (K), and land (L) as inputs and subject to locational differences in productivity because of amenities (Z): $X_i = X_i(N, K, L; Z)$. The marginal products for labor, capital, and land are all non-negative, but amenities can either increase or decrease productivity. The price of capital is determined exogenously in the world market, while the prices of labor (W) and land (P_L) are determined competitively in local markets. In equilibrium, firms earn zero profits and the price of each good is equal to its unit cost of production (C_i):

(1) $C_i(W, P_L; Z) = P_i, \quad i = 1, 2.$

Workers derive utility from consuming goods X_1 and X_2 and from location-specific amenities: $U = U(X_1, X_2; Z)$, and workers maximize their utility subject to a budget constraint. Workers are mobile across locations, and spatial equilibrium requires that utility for identical workers be equal across all locations. The indirect utility function can be written as a function of wages and the prices of X_1 and X_2 given amenities:

(2) $V = V(W, P_1, P_2; Z).$

Totally differentiating both sides of (2), setting $dV = 0$ so that there are no differences in utility across locations, rearranging, and employing Roy's Identity gives:

(3) $P_Z dZ = X_1 dP_1 + X_2 dP_2 - dW.$[15]

Dividing both sides of (3) by W converts the equation to:

(4) $(P_Z/W)dZ = (P_1X_1/W)d\ln P_1 + (P_2X_2/W)d\ln P_2 - d\ln W.$

[15] We could, instead, define the expenditure function and use Shephard's Lemma to obtain an equivalent result as in Albouy (2008, 2009).

According to equation (4) the implicit share of wages spent on amenity consumption in an area can be computed from logarithmic differences in real wages across areas, where real wages are equal to nominal wages, W, divided by the cost of living, $\boldsymbol{P}$. Logarithmic differences in nominal wages are represented by the $dln\, W$ term. Logarithmic differences in the cost of living are given by an expenditure share weighted average of the logarithmic differences in the prices of goods one and two. That is, $d\, ln\boldsymbol{P} = (P_1X_1/W)d\, \ln P_1 + (P_2X_2/W)d\, \ln P_2$. The implicit share of wages spent on amenity consumption is thus equal to the negative of logarithmic differences in real wages, i.e., $d\, ln\boldsymbol{P} - d\, lnW$.[16] Spatial equilibrium requires workers to accept lower real wages to live in an area with nice amenities.[17]

Appendix B: Detailed Data Description

Logarithmic differences across areas in nominal wages are computed by regressing the log of the after-tax hourly wage for worker i in area j on a vector of individual characteristics, X, and a vector of area fixed-effects, α:[18]

(5) $\ln W_{ij} = X_{ij}\beta + \alpha_j + \varepsilon_{ij}$.

Individual characteristics are controlled for to make workers comparable across areas and include variables commonly found to affect individual wages. These include a quadratic

[16] If the real wage is $W/\boldsymbol{P}$, then the log of the real wage is $ln\, W - ln\, \boldsymbol{P}$.

[17] For non-workers, the implicit price to live in a high quality of life area depends only on the cost of living and not on wages. Thus we would expect retirees and other non-workers to be attracted to areas where amenity values are capitalized more into wages than prices (Chen and Rosenthal 2008).

[18] Pre-tax hourly wages (w_{ij}) are estimated by dividing annual wage income by the number of weeks worked times the usual hours worked per week. Federal income taxes are estimated using the federal tax schedule and based on several assumptions. We assume that all married couples file jointly and receive two personal exemptions and non-married persons have a filing status of single and receive one personal exemption. Itemized deductions are assumed to equal 20 percent of annual income, but taxpayers take the standard deduction if it is more than their itemized deductions. Deductions and exemptions are subtracted from annual earnings to estimate taxable income. Tax schedules are then used to compute federal tax liabilities. We next compute the average tax rate for each taxpayer (τ_{ij}), and then multiply the pre-tax hourly wage by one minus the average tax rate to compute after-tax hourly wages ($W_{ij} = w_{ij}(1 - \tau_{ij})$).

specification in potential experience, dummy variables for highest level of education completed, gender, marital status, whether an individual is Black, Hispanic, Asian, or Other, citizenship status, industry, and occupation. Results for the individual characteristics are generally as expected and are available by request. The wage sample is restricted to workers between the ages of 25 and 61 who are not enrolled in school. The estimated area fixed-effects in (5) represent logarithmic differences in wages across metropolitan areas.

