



An aggregate approach to estimating quality of life in micropolitan areas

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Received: 19 February 2021 / Accepted: 24 May 2022 / Published online: 29 July 2022
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Abstract

Because of their reliance on large samples of micro-level housing and wage data, quality of life studies using Rosen–Roback models have focused almost exclusively on metropolitan areas, largely ignoring non-metropolitan areas. Although understandable given data constraints, this dominant focus on metropolitans has limited the data-driven approaches available to policymakers concerned with community and economic development in small cities, or micropolitan areas. To address this gap, we develop an aggregate approach to estimate both quality of life and quality of the business environment in micropolitan areas utilizing county-level housing and wage data that can be used when large samples of micro-level data are unavailable. Specifically, we use the county residuals from wage and housing regressions to replace the fixed effects typically estimated from the micro-level estimations in quality of life studies. We find compelling evidence that higher quality of life is not only associated with higher employment and population growth and lower poverty rates, but that it is more important than quality of the business environment in determining the success of micropolitan areas.

JEL Classification R1 · R5 · H4

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1 Introduction

Urban planners and urban economists have long noted the importance of quality of life (QOL) in determining the success of cities (see Jacobs, 1961; Rogerson, 1999; Florida, 2002; Shapiro, 2006). Indeed, the importance of quality of life has likely increased over time with the rise of the “consumer city” (Glaeser et al., 2001; Rappaport, 2009). While cities in general are well positioned to benefit from the consumer amenities they offer, recent work by Brown and Tousey (2020) finds that small urban areas (mostly micropolitan areas) face slower population and employment growth than do large urban areas. It remains an open question whether quality of life functions in a similar way, attracting population and facilitating growth and development, in micropolitans as it does in large urban areas.

The primary reason this question remains unanswered is a matter of data constraints. The most common model for estimating quality of life, Rosen–Roback, requires large samples of micro-level data in order to reveal when and under what circumstances *households* are willing to pay higher housing prices and/or forego higher wages in order to live where they do. Their willingness to pay for location, their “revealed preference,” is a reflection of amenities and the quality of life (Rosen, 1979; Roback, 1982; Albouy, 2008). Similarly, estimations of the quality of business environment (QOBE) reveals where *businesses* are willing to pay more to locate in places that are more productive. Because the publicly available micro-level data required to calculate these estimations is primarily available for metropolitan areas, however, the quality of life literature has necessarily focused on large urban centers. One consequence of this nearly exclusive focus on metropolitan areas in the QOL literature is that policymakers in smaller urban areas are less able to utilize research to develop effective and sustainable community and economic development strategies. Despite some prominent assumptions to the contrary, micropolitan areas are not simply scaled-back versions of metropolitans (Brown et al., 2004); we cannot assume that either research findings or successful policy prescriptions in major metropolitan areas like San Francisco are accurate or appropriate in small cities like Wooster, Ohio.

The 542 micropolitan statistical areas (μ SA) in the United States, which are defined by a population core between 10,000 and 50,000 people, are home to over 27 million people (Census, 2019),¹ and they vary in distance to larger urban areas, industrial structure, population, local and spatially contiguous amenities, and government structure. Moreover, micropolitans differ significantly in their levels of human capital and natural capital endowments, which influences their vastly different growth rates. Between 2010 and 2018, population growth in micropolitan counties ranged between negative 16.8 percent and positive 56.5 percent, with an average of 0.2 percent growth. The range of outcomes for employment growth was even wider, ranging between a 32.5 percent loss and an 81.2 percent gain, with an average of 6.0 percent growth.

¹ Calculated using county population data from the Bureau of Economic Analysis.

Four of the top five micropolitan area counties with the highest employment growth between 2010 and 2018 (Table 1) are dependent on natural resources. The counties in Texas and North Dakota, for example, have grown as a result of shale development (oil and gas extraction), whereas the mountains of Wasatch County, Utah have given rise to its growing reputation as a ski resort town. Capitalizing on natural resources has long been a successful economic strategy for small towns and cities (Nord and Cromartie, 1997; Beale and Johnson, 1998; McGranahan, 1999; English et al., 2000; Deller et al., 2001), but the inclusion of Lafayette County, Mississippi in the top five micropolitan growth counties highlights that it is not the *only* strategy. Instead, Lafayette County's growth stems from its institution of higher education, the University of Mississippi (Ole Miss). Reliance on natural resources or universities is not feasible for the majority of micropolitan area counties; however, so it is important to understand what *other* options policymakers in small cities have available to them. Because of the data constraints explained above, however, we must rely on an aggregate method in order to estimate QOL and QOBE in micropolitan areas to provide policymakers with a data-driven approach to understanding the revealed preferences of households and businesses in small towns. Ultimately, we expect that research findings explicitly about micropolitan areas will better help policymakers invest in the amenities that will improve the economic outlook in their communities rather than adapting findings from research focused on metropolitan areas.

In order to estimate quality of life and quality of the business environment in micropolitan areas and geographies that are too small for the breadth and depth of data necessary for traditional QOL methods (Rosen 1979; Roback, 1982), we instead use aggregate county-level data to run average wage and median home value regressions on county-level characteristics that affect wages and home values. We then use the residuals from these regressions to replace the fixed effects typically estimated from the micro-level estimations in QOL studies. In order to test the validity of this approach, we compared our findings using aggregate data to previous findings using the traditional micro-level data approach to estimating QOL in metropolitan areas and found that our aggregate approach produces similar results. We then focus our analysis on micropolitan area counties using our aggregate approach to estimate QOL and QOBE environment for these non-metropolitan counties. We find that micropolitan area counties with higher quality of life experience both higher

Table 1 The Top 5 Micropolitan area counties with the highest employment growth. *Source:* BEA (micropolitan area counties with populations between 10,000 and 50,000)

Rank	County	μSA	Population growth 2010–2018 (%)	Employment growth 2010–2018 (%)
1	Reeves county	Pecos, TX	13.50	81.20
2	Williams county	Williston, ND	56.50	70.50
3	Wasatch county	Heber, UT	40.60	55.90
4	Lafayette county	Oxford, MS	15.20	39.80
5	Andrews county	Andrews, TX	22.10	37.90

population growth *and* higher employment growth, but we find no statistically significant relationship between the quality of the business environment and growth in micropolitan areas. Furthermore, we find higher quality of life in micropolitan areas is associated with lower poverty rates in these counties. Finally, we examine a rich set of amenities to discover which amenities are associated with higher quality of life in micropolitan area counties. This examination complements the comparison of our findings to the micro-level data approach. We find the use of the error term in our county regressions yields findings comparable to other studies of amenity preferences.

2 Literature review

Rosen–Roback quality of life studies assume spatial equilibrium whereby housing prices and wages adjust to equalize utility across space (with desirable local attributes associated with higher housing prices and lower wages). Rosen–Roback models require large samples of micro-level data to estimate household willingness to pay to live near desirable local amenities. Although sample sizes of micro-level data are too small or unavailable for non-metropolitan areas to conduct a traditional Rosen–Roback type quality of life estimation, that is not to say non-metropolitan areas are devoid of QOL research. Previous research instead estimates the impact of various amenities separately on growth in county-level housing prices and wages (Wu and Gopinath, 2008; Yu and Rickman, 2012). Using county housing prices and wages in non-metropolitan counties, Yu and Rickman (2012) identify household preferences for higher government spending on highways and for lower taxes (similar to previous studies on larger cities for example, Gyourko and Tracy, 1991). Preferences for infrastructure suggest the importance of connectedness between non-metropolitan areas and nearby metropolitan areas found in other research (Partridge et al., 2008b; Wu and Gopinath, 2008). Yu and Rickman (2012) also consider the preferences of firms, finding preferences for investments in public safety and education.

When spatial equilibrium fails to hold (as Clark et al., 2003 suggest may be the case for metropolitan areas), migration may help bring about a new spatial equilibrium as people move to nice places (Rappaport, 2007 shows population growth is higher in counties with nice weather as demand for nice weather has increased over time). Non-metropolitan research has also focused on other measures of success, particularly growth. Irwin et al. (2010) offer valuable insights from several decades of economic research on nonmetropolitan American in their review of methods that have been used to examine rural growth and change. Economic research in these geographies have largely focused on rural migration and population change (Nord and Cromartie, 1997; Beale and Johnson, 1998; McGranahan, 1999), population and employment change (Carlino and Mills, 1987; Duffy-Deno, 1998; Carruthers and Vias, 2005), and simultaneous population, employment, and income change (Deller et al., 2001; Nzaku and Bukonya, 2005; Deller and Lledo, 2007). This literature has documented the transformation of non-metropolitan economies over the last century, moving from an overwhelming

dependence on agriculture and extractive industries to a greater dependence on manufacturing and services related to natural amenities. There are a number of reasons for this shift, including labor-saving technological progress, transportation cost declines, and rising household incomes (see Nord and Cromartie, 1997, and Irwin et al., 2010 for a review).

