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Workers in creative occupations play increasingly important roles in the economic development of the United States. Creative workers are members of the creative class and two different measures were studied. The first measure included all creative occupations originally identified in Richard Florida's creative class theory: technology, arts, professional, and education and medical occupations. The second measure of the creative class excluded educational and medical occupations due to their inverse relationship with economic development. The purpose of this dissertation is to analyze the geographical patterns of the two measures of creative class for all 3,109 counties within the 48 contiguous states to better understand the spatial variation of the creative class for the 654 counties in megapolitan areas and the 2,455 non-megapolitan counties. Megapolitan areas are very large urban regions with high levels of interconnectedness among the counties. Megapolitan counties generated over 71 percent of the gross domestic product in the United States in 2010.

Results show counties that act as bedroom communities or "edge cities" generally have a disproportionately higher share of both creative class measures than counties with principal cities. Getis-ord Gi cluster analysis identified "hot-spot" and "cold-spot" clusters for both measures of the creative class. Cluster analysis identified hot-spot clusters on the Northeast seaboard, Sierra Pacific around San Francisco and San Jose, and the Great Plains. The creative-class hot-spot cluster in the Great Plains suggests that the

creative economy is more than just a megapolitan phenomenon. A creative-class cold-spot cluster extended from Appalachia into the Southeastern counties. Additionally, stepwise regression analysis conducted for the two creative-class measures and 18 independent variables identified which socio-economic variables best explained the spatial distribution of the creative class for both the megapolitan and non-megapolitan counties. Regression analysis results indicated a positive relationship existed between the percentage of the workforce with a bachelor's degree and both measures of the creative class for the megapolitan and non-megapolitan counties alike. Average wages also had a positive relationship with the creative class in the megapolitan counties. Gross rent as a percentage of income was inversely related to the geography of the creative class for the non-megapolitan counties. The primary findings suggested that Florida's creative capital theory is mutually supportive of other economic development theories such as human-capital theory and Kotkin's resurgent heartland concept. Analysis of the spatial distribution of the creative class is an important first step to better understanding the creative economy of the United States.

GEOGRAPHIC PATTERNS OF THE CREATIVE CLASS FOR MEGAPOLITAN AND NON-MEGAPOLITAN COUNTIES OF THE CONTIGUOUS UNITED STATES: KEY PREDICTORS AND CLUSTERS

by

Michael Brian McCarthy

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Approved by

Dr. Keith Debbage
Committee Chair

To my kids: Zoey, Myles, & Josey.

For my wife, Lezah

For my parents, Mary and Brian.

For Chuck and Jacque Pagels.

For Mark Sattler, Samuel Spitzberg, Maureen Burton, Samantha Rossi, Catherine Green, Lisa Ransom, Karen Cameron, and Betsey Stallings.

APPROVAL PAGE

This dissertation written by MICHAEL BRIAN McCARTHY 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

America was once primarily an agricultural economy, then manufacturing, but now a service and creative economy increasingly dominates. The service industry continues to grow, but the so-called 'creative industries' have experienced the greatest recent growth in workforce and wages (Florida, 2002 and 2012a). The *creative class* has emerged in recent years as the portion of the workforce that enables economic growth through innovation rather than through the traditional factors of production of land, labor, capital, and natural resources (Florida, 2002 and 2012a; McGranahan and Wojan, 2007; Anderson *et al.*, 2010; Marrocu and Paci, 2012). Despite the increasing dominance of the creative economy, the principal proponent of the creative class thesis, Richard Florida at the University of Toronto, has several critics who suggest much of his work merely describes symptomatic aspects of economic growth rather than focusing on actual causal triggers of economic growth (Markusen, 2006; Hoyman and Faricy, 2009; Peck, 2005; MacGillas, 2009; Perry, 2011). Nevertheless, creative-class workers account for 47 percent of wages despite representing only 30 percent of the workforce. Furthermore, in the United States, 82 percent of the creative class live in megapolitan areas making the megapolitan areas the centers of creativity and economic development in the United States (Nelson and Lang, 2011). Megapolitan areas are identified using the current

definition of a combined statistical area projected for 2040 based on the current trends of increasing interconnectedness and interdependencies among spatially proximate counties.

Just as Americans do not work the same types of jobs as in the past, they have also relocated away from the city centers. In the post-World War II era, the development of cheaper, individual transportation modes like the automobile transformed the urban landscape. Low-cost transportation enabled the development of lower-cost, low-density housing at the urban fringe and allowed some metropolitan areas to spread toward other metropolitan areas eventually linking the nodes via suburban downtowns and a polycentric urban structure (Nelson and Lang, 2011). The notion of a *megapolitan area* captures the phenomenon of increasingly sophisticated, multi-metropolitan regions that are functionally interconnected through commuting flows and other interdependencies (Lang and Dhavale, 2005a and 2005b; Lang, 2011; Nelson and Lang, 2011; Ross and Woo, 2009).

Megapolitan areas (i.e., multi-metropolitan areas) account for less than 17 percent of the landmass of the 48 contiguous United States, but contained 63 percent of the population and 71 percent of the nation's gross domestic product in 2010 (Nelson and Lang, 2011; Kotkin, 2010). Megapolitan areas in the United States are so economically and socially dominant that 70 percent of the 100 million new residents and 80 percent of the employment growth expected by 2050 are predicted to be in these megapolitan areas (Kotkin, 2010; America 2050, 2012; Dewar and Epstein, 2007).