Logarithmic differences in housing prices are also based on ACS microdata. We regress the log of gross rents[19], R, for each housing unit on a vector of housing characteristics, F, and a vector of area fixed-effects, π:

(6) $$\ln R_{ij} = F_{ij}\Gamma + \pi_j + u_{ij}.$$

The housing characteristics included are dummy variables for the number of bedrooms, the total number of rooms, the age of the structure, the number of units in the building, modern plumbing, modern kitchen facilities, and lot size for single-family homes. These results are available upon request. Housing prices are measured by rents instead of owner-occupied housing values because the former are an appropriate measure of the present user cost of housing while the latter reflects the net present value of the stream of future benefits (Winters 2009). The area fixed-effects from (6) are used to measure logarithmic differences in housing prices.

Computing quality of life estimates also requires accounting for non-housing prices. This paper measures non-housing prices based on the ACCRA *Cost of Living Index*. There are a number of problems with the ACCRA data, but ACCRA is the best source available for data on

[19] Rents are measured to include certain utilities but exclude a portion of rents attributable to property tax payments based on the effective tax rates of owner-occupied housing. Removing property taxes from rents is based on the assumption that higher property taxes are offset by lowering other state and local taxes (e.g. income, sales, etc.). If this assumption holds, then including property taxes in rents to construct quality of life estimates would cause areas that heavily rely on property taxes to have higher QOL values than they should. As a practical matter, excluding property taxes has only a small effect on QOL estimates for most areas.

interarea differences in non-housing prices. We combine non-housing prices from ACCRA with the housing price fixed-effects from (6) to construct a composite price index. The price index is a weighted average of rents and non-housing prices excluding utilities with rents given a weight of 0.29 and non-housing prices given a weight of 0.71. Weights are chosen based on calculations from the 2005 Consumer Expenditure Survey suggesting that housing including certain utilities represents 29 percent of average consumption expenditures.[20]

Another issue with the ACCRA data is that they are not available for all metropolitan areas. For areas without ACCRA data on non-housing prices, non-housing prices are imputed based on information from those that are available. We regress $ln\boldsymbol{P}$ on the logarithmic differences in housing prices from (6) along with Census division dummies and metropolitan area population dummies. The coefficients from this regression are then used to predict values for areas with missing non-housing prices. The price index is imputed in this manner for 99 metropolitan areas in the sample. The results in this paper are largely robust to excluding metropolitan areas with imputed prices (not shown). The main exception is that the quality of life coefficient for the share of adults with a college degree decreases slightly to 0.064 and is no longer statistically significant when the share of the population enrolled in college is also included. However, the coefficient for the share of the population enrolled in college remains significant and increases slightly to 0.327.

Also note that the IPUMS data prevent identification of geographic areas with populations less than 100,000. Therefore, the lowest level of identifiable geography, the PUMA, often includes both metropolitan and non-metropolitan areas. We assign each PUMA to a

[20] Note that this expenditure share for housing differs from official reports of the CES expenditure share for both "Housing" and "Shelter." The housing share based on gross rents used herein includes certain utilities but excludes others and also excludes expenditures for household operations, housekeeping, and household furnishings. The housing share of 0.29 also differs from the official CES tabulations in that homeowner housing expenditures are measured by implicit rents and not by out-of-pocket expenses such as mortgage interest.

metropolitan area if more than 50 percent of the population of the PUMA is contained within the metropolitan area. This procedure identifies 293 metropolitan areas, but four metropolitan areas lack data for several amenities and are excluded from the analysis. It is also important to keep in mind that parts of metropolitan areas are often unobservable and quality of life estimates in this paper are subject to some degree of measurement error.

References

Albouy, D., 2008. Are big cities really bad places to live? Improving quality-of-life estimates across cities. NBER Working Paper No. 14472.

Albouy, D., 2009. The unequal geographic burden of federal taxation. Journal of Political Economy 117, 635-667.