Today, natural amenities are an important aspect of growth in much of nonmetropolitan America (Deller et al., 2001; Nzaku and Bukenya, 2005; McGranahan and Wojan, 2007; McGranahan, 2008; Davidsson and Rickman, 2011; Rickman and Rickman, 2011). Rickman and Wang (2017) find that natural amenities have attracted firms and households to non-metropolitan areas. But higher than average endowments of natural amenities do not guarantee higher than average employment growth. There is significant variation in outcomes for natural amenity-rich micropolitan areas due both to spatial variation in the growth effects of natural amenities and variation across different natural amenities (Kem et al., 2005; Partridge et al., 2008a). Stephens and Partridge (2015) note that there may be unrealized opportunities to leverage Great Lake amenities to attract highly skilled workers that could further economic growth in counties across the Great Lakes region. Moreover, natural amenities typically require some type of public or private investment, such as building a ski resort (as in Wasatch County) or land conservation, in order to realize the growth effects (McGranahan, 2008).

These investments do not guarantee success, however. If growth in the tourism-based service sector hollows out the distribution of income, for example, natural amenities can actually increase inequality in non-metropolitan areas (Leatherman and Marcouiller, 1999; Marcouiller et al., 2004). In part, this is why previous research suggests policymakers take caution in promoting amenity-led migration and population growth; various congestion effects of population growth can adversely impact quality of life (Rickman and Rickman, 2011; Davidsson and Rickman, 2011). Some researchers assert that micropolitan area growth and development should focus primarily on the wellbeing of its residents (Irwin et al., 2010; Partridge and Rickman, 2003b).

The QOL research for both non-metropolitan and metropolitan areas tends to focus on a few broad categories of amenities. For example, Deller et al. (2001) uses principle component analysis to compress a large number of amenities into smaller indices (climate, land, water, winter recreation, and developed recreational infrastructure). Recent work by Reynolds and Weinstein (2021) incorporates a rich set of location-specific amenities associated with higher quality of life to provide policymakers with a data-driven approach to urban development policy in metropolitan areas using a least absolute shrinkage and selection operator approach to pare down the number of amenities. With more detailed information on the importance of quality of life and the specific amenities that improve quality of life for micropolitan areas, policymakers in these geographies can pursue policies tailored to their community rather than pursuing ineffective sector-based policies that fight against the

larger economic trends (for example, by narrowly focusing on agriculture, extractive industries, and other export base development).²

3 Data and methodology

Indexing or restricting the number of amenities in QOL research is understandable, given the sheer quantity to consider. Yet, concerns arise when estimating quality of life (or quality of the business environment) with an incomplete set of amenities (see for example, Gyourko, 1991). Given that we likely do not have a complete list of amenities, and because some amenities are imperfectly measured, we first infer preferences for locations using wages and rents to estimate quality of life, and then look to the amenities that affect quality of life. As desirable amenities increase the utility and disamenities decrease the utility of residents, the assumption of spatial equilibrium suggests that prices will adjust across areas to reflect preferences for amenities.

To estimate the QOL for a location (j), wage and housing regressions are conducted typically for individuals (i) controlling for individual attributes (X_i^w) and housing characteristics (X_i^r) using large samples of micro-level data. From these wage and housing regressions (Eqs. 1 and 2), we can estimate fixed effects for each location, or the premium that households are willing to pay in higher housing costs (θ_j^r) or lower wages (θ_j^w) to live in location j . This premium is the location-specific amount above or below what the housing characteristics would suggest. After we establish the premium, we then incorporate these fixed effects to estimate the quality of life for each location (Eq. 3).

$$\ln(r_{ij}) = \alpha^r + \beta^r X_i^r + \theta_j^r + \varepsilon_{ij}^r \quad (1)$$

$$\ln(w_{ij}) = \alpha^w + \beta^w X_i^w + \theta_j^w + \varepsilon_{ij}^w \quad (2)$$

$$\widehat{QOL}_j = \theta_j^r - \theta_j^w \quad (3)$$

We use these same fixed effects to estimate a firms' willingness to pay to locate in a place that is more productive. Businesses are willing to pay higher real estate prices, estimated with the fixed effect from the housing regressions (θ_j^r), and are also willing to pay higher wages (θ_j^w) in order to locate in more productive places (Beeson and Eberts, 1989; Gabriel and Rosenthal, 2004). We call this the quality of business environment (QOBE), we estimate QOBE for each location j , incorporating the fixed effects into Eq. 4.

² Evidence that gains in farm incomes have improved the outcomes of counties is mixed (Irwin et al., 2010), and Kilkenny and Partridge (2009) fail to find evidence that export base development improves growth in rural areas between 1980 and 2005.

$$\widehat{QOBE}_j = \theta_j^r + \theta_j^w \tag{4}$$

This commonly used methodology is utilized for large metropolitan areas that can meet the data requirements, a large micro-level sample of individuals i to estimate the fixed effects (θ_j^r and θ_j^w). Reynolds and Rohlin (2014) address the data limitations for smaller locales, Empowerment Zones (j), by replacing individual micro-level data (i) with data available at the census tract and block group level. They then estimate fixed effects (θ_j^r and θ_j^w) to calculate QOL and QOBE in Empowerment Zones. They find that this small-area aggregate approach, replacing individual data with census tract and block group data, replicates the results produced from individual-level data for metropolitan areas. Instead, Wu and Gopinath (2008) and Yu and Rickman (2012) estimate the impact of various amenities separately on growth in non-metropolitan county-level housing prices and wages, and Welch et al. (2007) use metropolitan county-level median rents and wages to estimate the QOL impact of public services by estimating a seemingly unrelated regression. If we observed the full set of amenities, we could use the revealed preferences of households across the full set of amenities in wage growth and housing price growth regressions to determine quality of life in non-metropolitan areas. However, we likely do not observe the full set of amenities. We utilize aggregate county-level data (see Appendix 1 for a full list of the data sources) to first estimate QOL and QOBE for all counties in the U.S., and then estimate the impact of amenities on QOL.

Glaeser et al. (2001) regress housing prices on per capita income then use the residual as a proxy for the amenity value of large cities. Carruthers and Mulligan (2006) estimate a general amenity value for all counties in the U.S. using the residual from a regression of the natural logarithm of the median housing value on the natural logarithm of the median household income. We build on this methodology aligning it more closely with the quality of life methodology by using the residuals from separate wage and housing regressions.

Seen in Eq. 5, we regress the natural logarithm of 2010 median home values in county j on county-level housing characteristics (X_j^r), such as the share of the housing stock that has 2–3 bedrooms, the share of the housing stock that was built after the year 2000, etc. We also regress the natural logarithm of 2010 county average wages on county-level individual characteristics (X_j^w), such as the share of the population with a bachelor’s degree, the share of employment in manufacturing, etc. (Eq. 6; see Appendix 2 for the full list of factors and the regression results for Eqs. 5 and 6).

$$\ln(r_j) = \alpha^r + \beta^r X_j^r + \varepsilon_j^r \tag{5}$$

$$\ln(w_j) = \alpha^w + \beta^w X_j^w + \varepsilon_j^w \tag{6}$$

where our research diverges from previous research is in the use, or lack of use, of county fixed effects in the traditional estimations of QOL and QOBE.

Because we are using 2010 county-level data, we cannot include county fixed effects (θ_j^r and θ_j^w) in these regression equations. Instead, we replace or approximate these county fixed effects in the QOL and QOBE estimations with the residuals from Eqs. 5 and 6 (similar to Glaeser et al., 2001 and Carruthers and Mulligan, 2006 but with separate housing and wage regressions). The residuals (the difference between observed and predicted values) are our proxy for the premium that households and firms are willing to pay to locate in county j ; they are the portion of the county housing values and wages above or below what the characteristics of the housing stock or workforce would suggest they should be (Eqs. 7 and 8).³

$$\theta_j^r = \ln(r_j) - \widehat{\ln(r_j)} \quad (7)$$

$$\theta_j^w = \ln(w_j) - \widehat{\ln(w_j)} \quad (8)$$

We then incorporate our estimated θ_j^r and θ_j^w from Eqs. 7 and 8 back into Eqs. 3 and 4 to calculate QOL and QOBE environment for all U.S. counties. This allows us to rank and compare all counties and also separately rank and compare all metropolitan counties and all non-metropolitan counties, focusing on micropolitan area counties. We use metropolitan county estimates as a validity check by comparing our methodology results with previous research using micro-level individual data. Though our methodology produces similar results for metropolitan areas in previous studies, we fully acknowledge that using micro-level data has clear advantages for geographic areas that have micro-level data at their disposal. However, we suggest that our methodology has clear advantages for geographic areas that do *not* have publicly available micro-level data to understand the revealed preferences of households and businesses in these geographies.

