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The purpose of this research is to articulate the relationships that exist between housing affordability by metropolitan areas and the following variables: housing costs, income, educational attainment, population density, population growth rate, and employment composition by economic sector (professional, sales and office, and service). This paper will contribute to the existing affordability literature by considering all of these variables simultaneously through a regression equation based on US Census data.

The findings indicate that housing affordability is geographically differentiated with the West Coast metropolitan areas being the least affordable and the South Central metropolitan areas being most affordable. Some of the predictors of housing affordability appeared to be educational attainment, employment mix, and population density based on correlation and regression results.

# HOUSING AFFORDABILITY BY METROPOLITAN AREA

by
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Approved by

___Keith G. Debbage, PhD_______
Committee Chair

This thesis is dedicated to my husband Sam Wolff and my son Emmett Wolff. Their support through the long process made this work possible.

I am forever grateful for their sacrifice and their belief in me.

**For Sam and Emmett with all my love.**

This thesis was in part inspired by the Orange Community Housing and Land Trust (OCHLT) (Orange County, North Carolina), and their efforts toward "keeping homeownership affordable for generations to come." Executive Director, Robert Dowling, spearheads this effort with superior vision and leadership.

## APPROVAL PAGE

This thesis has been approved by the following committee of the Faculty of The Graduate School at The University of North Carolina at Greensboro.

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# CHAPTER I

# INTRODUCTION

It is well publicized that housing costs have been rising faster than incomes across the United States in many metropolitan areas. Downs (2005, p. 20) documented that "22.3 million American households (21.1 percent of all American households and 53.6 percent of all those with incomes below 80 percent of the national median) had a housing affordability problem in 1999…" Since 1999, the median sales price of a single family home rose 43.2 percent in just five years from $133,300 to $191, 000 (in current dollars) (Downs 2005). Across the United States, median household incomes rose only slightly in the same five-year period (Downs 2005).

The cost of housing is not uniform across the United States and certain metropolitan areas show a larger increase in home prices than others. According to the Office of Federal Housing Enterprise Oversight (OFHEO), home prices across the nation have increased about 50 percent in the past five years. Housing markets in Florida, California, Nevada, and Arizona show the highest rates of house price appreciation over the past year averaging an increase of 30 percent (Russel and Mullin 2005). Fiserv CSW, a leading home price research company, analyzed housing market data from the five-year period from 1999 to 2004 and found that "home prices in the Miami-Fort Lauderdale metro have doubled over the last five years, and [are] forecasting that they will appreciate another 16.4 percent this year" and that "over the past five years home prices in the Los Angeles area appreciated 125 percent, with prices in a handful of zip codes up nearly 200 percent" (Max 2005, p. 1).

Data from the U.S. Bureau of Labor Statistics (2006) shows Metropolitan Areas (MAs) in states that rank highest for percentage increases in job growth (Arizona, Nevada, and Florida from 1995-1996 and Arizona, California, and Nevada from 2004-2005) have similar rankings as the highest ranked MAs for increases in home prices (Arizona Department of Economic Security 2006). A Brookings Institution report also shows similarities in the growth rate rankings of "high human capital"[1] cities and cities with strong service industries suggesting a negative correlation exists between the percentage of civilians employed in manufacturing (in 1990) and the growth rate between 1990 and 2000 (Glaeser and Shapiro 2001). Areas with high growth rates tend to be leading contributors to job growth in the "new economy". That is, those areas where the employment sector consists largely of highly educated and skilled white-collar workers in service-oriented employment and where manufacturing industries make up a smaller portion of employment in the region.

Glaeser and Shapiro (2001) also find that cities with a higher median household income grew at a much faster rate than cities with lower household median incomes. They show that areas whose household median income is greater than $30,000 had an approximate growth rate of 18 percent between 1990 and 2000 while areas whose household median income is less than $20,000 had a less than one percent increase.

[1] "High human capital" cities refers to cities whose population is highly skilled with a substantial percentage of the workforce with a college degree.

Existing literature infers that housing affordability[2] problems in select metropolitan areas are a function of home prices, household incomes, population growth rates, population densities, education level, and employment composition. However, all of these variables have not previously been studied simultaneously. It is important to study all of these variables together in order to find out which variables have the most influence on housing affordability by metropolitan area. The answer to this question could provide a sound basis for policy initiatives in the future. To this end, further analysis of these factors could provide the answer regarding what relationships might exist between housing affordability and population growth rates, population densities, employment sector, education level and household median income. The aim of this research is to describe potential factors that most significantly contribute to the geographic variation of housing affordability rates by metropolitan areas. It is hypothesized that housing affordability problems in select metropolitan areas are a result of the dynamic interaction that exists between both home prices and household incomes, while additional important explanatory variables include the educational attainment of metropolitan workers, overall population densities, and relative location as measured by Census Division.

[2] Housing affordability for the purposes of this research refers to the "ease" with which the cost of housing can be absorbed by household income.

# CHAPTER II

## REVIEW OF THE LITERATURE

Recent literature on housing affordability claims that the cost of housing is an increasing problem across the United States. Additionally, trends in the literature suggest that examining housing affordability at a regional level is of increasing importance. Belsky and Lambert (2001) conducted a comprehensive metropolitan-wide study of housing and found that metropolitan housing markets have experienced significant growth during the 1990s. "Between 1990 and 2000, eleven of the nation's metropolitan areas added 250,000 or more homes and 23 metropolitan areas saw their housing stock expand by 25 percent or more" (Belsky and Lambert 2001, p. 2). However, affordable housing in many of these markets is in short supply, in part due to localized and restrictive regulations such as zoning, permit caps, development fees and decreased levels of governmental subsidies. Belsky and Lambert (2001) argued that affordable housing issues must be addressed in a metropolitan context and that the balance of housing start-ups to match employment locations must be addressed at a regional scale. They found that between 1990 and 1998 higher job growth rates are located on the periphery of many metropolitan areas in lower density counties, while the poor are concentrated in the central cities of these same metropolitan markets.

A metropolitan approach to examining housing affordability is paramount due to dramatic regional growth rates in recent history. Ehrlich and Gyourko (2000) show that the scale and size distribution of US metropolitan areas from 1910 to 1995 have changed in pattern. Prior to WWII, the country's population was becoming increasingly concentrated in a few large cities where there was also a dominance of manufacturing activities. The number of metropolitan areas has doubled since 1950 and the dispersion of this metropolitan growth was not absorbed evenly by all areas, but was concentrated in the second tier markets (Ehrlich and Gyourko 2000).

Squires and Kubrin (2005) describe recent patterns of metropolitan development across the US and present information showing the decrease in densities across metropolitan areas where population density declined from 407 to 330 persons per square mile. Overall, metropolitan area population increased from 55.1 per cent to 62.2 percent at the national level. In the 1990s suburban population grew 17.7 percent. Metropolitan areas grew from a total land area of 208,000 square miles that housed 84 million people in 1950 to 585,000 square miles housing 193 million people by 1990 (Squires and Kubrin 2005). The growth of metropolitan areas with uneven development and inequities between the isolated poor in central cities and the wealthier suburbs exacerbates the uneven development problem.

The dramatic increase in the physical and population size of the nation's metropolitan areas provide sufficient evidence of their importance. This is of particular interest to this thesis because both housing and employment opportunities are studied within a metropolitan context. Additionally, housing affordability at the metropolitan level is this thesis' main focus. Studies show that the increase in the lack of housing affordability impacts the population for those seeking both owner-occupied and tenured housing and that the problem has increased since patterns of suburbanization began to proliferate (Gyourko and Linneman 1993; Gyourko 1998; Case and Mayer 1996; Moore and Skaburskis 2004).

*1. Cost of Housing*

Gyourko and Linneman (1993) identified several key components of the affordability problem which include the increased cost of housing and real wage decline from 1960 to 1989. The increased cost of housing is attributed to the proliferation of more stringent building codes, approval delays, low-density zoning, and impact fees. Over this 30-year period, the least expensive homes have increased 6.4 percent per year and the most expensive homes have increased 5.1 percent per year with an overall median of 2.3 percent per year (Gyourko and Linneman 1993).

According to Gyourko and Linneman (2003), real wages have declined since the mid 1970s, especially for lower- and middle-class homeowners. This decline has made it difficult to achieve homeownership. Most home seekers in these classes are low-skilled workers and their wages have eroded due to an increasingly competitive global economy, particularly since the mid 1970s. For example, between 1960 and 1974, the mean family income rose 29.1 percent but it only rose 3.3 percent from 1974 to 1989 (Gyourko and Linneman 1993). After 1974 "workers with less than a high school education experienced a 21.7 percent real wage loss" and workers with a high school degree showed a 14.7 percent decrease in real wages (Gyourko and Linneman 1993, p.67). The education level of homeowners over this period shows that homeownership is increasingly associated with higher levels of educational attainment because of the potential to obtain a higher income (Gyourko and Linneman 1993).

Building on this 30-year study, Gyourko (1998) extends his findings to claim that affordability is more of a problem for households whose head of household is under the age of 36 because there is a decline in ownership rates for this demographic. He finds an increase in the number of female-headed households and that the number of married household heads has decreased. Gyourko (1998) further analyzes education levels and finds that the least well-educated class own at lower rates than in the past, particularly for younger age groups.

In a study across Canadian metropolitan areas, Moore and Skaburskis (2004) found that households with severe affordability problems have tripled from 4.5 percent to 13.6 percent from 1982-1999. These severe affordability problems are felt by all household types in all parts of the country but are more prevalent in the largest cities, especially those with higher growth rates. Moore and Skaburskis (2004) linked the problem to changes in employment patterns and increased government regulations within the housing market. In particular, single males and females and lone parents were most at risk. In Canada, as in the United States, the affordability crisis is attributed to the lack of an adequate supply of affordable housing and changes in income due to economic restructuring (Moore and Skaburskis 2004).

Housing affordability problems are increasingly associated with patterns of employment which have showed significant change during the era of suburbanization. Case and Mayer (1996) studied the Boston metropolitan area from 1982 to 1994 and found that house prices are related to differences in employment patterns (particularly in the manufacturing sector), accessibility to employment nodes, and the quality of schools in the local jurisdiction. The study analyzed 168 Massachusetts towns in the Boston metropolitan area and the results showed that towns with the greatest appreciation rates were closer to Boston. Also, home prices close to manufacturing employment opportunities fell because demand for these homes declined. The authors found that homebuyers viewed location and accessibility to employment as an amenity. Since manufacturing employment opportunities were declining, demand declined. Additionally, when there is a reduction in manufacturing employment, Case and Mayer (1996) relate the fall of home prices with the percentage of local residents employed in the service sector.

Much of the increasing housing affordability problem is attributed to increased government regulations including zoning, building codes, impact fees, permit caps, and other growth controls (Gyourko and Linneman 1993; Schill and Wachter 1995; Gyourko 1998; Lawhon 2004). Between 1960 and 1989, Gyourko and Linneman (1993; Gyourko1998) show that the quality of homes has increased such that homes are not produced at a low enough quality for a growing number of the population to afford.

While their study focuses on racial segregation, Schill and Wachter (1995) found that non-market forces (federal and local regulations) contributed to significant geographic differentiation within a housing market and they found that differences in local regulations can cause differences in house prices often times excluding low- and medium-income households.

Malpezzi (1996) examined supply side constraints such as average commute time, racial segregation, and neighborhood quality as functions of income, house prices, demographics, and regulation. Regulation was measured by rent controls, land use and zoning regulations, infrastructure policies, and building and subdivision codes. The results showed that regulation can raise house prices (rents and house value), and thus reduce homeownership rates; and substantial regulation can decrease homeownership by up to 10 percent. Such findings are important because many high growth communities have implemented impact fees to offset their costs for providing the required infrastructure and expected level and provision of amenities.

Lawhon (2004) describes the effects of development impact fees and growth by analyzing the price of housing in Loveland, Colorado and Fort Collins, Colorado between 1983 and 1986. The study found that high growth communities that implement impact fees can exacerbate the housing affordability problem. In addition to worsening the affordability problem, impact fees can cause the poor to pay a greater proportion of their income on housing (Lawhon 2004).

The literature reviewed above mostly finds that housing affordability is explained by a function of supply and demand where factors for each side are examined. However the following two studies solely analyzed the physical costs of housing without utilizing demographic variables. Glaeser and Gyourko (2002) argue that the price of housing is close to the marginal, physical costs of new construction and that housing prices are significantly higher than construction costs in only a limited number of areas, such as California and some eastern cities. Glaeser and Gyourko (2002) argued that excessive zoning[3] and land use controls are the primary factors explaining the higher housing costs. They define a housing affordability problem as existing when housing is expensive relative to its fundamental costs of production.

Glaeser and Gyourko (2002) focus on the gap between the cost of housing and the cost of construction. The results showed there are three broad housing markets by region: 1) housing priced far below the cost of new construction (these areas are found in central cities in the Northeast and Midwest, or areas that are not experiencing growth); 2) housing priced close to construction costs (mostly in areas of robust growth or sprawl where land is cheap – this is most of the US); and 3) homes that price higher than the cost of construction (New York City, California, Northeast and South). Glaeser and Gyourko (2002) argued that high cost places generally have good amenities or strong labor markets. Overall, this study shows that expensive housing markets can be due to stringent government regulation and highly skilled labor markets that offer robust salaries.

Glaeser and Gyourko (2005) published a report illustrating that construction costs can directly impact population growth rates by US city. Population growth rates were found to be lower in cities with a greater proportion of their housing stock valued below

[3] Excessive zoning refers to zoning codes that place multiple limitations on a property when being developed or re-developed. This can include, but is not limited to zoning codes that require landscaped buffers, street trees, and sidewalks; or limit the development or placement of accessory buildings, parking, or signage.

the cost of new construction. This connection was not causal in nature but suggests that the housing market plays a role in urban growth. Glaeser and Gyourko (2005) used a data sample that included cities with at least 30,000 residents in 1970. These cities, over time, experienced a decline in population when the construction cost of housing is at or below the price of a home. For example, the study showed that older rust belt cities tended to have two thirds or more of the housing stock priced at or below construction value and that for 60 percent of the homes in the Northeast and Midwest, population declined one percent for every two percent decline in house price (Glaeser and Gyourko 2005). These results show that homes can be built quickly but disappear slowly; placing a greater importance on the existing housing stock of a city and the opportunity to develop human capital in a shifting economy.

By contrast, in expensive housing markets where only 10 percent of the housing stock is priced below the cost of construction in many cities such as Los Angeles, San Diego, and Honolulu, (Glaeser and Gyourko 2005) concluded that cities with a growing population do so at a faster rate than cities in decline. For example, the fastest growing city in the 1990s was Las Vegas; where population grew by 61.6 percent. The fastest declining city among cities with a population of at least 100,000 was Hartford, CT, which showed a loss of 13.9 percent (Glaeser and Gyourko 2005). Overall, the authors concluded that high house prices are associated with markets that have a higher income level.

According to the literature, housing affordability is also affected by the growth rate of an entire region. Miller and Peng (2004) analyzed housing price volatility across

277 Metropolitan Statistical Areas (MSAs) and claimed that price volatility can increase home appreciation rates, reduce personal income growth rates and impact the population growth rate in complex ways. For example, in an MSA with unconstrained supplies, the population growth can affect volatility. However, in an MSA with a constrained housing supply, volatility can reduce population growth rates (Miller and Peng 2004).

Housing affordability is of particular interest in high growth regions because growth influences supply and demand. Strassman (2000) examined data from 25 of the largest cities in the US and found that different processes can infringe upon urban housing markets. Internationally, a high mobility rate indicates a high degree of housing welfare (or greater affordability). Differences among mobility rates arise due to the unexpected changes such as the growth rate of employment.

Strassman's (2000) study examined the influence of variables such as building codes, zoning, and the level of taxes that vary from one locality to another. The results showed that these government interventions affect mobility and tend to increase the price of owner-occupied housing. In this study, population growth was found to be more of a determinant of mobility than market interventions; and that mobility was not necessarily associated with household income growth. "Higher population growth reinforces greater prosperity and rising incomes, hence the demand for larger and better dwellings." (Strassman 2000, p. 124). Additionally, Strassman (2000, p. 125) argued that "What matters most are the economic fortunes of particular industries that spur the growth of some cities and hold back others." Myers and Park (2002) claim that the issue of housing affordability in California has been worsened by a lack of new housing construction such that housing markets have been unable to keep up with rapid population growth rates.

Growth control and growth management planning policies have been enacted to address some of the problems that stem from rapid suburban growth. However, poorly thought out growth controls in politically fragmented metropolitan areas can create spatial shifts in homebuilding by moving construction to nearby well-regulated localities (referred to as spillover effects) that can exacerbate housing affordability problems throughout the region. Growth management tools include population growth or housing permit caps, urban growth boundaries, adequate public facility ordinances, and implementing various restrictive residential zones (such as large lot, low density zones).

Byun, Waldorf, and Esparza (2005) examined growth controls and their effect on home building in two metropolitan areas in California (i.e., Los Angeles and San Francisco). Growth controls in these areas tended to generate spillover effects and impact surrounding jurisdictions. In California, generators of spillovers (i.e. local jurisdictions that implement growth control measures) are mostly located in the urban areas along the coast and the receiving communities are on the fringes of the metropolitan wide area. In the Los Angeles and San Francisco metropolitan areas, excess home building in peripherally located communities is linked to growth controls implemented in nearby jurisdictions. Of the 393 local jurisdictions that were studied, 152 (39 percent) did not have any growth controls implemented, 241 (61 percent) had at least one growth control measure and nearly 30 percent of these local jurisdictions had two or more growth control measure implemented (Byun et al. 2005). Byun et al. (2005) claim that the spillovers were a result of the lack of regional planning where growth management increased home building costs and therefore house prices. This study of growth controls in California emphasizes the importance of studying home prices at a regional scale.

Housing problems are also exacerbated in the Atlanta region because of its rapid population growth. A comprehensive study by the Atlanta Neighborhood Development Partnership (ANDP 2005) highlights the need for a metropolitan approach. The Atlanta metropolitan area has grown from five to 28 counties in the past few decades. Between 1992 and 2002 Atlanta also added 1.2 million people and 626,000 jobs. Issues cited by the study include the jobs-housing mismatch. In Atlanta, housing and transportation costs combined account for two thirds of household income. Nationally, 14.3 million households spent more than 50 percent of their income on housing while 17.3 percent spent between 30 and 50 percent in 2003 (ANDP 2005). In the Atlanta region, moderately priced housing close to emerging employment markets are limited by stringent zoning restrictions that further hinder affordable housing opportunities. These restrictions can limit densities, prohibit multi-family developments, and require higher levels of buffering and landscaping; all of which increase costs. The ANDP (2005) suggests that government must encourage the private sector to provide affordable housing through incentives, funding, land donations, and technical assistance. They also suggest that any regional approach to affordable housing should include a regional housing resource center, regional housing coalitions, regional fair-share plans, inclusionary zoning, and the establishment of housing trust funds.

Two more studies provide evidence that housing affordability is linked to the jobs-housing imbalance that proliferates across America's metropolitan areas (Ihlanfeldt 1994; Levine 1998). Levine (1998) examined the spatial distribution of affordable housing near employment centers for low and medium-income workers. He found that there is a need for greater efforts by local jurisdictions to rezone for more affordable housing units closer to existing employment centers. Levine's model assumes that there is a shortage of affordable housing in close proximity to major suburban employment centers and that people who work at these sites are willing to use nearby housing if it were available within their price range even if it were smaller and denser. Throughout his study, he found that homebuyers are finding only limited supplies of affordable and acceptable housing near their workplaces and that they are willing to accept a longer commute to buy a house that is affordable.

Ihlanfeldt (1994) argued that job decentralization has not been uniform across occupational categories. "Entry-level jobs and those with low educational requirements have been declining within inner cities, while information-processing jobs generally requiring postsecondary schooling have been expanding" (Ihlandeldt 1994, p.220). This phenomenon is compounded by the fact that many suburban employers are experiencing shortages of low-skilled workers because of the accessibility problem experienced by the inner city workforce and their inadequate transportation network. Consequently, there is a surplus of low skilled workers in the city in addition to a shortage in the suburbs (Ihlanfeldt 1994).