Alm, J., Winters, J.V., 2009. Distance and intrastate college student migration. Economics of Education Review 28, 728-738.

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

Blackwell, M., Cobb, S., Weinberg, D., 2002. The economic impact of educational institutions: Issues and methodology. Economic Development Quarterly 16, 88-95.

Brasington, D.M., Haurin, D.R. 2009. Parents, peers, or school inputs: Which components of school outcomes are capitalized into house value? Regional Science and Urban Economics 39, 523-529.

Card, D., 1995. Using geographic variation in college proximity to estimate the return to schooling. In: Christofides, L., Swideinsky, R., Grant, E.K. (Eds.), Aspects of Labour Market Behaviour: Essays in Honor of John Vanderkamp. University of Toronto Press, Toronto, pp. 201-222.

Chen, Y., Rosenthal, S.S., 2008. Local amenities and life-cycle migration: Do people move for jobs or fun? Journal of Urban Economics 64, 519-537.

Dalmazzo, A., de Blasio, G., 2007a. Production and consumption externalities of human capital: An empirical study for Italy. Journal of Population Economics 20, 359-382.

Dalmazzo, A., de Blasio, G., 2007b. Social Returns to Education in italian local labor markets. Annals of Regional Science 41, 51–69.

Drucker, J., Goldstein, H., 2007. Assessing the regional impacts of universities: A review of current approaches. International Regional Science Review 30, 20-46.

Elvery, J.A., 2010. City size and skill intensity. Regional Science and Urban Economics 40, 367-379.

Florida, R., 2002. Bohemia and economic geography. Journal of Economic Geography 2, 55-71.

Florida, R., Mellander, C., Stolarick, K., 2008. Inside the black box of regional development—human capital, the creative class, and tolerance. Journal of Economic Geography 8, 615-649.

Glaeser, E.L., Kolko, J., Saiz, A., 2001. Consumer city. Journal of Economic Geography 1, 27–50.

Glaeser, E.L., Saiz, A., 2004. The rise of the skilled city. Brookings-Wharton Papers on Urban Affairs, 47-94.

Glaeser, E.L., Scheinkman, J., Shleifer, A., 1995. Economic growth in a cross-section of cities. Journal of Monetary Economics 36, 117-143.

Groen, J.A., 2004. The effect of college location on migration of college-educated labor. Journal of Econometrics 121, 125-142.

Groen, J.A., White, M.J., 2004. In-state versus out-of-state students: The divergence of interest between public universities and state governments. Journal of Public Economics 88, 1793-1814.

Gumprecht, B., 2003. The American college town. Geographical Review 93, 51-80.

Gyourko, J., Kahn, M., Tracy, J., 1999. Quality of life and environmental comparisons. In: Cheshire, P., Mills, E.S. (Eds.), Handbook of Regional and Urban Economics, Vol. 3, North Holland, Amsterdam, pp. 1413-1454.

Henderson, J.V., 2007. Understanding knowledge spillovers. Regional Science and Urban Economics 37, 497-508.

Hickman, D.C., 2009. The effects of higher education policy on the location decision of individuals: Evidence from Florida's Bright Futures Scholarship Program. Regional Science and Urban Economics 39, 553-562.

Huffman, D., Quigley, J.M., 2002. The role of the university in attracting high tech entrepreneurship: A Silicon Valley tale. Annals of Regional Science 36, 403-419.

Iranzo, S., Peri, G., 2009. Schooling externalities, technology, and productivity: Theory and evidence from U.S. states. Review of Economics and Statistics 91, 420–431.

Lange, F., Topel, R., 2006. The social value of education and human capital. In: Hanushek, E., Welch, F. (Eds.), Handbook of the Economics of Education. Elsevier, Amsterdam, pp. 459-509.

Lochner, L., Moretti, E., 2004. The effect of education on crime: Evidence from prison inmates, arrests, and self-reports. American Economic Review 94, 155-189.

Milligan, K., Moretti, E., Oreopoulos, P., 2004. Does education improve citizenship? Evidence from the U.S. and the U.K. Journal of Public Economics 88, 1667–1695.