We then regress traditional measure of growth (population and employment growth between 2010 and 2018) on our QOL and QOBE estimations and include QOL and QOBE of neighboring counties for micropolitan areas in 2010 to examine the potential for regional and spatial effects. We also consider the impact of QOL and QOBE on other measures of development and wellbeing, specifically poverty rates between 2010 and 2018. Finally, we examine a rich set of location-specific amenities associated with QOL in micropolitan areas. This approach helps translate market-based responses to community characteristics which may respond to place-based policies.

³ Specifically, we use studentized residuals. We also estimated quality of life using normalized residuals with similar results (the correlation in the quality of life estimates between the two was approximately 0.97).

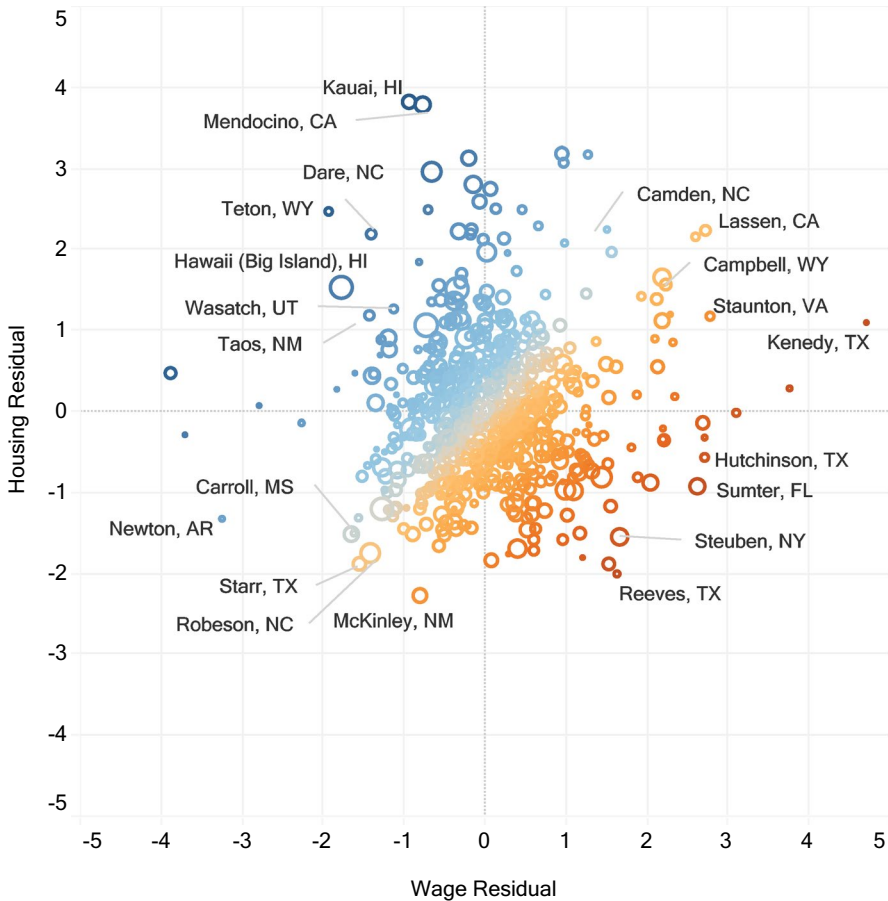


Fig. 1 Housing and wage residuals for micropolitan counties. *Note:* More populous counties are represented by larger markers. Darker blue markers have higher QOL (darker orange have lower QOL)

4 Results & discussion

Figure 1 shows the housing and wage residuals for micropolitan area counties from Eqs. 5 and 6. Counties with a large positive housing residual and large negative wage residual are more likely to be high amenity counties that are great places to live, given that households are willing to pay higher housing prices and accept lower wages to live there (the upper left quadrant—Fig. 1). These are micropolitan areas with a high estimated quality of life. The micropolitan areas that stand out most in this quadrant, including Wasatch County in Utah, are well known for their natural amenities, which comes at no particular surprise (Appendix 3 verifies the relationship between QOL and the natural amenity score for all U.S. counties). Teton County in Wyoming (Jackson, WY-ID μ SA) includes sections of both Yellowstone National Park and Grand Tetons National Park, as well as part of the Bridger-Teton National Forest. Similar to Wasatch County, UT, Taos County, NM is a well-known

skiing destination. Kauai, the Big Island in Hawaii, and Dare County in North Carolina (Kill Devil Hills, NC μ SA) are well known for their beautiful beaches, while Mendocino County (Ukiah, CA μ SA) is positioned on coastal waters and a national forest in addition to being part of California's wine country.

Note: More populous counties are represented by larger markers. Darker blue markers have higher QOL (darker orange have lower QOL).

The upper right quadrant of Fig. 1 is counties with large positive housing and wage residuals. Many of these counties tend to be viewed by firms as high productivity counties and households view them as a great place to live and work (they are willing to pay more for housing, but they also require more in wages). These micropolitan areas have a high estimated quality of the business environment. Many of these economies rely on federal institutions, from a Naval Air Station in the Kingsville, TX μ SA (Kenedy County), to the largest Coast Guard Station in the U.S. located in the Elizabeth City, NC μ SA (Camden County), and Herlong Federal Correctional Institution in the Susanville, CA μ SA (Lassen County). The economy of Campbell County in the Gillete, WY μ SA relies on its extractive industries, dubbing itself the "Energy Capital of the Nation." Staunton County (Staunton-Waynesboro μ SA) is home to Mary Baldwin University. Many of these counties are also near natural amenities such as coastal waters (Camden, NC; Kenedy, TX) or national forests (Lassen, CA).

Counties with a large negative housing residual and large positive wage residual (the bottom right quadrant of Fig. 1) are more likely to be low amenity areas, but still great places to work (high wage residual). These counties have a low estimated quality of life.. Many of these counties rely on extractive industries and agriculture (Reeves County in the Pecos, TX μ SA; Hutchinson County in the Borger, TX μ SA). Steuben County in the Corning, NY μ SA is the headquarters for the Fortune 500 company Corning Incorporated. Sumter County in The Villages, FL μ SA, which has the highest median age of any county in the U.S., is made up of 17 Community Development Districts with numerous retirement communities. It is important to note here that there is likely heterogeneity in our quality of life estimates that is not captured by this methodology. For example, Ulrich-Schad (2015) find the impact of natural amenities on in-migration and out-migration varied by age demographic. The Villages likely offers a higher quality of life to its older residents, but potentially less so to younger cohorts.

Finally, households and firms view counties with both large negative housing and wage residuals as a lower amenity places and particularly low quality of the business environment, many of which are neither a great place to live nor a great place to work. These counties are in the lower left quadrant in Fig. 1. Many of these counties have natural amenity scores below 0 (Newton County in the Harrison, AR μ SA; Carroll County in the Greenwood, MS μ SA; Robeson County in the Lumberton, NC μ SA), a history of racism and strained race relations (Newton County in AR; Carroll County in MS), or notably high crime rates (Robeson County, NC; McKinley County in the Gallup, NM μ SA), all of which make them less desirable places to live and especially less desirable to work. Many of these counties also have a history of nearly non-existent economic development (such as McKinley County, NM), have relied on industries that are in decline, such as manufacturing (Robeson County, NC

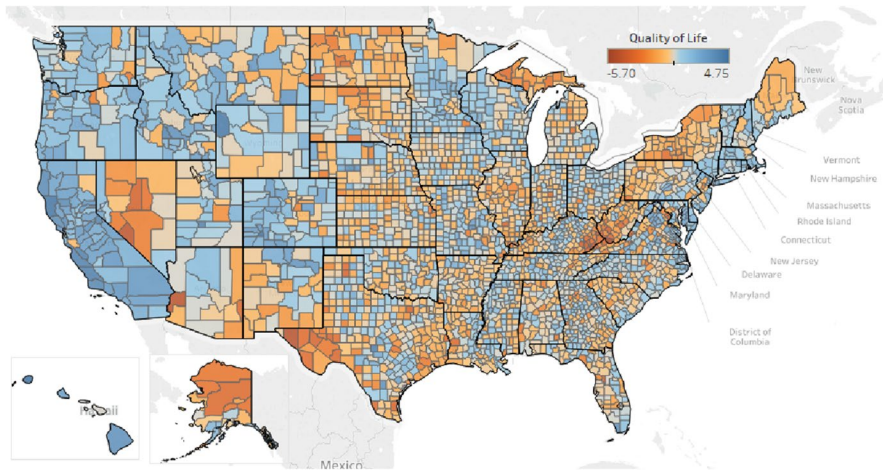


Fig. 2 Quality of life across counties in the U.S. (2010)

and Carroll County, MS), or have low educational attainment (Starr County in the Rio Grande City, TX μ SA).