*2. Regionalism*

It has already been established that employment changes affect affordability (Gyourko and Linneman 1993; Case and Mayer 1996; Gyourko 1998). It is from within a metropolitan region that employers compete for workers and where workers find housing; and consequently, a regional perspective is crucial. Metropolitan areas are comprised of many localities that regulate housing and these markets are spatially defined by income as well as their demand for amenities.

A regional policy focus could be the appropriate unit to battle social and economic ills. Katz and Rogers (2001) identify declining central cities in the midst of growing metropolitan areas and find that polarized income capacities and access to employment are the result of fragmented land use planning and the creation of employment opportunities that favor the highly skilled. Regional policies are important because it is the regional labor market that fuels the economy. It is maintained that proper land use planning and growth management could improve metro area quality and shared prosperity. However, a policy goal should be to provide affordable housing throughout a region in order to reduce the spatial mismatch of jurisdictions (Katz and Rogers 2001).

Not all metropolitan regions are the same. Case and Mayer (1996) found that the structure of metropolitan housing markets can be a result of certain unique contexts. For example, Houston's variations in home markets were due to quick reductions in entrepreneurial and professional income which may be attributed to an increase of immigrants and low-end demand for housing (Case and Mayer 1996). California is unique because it has an influx of immigrants (low-end demand for housing) as well as increases in entrepreneurial and professional income (high-end demand). In other metropolitan areas such as Boston, shifts in employment patterns within the region can cause one town to become less desirable than another. For example, when an employment node loses jobs, employment is sought in other towns that tend to be less accessible. Thus, transportation costs are increased to reach these new employment markets (Case and Mayer 1996). Housing and transportation costs, in this context, combine to impact affordability although the cost of transportation may not be as apparent.

A metropolitan perspective can capture isolated variations in housing affordability. Schill and Wachter (1995) show that extremely concentrated pockets of poverty have increased between 1980 and 1990 and are caused by both market and non-market forces within a metropolitan area. They suggest regulations such as zoning, impact fees, and growth controls exclude the poor by raising the cost of housing in local jurisdictions and cause the poor to search for housing elsewhere within a region. Schill and Wachter (1995) show that spatial stratification is a result of public choice through exclusion by taxation (for amenities) and the Not In My Backyard (NIMBY) phenomenon.

Fragmented regions can create spillover effects across local jurisdictions when certain localities use restrictive land use constraints and exclusionary zoning (Cho and Linneman 1993; Meyers and Park 2002). Cho and Linneman (1993) analyzed Fairfax County, Virginia to illustrate that a community with a significant amount of residentially zoned land relative to adjacent areas can generate positive spillover effects (higher priced homes) but if the area is zoned for large lot (low density) residential then there is a negative spillover effect from adjacent communities. Local jurisdictions attempt to protect themselves from negative spillovers by implementing restrictive land use constraints which only exacerbates the housing affordability problem within a metropolitan context.

Basolo and Hastings (2003) cite the need to study housing in a regional context for the same reasons as Schill and Wachter (1995); central cities tend to have median incomes that are lower than that of the median for the region, higher poverty rates, and their housing values are lower compared to that of the entire region. In a case study of four regions (Portland, Oregon, Minneapolis-St. Paul, Minnesota, Louisville, Kentucky, and New Orleans, Louisiana), Basolo and Hastings (2003) analyzed public regional housing policies and found that only two of the regions studied attempted a regional housing policy. When a regional housing policy was created, it either had no enforcement mechanism or was not enforced. Schill and Wachter blame the failure of regional approaches to housing on inter city competition and NIMBY attitudes.

While most studies argue that the central cities of large metropolitan areas have the greatest need for effective affordable housing policies, Bunting and Walks, et al. (2004) argue instead that there is an even greater need to address affordability problems in the suburbs. They argue that while there are greater percentages of the population that are poor living in central cities, there is a greater number of households suffering from affordability problems in the suburbs and this has been overlooked because these households are widely scattered across the suburbs. Bunting and Walks, et al. (2004) studied the nine largest urban centers in Canada and focused on renters experiencing affordability problems. Out of the four sub components of a metropolitan area (inner city, inner suburbs, outer suburbs and exurbs), it was found that the inner suburbs showed higher numbers of tenants with affordability problems.

There is consensus among housing advocates that housing must be more effectively addressed in the policy realm. Dreier (2000, p. 66) argued that housing problems are so acute that housing should be put back on the nation's political agenda and suggests that an attempt be initiated to develop a progressive housing agenda:

> A progressive Federal housing policy should accomplish three things: First, it should help house the poor and working class and provide them with housing choices besides living in high-poverty areas or distressed neighborhoods. Economic globalization has transformed the U.S. economy and produced growing economic inequality and deepening poverty. Some form of government support is necessary to make housing economically manageable for the poor as well as for growing segments of the working class. Second, it should stimulate homebuilding and homebuying, particularly for the middle class. In doing so, it should direct government help to those who could not otherwise achieve the American Dream. The well-known multiplier effects of homebuilding will help stimulate jobs and economic growth. Third, housing policy should help rebuild the social and economic fabric of troubled neighborhoods overwhelmed by unemployment, concentrated poverty, crime, drugs, abandoned buildings, and hopelessness (Drier 2000, p.66).

For some policy analysts, part of any national housing agenda should include a growth management approach at the regional scale. A recent joint symposium on growth management and affordable housing sponsored by the Department of Housing and Urban

Development, The Fannie Mae Foundation, the National Association of Realtors, and The Brookings Institution (Downs 2004) articulated three themes in this regard: 1) even though growth management can constrain the supply in land, it is theoretically possible for it not to aggravate affordability problems, 2) a lack of political will and NIMBYism reduces the likelihood of implementing any pro-affordability provisions of growth management policies, 3) cooperation between advocates for growth management and affordable housing is imperative to ensure that growth management programs do not thwart the production of affordable housing (Downs 2004).

Downs (2004) asserts that no one program or policy will be able to address all the issues surrounding metropolitan growth and housing affordability. However, the reader is left feeling hopeful that properly planned and executed growth management can create a better quality of life for residents, and it can be done without exacerbating affordability problems. Specifically, "a desirable outcome will occur only if the growth management programs involved contain provisions specifically designed to create affordable housing by offsetting those aspects of growth management that inherently limit the land available for development and if there is a strong political will in the communities concerned to actually implement those pro-affordability provisions." (Downs 2004, p. 19).

Such issues are crucial because Drieir and Atlas (1999, p.6) have indicated that "A census bureau study found that 48 % of American families could not afford to buy the median-price house in the region where they lived." Worse still, incomes for American workers including white collar and professional employees have declined – real wages fell 1.8 percent from 1973 to 1978 and fell 9.6 percent from 1979 to 1993 (Drier and

Atlas 1995). Along with this, home-ownership rates declined in the 1980s, from 65.6 percent in 1980 to 63.9 percent in 1989.

*3. The New Economy*

The so-called "new economy" may be directly affecting housing costs because it has been shown that high skilled labor markets tend to be those same metropolitan areas faced with acute housing affordability problems. According to Atkinson and Gottlieb (2001, p. 3) the New Economy " is a global knowledge and idea-based economy where the keys to wealth and job creation are the extent to which ideas, innovation, and technology are embedded in all sectors of the economy – services, manufacturing, and agriculture." Atkinson and Gottlieb (2001), briefly describe the emergence of the new economy and how they rank metropolitan areas in a Metropolitan New Economy Index report. They characterize the new economy as dispersed development in less dense areas of a metropolitan area. For example, most high technology jobs are located in the suburbs and in the 1990s, 57 percent of all offices were located in the suburbs (Atkinson and Gottlieb 2001). Unfortunately this trend increases the spatial mismatch problem between the underemployed and unemployed low skill population typically located in central cities and the available low-wage retail jobs in the periphery.

Furthermore, the majority of "new economy" jobs are located in suburban office parks as opposed to older central cities (Atkinson and Gottlieb 2001), while manufacturing employment now accounts for only 14 percent of total employment. Many of the New Economy jobs are managerial, professional, and technical positions that require at least two years of college and these types of positions have increased their total share of employment. Although prevalent across the nation, new economy activities are more concentrated in large and mid-sized metropolitan areas.

"The Metropolitan New Economy Index" published by the Progressive Policy Institute (Atkinson and Gottlieb 2001) uses 16 economic indicators to assess the 50 largest metropolitan areas. Approximately 60 percent of the nation's workforce is accounted for by these largest 50 metropolitan areas. The report highlights the differences among metropolitan economies and focuses attention on a policy framework that aims at promoting fast and widely shared income growth. The metropolitan areas were assessed by 16 indicators in five broad categories (Table 1) and listed the top 50 metropolitan areas (Table 2).

**Table 1: Indicators of New Economy**

| **Broad category** | **Indicator** |
|---|---|
| Knowledge jobs | Managerial/professional jobs |
| | Workforce education |
| Globalization | Export focus on manufacturing |
| Economic dynamism and competition | Gazelles (sales growth of >=20% for 4 years) |
| | Job churning (business starts vs. failures) |
| | New publicly traded companies |
| Transformation to a digital economy | Online population |
| | Broadband telecom |
| | Computer use in schools |
| | Commercial internet domains |
| | Internet backbone |
| Technological innovation capacity | High-tech jobs |
| | Degrees granted in science and engineering |
| | Patents |
| | Academic R&D funding |
| | Venture capital |

Source: Atkinson and Gotlieb, 2001

| Table 2: New Economy Ranking, 1999 | | | |
|---|---|---|---|
| **RANK** | **Metropolitan Area** | **RANK** | **Metropolitan Area** |
| 1 | San Francisco | 26 | Richmond |
| 2 | Austin | 27 | St. Louis |
| 3 | Seattle | 28 | Detroit |
| 4 | Raleigh-Durham | 29 | Indianapolis |
| 5 | San Diego | 30 | Charlotte |
| 6 | Washington | 31 | Buffalo |
| 7 | Denver | 32 | Nashville |
| 8 | Boston | 33 | Cleveland |
| 9 | Salt Lake City | 34 | Cincinnati |
| 10 | Minneapolis | 35 | Las Vegas |
| 11 | Atlanta | 36 | Columbus |
| 12 | Dallas | 37 | Pittsburgh |
| 13 | Miami | 38 | New Orleans |
| 14 | Houston | 39 | Oklahoma City |
| 15 | Portland | 40 | Milwaukee |
| 16 | Phoenix | 41 | West Palm Beach |
| 17 | New York | 42 | Dayton |
| 18 | Philadelphia | 43 | Tampa |
| 19 | Chicago | 44 | Norfolk |
| 20 | Los Angeles | 45 | Greensboro |
| 21 | Rochester | 46 | Louisville |
| 22 | Hartford | 47 | Memphis |
| 23 | Sacramento | 48 | Jacksonville |
| 24 | Kansas City | 49 | San Antonio |
| 25 | Orlando | 50 | Grand Rapids |

Source: Atkinson and Gottleib (2001)

According to Atkinson and Gottlieb (2001), the top ten new economy metropolitan areas included San Francisco, Austin, Seattle, Raleigh-Durham, San Diego, Washington, Denver, Boston, Salt Lake City, and Minneapolis. These regions generated a high concentration of managers, professionals, and college-educated residents working in "knowledge jobs", a large share of companies and residents embracing the digital economy, an innovation infrastructure (one that supports technological innovation, including universities that graduate a large number of scientists and engineers, conduct research, and interact with companies in the region), and adapted quickly by showing a high rate of creative destruction (can shed old business practices and embrace new ones quickly). These metropolitan areas also tended to be more affluent (Atkinson and Gottlieb 2001). However, they mention that job growth is not the best measure of economic well-being because "rapidly growing metros are likely to experience rising home prices and traffic congestion, declining open space, and increasing environmental pollution, among other negative impacts." (Atkinson and Gottlieb 2001, p. 12). Furthermore, O'Mara (1997, p. 2) concluded that "Information–age companies, which greatly rely on the quality of their work force for competitive advantage, view the quality of housing and the local community as integral parts of their operations. Communities must support the development of housing that is both affordable and attractive within a reasonable commuting range of its business sites."

The aim of this research is to build on the existing literature by analyzing home prices, income, population growth rates, population density, employment sector, and education level within a single body of work. Analysis of this data together may determine which of these variables most impact housing affordability within a metropolitan area.

The following section of this thesis will identify potential causal factors that most significantly contribute to the geographic variation of housing affordability rates by metropolitan area. It is assumed that economic sector (i.e. professional, sales and office, and service) is not truly an explanatory variable because it does not capture the skill levels within the workforce. Additionally, population growth rate is not believed to help explain housing affordability because there are too many factors that can impact growth (i.e. permit caps, urban growth boundaries, the review process, supply and demand of housing stock). It is hypothesized that housing affordability problems in select metropolitan areas are a result of the dynamic interaction that exists between both home prices and household incomes, while additional important explanatory variables include the educational attainment of metropolitan workers, overall population densities, and relative location as measured by Census Division.

# CHAPTER III

# RESEARCH DESIGN

It is hypothesized in this thesis that the spatial variation in housing affordability rate by metropolitan area can be explained by the variation in specific key independent variables including: home prices, household incomes, educational attainment, and population density.

The model will be tested across 276 metropolitan areas[4] where the spatial units will include Metropolitan Statistical Areas (MSAs) and Consolidated Metropolitan Statistical Areas (CMSAs) as defined by the Office of Management and Budget as defined for the 2000 census. The four CMSAs located in Puerto Rico have been omitted due to the vastly differing economic characteristics of those areas. A MSA is a geographic entity defined by the federal Office of Management and Budget for use by federal statistical agencies, based on the concept of a core area with a large population nucleus, plus adjacent communities having a high degree of economic and social integration with that core. Qualification of an MSA requires the presence of a city with 50,000 or more inhabitants, or the presence of an Urbanized Area (UA) and a total population of at least 100,000 (75,000 in New England). The county or counties containing the largest city and surrounding densely settled territory are central counties of the MSA. Additional outlying counties qualify to be included in the MSA by meeting

[4] The 2000 Census actually contains 280 metropolitan areas; however, the four Puerto Rican MAs were removed from this research due to their vastly different economic circumstances.

certain other criteria of metropolitan character, such as a specified minimum population density or percentage of the population that is urban. MSAs in New England are defined in terms of minor civil divisions, following rules concerning commuting and population density. A CMSA is a geographic entity defined by the federal Office of Management and Budget for use by federal statistical agencies. An area becomes a CMSA if it meets the requirements to qualify as a metropolitan statistical area, has a population of 1,000,000 or more, if component parts are recognized as primary metropolitan statistical areas, and local opinion favors the designation.

Table 3 is a list of the variables and their descriptions used in this analysis. All variables are derived from the US Bureau of the Census STF 1 and 3 or the 2002 Economic Census. The dependent variable in this analysis is housing affordability and is expressed as the relationship between median housing value and median household incomes. Chaplin and Freeman (1999) explain that while this ratio is the most popular measure (used internationally), it does not account for the non-housing consumption of goods. The formula for housing affordability is described as follows:

$$\text{Housing Affordability Ratio} = \frac{\text{Median housing value}}{\text{Median household income}}$$

| Table 3: Variables and their Descriptions | |
|---|---|
| ***Dependent Variable*** | ***Description*** |
| **Housing Affordability** | The ratio of median housing value to the household incomes of owner-occupants |
| Median housing value* | This measure represents the middle value (if n is odd) or the average of the two middle values (if n is even) in an ordered list of housing values and divides the total frequency distribution into two equal parts: one-half of the cases fall below the median and one-half of the cases exceed the median. Value is respondent reported. |
| Median Household Income* | The median income divides the income distribution into two equal groups, one having incomes above the median, and other having incomes below the median |
| **Independent Variables-Demographic and Growth** | |
| Growth Rate (1990-2000)*, ** | The rate at which a population is increasing (or decreasing) in a given year due to natural increase and net migration, expressed as a percentage of the base population |
| Total Population* | All people, male and female, child and adult, living in a given geographic area. |
| Population Density* | Total population or number of housing units within a geographic entity (for example, United States, state, county, place) divided by the land area of that entity measured in square kilometers or square miles. Density is expressed as both "people (or housing units) per square kilometer" and "people (or housing units) per square mile" of land area |
| **Independent Variables-New Economy** | |
| Educational Attainment* | Refers to the highest level of education completed in terms of the highest degree or the highest level of schooling completed |
| Employment Sector | Taken from the 2002 Economic Census and shown as percent distribution by occupation in professional, service, and sales and office work. |
| **Independent Variables-Geographic** | |
| Regions (see Table 4) | Numbers 1 through 4 representing one of four regions of the United States |
| Divisions (see Table 4) | Numbers 1 through 9 representing one of nine division of the United States |

*Sources: US Bureau of the Census: STF 1 and STF 3
** Growth rate between 1990 and 2000 Census data

Median housing value represents the middle value (if n is odd) or the average of the two middle values (if n is even) in an ordered list of housing values and divides the total frequency distribution into two equal parts: one-half of the cases fall below the median and one-half of the cases exceed the median. Median household income divides the income distribution into two equal groups, one having incomes above the median, and the other having incomes below the median. The resulting housing affordability ratio is the ability of all income groups to purchase housing of the type and quality they want where income determines the extent to which households can maximize housing preference. For example, it can be inferred that a metropolitan area with a housing affordability ratio score of four means that residents consume a larger portion of their household income for housing costs. Likewise a metropolitan area with a housing affordability ratio of two suggests that the housing market is more affordable because housing costs consume a smaller proportion of household income. Hypothetically, a metropolitan area with a housing affordability ratio of two may be due to a median household income of $40,000 and a median housing value of $80,000. By contrast, a metropolitan area with a housing affordability ratio of four may be due to a median household income of $40,000 and median housing values of $160,000. In the latter metropolitan area, home ownership may be more elusive even though median household income is comparable.

The independent variables that shape housing affordability and are included in this analysis are divided between various socio-economic/demographic and growth measures and new economy indicators. Some of these variables were chosen as proxy variables because growth management is an umbrella term used to describe how a geographic unit creates policies to address each of these issues. In this research we choose metropolitan area as the geographic unit because it is the metropolitan area in which the population lives and works. Population size, population density, and population growth rate are measurable indicators of how localities address growth-based issues. Population includes all people, male and female, child and adult, living in a given geographic area. Population density indicates the amount of people per square mile of land area. This population measure can capture the extent of sprawl and may be a good surrogate indicator of whether or not a community practices growth management. In this thesis, growth rates are determined by comparing the 1990 census population size to 2000 census population levels, thus measuring the rate at which a population is increasing (or decreasing) in any given year due to natural increase and net migration.

It is assumed that highly skilled "new economy" metropolitan areas will include well-educated labor pools. Educational attainment refers to the highest level of education completed in terms of the highest degree or the highest level of schooling completed. This analysis uses the level of educational attainment (expressed as a percentage of the population who have attained a bachelors degree or higher) because this indicates the level of skill in the workforce and the potential for higher paying "new economy" employment.

The comparison of the metro-wide employment sectors can also measure the level of participation in a new economy environment. It is an important factor in analysis because it can indicate the metropolitan areas' adaptation to new economic trends as well as economic diversification. The new economy will be analyzed by measuring the percentage of total employment in the following types of occupations: professional, service, and sales and office. These occupational categories were chosen over industry codes because occupation can provide a better indication of an individual's skill set. For example, within a single industry code, such as manufacturing, there are employees who are involved in research and development as well as those who work the shop floor. It is assumed that each of these employees will have obtained a different level of education and skill set.

The final independent variable, used to capture regional characteristics found across the United States, included in this model are the census regions and divisions. Table 4 lists the four regions (Northeast, Midwest, South, and West) and nine divisions (New England, Middle Atlantic, East North Central, West North Central, South Atlantic, East South Central, West South Central, Mountain, and Pacific) as defined by the US Census Bureau.