Moretti, E., 2004a. Human capital externalities in cities. In: Henderson, J.V., Thisse, J.F. (Eds.), Handbook of Regional and Urban Economics, Vol. 4. Elsevier, Amsterdam, pp. 2243-2291.

Moretti, E., 2004b. Estimating the social return to higher education: Evidence from longitudinal and repeated cross-sectional data. Journal of Econometrics 121, 175-212.

Plane, D.A., Heins, F., 2003. Age articulation of U.S. inter-metropolitan migration flows. Annals of Regional Science 37, 107-130.

Rappaport, J., 2007. Moving to nice weather. Regional Science and Urban Economics 37, 375-398.

Rappaport, J., 2009. The increasing importance of quality of life. Journal of Economic Geography 9, 779-804.

Rauch, J.E., 1993. Productivity gains from geographic concentration of human capital: Evidence from the cities. Journal of Urban Economics 34, 380-400.

Roback, J., 1982. Wages, rents, and the quality of life. Journal of Political Economy 90, 1257-1278.

Rosen, S., 1979. Wage-based indexes of urban quality of life. In: Mieskowski, P., Straszheim, M. (Eds.), Current Issues in Urban Economics. Johns Hopkins University Press, Baltimore, pp. 74-104.

Ruggles, S., Sobek, M., Alexander, T., Fitch, C.A., Goeken, R., Hall, P.K., King, M., Ronnander, C., 2008. Integrated Public Use Microdata Series: Version 4.0 [Machine-readable database]. Minnesota Population Center [producer and distributor], Minneapolis, MN.

Shapiro, J.M., 2006. Smart cities: Quality of life, productivity, and the growth effects of human capital. Review of Economics and Statistics 88, 324-335.

Simon, C.J., 1998. Human capital and metropolitan employment growth. Journal of Urban Economics 43, 223-243.

Simon, C.J., 2004. Industrial reallocation across U.S. cities, 1977–97. Journal of Urban Economics 56, 119-143.

Simon, C.J., Nardinelli, C., 2002. Human capital and the rise of American cities, 1900–1990. Regional Science and Urban Economics 32, 59-96.

Stover, M.E., Leven, C.L., 1992. Methodological issues in the determination of the quality of life in urban areas. Urban Studies 29, 737-754.

Waldfogel, J., 2008. The median voter and the median consumer: Local private goods and population composition. Journal of Urban Economics 63, 567-582.

Waldorf, B.S., 2009. Is human capital accumulation a self-propelling process? Comparing educational attainment levels of movers and stayers. Annals of Regional Science 43, 323-344.

Whisler R.L., Waldorf, B.S., Mulligan, G.F., Plane, D.A., 2008. Quality of life and the migration of the college-educated: A life-course approach. Growth and Change 39, 58–94.

Winters, J.V., 2009. Wages and prices: Are workers fully compensated for cost of living differences? Regional Science and Urban Economics 39, 632-643.

Winters, J.V., 2010. Differences in quality of life estimates using rents and home values, MPRA Working Paper No. 22455.

Winters, J.V., 2011. Why are smart cities growing? Who moves and who stays. Journal of Regional Science, doi: 10.1111/j.1467-9787.2010.00693.x.

Table 1: Summary Statistics

Variable	Mean	Std. Dev.	Min	Max
Log Wages	-0.005	0.087	-0.198	0.315
Log Price Index	-0.007	0.092	-0.186	0.378
Quality of Life (QOL)	-0.001	0.055	-0.173	0.158
Share of Adults with a College Degree	0.245	0.073	0.105	0.486
Share of Population Enrolled in College	0.077	0.040	0.030	0.285
Share of In-migrants Ages 18-24	0.306	0.128	0.055	0.762
Share of In-migrants Enrolled in College	0.207	0.137	0	0.701
Land-grant	0.135	0.342	0	1
January Temperature	35.726	12.465	3.8	66.7
July Temperature	76.205	5.519	61.8	93.7
January Sun	150.808	39.302	52.0	266.0
July Humidity	56.204	16.567	14.0	80.0
% Water Area	6.643	11.551	0.030	69.690
Topography 2	0.135	0.342	0	1
Topography 3	0.104	0.306	0	1
Topography 4	0.221	0.416	0	1
Topography 5	0.128	0.335	0	1
Atlantic Coast	0.073	0.260	0	1
Pacific Coast	0.024	0.154	0	1
Gulf Coast	0.059	0.236	0	1
Precipitation	35.319	14.131	3	67
Snow	23.117	24.898	0	109
Log Population	12.826	1.127	11.001	16.909
Log Population Density	5.055	0.846	1.923	7.529
Violent Crime per 1,000 people	4.505	2.701	0.671	32.730
Property Crime per 1,000 people	37.569	11.063	0.124	76.019
Particulate Matter (2.5)	11.716	2.636	4.457	19.223
Ozone	0.048	0.004	0.035	0.061
Mean Commute Time	21.639	3.215	14.196	33.648
Student-Teacher Ratio	15.624	2.713	10.164	31.555