Figure 2 shows the estimated QOL for all counties from Eq. 3 (see Appendix 3 for our robustness check using metropolitan counties).⁴ Visually, our map looks largely similar to the map created by Carruthers and Mulligan (2006) using the residuals from regressing housing values on income for the year 2000.⁵ One noticeable difference between the two maps is that the Appalachian region is notable as having lower quality of life. As expected, our maps shows us high estimated QOL for many counties that are well known to have high amenity values, such as coastal counties and mountainous counties in the West (Appendix 4). A scatter plot of the relationship between the Natural Amenity Scale (USDA ERS) and our estimated quality of life in micropolitan areas (Fig. 3) shows there is a positive and significant relationship between higher estimated QOL and higher quality of natural amenities in micropolitan area counties.⁶ Yet, we can also see from the map in Fig. 2 that Appalachia, despite the beautiful Great Smoky Mountains, Blue Ridge Mountains, Appalachian Mountains, and other natural amenities, has a notable cluster of counties with a

⁴ As a robustness check, we also compare the correlation between our aggregate approach to estimating quality of life across counties to Albouy's (2008) estimation. We match metropolitan counties to the appropriate metropolitan statistical areas and all non-metropolitan counties to Albouy's non-metro area within the state. Despite Albouy (2008) estimating quality of life in 2000 while we estimate quality of life in 2010, we still find a moderate and statistically significant correlation between the two quality of life estimations (a correlation of about 0.3). The correlation in our quality of life estimates was slightly higher using unweighted residuals as opposed to using Albouy's weighting scheme $QOL = 0.33\theta_j^r - 0.51\theta_j^w$. As a robustness check, we also calculate quality of life using Albouy's weighting scheme and using residuals that are means adjusted and find similar results.

⁵ See Fig. 4 of Carruthers and Mulligan (2006) paper to compare their map to ours.

⁶ We focus our analysis on μ SA counties. Although there are 542 μ SAs, some μ SA encompass more than one county giving us a sample size of about 686 depending on data availability.

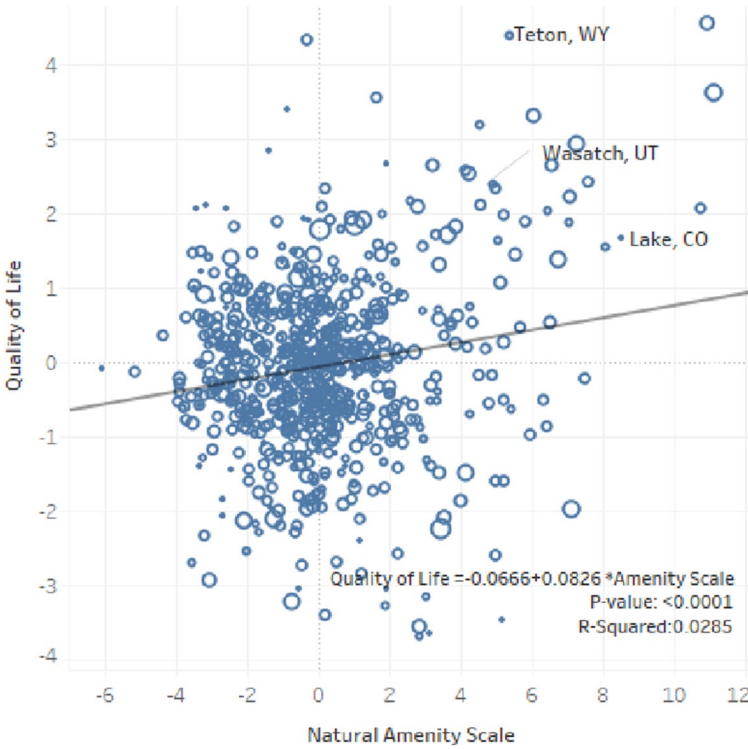


Fig. 3 Higher quality of life in micropolitan area counties and natural amenities. *Note:* we use the USDA natural amenity scale and our estimation of quality of life in 2010. Larger markers indicate counties that are more populous.

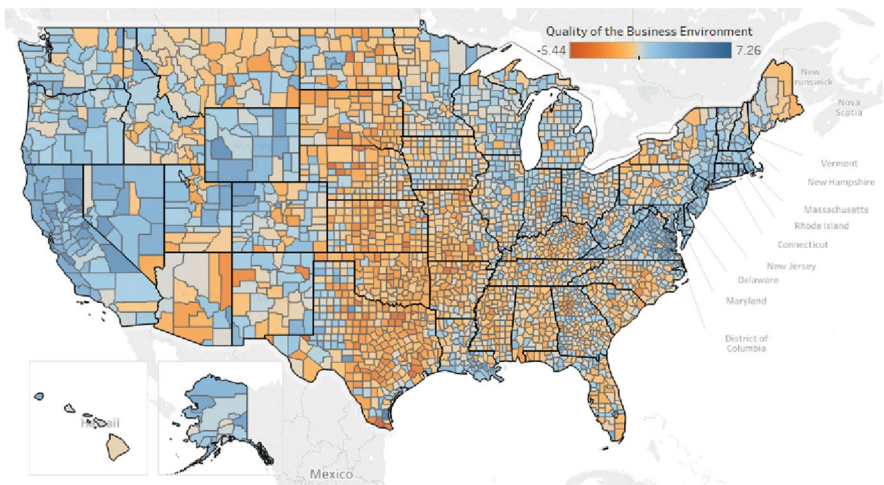


Fig. 4 Quality of the business environment across counties in the U.S. (2010)

low estimated QOL. Similarly, most of the counties in Alaska have a low estimated QOL, despite significant natural amenity endowments. Both of these examples indicate that while natural amenities can be leveraged to improve QOL, they are not the last word in what makes a county a good place to live. Carruthers and Mulligan (2006) similarly show the USDA natural amenity index plays an important role for some areas, but is not the only determinant of higher amenity values—they note that cultural amenities in cities, for example, are likely important drivers of amenity values.

Note: we use the USDA natural amenity scale and our estimation of quality of life in 2010. Larger markers indicate counties that are more populous.

Figure 4 depicts results from Eq. 4, our estimation of QOBE in all U.S. counties. Clearly, and perhaps unsurprisingly, counties along the northeastern seaboard (which includes New York and Washington D.C.) and along the west coast (which includes Silicon Valley) have *both* high QOBE as well as high QOL (Fig. 2), while other areas, such as in Appalachia that had a cluster of low QOL counties, rank higher in terms of its estimated QOBE. Table 2 shows the top 10 ranked micropolitan area counties for QOL along with their QOBE rankings.⁷ Although none of the top 10 QOL counties rank within the top 10 for QOBE, half of them are ranked within the top 55. We find a small positive but not statistically significant correlation between QOL and QOBE for micropolitan counties, indicating that firms and households do not necessarily *disagree* on what makes a micropolitan area nice, but that they do not have strong agreement either.⁸ This is in line with previous research that finds that while households and firms are increasingly valuing the same locations (Chen and Rosenthal, 2008), that they do not always agree on what makes a place nice (Gabriel and Rosenthal, 2004). This finding also suggests that policymakers in micropolitan areas can focus on QOL or QOBE without necessarily causing a large tradeoff between the two, but it does not answer the question about which, QOL or QOBE, provides more returns in terms of growth and development.

4.1 QOL, QOBE, and development in micropolitan areas

The next logical step in our analysis is an examination of how QOL and QOBE contribute to growth and development in micropolitan areas, which we have operationalized as population and employment growth. By examining the impact of QOL and QOBE on growth in micropolitan areas, we can test whether amenity-led migration or firm-led growth is stronger for micropolitan area development. Figure 5 shows the relationship between QOL, QOBE, and population growth. There is a positive and statistically significant relationship between QOL and population growth, with

⁷ It is important to note here that more sparsely populated counties may be more affected by error or noise in our methodology. All quality of life estimations should be viewed as approximations within some confidence interval. These confidence intervals may be larger for smaller counties. McPherson County, NE ranks among the top 10 in terms of quality of life, but it is also one of the least populated micropolitan area counties in the country.

⁸ The correlation coefficient between QOL and QOBE is 0.0271 with a p value of 0.4788. For metropolitan areas, the correlation coefficient between QOL and QOBE is 0.1189 with a p value < 0.0001.