The analysis will include a correlation of the dependent variable to each independent variable. A multiple linear regression analysis will be performed using the following methods: 1) Fit a full model with all the independent variables and conduct a diagnostic analysis using added variable plots and residual plots; 2) Check for multicollinearity (MC) using a correlation matrix, condition numbers and the variance inflation factors (VIF); 3) use forward selection, backward elimination, and stepwise selection to select a best regression equation; and finally, run a regression analysis using the best model.

| Table 4: US Census Bureau Regions and Divisions | | |
|---|---|---|
| **Region 1 (Northeast)** | **Division 1: New England** | |
| | Connecticut | New Hampshire |
| | Maine | Rhode Island |
| | Massachusettes | Vermont |
| | **Division 2: Middle Atlantic** | |
| | New Jersey | New York |
| | Pennsylvania | |
| **Region 2 (Midwest)** | **Division 3: East North Central** | |
| | Indiana | Wisconsin |
| | Illinois | Ohio |
| | Michigan | |
| | **Disivion 4: West North Central** | |
| | Iowa | Nebraska |
| | Kansas | North Dakota |
| | Minnesota | South Dakota |
| | Missouri | |
| **Region 3 (South)** | **Division 5: South Atlantic** | |
| | Delaware | North Carolina |
| | Maryland | South Carolina |
| | District of Columbia | Virginia |
| | Florida | West Virginia |
| | Georgia | |
| | **Division 6: East South Central** | |
| | Alabama | Mississippi |
| | Kentucky | Tennessee |
| | **Division 7: West South Central** | |
| | Arkansas | Oklahoma |
| | Louisiana | Texas |
| **Region 4 (West)** | **Division 8: Mountain** | |
| | Arizona | Montana |
| | Colorado | Utah |
| | Idaho | Nevada |
| | New Mexico | Wyoming |
| | **Division 9: Pacific** | |
| | Alaska | Oregon |
| | California | Washington |
| | Hawaii | |

The independent variables in this model were carefully researched and based on prior research in the literature reviewed, but of course, there are limitations to this model. First of all, the proxy variables that are used for the new economy and growth management are simply crude indicators. Also, this thesis research focuses on metropolitan areas across the United States so it is important to acknowledge that the data offer limited insights to local trends nor does it explain the potential differences, which can be quite significant, within a metropolitan area.

# CHAPTER IV

# FINDINGS

*1. The Spatial Distribution of Housing Affordability by MA.*

Figure 1 illustrates the spatial variation of housing affordability by metropolitan area and has been classified by natural breaks although the upper limit of the second class interval and the lower limit of the third class interval has been altered to utilize the Department of Housing and Urban Development's (HUD) definition of affordability. HUD indicates that a housing affordability ratio of less than 3 is affordable. With this alteration, Figure 1 clearly shows those metropolitan areas that are considered unaffordable; that being those metropolitan areas identified by largest class intervals. The housing affordability ratio is a broad indicator that uses median housing value divided by median household income as a proxy to measure housing affordability where a lower score indicates that the market is more affordable. The ratio has been extensively used in previous studies because it accounts for the different purchasing powers and cost of living that occur between metropolitan areas that may have very different economies.

Figure 1 clearly reveals that affordability by metropolitan area is regionally differentiated. This regionalization of housing affordability is most distinct in the West Census Region where the average housing affordability ratio is 3.34 (n=51 MAs)

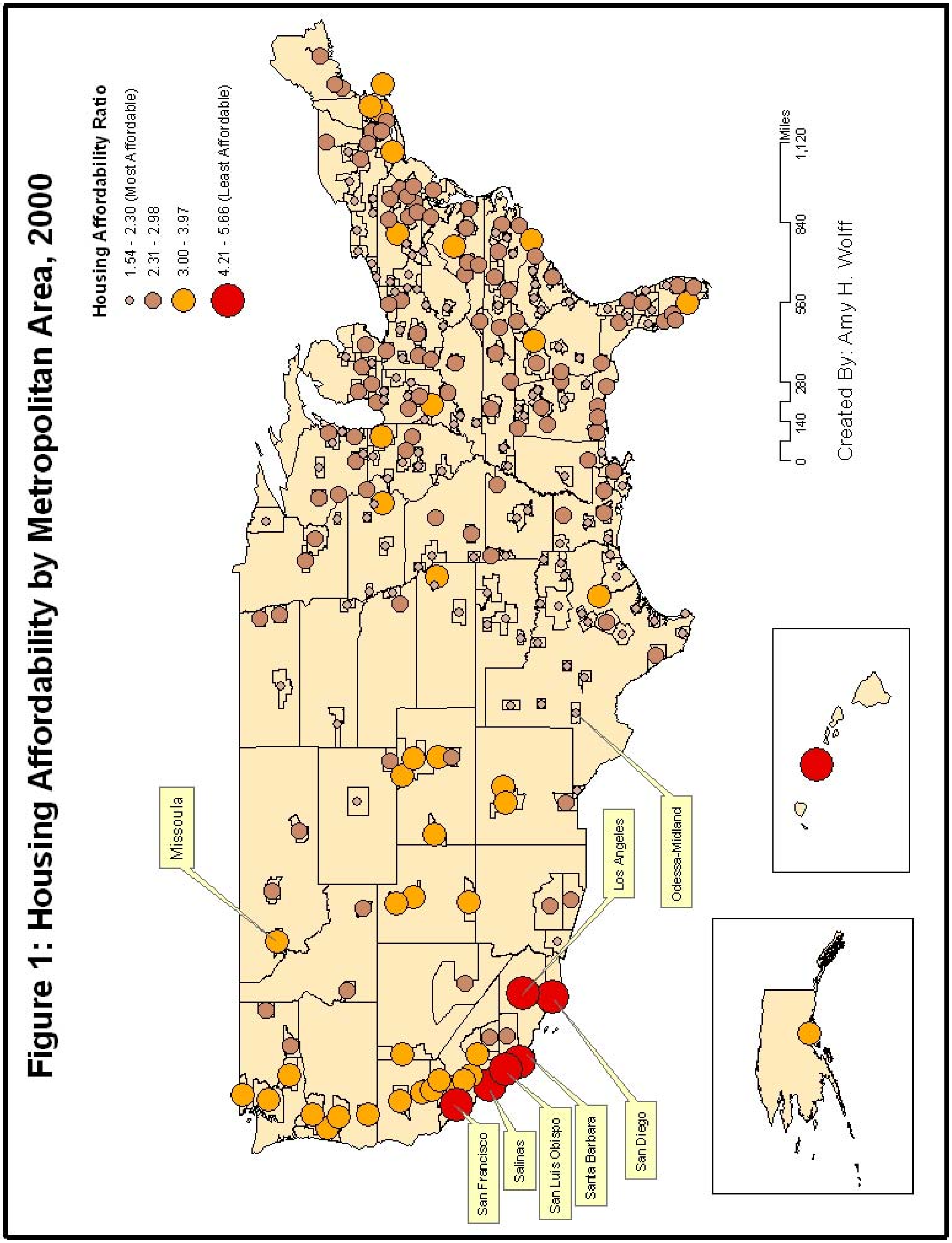


Figure 1: Housing Affordability by Metropolitan Area, 2000
Housing Affordability Ratio
1.54 - 2.30 (Most Affordable)
2.31 - 2.98
3.00 - 3.97
4.21 - 5.66 (Least Affordable)
0 140 280 560 840 1,120
Miles
Created By: Amy H. Wolff
Missoula
Los Angeles
Odessa-Midland
San Francisco
Salinas
San Luis Obispo
Santa Barbara
San Diego

compared to a United States (n=276) average of 2.52. The geography of housing affordability for the other Census Regions is more complex and less straightforward. For example, the Northeast, Midwest, and South US Census Regions contain metropolitan areas that have a far greater range of housing affordability scores; and whose average housing affordability score is nearer to or below the average for the nation (Northeast = 2.54, Midwest = 2.31, and South = 2.29). The central and southern portion of the United States (the West South Central Census Division) appear to have a larger percentage of their metropolitan areas with lower housing affordability scores (median of 2.08, n=41) than any of the other sub-regions. Table 5 below provides the housing affordability ratio by Census-defined region and Census division.

**Table 5: Housing Affordability Ratio by Census Region and Division, 2000**

| | **Mean Housing Affordability Ratio** |
|---|---|
| **United States** | **2.52** |
| **Northeast Region, n=35** | **2.54** |
| New England, n=11 | 2.96 |
| Middle Atlantic, n=24 | 2.36 |
| **Midwest Region, n=71** | **2.31** |
| East North Central, n=44 | 2.34 |
| West North Central, n=27 | 2.29 |
| **South Region, n=119** | **2.29** |
| South Atlantic, n=55 | 2.43 |
| East South Central, n=23 | 2.33 |
| West South Central, n=41 | 2.08 |
| **West Region, n=51** | **3.34** |
| Mountain, n=24 | 2.91 |
| Pacific, n=27 | 3.72 |

In Figure 1, the central part of the United States broadly located within the Mississippi River basin shows a proliferation of metropolitan areas with low affordability ratio scores indicating that the housing values in these areas are low relative to household income. More detailed regional comparisons will be presented in Chapter IV section 3 of this thesis.

*1.1 Most Affordable Housing Markets by Metropolitan Area*

The most affordable housing markets in the nation appear to be geographically clustered in the South Census Region and particularly the West South Central Census Division including Texas which has a significant number of metropolitan areas with low housing affordability scores. Table 6 ranks the 20 most affordable metropolitan areas. Of the 20 most affordable housing markets in the nation, 16 are located in the West South Central Division and 14 of these markets are located in Texas including five of the six most affordable markets in the nation as described by the housing affordability ratio. These metropolitan areas include Odessa—Midland, TX (1.54), Beaumont—Port Arthur, TX (1.64), and Wichita Falls, TX (1.75).

The average housing affordability ratio for the twenty most affordable metropolitan areas is 1.81 compared to a national average of 2.52. The most affordable MAs have house values that are less than twice as high as their median household incomes. It appears that the significant variation in housing values best explains the geography of housing affordability rather than the variation in median household income. For example, across the 276 MAs in this study, the average median housing value was$100,693 while the average median household income was $39,331. However, for

| Table 6: 20 Most Affordable Metropolitan Areas, 2000 | | | | |
|---|---|---|---|---|
| Rank | **Metropolitan Areas** | **Housing Affordability Ratio** | Median Household Income | Median Housing Value |
| 1 | Odessa--Midland, TX MSA | **1.54** | 34773 | 53500 |
| 2 | Beaumont--Port Arthur, TX MSA | **1.64** | 35669 | 58500 |
| 3 | Pine Bluff, AR MSA | **1.72** | 31327 | 53800 |
| 4 | Wichita Falls, TX MSA | **1.75** | 34098 | 59800 |
| 5 | Abilene, TX MSA | **1.76** | 34035 | 60000 |
| 6 | Victoria, TX MSA | **1.77** | 38732 | 68600 |
| 7 | Enid, OK MSA | **1.79** | 33006 | 59100 |
| 8 | Decatur, IL MSA | **1.81** | 37859 | 68500 |
| 9 | Elmira, NY MSA | **1.82** | 36415 | 66200 |
| 10 | Sherman--Denison, TX MSA | **1.82** | 37178 | 67800 |
| 11 | Brownsville--Harlingen--San Benito, TX MSA | **1.84** | 26155 | 48000 |
| 12 | McAllen--Edinburg--Mission, TX MSA | **1.85** | 24863 | 46000 |
| 13 | Jamestown, NY MSA | **1.87** | 33458 | 62700 |
| 14 | Corpus Christi, TX MSA | **1.88** | 35773 | 67100 |
| 15 | Wichita, KS MSA | **1.88** | 42651 | 80400 |
| 16 | San Angelo, TX MSA | **1.89** | 33148 | 62700 |
| 17 | San Antonio, TX MSA | **1.89** | 39140 | 74100 |
| 18 | Texarkana, TX--Texarkana, AR MSA | **1.90** | 32238 | 61100 |
| 19 | Longview--Marshall, TX MSA | **1.91** | 34253 | 65300 |
| 20 | Houston--Galveston--Brazoria, TX CMSA | **1.91** | 44761 | 85600 |
| **Mean Scores** | | **1.81** | **34977** | **63440** |

the twenty most affordable MAs, the average median house value was significantly lower at $63,440 while the average median household income of $34,977 was more closely comparable to the national average.

With so many of the most affordable areas in Texas, it is possible that a large, relatively low-income Hispanic or Latino population demands lower-priced housing. For the 14 Texas metropolitan areas listed in the most affordable top twenty, the average Hispanic or Latino population was 33.4 percent (n=14, median=29.8 percent). Nationally, the 2000 census estimates that 12.5 percent of the United States population is Hispanic or Latino. While the 14 Texas metropolitan areas have a high Hispanic or Latino market share, the percentage of Hispanic or Latino for all twenty of the most affordable areas is much lower (24.34 percent).

Other explanations for the affordability of many Texas metropolitan areas may be explained by the relatively relaxed regulatory environment that exists in Texas. Texas has a history of little or no land use regulations, and zoning was not implemented in the larger metropolitan areas until fairly recently. Development patterns in Texas are partly the result of an abundant supply of land and an automobile-dependent commute that seems to have encouraged sprawl. It is surprising that metropolitan areas as large as San Antonio (housing affordability ratio of 1.89) and especially Houston (housing affordability ratio of 1.91) are featured in the 20 most affordable metropolitan area rankings. The U.S. Census indicates that the San Antonio metropolitan area has grown 806.8 square miles between 1990 and 2000 (from 2,519.6 square miles to 3,326.4 square miles) while Houston has grown 597.59 square miles (from 7,107.4 square miles to 7,704.99 square miles) over the same period. Smart Growth America lists Houston and San Antonio among the nation's most sprawling metropolitan areas (Ewing, Pendall et al. 2002).

*1.2 Least Affordable Housing Markets by Metropolitan Area*

Of the 20 least affordable metropolitan areas (Table 7), 17 are located in the West Census Region (14 of which are in the Pacific Division 3.72, n=27), and seven in California. The Northeast contains the remaining three least affordable metropolitan areas listed in the top twenty ranking; including New York, Barnstable—Yarmouth, and Boston.

The average housing affordability ratio for the 20 least affordable metroplitan areas is 4.19. Compared to the national average of 2.52, these metropolitan areas have significantly higher housing costs relative to income. For example, closer examination of Table 7 shows that while it is evident that the average median household income of this group is 13 percent higher ($45,346) than the nation’s average ($39,331), the housing values of this group are 48 percent higher (where the average median housing value for this group is $192,140 versus $100,693.12 for the nation).

The least affordable housing markets appear to be located along the west coast of the United States. There are seven metropolitan areas that are selected by the natural breaks method to be in the least affordable category (MAs with the highest housing affordability scores, 4.50 and above, and are shown with the largest symbols in Figure 1). These seven metropolitan areas include Santa Barbara (5.66), San Francisco (5.50), Honolulu (5.29), Salinas (5.27), San Luis Obispo (5.15), San Diego (4.50), and Los Angeles (4.21).

| Table 7: 20 Least Affordable Metropolitan Areas, 2000 | | | | |
|---|---|---|---|---|
| **Metropolitan Areas** | | **Housing Affordability Ratio** | Median Household Income | Median Housing Value |
| 1 | Santa Barbara--Santa Maria--Lompoc, CA | **5.66** | 46677 | 264100 |
| 2 | San Francisco--Oakland--San Jose, CA | **5.50** | 62024 | 340800 |
| 3 | Honolulu, HI | **5.29** | 51914 | 274600 |
| 4 | Salinas, CA | **5.27** | 48305 | 254800 |
| 5 | San Luis Obispo--Atascadero--Paso Robles, CA | **5.15** | 42428 | 218600 |
| 6 | San Diego, CA | **4.50** | 47067 | 212000 |
| 7 | Los Angeles--Riverside--Orange County, CA | **4.21** | 45903 | 193400 |
| 8 | Corvallis, OR | **3.97** | 41897 | 166500 |
| 9 | New York--Northern New Jersey--Long Island, NY--NJ--CT--PA | **3.93** | 50795 | 199800 |
| 10 | Santa Fe, NM | **3.82** | 45822 | 174900 |
| 11 | Barnstable--Yarmouth, MA | **3.82** | 46034 | 175700 |
| 12 | Bellingham, WA | **3.74** | 40005 | 149500 |
| 13 | Missoula, MT | **3.74** | 34454 | 128700 |
| 14 | Eugene--Springfield, OR | **3.68** | 36942 | 136000 |
| 15 | Seattle--Tacoma--Bremerton, WA | **3.67** | 50733 | 186100 |
| 16 | Chico--Paradise, CA | **3.64** | 31924 | 116200 |
| 17 | Medford--Ashland, OR | **3.62** | 36461 | 132100 |
| 18 | Boston--Worcester--Lawrence, MA--NH--ME--CT | **3.57** | 52792 | 188600 |
| 19 | Portland--Salem, OR--WA | **3.52** | 46090 | 162200 |
| 20 | Fort Collins--Loveland, CO | **3.46** | 48655 | 168200 |
| **Mean Scores** | | **4.19** | **45346** | **192140** |

It appears that house value has the most influence on the housing affordability score (over income). The San Francisco—Oakland—San Jose metropolitan area has a particularly high median housing value ($340,800); it is the nation's highest housing value by 24 percent (the next closest median housing value is Honolulu with a housing value of $274,600). The San Francisco area's geography (bounded by mountains and water) seems to act like a natural urban growth boundary making land values rise with demand. Additionally, the increase in high-wage high-technology economic activity clustered in this region over the last 30 years has generated a significant number of high-wage jobs; thus allowing a portion of the population to afford higher housing costs. O'Toole (2006) finds that the San Francisco Bay Area has been the least affordable housing market since 1989 and claims that urban growth boundaries and preserved areas for parks have contributed to the housing price increases.

The thesis' literature review in chapter two suggested that growth management legislation can influence the cost of housing. All of the states represented by the least affordable metropolitan areas have state-wide comprehensive growth legislation with the exception of New Mexico, Montana, and Colorado. The states with substantial legislation include California, Hawaii, Massachusetts, New Jersey, New York, Oregon, and Washington (Nelson 1995). Strategies under the growth management umbrella, such as those pioneered by California in the 1970s, include urban growth boundaries, greenbelts, and annual limits on building permits. These techniques were implemented to address growth in these states and may have contributed to the higher housing values in their metropolitan areas. O'Toole (2006, p. 2) explains that "regions with growth management planning have seen prices increase by 4 to 14 percent per year. Regions without such planning have seen prices increase by only 1 to 3 percent per year." Additionally,

> Planning advocates argue that growth boundaries, greenbelts, and other restrictions are needed to preserve livability. But any benefits of these rules are dwarfed by the $2.7 trillion cost that planning-induced housing shortages have imposed on California homebuyers. In 2005 alone, homebuyers paid penalties totaling at least $136 billion for the privilege of owning a home in California (O'Toole, p. 3).

One of the metropolitan areas to make the list of the 20 least affordable metropolitan areas that seems out of place is Missoula, MT. The housing affordability score for Missoula was 3.74 which ranks as the 13th least affordable metropolitan area in the United States. A closer examination of the area's housing and income history reveals a similar trend as the other western metropolitan areas. The house prices in the area have been rising much faster than the resident's incomes. The Missoula metropolitan area has a median household income that is slightly lower than the average median household income on the national level; where Missoula's median household income is $34,454 compared to $34,977 nationally. However, Missoula's median housing value ($128,700) is much higher than the average median across all of the nation's metropolitan areas ($100,693). Rapid population growth combined with a limited supply of land has driven up the price of land in Missoula and has caused working-class residents to find housing elsewhere. "The average cost for a residential lot in Missoula doubled in price in the last five years" (Green 2006, p. 1). The response by Missoula's City Council was to consider subdivision tools such as planned neighborhood clusters (PNCs) and density bonuses (Green 2006). However, implementing more growth management tools may exacerbate the problem of housing affordability.