Notes: N=289 CSA/CBSAs. Time-varying variables are for the year 2007.

Table 2: Effects of Human Capital and Higher Education Importance on Quality of Life

Dependent Variable:	Log Wages	Log Prices	QOL	Log Wages	Log Prices	QOL	Log Wages	Log Prices	QOL
A.									
Share with a College Degree	1.0434***	1.1936***	0.1502**				1.1619***	1.2621***	0.1002
	(0.1591)	(0.2070)	(0.0710)				(0.1709)	(0.2304)	(0.0785)
Share Enrolled in College				0.2414	0.7867**	0.5452***	-1.0329***	-0.5976	0.4353**
				(0.2976)	(0.3913)	(0.1672)	(0.2949)	(0.4111)	(0.1838)
Additional Amenity Controls	No	No	No	No	No	No	No	No	No
B.									
Share with a College Degree	0.4093***	0.5724***	0.1631***				0.4808***	0.5678***	0.0870*
	(0.0813)	(0.0784)	(0.0429)				(0.0936)	(0.0931)	(0.0514)
Share Enrolled in College				0.2846**	0.6770***	0.3923***	-0.2738**	0.0175	0.2913***
				(0.1325)	(0.1330)	(0.0858)	(0.1352)	(0.1242)	(0.1031)
Additional Amenity Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: N=289 CSA/CBSAs. Robust standard errors in parentheses.

*Significant at 10%; **Significant at 5%; ***Significant at 1%.

Table 3: Effects of the Other Amenities on Quality of Life

Dependent Variable:	Log Wages	Log Price Index	QOL Value
January Temperature	0.0005	0.0017**	0.0012**
	(0.0007)	(0.0008)	(0.0006)
July Temperature	-0.0036*	-0.0059***	-0.0024**
	(0.0018)	(0.0018)	(0.0012)
January Sun	0.0002	0.0005***	0.0003***
	(0.0002)	(0.0002)	(0.0001)
July Humidity	-0.0013**	-0.0017**	-0.0003
	(0.0006)	(0.0007)	(0.0005)
% Water Area	0.0001	0.0013***	0.0012***
	(0.0003)	(0.0005)	(0.0004)
Topography 2	0.0012	0.0328***	0.0315***
	(0.0095)	(0.0118)	(0.0075)
Topography 3	-0.0163	0.0074	0.0237**
	(0.0153)	(0.0143)	(0.0119)
Topography 4	-0.0023	0.0340***	0.0364***
	(0.0097)	(0.0091)	(0.0071)
Topography 5	-0.0493***	0.0100	0.0592***
	(0.0129)	(0.0149)	(0.0103)
Atlantic Coast	0.0545***	0.0858***	0.0314***
	(0.0149)	(0.0146)	(0.0103)
Pacific Coast	0.0472	0.0820**	0.0348
	(0.0311)	(0.0319)	(0.0219)
Gulf Coast	0.0250*	0.0012	-0.0238
	(0.0133)	(0.0328)	(0.0257)
Precipitation	-0.0017**	-0.0002	0.0014***
	(0.0007)	(0.0007)	(0.0005)
Snow	-0.0004	-0.0006**	-0.0003
	(0.0003)	(0.0003)	(0.0002)
Log Population	0.0057	-0.0074	-0.0131***
	(0.0062)	(0.0061)	(0.0041)
Log Population Density	0.0031	-0.0115	-0.0147**
	(0.0109)	(0.0097)	(0.0071)
Violent Crime	0.0003	0.0019***	0.0017**
	(0.0012)	(0.0007)	(0.0008)
Property Crime	-0.0004	-0.0012***	-0.0009**
	(0.0005)	(0.0005)	(0.0004)
Particulate Matter (2.5)	0.0064**	0.0019	-0.0045**
	(0.0025)	(0.0025)	(0.0017)
Ozone	-3.0382***	-2.6082***	0.4300
	(0.8610)	(0.9245)	(0.6529)
Mean Commute Time	0.0096***	0.0121***	0.0025**
	(0.0018)	(0.0018)	(0.0011)
Student-Teacher Ratio	0.0027	0.0037	0.0010
	(0.0019)	(0.0023)	(0.0015)
R^2	0.87	0.92	0.71