Table 2 The top 10 Micropolitan areas for quality of life and quality of the business environment

County	μ SA	Housing residual	Wage residual	QOL	QOL rank	QOBE	QOBE rank
Kauai county	Kapaa, HI	3.8113	-0.9330	4.7443	1	2.8783	25
Mendocino county	Ukiah, CA	3.7909	-0.7723	4.5632	2	3.0186	20
Teton county	Jackson, WY-ID	2.4581	-1.9345	4.3927	3	0.5236	228
Danville city	Danville, VA	0.4595	-3.8837	4.3432	4	-3.4242	685
Humboldt county	Eureka-Arcata-Fortuna, CA	2.9483	-0.6675	3.6158	5	2.2808	36
Dare county	Kill Devil Hills, NC	2.1709	-1.3850	3.5560	6	0.7859	176
McPherson county	North Platte, NE	-0.3051	-3.6988	3.3937	7	-4.0040	570
Monroe county	Key West, FL	3.1238	-0.1826	3.3063	8	2.9412	24
Hawaii county	Hilo, HI	1.5265	-1.7717	3.2982	9	-0.2452	411
Hood River county	Hood River, OR	2.4857	-0.7020	3.1877	10	1.7838	55
County	μ SA	Housing residual	Wage residual	QOL	QOL rank	QOBE	QOBE rank
Kenedy county	Kingsville, TX	1.0800	4.7209	-3.6409	687	5.8009	1
Lassen county	Susanville, CA	2.2314	2.7436	-0.5122	462	4.9750	2
Waynesboro city	Staunton-Waynesboro, VA	2.1449	2.5899	-0.4450	439	4.7348	3
Inyo county	Bishop, CA	3.1546	1.2783	1.8763	41	4.4329	4
Tuolumne county	Sonora, CA	3.1720	0.9474	2.2246	22	4.1194	5
Greenlee county	Safford, AZ	0.2876	3.7606	-3.4730	685	4.0481	6
Del norte county	Crescent City, CA	3.0603	0.9804	2.0799	29	4.0408	7
Staunton city	Staunton-Waynesboro, VA	1.1686	2.7756	-1.6070	633	3.9443	8
St. Mary's county	California-Lexington Park, MD	1.6363	2.1948	-0.5584	476	3.8311	9
Campbell county	Gillette, WY	1.5446	2.2370	-0.6925	517	3.7816	10

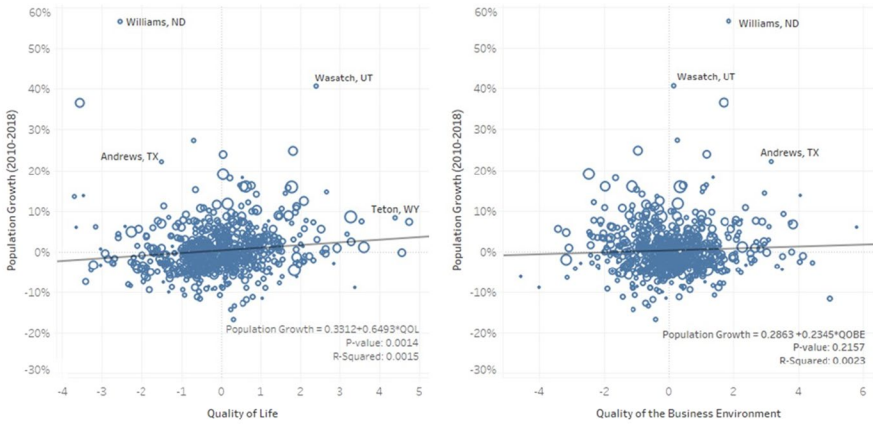


Fig. 5 QOL (more than QOBE) is associated with population growth

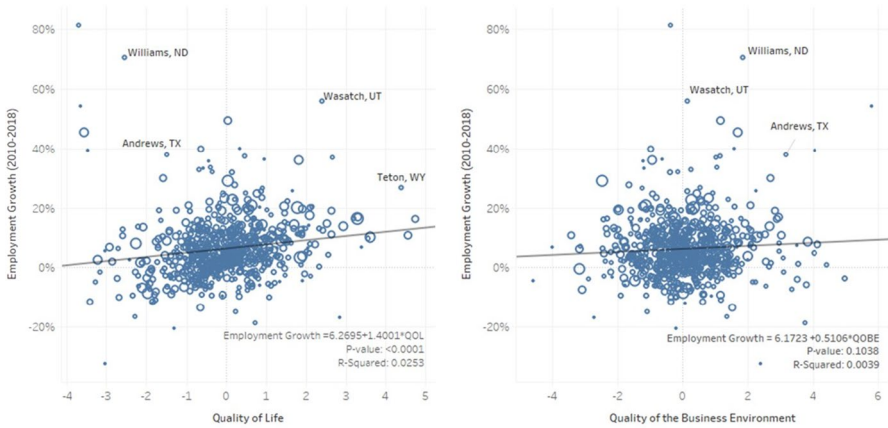


Fig. 6 QOL (more than QOBE) is associated with employment growth

high QOL counties experiencing more growth. We find *no statistically significant relationship* between QOBE in micropolitan area counties and population growth.⁹

We might expect that population growth tends to follow high QOL places while job growth tends to occur in high QOBE places; indeed, traditional economic development strategies would suggest that this is true. Yet, again, we see a stronger relationship between QOL and employment growth than between QOBE

⁹ If we remove the outlier counties of Williams County, ND and Wasatch County, UT the relationship between QOL and population growth gets slightly stronger (0.0070) while the relationship between QOBE and population growth only gets weaker (with a coefficient of 0.0014 and p value of 0.4164).

Table 3 The impact of QOL and QOBE on growth

Variable	2010–2018 population growth (%)		2010–2018 employment growth (%)	
	Model 1	Model 2	Model 1	Model 2
Quality of life	0.6364** (0.3062)	0.5654* (0.3307)	1.3720** (0.5754)	1.7514*** (0.5453)
Quality of the business environment	0.1988 (0.2348)	0.3233 (0.3075)	0.4337 (0.4609)	0.7472 (0.5629)
Neighboring QOL		0.1363* (0.0742)		0.0683 (0.1133)
Neighboring QOBE		-0.1141* (0.0620)		-0.2240** (0.1037)
QOL*neighboring QOL		0.1272** (0.0532)		0.2676* (0.1450)
QOL*Neighboring QOBE		0.0295 (0.0490)		0.0525 (0.0877)
QOBE*Neighboring QOL		-0.1260** (0.0608)		-0.1892* (0.1069)
QOBE*Neighboring QOBE		-0.0199 (0.0317)		-0.1099** (0.0486)
Intercept	0.3174 (0.2323)	-0.0026 (0.2511)	6.23933*** (0.37392)	5.8214*** (0.4593)
Adjusted R ²	0.0136	0.0427	0.0252	0.0702
N	682	680	682	680

Robust standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

and employment growth,¹⁰ as seen in Fig. 6. Taken together, results presented in Figs. 5 and 6 provide compelling evidence to support amenity-led growth over firm-led growth (as Vias, 1999; Partridge, 2010 have suggested). Furthermore, we find that quality of life is even more important for micropolitan areas than for metropolitan areas in predicting future employment and population growth between 2010 and 2018.

Our results suggest that a one standard deviation increase in the estimated QOL is associated with 0.77 percentage point increase in population and a 1.66 percentage point increase in employment (Figs. 5 and 6). Next, we regress population and employment growth from 2010 to 2018 on our estimations of quality of life and quality of the business environment to compare the growth effects of each within the same model (Eq. 9).

¹⁰ If we exclude the three outlier counties (Reeves County, TX; Williams County, ND; Wasatch County, UT), the relationship between QOL and employment growth gets stronger (0.0178) and the relationship between QOBE and employment growth gets weaker (a coefficient of 0.0042 and a p value of 0.1310).

$$\text{Population/Employment Growth}_{2010-2018} = \beta_0 + \beta_1 QOL_i + \beta_2 QOBE_i + \mu_i \quad (9)$$

The results (Table 3) show that model 1 verifies the growth relationship is stronger for QOL than the QOBE.¹¹ Model 1 shows that a 1 unit change is associated with a 0.64 percentage point increase in population growth between 2010 and 2018 and a 1.37 percentage point increase in employment growth.¹²

We estimate the effect of QOL and QOBE on the neighboring county to examine spatial spillover effects (Eq. 10).¹³ For this estimation, our goal is to quantify the spatial effects of QOL and QOBE (represented by wQOL and wQOBE) rather than net them out. We also include an interaction effect between both QOL and QOBE and neighboring counties to examine the heterogeneous effects of the spatial spillover. Model 2 (Table 3) shows the coefficient on the interaction between QOBE and neighboring QOBE suggests that high QOBE counties may be in competition for jobs with neighboring high QOBE counties, whereas the interaction between QOBE and neighboring QOL suggests that high QOBE counties will experience lower growth as people and jobs go to the neighboring county with high quality of life. High QOL counties neighboring other high QOL counties experience even *higher population and employment growth* as a result and do not seem to be impacted by neighboring high QOBE counties. These results provide evidence for a regional approach to quality of life.

$$\begin{aligned} \text{Population/Employment Growth}_{2010-2018} = & \beta_0 + \beta_1 QOL_i + \beta_2 QOBE_i \\ & + \beta_3 wQOL_i + \beta_4 wQOBE_i + \\ & \beta_5 wQOL_i(QOL_i) \\ & + \beta_6 wQOL_i(QOBE_i) + \\ & \beta_7 wQOBE_i(QOL_i) \\ & + \beta_8 wQOBE_i(QOBE_i) + \mu_i \end{aligned} \quad (10)$$

Development in micropolitan areas is distinct from growth (Irwin et al., 2010). With rising inequality in the U.S., growth may leave some residents behind. To examine this issue, we turn our focus to the relationship between QOL, QOBE, and the change in poverty rates between 2010 and 2018 and find that high QOL micropolitan area counties have had a statistically significant impact on lowering poverty, but high QOBE micropolitan areas have had a statistically significant impact

¹¹ Although the R-squared value is low, we would expect low R-squared values when predicting economic growth in micropolitan areas that we note are particularly heterogeneous. In models where we include more traditional predictors of growth (for example, when we include education level, industry shares, etc. from our wage regression) the R-squared value increases to over 0.3 for our population growth models and over 0.15 for our employment growth models.