### *1.3. Comparison of Extremes: Odessa, TX and Santa Barbara, CA*

The Odessa—Midland, Texas MA is this thesis' most affordable metropolitan area with a housing affordability ratio score of 1.54 (median household income of $34,773 and median housing value of $53,500). The low housing values in this metropolitan area are the main contributors to this low ratio. Odessa—Midland has a Hispanic/Latino population of 35.8 percent which is much higher than the national average of 12.5 percent. This statistic's importance is reflective of a demographic trend in Texas where Hispanic/Latino migrants are growing more rapidly than any other ethnic group (Peterson and Assanie 2005). Fullerton (2001) argues that these migrants are less educated and pose a challenge for Texas since its fastest growing economic sectors typically require higher levels of education. Hispanic laborers in Texas with lower levels of education and lower levels of incomes may contribute to lower housing costs simply due to the lack of demand for more expensive housing units.

By contrast, the Santa Barbara MA is this thesis' least affordable area with a housing affordability ratio of 5.66 (median household income of $46,677 and median housing value of $264,100). Surprisingly, Santa Barbara's population is 34.2 percent Hispanic/Latino which is comparable to Odessa—Midland (35.8 percent). For all the California metropolitan areas included in this study, the average Hispanic and Latino population share was 29.77 percent.

By comparing the most and least affordable metropolitan area by Hispanic or Latino percentages it becomes clearer that ethnicity may not be a major determining factor when metropolitan area housing affordability ratios are analyzed. However, it is possible that unaffordable areas with large Hispanic or Latino populations have a dual labor market, each with markedly different income levels and housing situations. For example, low wage Hispanic or Latino laborers may commute considerable distances in the least affordable metropolitan areas in order to access low-wage entry-level opportunities in the economic centers of these regions; the less expensive housing (the only housing this group can afford) is typically located in the rural periphery where few jobs are found. Of course, further research is needed to fully evaluate the impact of significant Hispanic or Latino ethnic groups on the variation in affordability in different regions of the United States.

Table 8 compares the most and least affordable metropolitan areas in our study for a wide variety of socio-economic indicators. Only marginal differences are revealed in employment by economic sector. For example, both metropolitan areas show very similar percentages of their populations employed in the service sector; Odessa—Midland with 16 percent and Santa Barbara with 17 percent although the service category covers a broad range of employment descriptions. Based on the education level in each of these metropolitan areas (Odessa—Midland with 18 percent and Santa Barbara with 29 percent of the population with a Bachelor's degree or higher) variations in skill levels may play an important role in the determination of the type of service industries that are present. Data processing is a service industry that could require a higher level of education compared to say janitorial services. Although the percentage of people employed in each of these occupations may be similar, a higher level of education could

| Table 8: Comparison of the Two Extremes: Odessa, TX and Santa Barbara, CA, 2000 | | |
|---|---|---|
| | **Most Affordable** Odessa, TX | **Least Affordable** Santa Barbara, CA |
| Housing Affordability Ratio | 1.54 | 5.66 |
| Median Housing Value | $53,500 | $264,100 |
| Population Growth Rate: 1990 - 2000 | 99% | 8% |
| Population | 237,132 | 399,347 |
| Educational Attainment (BA or greater) | 18% | 29% |
| Median Household Income | $34,773 | $46,677 |
| Mean Annual Wage Estimate* | $31,340 | $40,190 |
| Population Density (persons per square mile) | 131.6 | 145.9 |
| **Economic Sector** | | |
| Professional Employment | 29% | 35% |
| Sales and Office Employment | 29% | 25% |
| Service Employment | 16% | 17% |

*All data derived from 1990 or 2000 census data per Table 1 except Mean Annual Wage Estimate which is taken from the May 2005 Metropolitan Area Occupational Employment and Wage Estimates from the Bureau of Labor Statistics.

be required for data processing services. However, it is not these services alone that provides a clear explanation of the types of employment in each metropolitan areas because, according to the 2002 US Economic Census, California has 14.2 percent of the US market for data processing services and 12.7 percent for janitorial services. The Texas share is 10.4 percent and 7.4 percent respectively for these service industries.

However, by considering the educational attainment and wage estimates for Odessa—Midland and Santa Barbara it becomes clearer that the type of employment in each of these areas could be vastly different. The difference in the percentage of the population in each of these areas with a Bachelor’s degree or higher may explain the wage differential even though the economic sector composition is markedly similar.

Also, for the two metropolitan areas, a surprising result is the substantial difference between the population growth rates of Oddessa—Midland (i.e. 99 percent) and the growth rate of Santa Barbara (i.e. 8 percent). Odessa—Midland is located in a state that has relatively few development regulations, thus allowing the metropolitan area to grow at a faster rate. By contrast, California and its metropolitan areas have strict regulations for development which can significantly constrain land supply.

As discussed previously, California is also a growth management state that utilizes growth management tools such as urban growth boundaries, greenbelts, and annual limits on building permits; all of which contribute to higher costs of development. Urban growth boundaries (UGBs) are used to redirect development back toward city centers for the purposes of preserving surrounding land for agriculture or other open-space uses (Nelson 1995). When development is prohibited in these areas, demand for land increases causing the land value to increase which can lead to higher development costs. Greenbelts essentially cause the same effect by placing mandatory buffers between areas of development to preserve environmentally sensitive areas (Nelson 1995). One of the most onerous of all regulatory limitations on development is the implementation of building permit caps. Generally this practice is implemented in an area that has already experienced significant development pressures. Such a pressure can trigger significant house price increases and may also infringe upon the constitutional right of the landowner.

*1.4 Regional Differences*

Comparing the broad indicators for only two metropolitan areas (i.e. Odessa—Midland and Santa Barbara) cannot provide a definitive answer regarding national trends in the spatial variation of housing affordability rates. Table 9 presents the broad trends and socio-economic indicators for each of the four Census regions. As discussed earlier, the least affordable region is the West Census Region with a housing affordability ratio of 3.34 compared to a low of 2.29 in the South Census Region. Broadly speaking, it is clear that the regional variation in median housing value is the primary factor for the geographic variation in housing affordability ratio by Census Region given the marginal differences in median household income by Census Region.

Table 9 also presents two interesting trends. Besides the substantial differences in the average housing affordability ratio, substantively different trends are noted regarding the mean population growth rate and population density between the Census regions. By region, the population growth rate varies greatly. The growth rates are notably higher in the Sunbelt region relative to the Rustbelt which should not be surprising given the considerable populations shifts of the last two decades. Growth management regulations may have lessened Santa Barbara's growth relative to Odessa, as evident in the previous comparison between the extreme metropolitan areas; the same conclusion is not evident at a regional scale. With respect to regional differences in population density, the fast-growing regions of the South and West are less densely populated than the slower-growing metropolitan areas of the densely settled Northeast and Midwest Census regions. The conclusion here is that the higher house values appear to occur where land is less densely settled – a counter-intuitive finding. Some of this lower-density phenomenon in the West, however, is explained by the larger land areas by county in these western metropolitan areas.

**Table 9: Regional Comparisons, 2000**
**(Value = Mean of all MAs in each Region)**

| | Northeast | Midwest | South | West |
|---|---|---|---|---|
| Housing Affordability Ratio | 2.54 | 2.31 | 2.29 | 3.34 |
| Median Household Income | \$40,733 | \$41,476 | \$36,902 | \$41,053 |
| Median Housing Value | \$105,483 | \$96,476 | \$84,893 | \$140,143 |
| Population Growth Rate (1990 to 2000) | 5% | 14% | 24% | 26% |
| Population | 1,388,158 | 671,997 | 769,571 | 1,080,062 |
| Population Density (persons per square mile) | 451 | 284 | 259 | 202 |
| Educational Attainment (BA or greater) | 23% | 24% | 22% | 25% |
| **Employment Sector** | | | | |
| Professional Employment | 33% | 32% | 31% | 33% |
| Service Employment | 16% | 15% | 16% | 16% |
| Sales and Office Employment | 27% | 27% | 27% | 27% |

Table 9 also reveals similarities between the Census Regions in terms of median household income, educational attainment, and employment composition. Across three of the four Census Regions average median household income varies a mere \$743 (Midwest = \$41,476, West = \$41,053, Northeast = \$40,733). The South has the lowest median household income (\$36,902) which is 11 percent less than the nation's highest average median household income.

Regional comparisons in Table 9 show similar labor compositions for employment categories. For example, the percentage of the population employed in the sales and office sector across all four Census regions is identical at 27 percent. Service sector employment is nearly identical across the regions with three of the four showing 16 percent employment (the Midwest has 15 percent of its workforce employed in the service sector). The professional employment sector shows the greatest range, of the three employment sectors, across the four Census Regions; ranging from 31 percent in the South to 33 percent in the Northeast and West. The similarities in labor composition may be a result of this analysis using only three broad-ranging employment categories (i.e professional, service, and sales and office). Additionally, the quality of work being performed across the regions cannot be ascertained from employment sector percentages alone. If analyzed in conjunction with income levels, one might conclude that there is a higher level of value-added employment in those regions that have a higher level of educational attainment due to the higher incomes being earned.

### *1.5 The New Economy and Housing Affordability*

The literature review for this thesis shows that the New Economy may be directly affecting housing costs because it has been shown that high skilled labor markets tend to be those same metropolitan areas faced with acute housing affordability problems. According to Atkinson and Gottlieb (2001, p. 3) the New Economy " is a global knowledge and idea-based economy where the keys to wealth and job creation are the extent to which ideas, innovation, and technology are embedded in all sectors of the economy – services, manufacturing, and agriculture." For this reason, it is evident that this economic sector analysis masks the quality of jobs being performed even though new economy positions are often classified as managerial, professional and technical in nature (hence this thesis' inclusion of the professional, service, and sales and office employment sectors as variables in the analysis).

The three employment sectors are shown to be comparable across regions – especially sales and office. Even though the number of jobs by employment sector may be comparable, the skills and earnings vary. The variation in skills (educational attainment) and earnings (median household income) is evident in Table 9. Furthermore, it is also shown that the percentage of educational attainment is directly proportional to median household income by region; as educational attainment increases, median household income also increases.

Table 10 identifies the Census region and division for each of the top 50 New Economy cities as identified by Attkinson and Gottleib (2001). Considering the New Economy metropolitan areas, we see that nearly half are located in the South Census Region (21 out of the top 50) and only 10 are located in the West Census Region. This finding seems contrary to the widely believed relationship that the new economy metropolitan areas have the highest levels of educational attainment because the South has the lowest level of educational attainment in this study (22 percent) and the West has the highest level of educational attainment in this study (25 percent). O'Mara's (1997) study found that the New Economy industries "which greatly rely on the quality of their work force for competitive advantage, view the quality of housing and the local

| Table 10: New Economy Ranking, 1999 | | | | | |
|---|---|---|---|---|---|
| **RANK** | **Metropolitan Area** | **Region** | **RANK** | **Metropolitan Area** | **Region** |
| 8 | Boston | Northeast | 14 | Houston | South |
| 17 | New York | Northeast | 25 | Orlando | South |
| 18 | Philadelphia | Northeast | 26 | Richmond | South |
| 21 | Rochester | Northeast | 30 | Charlotte | South |
| 22 | Hartford | Northeast | 32 | Nashville | South |
| 31 | Buffalo | Northeast | 38 | New Orleans | South |
| 37 | Pittsburgh | Northeast | 39 | Oklahoma City | South |
| 10 | Minneapolis | Midwest | 41 | West Palm Beach | South |
| 19 | Chicago | Midwest | 43 | Tampa | South |
| 24 | Kansas City | Midwest | 44 | Norfolk | South |
| 27 | St. Louis | Midwest | 45 | Greensboro | South |
| 28 | Detroit | Midwest | 46 | Louisville | South |
| 29 | Indianapolis | Midwest | 47 | Memphis | South |
| 33 | Cleveland | Midwest | 48 | Jacksonville | South |
| 34 | Cincinnati | Midwest | 49 | San Antonio | South |
| 36 | Columbus | Midwest | 1 | San Francisco | West |
| 40 | Milwaukee | Midwest | 3 | Seattle | West |
| 42 | Dayton | Midwest | 5 | San Diego | West |
| 50 | Grand Rapids | Midwest | 7 | Denver | West |
| 2 | Austin | South | 9 | Salt Lake City | West |
| 4 | Raleigh-Durham | South | 15 | Portland | West |
| 6 | Washington | South | 16 | Phoenix | West |
| 11 | Atlanta | South | 20 | Los Angeles | West |
| 12 | Dallas | South | 23 | Sacramento | West |
| 13 | Miami | South | 35 | Las Vegas | West |

Source: Atkinson and Gottleib (2001)

community as integral parts of their operations. Communities must support the development of housing that is both affordable and attractive within a reasonable commuting range of its business sites.” The New Economy industries appear to be looking to the South in order to create their perceived competitive advantage anew with the hopes of attracting educated workers.

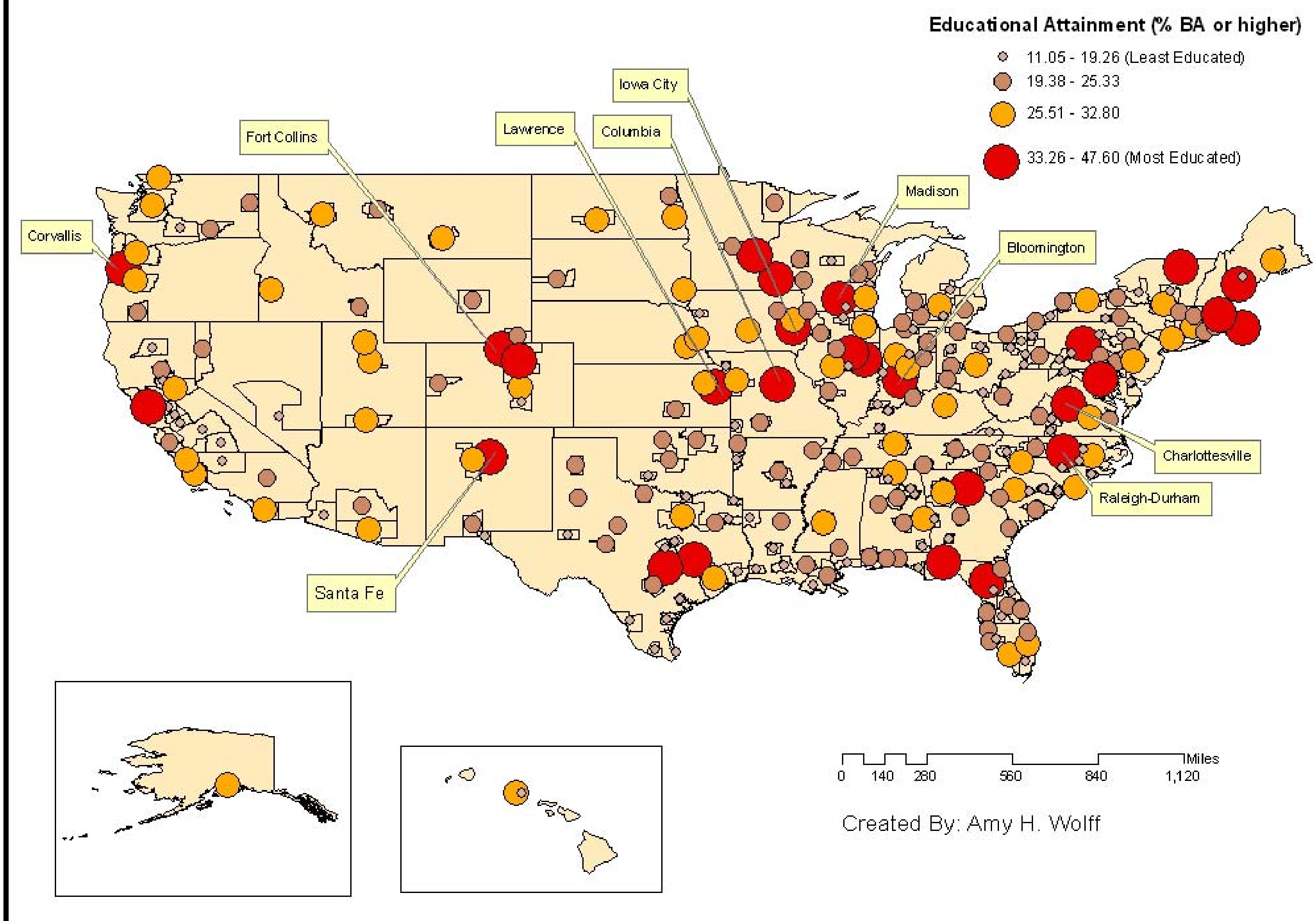
It is clear from Figure 1 and this analysis that geography matters. The next section of these findings will show the spatial distribution of educational attainment by metropolitan area as well as the spatial distribution of population density and consider the differences and patterns that are revealed. The statistical analysis indicated that the highest correlation scores with housing affordability ratio by metropolitan area included educational attainment (percent of the population with a BA degree or higher), professional employment (percent of the population employed in the professional sector), and population density.

*2. Spatial Distribution of Educational Attainment by Metropolitan Area*

The spatial distribution of educational attainment by metropolitan area in Figure 2 indicates that the more educated metropolitan areas are found in the eastern half of the United States with clusters of MAs with higher education levels along the east coast, upper mid-west and eastern Texas. Figure 2 has been classified by natural breaks with 27 metropolitan areas classified in the highest-educated category; which includes 33.26 percent to 47.6 percent of the metropolitan population who have obtained a bachelor's degree or higher.

Table 11 is a list of the top ten ranked metropolitan areas with the highest educational attainment. Iowa City, IA leads the nation's metropolitan areas with the highest educational attainment at 47.6 percent and Merced, CA ranks at the bottom with 11.05 percent. It is noted that the top-ranked metropolitan areas for educational attainment are notably university/college areas where one might expect a higher level of educational achievement among the population at large. The average educational attainment level across all 276 metropolitan areas in this analysis was 23 percent.