Notes: N=289 CSA/CBSAs. Robust standard errors in parentheses. Regressions also include the share of adults with a college degree and the share of the population enrolled in college.
*Significant at 10%; **Significant at 5%; ***Significant at 1%.

Table 4: Robustness to Alternative Measures of Higher Education Importance

Dependent Variable:	Log Wages	Log Price Index	QOL Value
A.			
Share of Adults with a College Degree	0.4282***	0.5587***	0.1305***
	(0.0836)	(0.0847)	(0.0463)
Share of In-migrants Ages 18-24	-0.0389	0.0283	0.0672*
	(0.0376)	(0.0332)	(0.0345)
Additional Amenity Controls	Yes	Yes	Yes
B.			
Share of Adults with a College Degree	0.4420***	0.5631***	0.1211**
	(0.0851)	(0.0852)	(0.0471)
Share of In-migrants Enrolled in College	-0.0545	0.0155	0.0700**
	(0.0374)	(0.0309)	(0.0316)
Additional Amenity Controls	Yes	Yes	Yes
C.			
Share of Adults with a College Degree	0.3535***	0.4700***	0.1165**
	(0.0780)	(0.0734)	(0.0474)
Land-grant	0.0201*	0.0369***	0.0168**
	(0.0106)	(0.0114)	(0.0070)
Additional Amenity Controls	Yes	Yes	Yes

Notes: N=289 CSA/CBSAs. Robust standard errors in parentheses. All regressions include the additional explanatory variables in Table 3.

*Significant at 10%; **Significant at 5%; ***Significant at 1%.

Table 5: Robustness to Including Additional Education Variables

Dependent Variable:	Log Wages	Log Price Index	QOL Value
Share of Adults with High School but no Bachelor's	0.0311	0.1901	0.1589*
	(0.1389)	(0.1189)	(0.0927)
Share of Adults with only a Bachelor's Degree	-0.048	0.2703	0.3183***
	(0.1464)	(0.1674)	(0.1158)
Share of Adults with a Graduate Degree	1.2229***	1.1963***	-0.0266
	(0.2314)	(0.2701)	(0.1764)
Share of Population Enrolled in College	-0.4598***	-0.0857	0.3741***
	(0.1431)	(0.1433)	(0.1134)
Additional Amenity Controls	Yes	Yes	Yes

Notes: N=289 CSA/CBSAs. Robust standard errors in parentheses. All regressions include the additional explanatory variables in Table 3.
*Significant at 10%; ***Significant at 1%.

Table 6: Robustness to Using Adjusted QOL Values from Albouy

Dependent Variable:	Wages	Housing Costs	Adjusted QOL
Share of Adults with a College Degree	0.4960***	1.3566***	0.1984***
	(0.0996)	(0.1884)	(0.0475)
Share of Population Enrolled in College	-0.4843***	-0.2903	0.1298**
	(0.1348)	(0.2477)	(0.0656)
Additional Amenity Controls	Yes	Yes	Yes

Notes: N=239 CMSA/MSAs. Dependent variables are obtained from Albouy (2008) and are for the year 2000. Robust standard errors in parentheses. All regressions include the additional explanatory variables in Table 3. **Significant at 5%; ***Significant at 1%.