¹² Our results are similar when we use other methods of estimating quality of life and quality of the business environment, specifically, when we estimate the residuals using the difference between the county's wages and housing values and the sample mean. This method produces robust standard errors as suggested by Pesaran (2006).

¹³ We use the maximum value of the quality of life (and the quality of the business environment) estimations for all neighboring counties. We find similar results using the average value of the quality of life (and the quality of the business environment) estimation for neighboring counties.

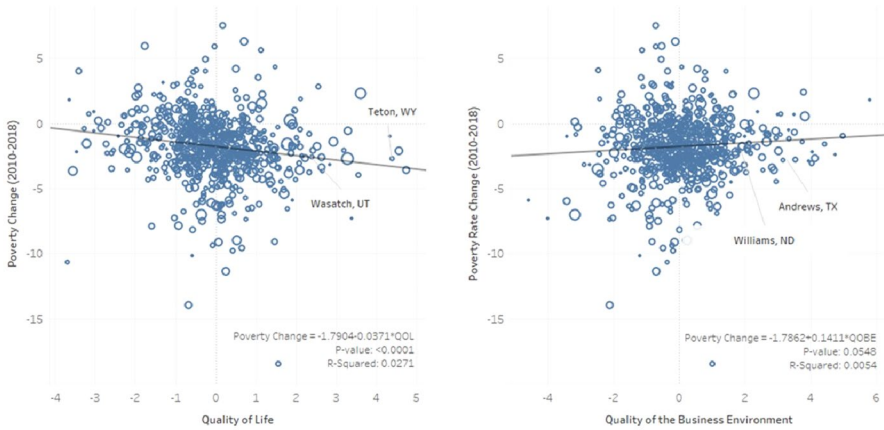


Fig. 7 High QOL micropolitan counties have lowered poverty more than high QOBE counties

on *increasing* poverty (see Fig. 7). Our results here, coupled with our results on the relationship between QOL and employment growth, are in line with previous research by Partridge and Rickman (2005; 2007) that showed job growth can help lower poverty rates in non-metropolitan area counties.

These results suggest that quality of life is becoming an important determinant of location choice for households and firms (similar to previous studies for metropolitan areas—see for example Glaeser et al., 2001). Our results provide compelling evidence that policymakers in America’s small cities are likely to receive more robust returns by focusing on improving the quality of life in their towns rather than narrowly focusing on improving quality of the business environment, which has been the dominant refrain of economic development specialists for several decades. But what does it mean to focus on QOL? In our last analysis, we consider a rich set of location-specific amenities to discover which amenities are associated with higher QOL in micropolitan area counties. This is our bridge to public policy.

4.2 Location-specific amenities and quality of life in micropolitan areas

Our results thus far verify that exogenous natural amenities are important for QOL and growth in micropolitan area counties (see Fig. 3). While this may give policymakers a better idea of which specific natural amenities in their stock of natural capital they can focus on, whether through land conservation or investments in recreational amenities, most natural amenities are not subject to the whims of policy; policymakers cannot build beaches or mountains or change the weather. Thus, to provide policymakers with a more practical set of suggestions, we examine a rich set of public and private amenities that policymakers can build or invest in to promote QOL in their towns. In Fig. 3, we examine the relationship between the USDA natural amenity index (exogenous) and our quality of life estimate (finding a positive and statistically significant relationship between the two). We next expand our examination to include exogenous natural amenities and potentially endogenous amenities.

Table 4 Location-specific amenities associated with higher quality of life in micropolitan areas

Variable	Full model		LAR model	
	Coefficient	Standard error	Coefficient	Standard error
Mean January temperature	0.0269***	(0.0083)	0.0283***	(0.0066)
Mean July temperature	-0.0597***	(0.0159)	-0.0595***	(0.0139)
Mean July relative humidity	-0.0020	(0.0050)		
Hilliness	0.00004	(0.0000)	0.00003	(0.0000)
Miles to coast	-0.0001	(0.0004)		
Water square miles	-0.0003	(0.0002)		
Park square miles	0.00002	(0.0001)		
Forest coverage	-0.9889***	(0.2322)	-0.9593***	(0.2062)
Miles to metro	-0.0043**	(0.0019)	-0.0043***	(0.0016)
Metro adjacent	0.1161	(0.0978)		
Road miles	-0.0008	(0.0007)		
Share worked at home	0.0930**	(0.0421)	0.0998***	(0.0375)
Population density	0.0006	(0.0014)		
Ln (2010 Population)	-0.0890	(0.1223)		
Violent crime rate	-0.0006***	(0.0002)	-0.0006***	(0.0002)
School spending share	7.7235***	(1.4817)	7.8447***	(1.3090)
Gini 2010	-2.0710	(1.4391)		
Relative mobility	0.0289***	(0.0072)	0.0206***	(0.0066)
Absolute mobility	-0.0070	(0.0068)		
Physically unhealthy days	0.0473	(0.0525)		
Mentally unhealthy days	-0.0834	(0.0521)		
Urgent care facilities 2009	0.0327	(0.0562)		
Health service places per cap 2010	2.0471	(90.6128)		
Mortality (YPLL Rate)	0.00001	(0.0000)		
Arts & Culture Places 2010	0.0549***	(0.0201)	0.0484**	(0.0197)
Places of worship 2009	-0.0240***	(0.0078)	-0.0240***	(0.0068)
Recreation places 2010	0.0517***	(0.0123)	0.0507***	(0.0112)
Fitness places per capita 2010	1070.91	(1040.0904)	1063.19	(929.9467)
Golf courses per capita 2010	-748.19	(689.1970)		
Bowling places per capita 2010	-834.98	(1374.5120)		
Movie theaters per capita 2010	349.11	(1736.9377)		
Eating & drinking places per cap 2010	67.71	(75.7456)		
Food stores per capita 2010	767.95***	(231.6414)	846.09***	(243.1766)
Home furnishing places per cap 2010	2465.65***	(1133.8796)	2388.70**	(1058.4589)
Personal care places per cap 2010	526.15***	(182.0613)	436.91**	(176.0051)
Intercept	3.7151**	(1.8311)	1.7589*	(1.0467)
N	677	677		
Adj-R ²	0.3236	0.3267		

Robust standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

This list of amenities is large (see Appendix 1), so we utilize a least angle regression (LAR) to pare down the number of variables to those with the most predictive power in our model. Though this list of amenities is large, we do not assume this list is exhaustive. Descriptive statistics for micropolitan area counties above and below average QOL are provided in Appendix 5.

Table 4 provides results for the full model of amenities and the restricted LAR model. We find that while climate (moderate winter and summer temperatures) and other natural amenities matter for the QOL in micropolitan area counties, there are a number of public and private amenities that increase QOL as well. Specifically, improving basic public goods may significantly improve the QOL, as micropolitan areas with lower crime rates and higher school spending are strongly associated with higher QOL. In addition to basic public goods, we find that access to basic amenities such as food stores and personal care service places are important for QOL, as are various other shopping places such as home furnishing stores. Additionally, micropolitans with better broadband access (which we proxy with the share workers that work from home) have higher estimated QOL, a finding that we expect is likely to strengthen over time as remote working becomes more accepted and normalized.

Interestingly, we do not find a statistically significant relationship between inequality (measured by the Gini index) and QOL, but, rather, find that higher relative mobility (how children rank in the income distribution compared to their parents) increases QOL. This suggests that residents are less concerned with inequality than they are with mobility. Thus, government services that increase mobility (in addition to school spending) can improve economic outcomes and promote the success of all of its people while also improving the QOL. Finally, we find evidence that arts and cultural places are associated with higher QOL, whereas places of worship seem to lower QOL. While this may seem inconsistent with the literature, particularly coming out of sociology (Putnam, 2001), it is consistent with economic findings in metropolitan areas. For example, Reynolds and Weinstein (2021) show the number of places of worship and religiosity is also associated with less progressive gender role attitudes and that less progressive gender role attitudes decrease the estimated QOL in an area, especially for women.

Overall, we find evidence that there are a number of policy-responsive amenities that may increase QOL in micropolitan areas. In addition to building recreation places to capitalize on natural resources endowments, policymakers should ensure they are promoting QOL and the success of all their residents by focusing on basic public amenities. Although we do not have data to estimate the quality of local amenities (such as the quality of eating and drinking establishments), we do find that better access to shopping, from food stores to home furnishing stores, increases quality of life, as does quality broadband access and the opportunity for social mobility.