## Figure 2: Educational Attainment by Metropolitan Area, 2000

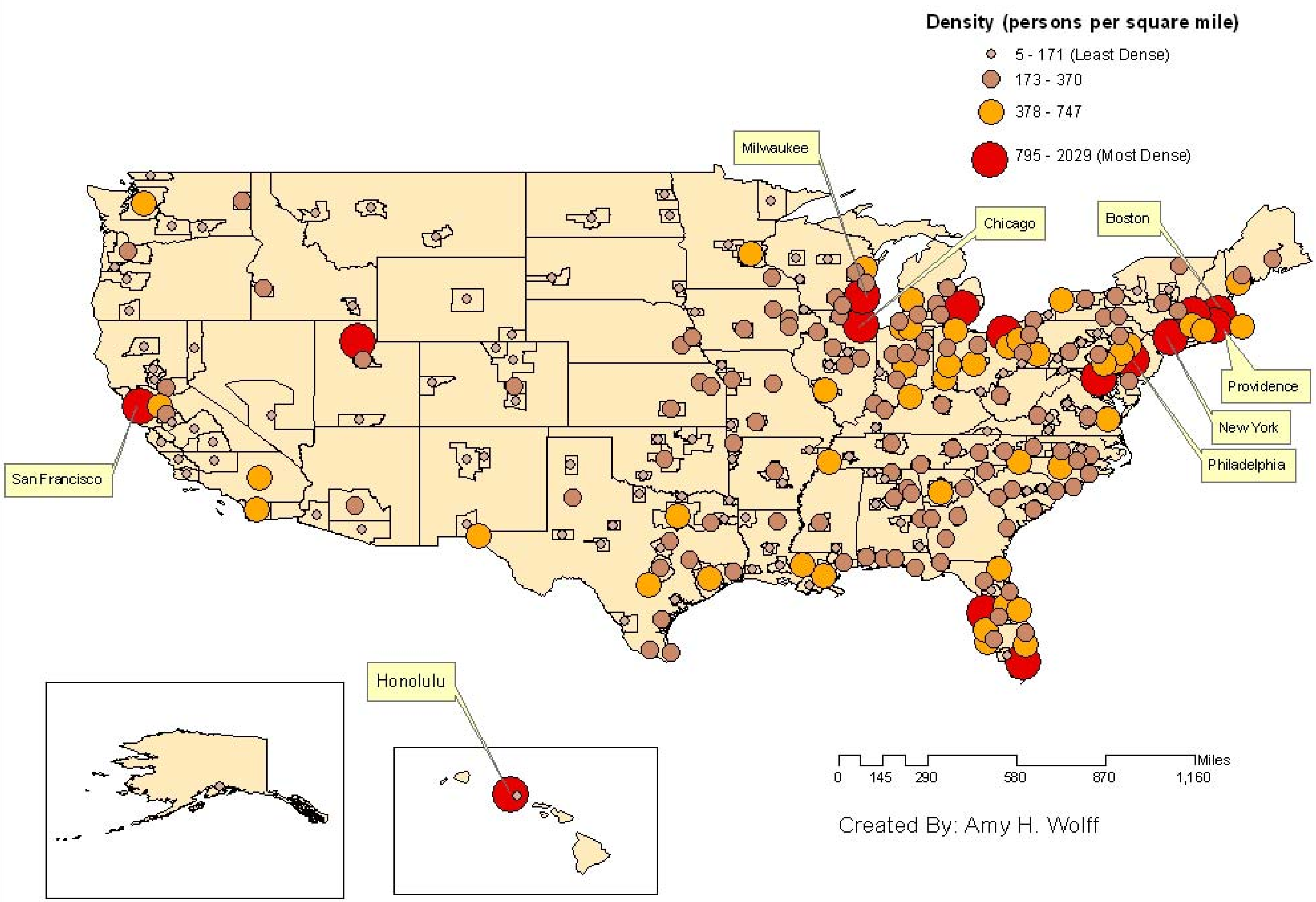


| Table 11: Top 10 Metropolitan Areas by Educational Attainment, 2000 (% BA or higher) | | |
|---|---|---|
| **Rank** | **Metropolitan Area** | **Educational Attainment (%)** |
| 1 | Iowa City, IA | 47.6 |
| 2 | Corvallis, OR | 47.4 |
| 3 | Lawrence, KS | 42.7 |
| 4 | Columbia, MO | 41.7 |
| 5 | Madison, WI | 40.6 |
| 6 | Charlottesville, VA | 40.1 |
| 7 | Santa Fe, NM | 39.9 |
| 8 | Bloomington, IN | 39.6 |
| 9 | Fort Collins--Loveland, CO | 39.5 |
| 10 | Raleigh--Durham--Chapel Hill, NC | 38.9 |

*3. Spatial Distribution of Population Density by Metropolitan Area*

Figure 3 illustrates the spatial distribution of population density by metropolitan areas indicating that the most densely settled metropolitan areas are found in the Northeast with an additional cluster of high density metropolitan areas in the Great Lakes region and another cluster located in Florida. Figure 3 has been classified by natural breaks with 15 metropolitan areas falling into the most densely settled category; that being 747 to 2029 persons per square mile. Table 12 illustrates the top ten metropolitan areas by population density. New York is the most densely settled with 2029 people per square mile and Flagstaff, AR is the least densely settled with 5 people per square mile. The average population density across all 276 metropolitan areas was 279 people per square mile.

Figure 3: Population Density by Metropolitan Area, 2000



| Table 12: Top 10 Metropolitan Areas by Population Density, 2000 | | |
|---|---|---|
| **Rank** | **Metropolitan Areas** | **Population Density (persons per square mile)** |
| 1 | New York--Northern New Jersey--Long Island, NY--NJ--CT--PA | 2029 |
| 2 | Honolulu, HI | 1461 |
| 3 | Chicago--Gary--Kenosha, IL--IN--WI | 1322 |
| 4 | Miami--Fort Lauderdale, FL | 1230 |
| 5 | Philadelphia--Wilmington--Atlantic City, PA--NJ--DE--MD | 1043 |
| 6 | Providence--Fall River--Warwick, RI--MA | 1042 |
| 7 | Boston--Worcester--Lawrence, MA--NH--ME--CT | 1034 |
| 8 | San Francisco--Oakland--San Jose, CA | 955 |
| 9 | Milwaukee--Racine, WI | 942 |
| 10 | Tampa--St. Petersburg--Clearwater, FL | 938 |

The Northeast region metropolitan areas contain older central cities whose development patterns are much denser than the newer development patterns of the Sunbelt metropolitan areas given the prevailing form of transportation at the time of development. For example, the Northeast's older and larger cities such as New York, Boston, and Philadelphia are densely populated due to the heavy reliance on public transit systems and the mixed-use morphology that prevailed before the advent of the automobile. The same can be said for the Great Lakes and San Francisco metropolitan areas that are also classified as the most densely settled.

The next section of this thesis will present the additional statistical analysis of the most significant variables that explain the spatial variation of housing affordability by metropolitan area.

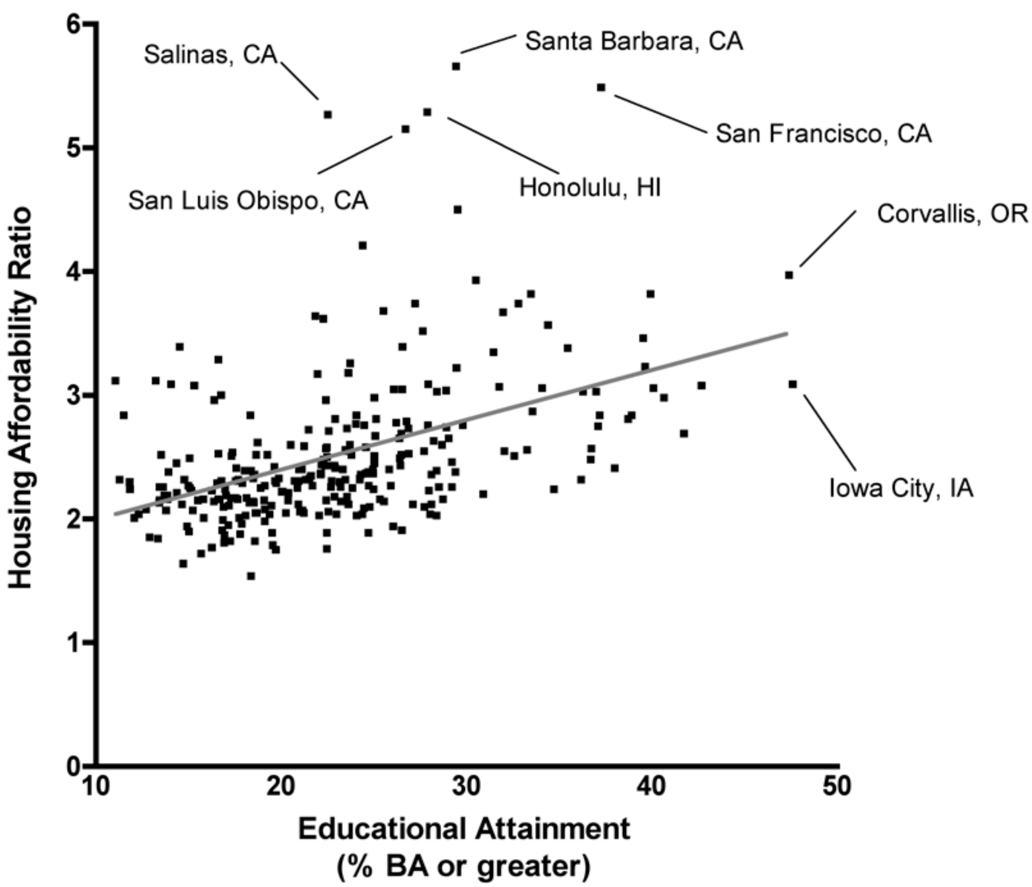
*4. Statistical Analysis*

To begin the statistical analysis, four scatterplots are presented that show the correlation of housing affordability ratio by metropolitan area to educational attainment, professional employment, population density, and growth rate by metropolitan area. Other variables analyzed include the two remaining economic sectors: the service industry, and sales and office employment.

*4.1 Relationship Between Housing Affordability and Educational Attainment*

The level of educational attainment by metropolitan area generated the highest correlation coefficient score relative to the housing affordability. The Pearson's Correlation coefficient was 0.45 at the 1 percent level of significance. Pearson's was used in this thesis because of the relatively normal distribution curve and low standard deviations for the data. Figure 4 is a scatter plot of the housing affordability ratio and educational attainment by metropolitan area suggesting a strong linear relationship exists between the two variables. As educational attainment levels increase there is likely to be fewer affordable housing units in that metropolitan market. The implication is that well-educated metropolitan areas likely support significant wage earnings due to the superior

**Figure 4: Housing Affordability and Educational Attainment by MA**



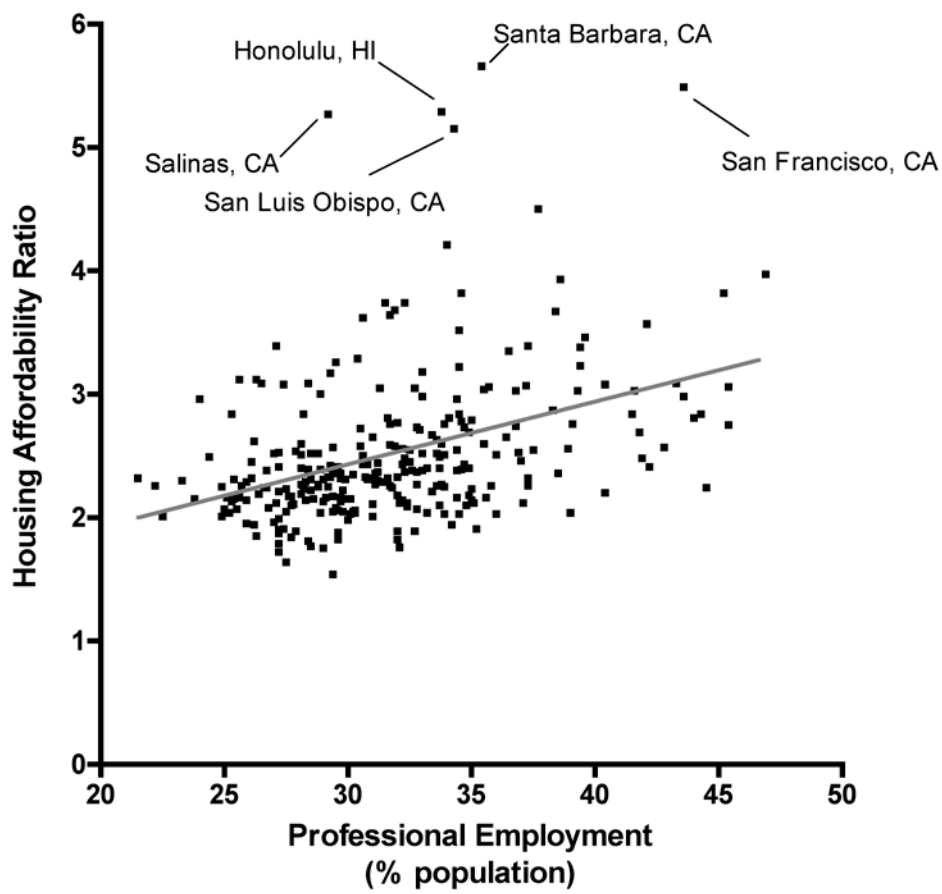

skill levels in the labor market. The elevated earning powers probably contribute to an increased demand for more expensive housing units.

Most of the significant outliers in the scatterplot are the West coast metropolitan areas and include Salinas, CA (educational attainment = 22.5 percent), Honolulu, HI (educational attainment = 27.9 percent), and Santa Barbara, CA (educational attainment = 29.4 percent).

*4.2 Relationship Between Housing Affordability and Professional Employment*

The population share that is employed in the professional sector by metropolitan area generated the second highest correlation coefficient score relative to the spatial variation in housing affordability. The correlation score was 0.40 at the 1 percent level of significance. Figure 5 is a scatter plot of the housing affordability ratio and professional employment by metropolitan area suggesting that a fairly strong linear relationship exists between the two variables. As the percentage of the population in a metropolitan area

**Figure 5: Housing Affordability and Professional Employment by MA**



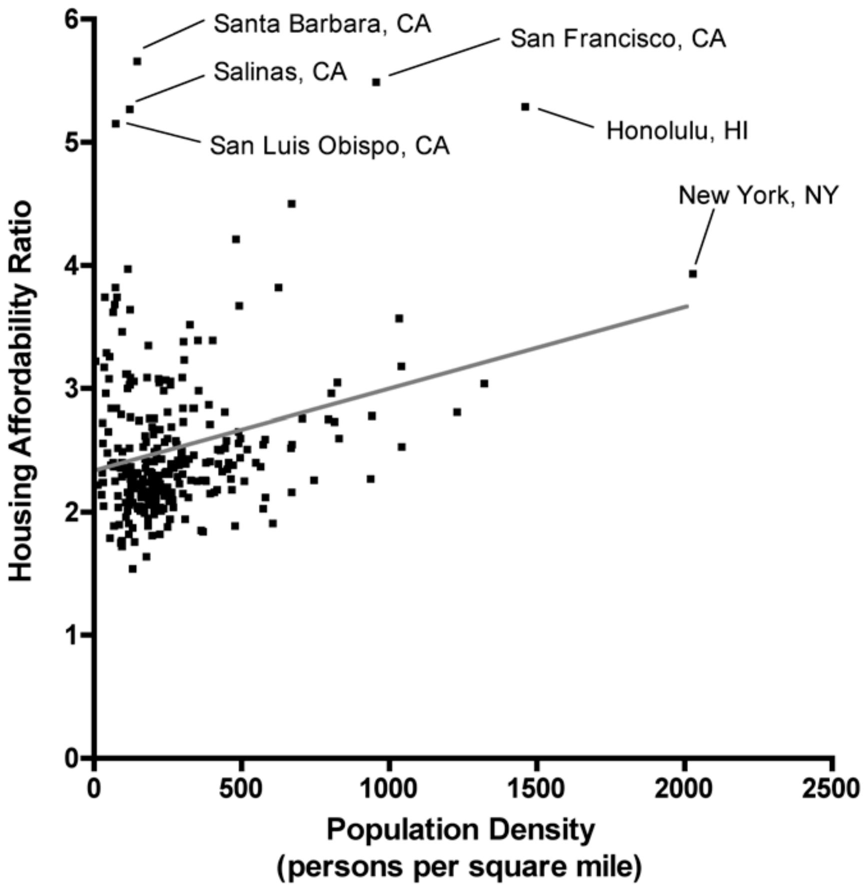
that is employed in the professional sector increases, housing becomes less affordable. As with high levels of educational attainment, a higher percentage of professionals in a metropolitan area can cause an increased demand for higher-end housing due to the higher earning power of employees in this economic sector.

Most of the significant outliers in this scatterplot are also West coast metropolitan areas and include Salinas, CA (percent professional employment = 29.2), Honolulu, HI (percent professional employment = 33.8), and Santa Barbara, CA (percent professional employment = 35.4).

*4.3 Relationship Between Housing Affordability and Population Density*

Population density by metropolitan area generated a lower correlation coefficient score of 0.27 at the 1 percent level of significance. Figure 6 is a scatter plot of the housing affordability ratio and population density by metropolitan area which suggests that, although a linear relationship exists between the two variables, it may not be as strong as those lines of best fit for educational attainment and the percentage of the labor force in professional employment. As population density increases the trend line shows a higher housing affordability ratio meaning there is likely to be fewer affordable housing units in that metropolitan market. In a relatively normal housing market, high housing unit densities often suggest a higher demand for land; as demand for land increase, land values tend to rise in a similar fashion. Thus, developers build more units per acre in order to offset the price of land and recoup the cost of land when the houses are sold.

**Figure 6: Housing Affordability and Population Density by MA**

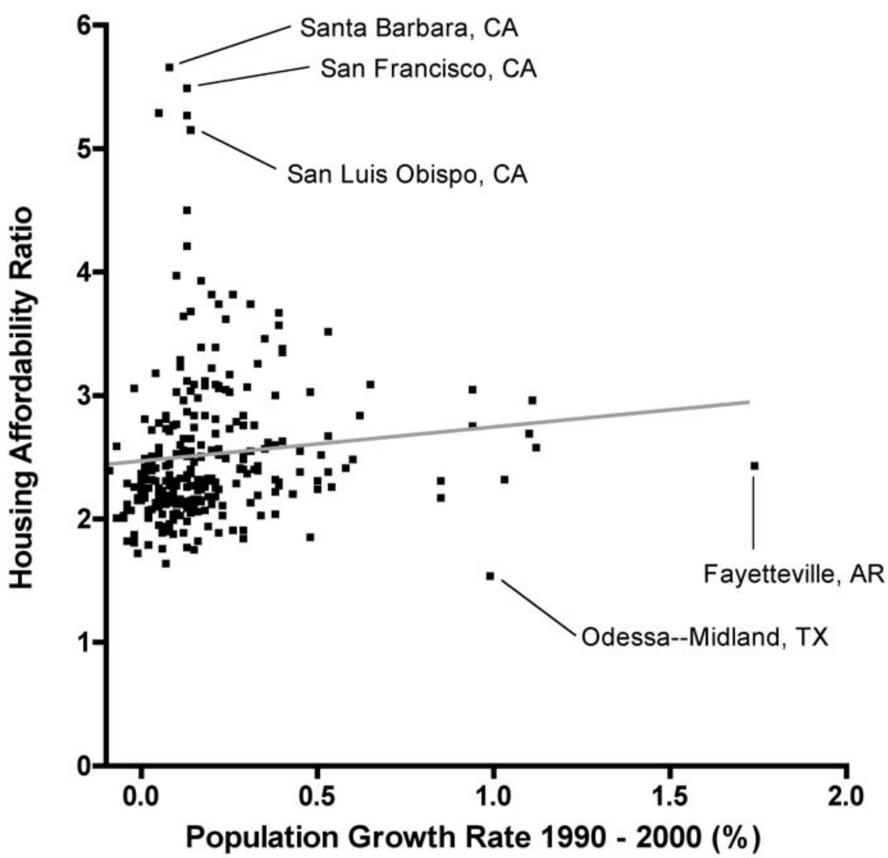



Similar to Figure 4 and Figure 5, it is the least affordable metropolitan areas that show the most deviation from the line of correlation. These outliers include Santa Barbara, CA (density = 146), San Francisco, CA (density = 955), and Honolulu, HI (density = 1461).

*4.4 Relationship Between Housing Affordability and Population Growth Rate*

The literature review in this thesis indicated that housing affordability in a metropolitan area may be explained by that area's growth rate. However, the correlation coefficient of 0.10 was not significant suggesting that the empirical findings in this thesis indicate that growth rate did not significantly contribute to any explanation of the variation of housing affordability. A visual inspection of the scatterplot in Figure 7 also indicates that a weak relationship exists between these two variables.

**Figure 7: Housing Affordability and Population Growth Rate by MA**



The existing literature linking population growth rate to housing affordability is divided; where several studies indicate that a high population growth rate can lead to more expensive housing and others suggest that a high population growth rate indicates increased availability of affordable housing and higher mobility. Most of these studies, however, acknowledge that housing cost is a product of supply and demand and that different markets have different regulatory mechanisms to address growth (i.e. some metropolitan areas encourage growth and other metropolitan areas discourage growth). Metropolitan areas that discourage growth but are also experiencing growth, tend to have higher housing values (i.e. the California metropolitan areas in this study). On the contrary, metropolitan areas that appear to encourage growth (i.e. the Texas metropolitan areas in this study) tend to have lower housing values.

The existing literature linking population growth rate to housing affordability has mixed findings. Several studies indicate that a high population growth rate can lead to more expensive housing and others suggest that a high population growth rate indicates an increased availability of affordable housing that attracts new migrants. Most of these studies, however, acknowledge that housing cost is a product of supply and demand and that different markets have different regulatory mechanisms to address growth (i.e. some metropolitan areas encourage growth and other metropolitan areas discourage growth). Metropolitan areas that have experienced a recent history of rapid growth and then try to manage that growth by introducing permit caps, urban growth boundaries and tough growth management legislation tend to be the same metropolitan areas experiencing high housing values and above average housing affordability ratios (i.e. the California metropolitan areas in this study). On the contrary, metropolitan areas that appear to encourage growth (i.e. the Texas metropolitan areas in this study) tend to have lower housing values.

### *4.5 Regression Analysis*

It is shown above that the variables most closely correlated to our housing affordability ratio are educational attainment, professional employment, and population density. A regression analysis is used here to provide an additional explanation of the effect of the housing affordability ratio when these variables interact. This research hypothesized that the housing affordability ratio by metropolitan area can be explained by variation in specific key independent variables including: home prices, household incomes, educational attainment, and population density. Other independent variables that may explain housing affordability include the population growth rate and employment composition (the percentage of the population employed in professional, service, and sales and office occupations). Through regression analysis it is determined that the significant independent variables in this thesis included educational attainment and population density. Although population growth rate has been heavily linked to housing affordability in the literature, it was left out of the final regression model due to its low correlation score and lack of statistical significance. Also, because of the high correlation between educational attainment and the percentage of the population employed in the professional sector[5] (0.94 at the 1 percent level), only educational attainment was included in the final regression model.

The literature review indicated that geographic region may also explain some of the variation in affordability across metropolitan areas. Categorical variables for Census Region[6] and Division[7] were added to the model with the thinking here that the regression model is strengthened by including a geographic component. It should be noted that Census Division was ultimately chosen since it is more geographically disaggregated than Census Region. The following is the final model of the regression analysis for this thesis and Table 13 presents the detailed results:

HAR = 0.89 + 0.00072 density + 0.0355 education + 0.1179 Census Division

R-square = 0.41
F-Statistic = 62.01 at the 1% level

This final regression provides a model that shows the line of best fit with the y-intercept (0.89) and regression coefficients for density (0.00072) and education (0.0355).[8] The regression coefficient represents the amount the dependent variable will change when the corresponding independent variable changes by one unit. Here, with all else

[5] When both educational attainment and professional employment were included in the regression model each had a VIF greater than 9; indicating a multicollinearity problem. Consequently when only educational attainment was included in the model its VIF was 1.05.
[6] Coded variables for Census Regions are as follows: 1=Northeast, 2=Midwest, 3=South, and 4=West.
[7] Coded variables for Census Divisions are as follows: 1=New England, 2=Middle Atlantic, 3=East North Central, 4=West North Central, 5=South Atlantic, 6=East South Central, 7=West South Central, 8=Mountain, and 9=Pacific.
[8] The regression coefficient for Census Division cannot be interpreted in the same way because coded variables were used as opposed to a continuous variable in the multiple linear regression model (as opposed to a logistic regression model). It is assumed that the Census Division of a metropolitan area will be held constant.

constant, if density increases by one unit in a metropolitan area, its housing affordability ratio is predicted to increase by 0.00072. Likewise, if educational attainment were to increase by one unit in any given metropolitan area, its housing affordability ratio is predicted to increase by 0.0355.

| **Table 13: Housing Affordability Ratio Regression Output, Final Model** | | | | |
|---|---|---|---|---|
| **Variable** | **Parameter Estimate** | **Standard Error** | **t Statistic** | **P-value** |
| **Intercept** | 0.89 | 0.1252 | 7.127 | <.001 |
| **DENS** | 0.00072 | 0.0123 | 5.854 | <.001 |
| **EDUC** | 0.0355 | 0.0043 | 8.321 | <.001 |
| **DIV** | 0.11785 | 0.0133 | 8.884 | <.001 |

Through this regression analysis it has been determined that 41 percent (R-square) of the variation in housing affordability by metropolitan area can be explained by three variables: educational attainment, population density, and Census Division. This best-fit model emphasizes that, across all 276 metropolitan areas, the traditional indicators of educational attainment and population density prevail over different types of economic sectors and employment composition even though some of the existing literature has suggested these employment/economic issues may be a leading cause of housing affordability problems. Additionally, this model illustrates the significant influence of the relative location of a metropolitan area. For example, when the Census Division variable is removed from the model the R-squared value drops nearly 18 percent (from 41 percent to 23 percent). Visual inspection of Figure 1 reinforces this finding where those metropolitan areas with the highest housing affordability scores (i.e. least affordable) are geographically clustered on the West coast and the lowest housing affordability scores (i.e. most affordable) are clustered in the southern Mississippi River basin.

# CHAPTER V

# CONCLUSION

This thesis hypothesized that housing affordability problems in select metropolitan areas are a result of the dynamic interaction that exists between both home prices and household incomes while additional important explanatory variables include the educational attainment of the metropolitan workers, overall population densities and relative location as measured by Census Division. In this analysis, a housing affordability ratio (expressed as the relationship between median housing value and median household incomes) was used as a proxy to measure housing affordability. This ratio made it possible to correct for different purchasing powers that occur between metropolitan areas with very different economies.

The first key finding in this thesis is the clear regionalization of housing affordability. The metropolitan areas with higher housing affordability ratios (least affordable) are concentrated along the West Coast and the metropolitan areas with lower housing affordability ratios (most affordable) are concentrated in the lower Mississippi River basin. The second key finding is that housing affordability is determined more by the variation in house values than by the variation in household incomes; where, across all metropolitan areas there is little variation in household income relative to the variation found for house values. This finding is consistent with the existing literature reviewed in this thesis and also parallels the results of a recent 2006 Census Bureau study which found that “Nationwide, median home values jumped 32 percent from 2000 to 2005…[and] household incomes have not kept up, dropping 2.8 percent during the same period” (Ohlemacher 2006).

The final regression model shows that the key triggers of our model are educational attainment, population density and Census Division. These variables interact in such a way as to explain 41 percent of the variation in the housing affordability ratio by metropolitan area. The non-significant variables tested included population growth rate and employment composition in ‘new economy’ industries. These results imply that the high-technology jobs that typically characterize the New Economy may be embedded in other traditional industries (i.e. innovations in research and design for manufacturing processes). Consequently, conventional measures of employment composition may be less helpful in explaining variations in housing affordability ratios than simple crude overall measures of the workforce’s skill levels as measured by overall levels of education attainment. The implication is that well-educated workers realize higher average wages and, thus, bid-up the prices of houses. However, not all workers are able to participate in this process as evidenced by the lack of variation in median household incomes across metropolitan areas when compared to average housing prices

This thesis did not find that population growth rate was a significant indicator of housing affordability across metropolitan areas. This is likely due to the vastly different regulatory powers that are exercised in some jurisdictions and not in others; causing some jurisdictions to purposefully hinder growth while others encourage it.

This thesis focused on metropolitan areas across the United States. It is acknowledged that to reach a clearer understanding of affordability, further analysis is needed. Future research should examine housing affordability ratios within specific metropolitan areas to determine if those metropolitan areas that are considered less affordable generate 'ghettoized' pockets of affordable housing in specific housing sub-markets within the metropolitan area. The significant variation in house prices relative to the lack of variation in household incomes suggest that some metropolitan workers in low-wage occupations face significant challenges if they are to become home-owners. A more detailed disaggregation of specific metropolitan housing markets may be helpful in this regard. Additionally, more research is needed to determine if growth management is solely the cause of higher housing costs in select markets. And finally, the second largest allocation of a household budget is taken up by transportation costs. For a more refined assessment of affordability, transportation costs should also be examined because the suspicion here is that some low-income workers must endure substantial commutes in order to access affordable housing in the extreme outlying areas of a metropolitan market that is dominated by high priced housing in the urban core areas.