These findings complement the comparison of our aggregate approach to previous micro-level data studies of QOL. If the error term contained no amenity information, but was merely a randomly generated disturbance, we would not expect covariates with amenity measures. That our results mimic those of earlier QOL studies that focused on identifying specific amenities we feel more confidence in our approach. Though we find a number of amenities are associated with higher

quality of life in micropolitan areas, we also suggest that more research is necessary to determine a causal link.

5 Conclusion

Data constraints in non-metropolitan areas have left policymakers in America's small towns at a disadvantage when considering and targeting community and economic development strategies. Because large samples of micro-level data are necessary to estimate traditional QOL models, the vast majority of this literature has focused on metropolitan areas, where the data is available. Thus, data-driven approaches to effective and successful growth and development strategies are based primarily on the experience of large urban centers. To fill this gap, we create a new approach using aggregate county-level data based on the revealed preferences of residents and firms to estimate quality of life and quality of the business environment in micropolitan area counties.

Our results confirm previous literature emphasizing the importance of QOL (particularly natural amenities) for growth and development. We find that higher QOL drives *both* population growth and employment growth more than QOBE in micropolitan area counties. Indeed, our results suggest a one standard deviation increase in estimated QOL is associated with a 0.77 percentage point increase in population and a 1.66 percentage point increase in employment. Thus, policies that focus on the aspects of a community that increase QOL will more likely generate higher levels of employment *and* population growth, which is a nearly universal policy interest in micropolitan areas. Furthermore, we find that higher QOL in micropolitan areas is also associated with improvements in poverty rates. A deeper look at the location-specific amenities shows that many of the amenities associated with higher QOL—higher school spending and programs to increase mobility, for example—also promote the success of all of its residents. We also find that there are local amenities that can be built to improve the QOL life in small cities. In addition to building recreation sites that capitalize on natural amenities, policymakers and businesses can invest in local arts and cultural sites and provide access to food stores, personal care services places, and home furnishing stores. As high QOL counties benefit from neighboring high QOL counties, our findings also suggest that micropolitan counties would likely benefit from a regional approach to QOL. This suggests a regional approach to estimating quality of life may provide additional value specific to a region such as the Midwest—which may also start to parse out some of the heterogeneity that may be underlying our results. Furthermore, we note that an analysis of other levels of geography (such as core-based statistical areas, for example) warrant further research.

As with any work, however, there are specific elements of this research that require additional exploration. Although we incorporate a rich set of amenities into our analysis, there are still likely amenities that we miss altogether or measure imperfectly. For example, we do not have data on the *quality* of amenities. For example, fast food restaurants are included in the same category as fine-dining

establishments, but it is reasonable to assume that their impact on QOL may be quite different. This warrants more research on not only the quality of amenities but other qualitative aspects that our quantitative approach may miss. Furthermore, qualitative work evaluating programmatic design of policy is critical to translating these findings into state and local public policy. This might best be approached through a sample selection process that employs outlier (extreme) micropolitan areas as a tool for contrasting state and local public policy.

This research also examines a relatively brief, but recent period of time. More detailed work examining QOL and QOBE in previous decades would be important in understanding population change in micropolitan regions, as would extensions of this work across the business cycle and the role of QOL and QOBE in the resiliency of micropolitan areas in the face of labor demand shocks. More work is warranted to disentangle the effects of potentially endogenous amenities and their ability to attract high skilled workers to combat negative labor demand shocks (as suggested by Stephens and Partridge, 2015 and Diamond, 2016). Additionally, while we have spoken to the role of QOL and QOBE on wellbeing—operationalized as poverty—this question requires more analysis. Research should address whether QOL or QOBE affects intergenerational mobility, or whether or not intra-micropolitan population dynamics explains part of the effect. For example, does the composition of migration across communities affect poverty in ways that are influenced by QOL or QOBE? Finally, we acknowledge there are limitations to using aggregate data when large samples of micro-level data are available—as is the case for metropolitan area counties. In the absence of such data, however, we believe that this aggregate approach focused specifically on micropolitan area counties provides important insights and considerations regarding community and economic development for policy makers in these geographies.

6 Appendix 1

Data sources

Variable	Source
Absolute mobility	How an individual's income compares with their parent's from Chetty et al., 2014
Arts & culture places 2010	Census
Bachelors popn Share	Census
Bowling places per capita 2010	County business patterns (Census)
Children popn share	Census
Construction share	Bureau of economic analysis, regional economic information system
Eating & drinking places per cap 2010	County business patterns (Census)
Emp/pop ratio	Census

Variable	Source
Employment	Bureau of economic analysis, regional economic information system
Fitness places per capita 2010	County business patterns (Census)
Food stores per capita 2010	County business patterns (Census)
Forest coverage	US Department of Agriculture, Economic Research Service
Forest share	US Department of Agriculture, Economic Research Service
Gini 2010	Chetty, et. al., 2014
Golf courses per capita 2010	County business patterns (Census)
Government share	Bureau of economic analysis, regional economic information system
Health service places per cap 2010	County business patterns (Census)
Herfindahl index	Bureau of economic analysis, regional economic information system and author's calculation
Hilliness	US Department of agriculture, economic research service
Home furnishing places per cap 2010	County business patterns (Census)
Manufacturing share	Census
Mean January temperature	US Department of agriculture, economic research service
Mean July relative humidity	US Department of agriculture, economic research service
Mean July temperature	US Department of agriculture, economic research service
Median age	Census
mentally unhealthy days	CDC/NCHS via County health rankings
Metro adjacent	OMB (author's calculation)
Miles to coast	National oceanic and atmospheric administration
Miles to metro	Author's calculations
Mining share	Census
Movie theaters per capita 2010	County business patterns (Census)
Park square miles	US Department of agriculture, economic research service
Percent black	Census
Percent hispanic	Census
Percent immigrant	Census
Percent single headed house	Census
Percent white	Census
Personal care places per cap 2010	County business patterns (Census)
Physically unhealthy days	CDC/NCHS
Places of worship 2009	County Business Patterns (Census)
Population	Census
Population density	Census, author's calculations
Poverty rate change (2010–2018)	Census, author's calculations
Recreation places 2010	County business patterns (Census)
Relative mobility	How a child's ranking in the income distribution compares to her parents from Chetty et al., 2014
Retail/trade share	Bureau of economic analysis, regional economic information system
Road miles	Department of transportation, bureau of transportation statistics
School spending share	Census

Variable	Source
Share of housing 2–3 Bedrooms	Census housing characteristics (HC01-HC03)
Share of housing built > 2000	Census housing characteristics (HC01-HC03)
Share of housing built 1940–1959	Census housing characteristics (HC01-HC03)
Share of housing built 1960–1979	Census housing characteristics (HC01-HC03)
Share of housing built 1980–1989	Census housing characteristics (HC01-HC03)
Share of housing built 1990–1999	Census housing characteristics (HC01-HC03)
Share of Housing > 4 Bedrooms	Census housing characteristics (HC01-HC03)
Share worked at home	Census housing characteristics (HC01)
Transport/ware share	Bureau of economic analysis, regional economic information system
Urgent care facilities 2009	County business patterns (Census)
Utilities share	Bureau of economic analysis, regional economic information system
Vacancy rate	Census housing characteristics (HC01-HC03)
Veteran popn Share	census
Violent crime rate	FBI via County health rankings
Water square miles	US Department of agriculture, economic research service
Wholesale share	US Department of agriculture, economic research service
YPLL rate	Years of potential life lost (YPLL) is a measure of mortality from Chetty et al., 2014

7 Appendix 2

Table of results from county housing and wage regressions (2010)

Variable	ln(Median House Value)		Variable	ln(Average Wage)	
	Coefficient	Standard error		coefficient	Standard error
Intercept	12.5877***	(0.3192)	Intercept	8.4015***	(0.1939)
Share of housing 2–3 bedrooms	–0.0218***	(0.0025)	Median Age	0.0405***	(0.0098)
Share of housing > 4 bedrooms	–0.0154***	(0.0026)	Median Age ²	–0.0006***	(0.0001)
Share of Housing Built > 2000	0.0028**	(0.0014)	Construction Share	–0.5957***	(0.1485)
Share of housing built 1990–1999	0.0121***	(0.0015)	Manufacturing Share	0.2148***	(0.0515)
Share of housing built 1980–1989	0.0021	(0.0014)	Retail/Trade Share	–1.0943***	(0.1472)
Share of Housing Built 1960–1979	0.0021**	(0.0010)	Transport/ware share	0.3487***	(0.1203)
Share of housing built 1940–1959	–0.0048***	(0.0014)	Wholesale share	–0.8232***	(0.1537)
Vacancy rate	0.2815***	(0.0789)	Forest share	0.0041	(0.0134)