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## Appendix A: DATA SET

| Metropolitan Area | HAR | MH Income | HM Value | Growth (90-2000) | Population Density | Education (>=BA) | Professional | Service | Sales/ Office | Region | Division |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Abilene, TX MSA** | 1.76 | 34035 | 60000 | 0.06 | 138.2 | 0.2245 | 32.1 | 19.5 | 26.9 | 3 | 7 |
| **Albany, GA MSA** | 2.16 | 34829 | 75400 | 0.07 | 176.3 | 0.1765 | 29.7 | 16 | 27.6 | 3 | 5 |
| **Albany--Schenectady--Troy, NY MSA** | 2.36 | 43250 | 102200 | 0.00 | 271.7 | 0.281 | 38.5 | 14.2 | 27.9 | 1 | 2 |
| **Albuquerque, NM MSA** | 3.03 | 39088 | 118500 | 0.48 | 119.9 | 0.284 | 36.8 | 15.7 | 28.1 | 4 | 8 |
| **Alexandria, LA MSA** | 2.29 | 29856 | 68300 | -0.04 | 95.5 | 0.1655 | 31.4 | 18.6 | 26.5 | 3 | 7 |
| **Allentown--Bethlehem--Easton, PA MSA** | 2.59 | 43098 | 111600 | -0.07 | 579.2 | 0.2124 | 31.7 | 14.1 | 27 | 1 | 2 |
| **Altoona, PA MSA** | 2.16 | 32861 | 71100 | -0.01 | 245.6 | 0.1388 | 25.6 | 16.4 | 26.7 | 1 | 2 |
| **Amarillo, TX MSA** | 2.06 | 35679 | 73600 | 0.16 | 119.5 | 0.21 | 29.6 | 17.7 | 27.7 | 3 | 7 |
| **Anchorage, AK MSA** | 2.74 | 55546 | 152300 | 0.15 | 153.4 | 0.2891 | 36.8 | 15.1 | 28.5 | 4 | 9 |
| **Anniston, AL MSA** | 2.07 | 31768 | 65700 | -0.03 | 184.5 | 0.1522 | 25.5 | 14.6 | 25 | 3 | 6 |
| **Appleton--Oshkosh--Neenah, WI MSA** | 2.15 | 47438 | 102000 | 0.14 | 256.2 | 0.2243 | 29.8 | 12.8 | 25.5 | 2 | 3 |
| **Asheville, NC MSA** | 2.76 | 36179 | 99800 | 0.29 | 204.4 | 0.2448 | 31.7 | 15.4 | 25.2 | 3 | 5 |
| **Athens, GA MSA** | 3.06 | 33416 | 102400 | -0.02 | 259.9 | 0.3408 | 35.7 | 15.4 | 25 | 3 | 5 |
| **Atlanta, GA MSA** | 2.55 | 51948 | 132600 | 0.45 | 671.5 | 0.3205 | 37.5 | 12.1 | 28.7 | 3 | 5 |
| **Auburn--Opelika, AL MSA** | 2.76 | 30952 | 85500 | 0.32 | 189.1 | 0.2791 | 33.9 | 15.2 | 25.8 | 3 | 6 |
| **Augusta--Aiken, GA--SC MSA** | 2.12 | 38103 | 80800 | 0.20 | 195 | 0.2092 | 32.4 | 15.5 | 24.2 | 3 | 5 |
| **Austin--San Marcos, TX MSA** | 2.48 | 48950 | 121300 | 0.60 | 295.9 | 0.3669 | 41.9 | 12.4 | 26.7 | 3 | 7 |
| **Bakersfield, CA MSA** | 2.52 | 35446 | 89400 | 0.22 | 81.3 | 0.1352 | 27 | 17.6 | 24.1 | 4 | 9 |
| **Bangor, ME MSA** | 2.43 | 35837 | 87200 | 0.02 | 228.7 | 0.2642 | 34.7 | 16.7 | 28.6 | 1 | 1 |
| **Barnstable--Yarmouth, MA MSA** | 3.82 | 46034 | 175700 | 0.20 | 625.8 | 0.3347 | 34.6 | 18.5 | 28 | 1 | 1 |
| **Baton Rouge, LA MSA** | 2.40 | 38438 | 92200 | 0.14 | 380.1 | 0.2494 | 33.2 | 14.3 | 28.6 | 3 | 7 |
| **Beaumont--Port Arthur, TX MSA** | 1.64 | 35669 | 58500 | 0.07 | 178.8 | 0.1471 | 27.5 | 16.4 | 26.2 | 3 | 7 |
| **Bellingham, WA MSA** | 3.74 | 40005 | 149500 | 0.31 | 78.7 | 0.2723 | 31.5 | 16.5 | 26.3 | 4 | 9 |
| **Benton Harbor, MI MSA** | 2.42 | 38567 | 93300 | 0.01 | 284.5 | 0.1962 | 29.3 | 15.3 | 24.1 | 2 | 3 |
| **Billings, MT MSA** | 2.65 | 36727 | 97200 | 0.14 | 49.1 | 0.2638 | 31 | 16.7 | 30.8 | 4 | 8 |
| **Biloxi--Gulfport--Pascagoula, MS MSA** | 2.17 | 36662 | 79500 | 0.85 | 203.9 | 0.1755 | 27.7 | 20.1 | 25.3 | 3 | 6 |
| **Binghamton, NY MSA** | 2.03 | 36374 | 73800 | -0.05 | 205.9 | 0.2204 | 34.5 | 15.7 | 26.3 | 1 | 2 |
| **Birmingham, AL MSA** | 2.38 | 39278 | 93500 | 0.01 | 289.1 | 0.2471 | 34.4 | 12.7 | 29.8 | 3 | 6 |
| **Bismarck, ND MSA** | 2.14 | 40148 | 85800 | 0.13 | 26.6 | 0.2554 | 35 | 16.5 | 28.1 | 2 | 4 |
| **Bloomington, IN MSA** | 3.23 | 33311 | 107500 | 0.11 | 305.7 | 0.3963 | 39.4 | 17.1 | 25.4 | 2 | 3 |
| **Bloomington--Normal, IL MSA** | 2.32 | 47021 | 109300 | 0.16 | 127.1 | 0.3617 | 37.3 | 15.3 | 28.9 | 2 | 3 |
| **Boise City, ID MSA** | 2.69 | 42570 | 114600 | 1.10 | 262.9 | 0.2648 | 34.9 | 14.5 | 26.9 | 4 | 8 |
| **Boston--Worcester--Lawrence, MA--NH--ME--CT CMSA** | 3.57 | 52792 | 188600 | 0.39 | 1034.1 | 0.3439 | 42.1 | 13.3 | 26.1 | 1 | 1 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Brownsville--Harlingen--San Benito, TX MSA** | 1.84 | 26155 | 48000 | 0.29 | 370.1 | 0.1336 | 27.7 | 19.8 | 24.9 | 3 | 7 |
| **Bryan--College Station, TX MSA** | 3.03 | 29104 | 88200 | 0.25 | 260.2 | 0.3699 | 39.3 | 16.4 | 25.3 | 3 | 7 |
| **Buffalo--Niagara Falls, NY MSA** | 2.26 | 38488 | 86900 | -0.02 | 746.6 | 0.2321 | 33.6 | 15.7 | 27.9 | 1 | 2 |
| **Burlington, VT MSA** | 2.84 | 46732 | 132600 | 0.29 | 301.4 | 0.3718 | 41.5 | 13 | 26 | 1 | 1 |
| **Canton--Massillon, OH MSA** | 2.51 | 39457 | 99200 | 0.03 | 419.2 | 0.1732 | 28.1 | 14.6 | 26.2 | 2 | 3 |
| **Casper, WY MSA** | 2.22 | 36619 | 81400 | 0.09 | 12.5 | 0.2002 | 28.5 | 15.8 | 29.9 | 4 | 8 |
| **Cedar Rapids, IA MSA** | 2.10 | 46206 | 97200 | 0.14 | 267.2 | 0.2773 | 34.8 | 12.4 | 29.6 | 2 | 4 |
| **Champaign--Urbana, IL MSA** | 2.41 | 37780 | 91200 | 0.04 | 180.2 | 0.3799 | 42.2 | 14.9 | 25.3 | 2 | 3 |
| **Charleston, WV MSA** | 2.21 | 35418 | 78400 | 0.00 | 201.4 | 0.204 | 33.4 | 14.6 | 30.1 | 3 | 5 |
| **Charleston--North Charleston, SC MSA** | 2.45 | 39491 | 96700 | 0.08 | 211.9 | 0.2503 | 32.5 | 16.2 | 26.3 | 3 | 5 |
| **Charlotte--Gastonia--Rock Hill, NC--SC MSA** | 2.52 | 46119 | 116200 | 0.29 | 444 | 0.2647 | 33 | 12.1 | 27.4 | 3 | 5 |
| **Charlottesville, VA MSA** | 3.06 | 44356 | 135600 | 0.22 | 135.6 | 0.4008 | 45.4 | 14.3 | 23.7 | 3 | 5 |
| **Chattanooga, TN--GA MSA** | 2.31 | 37411 | 86500 | 0.07 | 255.1 | 0.1967 | 29.9 | 13.5 | 26.8 | 3 | 6 |
| **Cheyenne, WY MSA** | 2.56 | 39607 | 101200 | 0.12 | 30.4 | 0.2345 | 32.2 | 14.8 | 27.7 | 4 | 8 |
| **Chicago--Gary--Kenosha, IL--IN--WI CMSA** | 3.04 | 51046 | 155100 | 0.14 | 1322 | 0.2889 | 35.5 | 13.1 | 28.4 | 2 | 3 |
| **Chico--Paradise, CA MSA** | 3.64 | 31924 | 116200 | 0.12 | 123.9 | 0.2184 | 31.7 | 18.7 | 26.7 | 4 | 9 |
| **Cincinnati--Hamilton, OH--KY--IN CMSA** | 2.51 | 44914 | 112800 | 0.13 | 519.6 | 0.2502 | 33.9 | 13.9 | 28 | 2 | 3 |
| **Clarksville--Hopkinsville, TN--KY MSA** | 2.24 | 36313 | 81400 | 0.22 | 164.2 | 0.1698 | 26.6 | 16.6 | 25.3 | 3 | 6 |
| **Cleveland--Akron, OH CMSA** | 2.73 | 42215 | 115300 | 0.07 | 815.6 | 0.2354 | 32.8 | 14.5 | 27.7 | 2 | 3 |
| **Colorado Springs, CO MSA** | 3.07 | 46844 | 143600 | 0.30 | 243.1 | 0.3176 | 37.2 | 14.5 | 27.7 | 4 | 8 |
| **Columbia, MO MSA** | 2.69 | 37485 | 100800 | 0.21 | 197.6 | 0.4173 | 41.8 | 14.8 | 27 | 2 | 4 |
| **Columbia, SC MSA** | 2.26 | 41677 | 94000 | 0.18 | 368.7 | 0.292 | 37.3 | 14.1 | 28 | 3 | 5 |
| **Columbus, GA--AL MSA** | 2.36 | 34512 | 81400 | 0.13 | 174.9 | 0.1856 | 29.4 | 16 | 26.5 | 3 | 5 |
| **Columbus, OH MSA** | 2.65 | 44782 | 118700 | 0.12 | 490.3 | 0.2905 | 36.4 | 13.7 | 29.2 | 2 | 3 |
| **Corpus Christi, TX MSA** | 1.88 | 35773 | 67100 | 0.09 | 249.3 | 0.178 | 29.6 | 17.7 | 27.2 | 3 | 7 |
| **Corvallis, OR MSA** | 3.97 | 41897 | 166500 | 0.10 | 115.5 | 0.4739 | 46.9 | 14.8 | 20.7 | 4 | 9 |
| **Cumberland, MD--WV MSA** | 2.26 | 30916 | 69900 | 0.00 | 135.4 | 0.1344 | 25.7 | 18.7 | 25 | 3 | 5 |
| **Dallas--Fort Worth, TX CMSA** | 2.03 | 47418 | 96200 | 0.34 | 573.6 | 0.2837 | 36 | 12.4 | 28.9 | 3 | 7 |
| **Danville, VA MSA** | 2.32 | 31201 | 72500 | 0.01 | 108.7 | 0.1127 | 21.5 | 14.1 | 23.9 | 3 | 5 |
| **Davenport--Moline--Rock Island, IA--IL MSA** | 2.05 | 40621 | 83300 | 0.02 | 210.2 | 0.2026 | 29.4 | 16.1 | 27.3 | 2 | 4 |
| **Daytona Beach, FL MSA** | 2.39 | 35722 | 85300 | 0.33 | 310.5 | 0.1803 | 28.9 | 18.2 | 28.7 | 3 | 5 |
| **Dayton--Springfield, OH MSA** | 2.37 | 41550 | 98300 | 0.00 | 564.6 | 0.2215 | 32.8 | 14.6 | 26.3 | 2 | 3 |
| **Decatur, AL MSA** | 2.16 | 36299 | 78300 | 0.11 | 114.4 | 0.1581 | 25.1 | 13 | 22.9 | 3 | 6 |
| **Decatur, IL MSA** | 1.81 | 37859 | 68500 | -0.02 | 197.6 | 0.1692 | 28.4 | 15.7 | 26.2 | 2 | 3 |
| **Denver--Boulder--Greeley, CO CMSA** | 3.38 | 51088 | 172800 | 0.40 | 303.9 | 0.3546 | 39.4 | 12.5 | 28 | 4 | 8 |
| **Des Moines, IA MSA** | 2.16 | 46651 | 100800 | 0.16 | 264 | 0.2872 | 35.6 | 13.6 | 30.6 | 2 | 4 |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| **Detroit--Ann Arbor--Flint, MI CMSA** | 2.60 | 49160 | 127900 | 0.17 | 831.1 | 0.237 | 33.8 | 14.1 | 26.2 | 2 | 3 |
| **Dothan, AL MSA** | 2.10 | 33455 | 70200 | 0.05 | 120.8 | 0.1689 | 27.7 | 15.7 | 26.5 | 3 | 6 |
| **Dover, DE MSA** | 2.52 | 40950 | 103300 | 0.14 | 214.8 | 0.1864 | 28.5 | 17 | 26.9 | 3 | 5 |
| **Dubuque, IA MSA** | 2.32 | 39582 | 91900 | 0.03 | 146.6 | 0.2133 | 29.7 | 15.7 | 26.5 | 2 | 4 |
| **Duluth--Superior, MN--WI MSA** | 2.05 | 36081 | 73900 | 0.02 | 32.4 | 0.2123 | 29.8 | 18.2 | 26.5 | 2 | 4 |
| **Eau Claire, WI MSA** | 2.36 | 39372 | 93100 | 0.08 | 90 | 0.2212 | 29.7 | 16 | 26.6 | 2 | 3 |
| **El Paso, TX MSA** | 2.16 | 31051 | 67100 | 0.15 | 670.8 | 0.1661 | 29.1 | 16.9 | 28.1 | 3 | 7 |
| **Elkhart--Goshen, IN MSA** | 2.15 | 44478 | 95600 | 0.17 | 394.1 | 0.1551 | 23.8 | 11 | 23.4 | 2 | 3 |
| **Elmira, NY MSA** | 1.82 | 36415 | 66200 | -0.04 | 223.1 | 0.1858 | 32 | 19.2 | 25.2 | 1 | 2 |
| **Enid, OK MSA** | 1.79 | 33006 | 59100 | 0.02 | 54.6 | 0.1955 | 27.2 | 19.1 | 25.6 | 3 | 7 |
| **Erie, PA MSA** | 2.25 | 36627 | 82500 | 0.02 | 350.2 | 0.2087 | 29.2 | 16.3 | 25.6 | 1 | 2 |
| **Eugene--Springfield, OR MSA** | 3.68 | 36942 | 136000 | 0.14 | 70.9 | 0.2551 | 31.9 | 15.7 | 26.3 | 4 | 9 |
| **Evansville--Henderson, IN--KY MSA** | 2.14 | 39307 | 84000 | 0.06 | 201.9 | 0.1849 | 28.3 | 14.5 | 27.4 | 2 | 3 |
| **Fargo--Moorhead, ND--MN MSA** | 2.38 | 38069 | 90600 | 0.14 | 62 | 0.294 | 33 | 15.4 | 30 | 2 | 4 |
| **Fayetteville, NC MSA** | 2.27 | 37466 | 84900 | 0.10 | 464.2 | 0.1911 | 28.8 | 16.7 | 27 | 3 | 5 |
| **Fayetteville--Springdale--Rogers, AR MSA** | 2.43 | 37322 | 90700 | 1.74 | 173.3 | 0.2237 | 30.8 | 13.3 | 26.7 | 3 | 7 |
| **Flagstaff, AZ--UT MSA** | 3.22 | 37971 | 122300 | 0.20 | 5.4 | 0.2946 | 34.5 | 19.1 | 25.6 | 4 | 8 |
| **Florence, AL MSA** | 2.31 | 32704 | 75500 | 0.09 | 113.1 | 0.1678 | 25.4 | 13.9 | 25.9 | 3 | 6 |
| **Florence, SC MSA** | 2.05 | 35144 | 71900 | 0.10 | 157.2 | 0.1868 | 30.2 | 14.9 | 24.8 | 3 | 5 |
| **Fort Collins--Loveland, CO MSA** | 3.46 | 48655 | 168200 | 0.35 | 96.7 | 0.3953 | 39.6 | 13.9 | 24.8 | 4 | 8 |
| **Fort Myers--Cape Coral, FL MSA** | 2.40 | 40319 | 96700 | 0.32 | 548.6 | 0.211 | 28.1 | 18.5 | 29.7 | 3 | 5 |
| **Fort Pierce--Port St. Lucie, FL MSA** | 2.29 | 38724 | 88700 | 0.27 | 283.2 | 0.1974 | 28.3 | 18.1 | 28.2 | 3 | 5 |
| **Fort Smith, AR--OK MSA** | 2.07 | 32399 | 67100 | 0.18 | 114.8 | 0.1379 | 25 | 14.4 | 24.3 | 4 | 8 |
| **Fort Walton Beach, FL MSA** | 2.33 | 41474 | 96800 | 0.19 | 182.2 | 0.2424 | 32 | 19 | 26.9 | 3 | 5 |
| **Fort Wayne, IN MSA** | 2.04 | 42817 | 87400 | 0.38 | 205.2 | 0.1938 | 28.9 | 13 | 25.6 | 2 | 3 |
| **Fresno, CA MSA** | 3.00 | 34960 | 105000 | 0.38 | 113.9 | 0.1676 | 28.9 | 16.2 | 25.7 | 4 | 9 |
| **Gadsden, AL MSA** | 2.13 | 31170 | 66500 | 0.04 | 193.4 | 0.1342 | 25.3 | 13.7 | 25 | 3 | 6 |
| **Gainesville, FL MSA** | 2.81 | 31426 | 88400 | 0.07 | 249.3 | 0.387 | 44 | 16.2 | 26.3 | 3 | 5 |
| **Glens Falls, NY MSA** | 2.25 | 38526 | 86600 | 0.05 | 72.9 | 0.189 | 28.8 | 17.4 | 25.9 | 1 | 2 |
| **Goldsboro, NC MSA** | 2.27 | 33942 | 77000 | 0.08 | 205.1 | 0.1499 | 28.1 | 15.1 | 24.3 | 3 | 5 |
| **Grand Forks, ND--MN MSA** | 2.32 | 35562 | 82600 | 0.38 | 28.6 | 0.2424 | 31.6 | 19.2 | 25 | 2 | 4 |
| **Grand Junction, CO MSA** | 3.17 | 35864 | 113800 | 0.25 | 34.9 | 0.2195 | 29.3 | 17.2 | 27.9 | 4 | 8 |
| **Grand Rapids--Muskegon--Holland, MI MSA** | 2.41 | 46116 | 111000 | 0.58 | 394.6 | 0.2291 | 29.6 | 13.5 | 25.6 | 2 | 3 |
| **Great Falls, MT MSA** | 2.72 | 32971 | 89600 | 0.03 | 29.8 | 0.2148 | 30.5 | 18.4 | 29.7 | 4 | 8 |
| **Green Bay, WI MSA** | 2.50 | 46447 | 116100 | 0.17 | 429 | 0.2247 | 30.6 | 12.6 | 28.5 | 2 | 3 |
| **Greensboro--Winston-Salem--High Point, NC MSA** | 2.43 | 40913 | 99600 | 0.33 | 322.5 | 0.2288 | 30.6 | 12.4 | 26.2 | 3 | 5 |
| **Greenville, NC MSA** | 2.49 | 32868 | 82000 | 0.24 | 205.3 | 0.264 | 33.7 | 15.5 | 26.1 | 3 | 5 |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| **Greenville--Spartanburg--Anderson, SC MSA** | 2.31 | 38458 | 88700 | 0.50 | 300 | 0.2073 | 29 | 13.2 | 25 | 3 | 5 |
| **Harrisburg--Lebanon--Carlisle, PA MSA** | 2.43 | 43022 | 104700 | 0.07 | 316.2 | 0.2261 | 32.2 | 14.1 | 28.1 | 1 | 2 |
| **Hartford, CT MSA** | 2.76 | 52188 | 143800 | 0.09 | 705.4 | 0.2979 | 39.1 | 13.9 | 27 | 1 | 1 |
| **Hattiesburg, MS MSA** | 2.36 | 30981 | 73200 | 0.13 | 115.9 | 0.243 | 31.1 | 16.3 | 28.1 | 3 | 6 |
| **Hickory--Morganton--Lenoir, NC MSA** | 2.26 | 37818 | 85600 | 0.54 | 208.6 | 0.1362 | 22.2 | 11.8 | 21.9 | 3 | 5 |
| **Honolulu, HI MSA** | 5.29 | 51914 | 274600 | 0.05 | 1460.8 | 0.2787 | 33.8 | 19.6 | 29.1 | 4 | 9 |
| **Houma, LA MSA** | 2.04 | 35089 | 71700 | 0.06 | 83.1 | 0.123 | 25.2 | 13.8 | 26.1 | 3 | 7 |
| **Houston--Galveston--Brazoria, TX CMSA** | 1.91 | 44761 | 85600 | 0.26 | 606 | 0.2651 | 35.2 | 13.6 | 27.3 | 3 | 7 |
| **Huntington--Ashland, WV--KY--OH MSA** | 2.21 | 29415 | 65100 | 0.01 | 146.1 | 0.1438 | 27.2 | 16.6 | 28.2 | 3 | 5 |
| **Huntsville, AL MSA** | 2.20 | 43104 | 95000 | 0.43 | 249.4 | 0.309 | 40.4 | 12.4 | 23.5 | 3 | 6 |
| **Indianapolis, IN MSA** | 2.40 | 45548 | 109200 | 0.29 | 456.3 | 0.2583 | 33.7 | 13.5 | 27.9 | 2 | 3 |
| **Iowa City, IA MSA** | 3.09 | 40060 | 123700 | 0.15 | 180.7 | 0.476 | 43.3 | 15.5 | 26.1 | 2 | 4 |
| **Jackson, MI MSA** | 2.23 | 43171 | 96300 | 0.06 | 224.2 | 0.1626 | 27.5 | 16.5 | 24.6 | 2 | 3 |
| **Jackson, MS MSA** | 2.12 | 38887 | 82400 | 0.11 | 186.7 | 0.281 | 35.1 | 14.2 | 29.1 | 3 | 6 |
| **Jackson, TN MSA** | 2.22 | 36649 | 81200 | 0.38 | 127 | 0.2007 | 29.8 | 13.9 | 26.1 | 3 | 6 |
| **Jacksonville, FL MSA** | 2.18 | 42439 | 92500 | 0.21 | 417.6 | 0.2287 | 32 | 14.4 | 31.4 | 3 | 5 |
| **Jacksonville, NC MSA** | 2.32 | 33756 | 78200 | 0.00 | 196.1 | 0.1477 | 26.1 | 19.2 | 28 | 3 | 5 |
| **Jamestown, NY MSA** | 1.87 | 33458 | 62700 | -0.02 | 131.6 | 0.1694 | 27.2 | 18.2 | 23.4 | 1 | 2 |
| **Janesville--Beloit, WI MSA** | 2.16 | 45517 | 98300 | 0.09 | 211.4 | 0.1668 | 25.4 | 14 | 23.7 | 2 | 3 |
| **Johnson City--Kingsport--Bristol, TN--VA MSA** | 2.53 | 31596 | 79800 | 0.10 | 167.5 | 0.166 | 27.2 | 14 | 26 | 3 | 6 |
| **Johnstown, PA MSA** | 2.08 | 30442 | 63400 | -0.04 | 132 | 0.1271 | 26.8 | 17.9 | 24.4 | 1 | 2 |
| **Jonesboro, AR MSA** | 2.31 | 32425 | 74800 | 0.19 | 115.6 | 0.2094 | 28.5 | 14.4 | 26 | 3 | 7 |
| **Joplin, MO MSA** | 2.14 | 32446 | 69300 | 0.17 | 124.3 | 0.1637 | 25.9 | 14.4 | 25.3 | 2 | 4 |
| **Kalamazoo--Battle Creek, MI MSA** | 2.32 | 40710 | 94600 | 1.03 | 240.7 | 0.2346 | 31 | 15.7 | 24.8 | 2 | 3 |
| **Kansas City, MO--KS MSA** | 2.26 | 46193 | 104400 | 0.13 | 328.5 | 0.285 | 35.8 | 13.5 | 28.9 | 2 | 4 |
| **Killeen--Temple, TX MSA** | 2.03 | 36669 | 74500 | 0.23 | 148.2 | 0.1807 | 30.1 | 17.9 | 27 | 3 | 7 |
| **Knoxville, TN MSA** | 2.55 | 36874 | 94000 | 0.14 | 280.6 | 0.2347 | 32.5 | 15 | 27.9 | 3 | 6 |
| **Kokomo, IN MSA** | 1.95 | 44531 | 87000 | 0.05 | 183.5 | 0.1714 | 25.9 | 15.7 | 20.6 | 2 | 3 |
| **La Crosse, WI--MN MSA** | 2.37 | 39692 | 94100 | 0.30 | 125.4 | 0.2457 | 31.2 | 16.4 | 26.7 | 2 | 3 |
| **Lafayette, IN MSA** | 2.63 | 39072 | 102900 | 0.40 | 202 | 0.2823 | 33.6 | 15.4 | 23 | 2 | 3 |
| **Lafayette, LA MSA** | 2.31 | 30998 | 71700 | 0.85 | 148.7 | 0.1755 | 29.9 | 15.6 | 26.8 | 3 | 7 |