Variable	ln(Median House Value)		Variable	ln(Average Wage)	
	Coefficient	Standard error		coefficient	Standard error
Population density	0.00002*	(0.0000)	Mining share	-0.0115***	(0.0041)
ln(Popn)	0.1028***	(0.0062)	Utilities share	0.0110	(0.0334)
Children popn share	-0.9153***	(0.2620)	Government share	-0.0016	(0.0016)
Percent single headed house	-1.2702***	(0.1520)	Herfindahl index	0.000001*	(0.0000)
Bachelors popn share	0.0222***	(0.0011)	Bachelors popn share	0.0008	(0.0008)
Veteran popn share	0.0193***	(0.0025)	Veteran popn share	0.0080***	(0.0019)
Percent white	-0.2260**	(0.0943)	Percent white	-0.2413***	(0.0501)
Percent black	-0.2957***	(0.0862)	Percent black	-0.0183	(0.0529)
Percent hispanic	-0.4434***	(0.0766)	Percent hispanic	-0.0346	(0.0508)
Percent immigrant	1.9374***	(0.3229)	Percent immigrant	0.2290	(0.1546)
		Emp/pop ratio	0.5597***	(0.0392)	
		ln(Popn)	0.1090***	(0.0043)	
N	3140	N	3139		
Adj R ²	0.7013	Adj R ²	0.6065		

Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

8 Appendix 3

Top ranked metropolitan statistical area counties in 2010

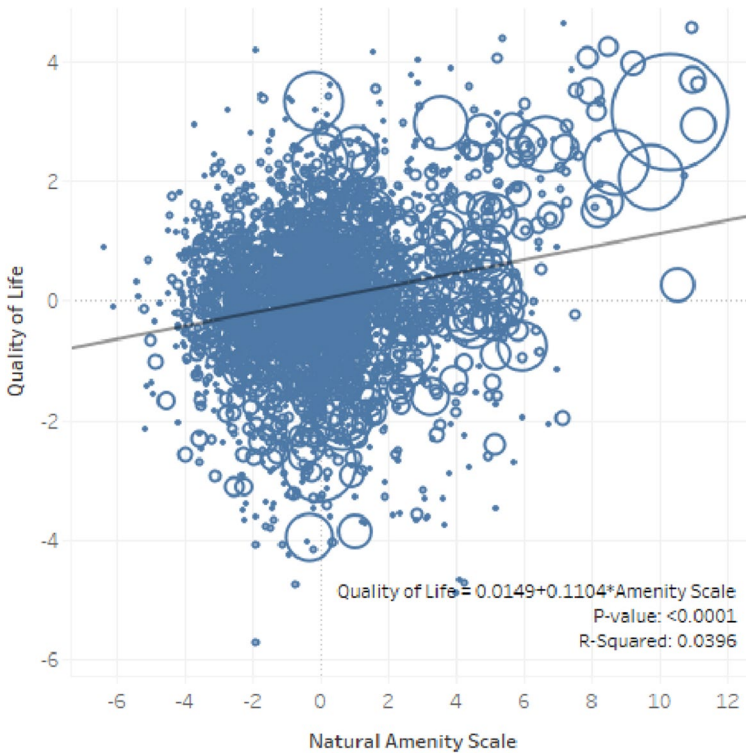
We list the top ranked counties that are in a Metropolitan Statistical Area (MSA) in 2010 and compare them with the MSA ranking in 2000 from Albouy (2008). Because we rank the quality of life in the county, whereas Albouy (2008) ranks the quality of life in the entire MSA, some notable differences are expected to arise. For example, while Clarke county ranks highly in terms of quality of life, other counties in the Washington DC MSA rank much lower. Still, there are notable similarities in our ranking with many MSAs from California topping the list. Overall, we find a moderate and statistically significant (with a p value of < 0.0001) correlation between the two quality of life estimations (a correlation of about 0.3).

County	Metropolitan statistical area (2010)	MSA county rank in 2010	Albouy MSA rank in 2000
Santa cruz	Santa Cruz-Watsonville, CA	1	-
San luis obispo	San Luis Obispo-Atascadero-Paso Robles, CA	2	5
Monterey	Salinas, CA	3	3
Santa barbara	Santa Barbara-Santa Maria-Lompoc, CA	4	2
Napa	Vallejo-Fairfield-Napa, CA	5	-
Sonoma	Santa Rosa, CA	6	-
Clarke	Washington-baltimore, DC-MD-VA-WV	7	122
Kings	New York, N. New Jersey, Long Island, NY-NJ-CT-PA	8	51

County	Metropolitan statistical area (2010)	MSA county rank in 2010	Albouy MSA rank in 2000
Marin	San Francisco, CA	9	4
Los angeles	Los Angeles-riverside-orange County, CA	10	15

9 Appendix 4

Comparison of the top ranked metropolitan area counties to Albouy’s (2008) rankings



10 Appendix 5

Descriptive statistics for micropolitan area counties that are above and below average QOL

Variable	Above Average QOL N= 339		Below Average QOL N= 347		Difference
	Mean	StdDev	Mean	StdDev	
QOBE	0.1049	(1.2890)	0.0664	(1.3052)	0.0386
Employment growth (2010–2018)	7.9318	(9.1517)	4.5473	(11.1025)	3.3845
Population growth (2010– 2018)	1.0831	(6.2461)	–0.4551	(6.1376)	1.5381
Poverty rate change (2010–2018)	–2.2468	(2.5121)	–1.3181	(2.3947)	–0.9287
Mean January temperature	32.8504	(11.8763)	33.3724	(11.8991)	–0.5220
Mean July temperature	74.6767	(5.9214)	76.6184	(5.0982)	–1.9417
Mean July relative humidity	56.3970	(16.0492)	55.9713	(13.6354)	0.4258
Hilliness	1865.8600	(2671.1900)	1192.2600	(1748.7400)	673.6000
Miles to coast	200.0874	(254.7082)	212.9390	(201.8093)	–12.8516
Water square miles	30.2990	(90.0086)	39.0036	(162.6248)	–8.7047
Park square miles	150.0777	(610.4622)	71.1971	(284.8790)	78.8806
Forest coverage	0.3186	(0.2511)	0.3044	(0.2509)	0.0142
Miles to metro	51.5151	(52.2738)	50.6536	(31.6912)	0.8615
Metro adjacent	0.3059	(0.4615)	0.2808	(0.4500)	0.0251
Road miles	46.1896	(65.8370)	49.8141	(76.6486)	–3.6245
Share worked at home	4.7018	(3.0092)	3.6493	(2.2745)	1.0525
Population density	70.5498	(73.8967)	72.8511	(121.5406)	–2.3012
2010 population	46,803.5500	(34,217.6500)	43,190.2600	(26,459.6500)	3613.2900
Violent crime rate	254.6712	(216.0680)	298.1339	(217.5894)	–43.4627
School spending share	0.0659	(0.0355)	0.0571	(0.0293)	0.0089
Gini 2010	0.4317	(0.0359)	0.4360	(0.0319)	–0.0043
Relative mobility	32.3037	(9.4272)	32.5982	(8.7407)	–0.2946
Absolute mobility	41.0139	(9.3161)	41.7734	(9.5953)	–0.7595
Physically unhealthy days	3.6918	(1.0546)	3.8519	(1.2593)	–0.1601
Mentally unhealthy days	3.4135	(1.0021)	3.5069	(1.2206)	–0.0933
Urgent care facilities 2009	0.5000	(0.8111)	0.4527	(0.7320)	0.0473
Health service places per cap 2010	0.0015	(0.0006)	0.0015	(0.0006)	0.0000
YPLL rate	7774.2500	(2470.8800)	8196.7800	(2131.8500)	–422.5300
Arts & culture places 2010	1.3176	(2.7306)	0.6734	(1.6771)	0.6443
Places of worship 2009	4.7353	(5.7602)	5.4986	(5.7002)	–0.7633
Recreation places 2010	3.5824	(5.7778)	2.0258	(2.6893)	1.5566
Fitness places per capita 2010	0.00009	(0.0001)	0.00008	(0.0001)	0.00001
Golf courses per capita 2010	0.00007	(0.0001)	0.00007	(0.0001)	0.00000
Bowling places per capita 2010	0.00002	(0.0000)	0.00003	(0.0000)	0.00000

Variable	Above Average QOL N=339		Below Average QOL N=347		Difference
	Mean	StdDev	Mean	StdDev	
Movie theaters per capita 2010	0.00002	(0.0000)	0.00002	(0.0000)	0.00000
Eating & drinking places per cap 2010	0.00183	(0.0010)	0.00169	(0.0006)	0.00013
Food stores per capita 2010	0.00049	(0.0002)	0.00040	(0.0002)	0.00009
Home furnishing places per cap 2010	0.00002	(0.0000)	0.00001	(0.0000)	0.00001
Personal care places per cap 2010	0.00058	(0.0003)	0.00056	(0.0002)	0.00002

Acknowledgement This work was supported by funding from the robert wood johnson foundation and the institute for advanced learning and research

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