| **Lake Charles, LA MSA** | 1.99 | 35372 | 70300 | 0.09 | 171.4 | 0.1686 | 27.2 | 18.2 | 25.6 | 3 | 7 |
| **Lakeland--Winter Haven, FL MSA** | 1.94 | 36036 | 69800 | 0.19 | 258.2 | 0.1492 | 26.2 | 16.7 | 27.1 | 3 | 5 |
| **Lancaster, PA MSA** | 2.60 | 45507 | 118300 | 0.11 | 495.9 | 0.2051 | 28.1 | 13.9 | 24.9 | 1 | 2 |
| **Lansing--East Lansing, MI MSA** | 2.39 | 44441 | 106200 | 0.03 | 262.3 | 0.2838 | 34.6 | 15.3 | 27.2 | 2 | 3 |
| **Laredo, TX MSA** | 2.38 | 28100 | 67000 | 0.45 | 57.5 | 0.1393 | 26.7 | 17.8 | 29 | 3 | 7 |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| **Las Cruces, NM MSA** | 2.48 | 29808 | 74000 | 0.29 | 45.9 | 0.2229 | 32.3 | 18.3 | 25.1 | 4 | 8 |
| **Las Vegas, NV--AZ MSA** | 2.96 | 42468 | 125700 | 1.11 | 39.7 | 0.1639 | 24 | 26.7 | 27.8 | 4 | 8 |
| **Lawrence, KS MSA** | 3.08 | 37547 | 115600 | 0.22 | 218.8 | 0.4268 | 40.4 | 16.6 | 25 | 2 | 4 |
| **Lawton, OK MSA** | 2.08 | 33867 | 70500 | 0.03 | 107.5 | 0.1911 | 29.5 | 19.5 | 25.6 | 3 | 7 |
| **Lewiston--Auburn, ME MSA** | 2.45 | 35244 | 86500 | 0.03 | 298.2 | 0.1435 | 26.1 | 14.6 | 29.3 | 1 | 1 |
| **Lexington, KY MSA** | 2.60 | 39357 | 102500 | 0.38 | 249.7 | 0.2868 | 35.5 | 14.8 | 25.7 | 3 | 6 |
| **Lima, OH MSA** | 2.15 | 39284 | 84500 | 0.00 | 192.5 | 0.1344 | 25.4 | 16 | 22.5 | 2 | 3 |
| **Lincoln, NE MSA** | 2.51 | 41850 | 105100 | 0.17 | 298.4 | 0.3257 | 36 | 15 | 26.8 | 2 | 4 |
| **Little Rock--North Little Rock, AR MSA** | 2.10 | 39145 | 82100 | 0.14 | 200.8 | 0.2477 | 33.7 | 13.6 | 29.2 | 3 | 7 |
| **Longview--Marshall, TX MSA** | 1.91 | 34253 | 65300 | 0.29 | 118.6 | 0.1682 | 27.4 | 14.3 | 26.6 | 3 | 7 |
| **Los Angeles--Riverside--Orange County, CA CMSA** | 4.21 | 45903 | 193400 | 0.13 | 482.2 | 0.2439 | 34 | 14.7 | 27.7 | 4 | 9 |
| **Louisville, KY--IN MSA** | 2.44 | 40821 | 99800 | 0.08 | 495 | 0.2217 | 31.2 | 13.9 | 27.9 | 3 | 6 |
| **Lubbock, TX MSA** | 2.04 | 32198 | 65700 | 0.09 | 269.7 | 0.2437 | 33.2 | 16.7 | 29.3 | 3 | 7 |
| **Lynchburg, VA MSA** | 2.52 | 37010 | 93400 | 0.51 | 120 | 0.1926 | 28.8 | 13.9 | 26.8 | 3 | 5 |
| **Macon, GA MSA** | 2.11 | 38565 | 81400 | 0.15 | 210.6 | 0.1948 | 31 | 15.5 | 27.3 | 3 | 5 |
| **Madison, WI MSA** | 2.98 | 49223 | 146600 | 0.16 | 354.9 | 0.4064 | 43.6 | 12.7 | 26.5 | 2 | 3 |
| **Mansfield, OH MSA** | 2.30 | 37060 | 85200 | 0.39 | 195.6 | 0.1182 | 23.3 | 15.2 | 23.7 | 2 | 3 |
| **McAllen--Edinburg--Mission, TX MSA** | 1.85 | 24863 | 46000 | 0.48 | 362.8 | 0.1291 | 26.3 | 18.5 | 25.4 | 3 | 7 |
| **Medford--Ashland, OR MSA** | 3.62 | 36461 | 132100 | 0.24 | 65.1 | 0.2228 | 30.6 | 17.4 | 26.6 | 4 | 9 |
| **Melbourne--Titusville--Palm Bay, FL MSA** | 2.18 | 40099 | 87600 | 0.19 | 467.7 | 0.2355 | 34.9 | 16.5 | 26.9 | 3 | 5 |
| **Memphis, TN--AR--MS MSA** | 2.26 | 40201 | 90900 | 0.16 | 377.7 | 0.2269 | 31.7 | 14.1 | 29.7 | 3 | 6 |
| **Merced, CA MSA** | 3.12 | 35532 | 110900 | 0.18 | 109.2 | 0.1105 | 25.6 | 15.8 | 22 | 4 | 9 |
| **Miami--Fort Lauderdale, FL CMSA** | 2.81 | 38632 | 108400 | 0.21 | 1230 | 0.2291 | 31.6 | 16.7 | 31 | 3 | 5 |
| **Milwaukee--Racine, WI CMSA** | 2.78 | 46132 | 128200 | 0.05 | 942.3 | 0.262 | 34.6 | 13.4 | 27.1 | 2 | 3 |
| **Minneapolis--St. Paul, MN--WI MSA** | 2.56 | 54304 | 139200 | 0.20 | 489.7 | 0.3326 | 38.9 | 12.4 | 28 | 2 | 4 |
| **Missoula, MT MSA** | 3.74 | 34454 | 128700 | 0.22 | 36.9 | 0.328 | 32.3 | 17.9 | 28.3 | 4 | 8 |
| **Mobile, AL MSA** | 2.33 | 35629 | 83000 | 0.13 | 190.9 | 0.1987 | 29.2 | 15 | 27.1 | 3 | 6 |
| **Modesto, CA MSA** | 3.09 | 40101 | 123900 | 0.21 | 299.2 | 0.1405 | 26.5 | 15.4 | 25.6 | 4 | 9 |
| **Monroe, LA MSA** | 2.31 | 32047 | 74000 | 0.04 | 241.2 | 0.2273 | 30.8 | 16.6 | 29.6 | 3 | 7 |
| **Montgomery, AL MSA** | 2.27 | 37619 | 85300 | 0.14 | 165.9 | 0.2472 | 33.8 | 14.8 | 28.7 | 3 | 6 |
| **Muncie, IN MSA** | 2.15 | 34659 | 74400 | -0.01 | 302 | 0.2038 | 30.1 | 17.5 | 26.4 | 2 | 3 |
| **Myrtle Beach, SC MSA** | 2.62 | 36470 | 95400 | 0.36 | 173.4 | 0.1872 | 26.2 | 20.1 | 29.8 | 3 | 5 |
| **Naples, FL MSA** | 3.09 | 48289 | 149000 | 0.65 | 124.1 | 0.2792 | 28.4 | 19.9 | 27.9 | 3 | 5 |
| **Nashville, TN MSA** | 2.73 | 44223 | 120800 | 0.25 | 302.3 | 0.2685 | 34.7 | 12.7 | 28.3 | 3 | 7 |
| **New London--Norwich, CT--RI MSA** | 2.81 | 49283 | 138500 | 0.01 | 443.3 | 0.2513 | 34.1 | 20 | 24.7 | 1 | 1 |
| **New Orleans, LA MSA** | 2.71 | 35317 | 95800 | 0.08 | 393.5 | 0.2256 | 32.9 | 17.3 | 28 | 3 | 7 |
| **New York--Northern New Jersey--Long Island, NY--NJ--CT--PA CMSA** | 3.93 | 50795 | 199800 | 0.17 | 2028.7 | 0.305 | 38.6 | 15.2 | 27.9 | 1 | 2 |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| **Norfolk--Virginia Beach--Newport News, VA--NC MSA** | 2.52 | 42448 | 107100 | 0.12 | 668.3 | 0.238 | 33.6 | 15.6 | 27.8 | 3 | 5 |
| **Ocala, FL MSA** | 2.19 | 31944 | 70100 | 0.33 | 164 | 0.1369 | 26.4 | 17.5 | 28.2 | 3 | 5 |
| **Odessa--Midland, TX MSA** | 1.54 | 34773 | 53500 | 0.99 | 131.6 | 0.1838 | 29.4 | 15.8 | 28.6 | 3 | 7 |
| **Oklahoma City, OK MSA** | 2.09 | 36797 | 76900 | 0.13 | 255.1 | 0.2445 | 32.4 | 15.1 | 28.8 | 3 | 7 |
| **Omaha, NE--IA MSA** | 2.23 | 44981 | 100100 | 0.16 | 289.6 | 0.2796 | 35 | 13.7 | 30.1 | 2 | 4 |
| **Orlando, FL MSA** | 2.38 | 41871 | 99500 | 0.53 | 471.1 | 0.248 | 32.6 | 17.3 | 29.8 | 3 | 5 |
| **Owensboro, KY MSA** | 2.19 | 36813 | 80600 | 0.05 | 198 | 0.1702 | 28.1 | 15.4 | 23.6 | 3 | 6 |
| **Panama City, FL MSA** | 2.32 | 36092 | 83700 | 0.17 | 194.1 | 0.1768 | 28.5 | 19.7 | 28.1 | 3 | 5 |
| **Parkersburg--Marietta, WV--OH MSA** | 2.23 | 33696 | 75200 | 0.01 | 150.9 | 0.1516 | 28.2 | 14.8 | 27.9 | 3 | 5 |
| **Pensacola, FL MSA** | 2.33 | 36975 | 86100 | 0.20 | 245.4 | 0.2153 | 30.7 | 17 | 28 | 3 | 5 |
| **Peoria--Pekin, IL MSA** | 2.07 | 42986 | 88900 | 0.02 | 193.4 | 0.2114 | 32.8 | 15.5 | 27 | 2 | 3 |
| **Philadelphia--Wilmington--Atlantic City, PA--NJ--DE--MD CMSA** | 2.53 | 47528 | 120300 | 0.05 | 1042.7 | 0.2688 | 36.9 | 14.8 | 28.6 | 1 | 2 |
| **Phoenix--Mesa, AZ MSA** | 2.67 | 44752 | 119600 | 0.53 | 223.1 | 0.2508 | 33.4 | 14.9 | 29.5 | 4 | 8 |
| **Pine Bluff, AR MSA** | 1.72 | 31327 | 53800 | -0.01 | 95.2 | 0.1568 | 27.2 | 15.6 | 25.3 | 3 | 7 |
| **Pittsburgh, PA MSA** | 2.25 | 37467 | 84300 | 0.05 | 509.9 | 0.2384 | 33.9 | 15.9 | 27.7 | 1 | 2 |
| **Pittsfield, MA MSA** | 2.84 | 38515 | 109500 | 0.07 | 336.4 | 0.2406 | 34.5 | 18.3 | 26.8 | 1 | 1 |
| **Pocatello, ID MSA** | 2.37 | 36683 | 87000 | 0.14 | 67.9 | 0.2495 | 32.3 | 16.3 | 27.8 | 4 | 8 |
| **Portland, ME MSA** | 2.87 | 44707 | 128500 | 0.13 | 388.9 | 0.3356 | 38.3 | 13.9 | 28.8 | 1 | 1 |
| **Portland--Salem, OR--WA CMSA** | 3.52 | 46090 | 162200 | 0.53 | 325.8 | 0.2765 | 34.5 | 14 | 27.1 | 4 | 9 |
| **Providence--Fall River--Warwick, RI--MA MSA** | 3.18 | 41748 | 132700 | 0.04 | 1041.5 | 0.2362 | 33 | 15.3 | 27.1 | 1 | 1 |
| **Provo--Orem, UT MSA** | 3.35 | 45833 | 153600 | 0.40 | 184.4 | 0.3146 | 36.5 | 14 | 27.7 | 4 | 8 |
| **Pueblo, CO MSA** | 2.84 | 32775 | 93100 | 0.15 | 59.2 | 0.1834 | 28.2 | 18.2 | 28.2 | 4 | 8 |
| **Punta Gorda, FL MSA** | 2.41 | 36379 | 87700 | 0.28 | 204.2 | 0.1758 | 27.2 | 20.9 | 29.6 | 3 | 5 |
| **Raleigh--Durham--Chapel Hill, NC MSA** | 2.84 | 48845 | 138500 | 0.62 | 340.5 | 0.3891 | 44.3 | 11.8 | 24.8 | 3 | 5 |
| **Rapid City, SD MSA** | 2.24 | 37485 | 83800 | 0.09 | 31.9 | 0.2498 | 31.8 | 16.8 | 28.6 | 2 | 4 |
| **Reading, PA MSA** | 2.33 | 44714 | 104400 | 0.11 | 435 | 0.1849 | 29.3 | 13.3 | 26.1 | 1 | 2 |
| **Redding, CA MSA** | 3.29 | 34335 | 112900 | 0.11 | 43.1 | 0.166 | 30.4 | 19.6 | 27 | 4 | 9 |
| **Reno, NV MSA** | 3.26 | 45815 | 149500 | 0.33 | 53.5 | 0.2372 | 29.5 | 19.9 | 28.9 | 4 | 8 |
| **Richland--Kennewick--Pasco, WA MSA** | 2.40 | 44886 | 107600 | 0.28 | 65.1 | 0.2332 | 34.9 | 14.5 | 23.1 | 4 | 9 |
| **Richmond--Petersburg, VA MSA** | 2.46 | 46800 | 115000 | 0.15 | 338.4 | 0.2921 | 37 | 13.2 | 28.8 | 3 | 5 |
| **Roanoke, VA MSA** | 2.58 | 39288 | 101200 | 0.05 | 277.2 | 0.2246 | 31.9 | 13.8 | 30.3 | 3 | 5 |
| **Rochester, MN MSA** | 2.24 | 51316 | 114700 | 0.17 | 190.3 | 0.3471 | 44.5 | 14.1 | 23.4 | 2 | 4 |
| **Rochester, NY MSA** | 2.12 | 43955 | 93300 | 0.10 | 320.6 | 0.271 | 37.1 | 14.5 | 25.4 | 1 | 2 |
| **Rockford, IL MSA** | 2.13 | 44988 | 95600 | 0.31 | 238.9 | 0.1852 | 29 | 12.9 | 25.9 | 2 | 3 |
| **Rocky Mount, NC MSA** | 2.19 | 34795 | 76200 | 0.07 | 136.8 | 0.1388 | 25.6 | 13.6 | 25.4 | 3 | 5 |
| **Sacramento--Yolo, CA CMSA** | 3.39 | 46106 | 156200 | 0.21 | 352.7 | 0.2655 | 37.3 | 14.7 | 28.6 | 4 | 9 |
| **Saginaw--Bay City--Midland, MI MSA** | 2.17 | 39909 | 86700 | 0.01 | 227.2 | 0.1813 | 29.4 | 17.2 | 26.3 | 2 | 3 |
| **Salinas, CA MSA** | 5.27 | 48305 | 254800 | 0.13 | 120.9 | 0.225 | 29.2 | 16.8 | 23.2 | 4 | 9 |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| **Salt Lake City--Ogden, UT MSA** | 3.05 | 48594 | 148300 | 0.24 | 824.7 | 0.2653 | 32.7 | 13 | 30.8 | 4 | 8 |
| **San Angelo, TX MSA** | 1.89 | 33148 | 62700 | 0.06 | 68.3 | 0.195 | 27.9 | 18.9 | 28.5 | 3 | 7 |
| **San Antonio, TX MSA** | 1.89 | 39140 | 74100 | 0.22 | 478.7 | 0.2245 | 32.7 | 15.7 | 29.5 | 3 | 7 |
| **San Diego, CA MSA** | 4.50 | 47067 | 212000 | 0.13 | 670 | 0.2952 | 37.7 | 16.1 | 27.2 | 4 | 9 |
| **San Francisco--Oakland--San Jose, CA CMSA** | 5.49 | 62024 | 340800 | 0.13 | 955.4 | 0.3725 | 43.6 | 12.9 | 25.6 | 4 | 9 |
| **San Luis Obispo--Atascadero--Paso Robles, CA MSA** | 5.15 | 42428 | 218600 | 0.14 | 74.7 | 0.267 | 34.3 | 18.8 | 25.3 | 4 | 9 |
| **Santa Barbara--Santa Maria--Lompoc, CA MSA** | 5.66 | 46677 | 264100 | 0.08 | 145.9 | 0.2942 | 35.4 | 17.1 | 25.3 | 4 | 9 |
| **Santa Fe, NM MSA** | 3.82 | 45822 | 174900 | 0.26 | 73.1 | 0.3992 | 45.2 | 15.5 | 24.1 | 4 | 8 |
| **Sarasota--Bradenton, FL MSA** | 2.58 | 40649 | 104700 | 1.12 | 449.5 | 0.2458 | 30.5 | 18.1 | 29 | 3 | 5 |
| **Savannah, GA MSA** | 2.30 | 39622 | 91100 | 0.21 | 215.6 | 0.2316 | 31.2 | 16.1 | 26.8 | 3 | 5 |
| **Scranton--Wilkes-Barre--Hazleton, PA MSA** | 2.54 | 34161 | 86700 | -0.15 | 279.9 | 0.1737 | 27.9 | 15.4 | 27.9 | 1 | 2 |
| **Seattle--Tacoma--Bremerton, WA CMSA** | 3.67 | 50733 | 186100 | 0.39 | 492 | 0.3198 | 38.4 | 14 | 26.4 | 4 | 9 |
| **Sharon, PA MSA** | 2.17 | 34666 | 75100 | -0.01 | 179.1 | 0.1729 | 27.6 | 17.3 | 25.3 | 1 | 2 |
| **Sheboygan, WI MSA** | 2.29 | 46237 | 105800 | 0.08 | 219.3 | 0.1791 | 25.9 | 13.6 | 21.6 | 2 | 3 |
| **Sherman--Denison, TX MSA** | 1.82 | 37178 | 67800 | 0.16 | 118.5 | 0.1724 | 29.6 | 14.4 | 26.5 | 3 | 7 |
| **Shreveport--Bossier City, LA MSA** | 2.15 | 32558 | 70100 | 0.17 | 169.4 | 0.1907 | 28.6 | 18.5 | 26.7 | 3 | 7 |
| **Sioux City, IA--NE MSA** | 1.96 | 38563 | 75600 | 0.08 | 109.2 | 0.1788 | 27 | 15.4 | 27.1 | 2 | 4 |
| **Sioux Falls, SD MSA** | 2.27 | 43387 | 98600 | 0.39 | 124.2 | 0.2591 | 31.1 | 12.9 | 32.2 | 2 | 4 |
| **South Bend, IN MSA** | 2.12 | 40420 | 85800 | 0.07 | 580.7 | 0.2363 | 32.1 | 14.5 | 27.2 | 2 | 3 |
| **Spokane, WA MSA** | 2.98 | 37308 | 111200 | 0.16 | 237 | 0.2502 | 33 | 16.9 | 28.4 | 4 | 9 |
| **Springfield, IL MSA** | 2.04 | 43180 | 87900 | 0.06 | 170.4 | 0.2805 | 39 | 14.6 | 29.7 | 2 | 3 |
| **Springfield, MA MSA** | 2.96 | 40740 | 120400 | 0.12 | 804.7 | 0.2241 | 34.4 | 16.5 | 26.1 | 1 | 1 |
| **Springfield, MO MSA** | 2.57 | 34661 | 89000 | 0.35 | 177.8 | 0.2241 | 29.4 | 15.5 | 29.1 | 2 | 4 |
| **St. Cloud, MN MSA** | 2.40 | 42321 | 101500 | -0.12 | 95.5 | 0.2096 | 29.3 | 14.4 | 26.8 | 2 | 4 |
| **St. Joseph, MO MSA** | 2.11 | 35675 | 75100 | 0.23 | 121.3 | 0.1718 | 27.8 | 16.9 | 26.3 | 2 | 4 |
| **St. Louis, MO--IL MSA** | 2.16 | 44437 | 96200 | 0.07 | 407.3 | 0.2533 | 34.4 | 14.8 | 28.1 | 2 | 4 |
| **State College, PA MSA** | 3.03 | 36165 | 109400 | 0.10 | 122.6 | 0.3628 | 41.6 | 16.5 | 23.5 | 1 | 2 |
| **Steubenville--Weirton, OH--WV MSA** | 2.01 | 31982 | 64400 | -0.07 | 227.1 | 0.1207 | 22.5 | 17.6 | 26.6 | 2 | 3 |
| **Stockton--Lodi, CA MSA** | 3.39 | 41282 | 139800 | 0.17 | 402.8 | 0.1453 | 27.1 | 14.6 | 27.1 | 4 | 9 |
| **Sumter, SC MSA** | 2.01 | 33278 | 67000 | 0.02 | 157.3 | 0.1582 | 24.9 | 15.5 | 24.5 | 3 | 5 |
| **Syracuse, NY MSA** | 2.03 | 39750 | 80600 | 0.11 | 237.5 | 0.2408 | 33.9 | 15.3 | 27 | 1 | 2 |
| **Tallahassee, FL MSA** | 2.57 | 36441 | 93600 | 0.22 | 240.5 | 0.3673 | 42.8 | 15.1 | 28.3 | 3 | 5 |
| **Tampa--St. Petersburg--Clearwater, FL MSA** | 2.27 | 37406 | 84800 | 0.16 | 938.1 | 0.2169 | 32.8 | 15.2 | 31.1 | 3 | 5 |
| **Terre Haute, IN MSA** | 2.05 | 34222 | 70200 | 0.14 | 146.6 | 0.1861 | 27.5 | 17.4 | 26.2 | 2 | 3 |
| **Texarkana, TX--Texarkana, AR MSA** | 1.90 | 32238 | 61100 | 0.08 | 85.8 | 0.1503 | 27.2 | 16.3 | 26.9 | 3 | 7 |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| **Toledo, OH MSA** | 2.35 | 39902 | 93600 | 0.01 | 453 | 0.2161 | 30.2 | 15.4 | 25.7 | 2 | 3 |
| **Topeka, KS MSA** | 1.94 | 40988 | 79600 | 0.06 | 309 | 0.2604 | 34.2 | 14.4 | 29.8 | 2 | 4 |
| **Tucson, AZ MSA** | 2.79 | 36758 | 102600 | 0.27 | 91.8 | 0.2675 | 35 | 17.6 | 27.1 | 4 | 8 |
| **Tulsa, OK MSA** | 2.14 | 38261 | 81900 | 0.13 | 160.2 | 0.2322 | 32.2 | 13.7 | 28.9 | 3 | 7 |
| **Tuscaloosa, AL MSA** | 2.77 | 34436 | 95400 | 0.10 | 124.5 | 0.2403 | 32 | 14.1 | 27.1 | 3 | 6 |
| **Tyler, TX MSA** | 2.06 | 37148 | 76500 | 0.15 | 188.2 | 0.2255 | 30.3 | 15.3 | 27.1 | 3 | 7 |
| **Utica--Rome, NY MSA** | 2.01 | 35292 | 71100 | -0.05 | 114.3 | 0.1774 | 31 | 18 | 26.7 | 1 | 2 |
| **Victoria, TX MSA** | 1.77 | 38732 | 68600 | 0.13 | 95.3 | 0.1625 | 28.5 | 15.1 | 27.4 | 3 | 7 |
| **Visalia--Tulare--Porterville, CA MSA** | 2.84 | 33983 | 96500 | 0.18 | 76.3 | 0.115 | 25.3 | 16.2 | 22.7 | 4 | 9 |
| **Waco, TX MSA** | 1.98 | 33560 | 66400 | 0.13 | 204.9 | 0.191 | 30 | 16 | 27.6 | 3 | 7 |
| **Washington--Baltimore, DC--MD--VA--WV CMSA** | 2.75 | 57291 | 157400 | 0.94 | 794.5 | 0.371 | 45.4 | 13.4 | 25.3 | 3 | 5 |
| **Waterloo--Cedar Falls, IA MSA** | 2.04 | 37266 | 76200 | -0.13 | 225.7 | 0.2298 | 30.3 | 16 | 27.5 | 2 | 4 |
| **Wausau, WI MSA** | 2.13 | 45165 | 96200 | 0.09 | 81.4 | 0.183 | 29.7 | 12.2 | 26.2 | 2 | 3 |
| **West Palm Beach--Boca Raton, FL MSA** | 2.55 | 45062 | 115000 | 0.31 | 573 | 0.2771 | 34.4 | 17.7 | 29 | 3 | 5 |
| **Wheeling, WV--OH MSA** | 2.12 | 30335 | 64400 | -0.04 | 161.1 | 0.1464 | 27.1 | 18.3 | 26.2 | 2 | 3 |
| **Wichita Falls, TX MSA** | 1.75 | 34098 | 59800 | 0.15 | 91.4 | 0.197 | 29 | 18.4 | 26.1 | 3 | 7 |
| **Wichita, KS MSA** | 1.89 | 42651 | 80400 | 0.12 | 183.8 | 0.2471 | 32 | 13.7 | 26.5 | 2 | 4 |
| **Williamsport, PA MSA** | 2.49 | 34016 | 84700 | 0.01 | 97.2 | 0.1506 | 24.4 | 15.8 | 26.7 | 1 | 2 |
| **Wilmington, NC MSA** | 3.05 | 38632 | 118000 | 0.94 | 221.5 | 0.2607 | 31.3 | 16.9 | 26.5 | 3 | 5 |
| **Yakima, WA MSA** | 3.08 | 34828 | 107200 | 0.18 | 51.8 | 0.153 | 27.4 | 16.1 | 22.5 | 4 | 9 |
| **York, PA MSA** | 2.39 | 45268 | 108200 | -0.09 | 422.1 | 0.1838 | 28.4 | 12.5 | 26.2 | 1 | 2 |
| **Youngstown--Warren, OH MSA** | 2.25 | 36255 | 81500 | 0.21 | 380.2 | 0.1508 | 24.9 | 15.7 | 25.7 | 2 | 3 |
| **Yuba City, CA MSA** | 3.12 | 34658 | 108100 | 0.13 | 112.8 | 0.1322 | 26.3 | 16.3 | 24.5 | 4 | 9 |
| **Yuma, AZ MSA** | 2.24 | 32182 | 72100 | 0.50 | 29 | 0.1184 | 26.7 | 17.7 | 26.4 | 4 | 8 |