The purpose of this dissertation is to better understand the spatial distribution of the creative class in the megapolitan and non-megapolitan areas of the United States.

Previous studies of the creative class focus only at the metropolitan statistical area or county scale, but this dissertation is the first (to my knowledge) to assess the creative class at the megapolitan scale. The creative class is considered by many to be the key economic driver of the knowledge economy of the United States and the megapolitan areas are the location for much of this current economic output, so this dissertation's specific contribution is to better understand this geography.

There are many ways to define the creative class using different sets of occupational classifications (McGranahan and Wojan, 2007; Mellander and Florida, 2007; Florida *et al.*, 2008; Florida 2012a). Therefore, in addition to Florida's original measure of the creative class developed in 2002, a similar, yet narrower definition of the creative class using only those occupations that have a positive economic effect on an area will be used in this dissertation to evaluate the utility of the original creative-class definition. The purpose of this analysis is to evaluate and compare the two creative-class measures at the megapolitan and non-megapolitan scale and determine the relative strength of the predictor variables using both measures. Predictor variables were identified from the 20 independent variables used in the regression analysis and include geographic, economic, demographic, and educational variables.

The following central research questions were addressed. Specifically:

Q1) How is Florida's original definition of the creative class distributed by megapolitan county and what socio-economic variables best explain this distribution?

Q2) How is the newly evolved technical, arts and professional occupations or TAP portion of the original creative class definition distributed by megapolitan county and

how are the socio-economic variables that best explain this distribution different from the explanations for the more conventional interpretation of the creative class?

Q3) How do the predictor variables identified for the TAPE and TAP creative class for the megapolitan counties contrast with the socio-economic predictor variables for the non-megapolitan counties?

The creative class is an important part of the labor factor of production and it is imperative to understand whether the different measures of the creative class — Florida's original creative class and the TAP portion of the creative class — have different predictor variables. Additionally, few scholars have studied the socio-economic predictors that affect the creative class at the megapolitan-area scale. If planners and policy makers alike understand how the creative class influences the major megapolitan areas of the United States there will likely be a better allocation of resources to more efficiently and effectively leverage the competitive advantage of the creative class and economies of scale within megapolitan areas. Additionally, understanding how different measures of the creative class affect the predictor variables will help to focus the efforts of planners and politicians as they try to recruit members of the creative class to their region.

CHAPTER II

LITERATURE REVIEW

The creative capital theory is a relatively new typology compared to other theories of economic development, but the study of multi-metropolitan areas that form larger megapolitan areas began in the late 1950's.

2.1 The Creative Class

Classical and neo-classical economic theories have traditionally identified four factors of production: land, capital, natural resources, and labor (Burton *et al.,* 2010). These four ingredients are still the main elements used to analyze a region's economy, but several nuances exist that emerge as one scrutinizes contemporary trends. Land is necessary because production must occur somewhere, even if the product is intangible or virtual and workers must locate somewhere (Lanigan, 2000). Capital includes the machines and buildings used for production (Lanigan, 2000). Natural resources are important because they are often the commodity building blocks of products. For example, oil is used for energy and provides the natural resources to make plastics and chemicals. Similarly, wood is used for paper and cardboard and silicon is used in microchips (Lanigan, 2000). Labor are the people who work. Labor is unique because in a free market, unlike land, capital, and natural resources, labor has freewill (Lanigan, 2000) meaning, it is up to the worker to choose where to work, the worker can freely change jobs, and the worker can decide to migrate to a better location for employment.

The focus of this research is the 'labor' factor of production, specifically workers in creative occupations identified by Florida as the *creative class* (Florida, 2002 and 2012a). The creative class are workers in technology and science, arts, culture and media, business professionals, and education and medical occupations.

Creativity is the main driver of economic development in the knowledge economies of today (Florida, 2002 and 2012a). Human creativity is the "defining feature of economic life" and is increasingly recognized as the source for new technology and industries, and therefore new wealth (Florida, 2012a, p. 15). Creativity is not turned on when at work and turned off when home, but rather creative people are always creative and inspiration can strike anytime. Industries and companies focused on increased profitability evolved to accommodate and promote the creative potential of their workforce. Likewise, communities attempt to generate economic development by making themselves more accepting to the creative class by influencing the four "T's of economic development" that include technology, talent, tolerance, and territorial assets (Florida, 2002, 2008a, 2012a).

Creative capital theory suggests that workers in creative occupations, regardless of the education of the worker, can generate innovation and thereby transform the economy of an area (Florida, 2002 and 2012a). Florida (2002) introduced the creative capital theory and the "creative class" as a means to assess workers in occupations who provide value added via innovation. In his book, "*The Rise of the Creative Class: And How It's Transforming Work, Leisure, Community, and Everyday Life*," Florida defines the creative class in the following manner:

> The distinguishing feature of the *Creative Class* is that its members engage in work whose function is to "create meaningful new forms." (Florida, 2002, p. 68, *emphasis added*).

Florida argues that creativity is the driving force of economic growth and that the creative class is the most important class of workers in this regard. Creative capital theory links the economic development of an area to the workers that provide creative innovation. Florida (2002 and 2012a) identified the occupations that use creativity from the standard occupational classifications (SOCs) developed by the Bureau of Labor Statistics:

- Computer and mathematical occupations *SOC 15-0000* (e.g., computer programmers, computer research scientists, actuaries, operations research analysts),
- Architecture and engineering occupations *SOC 17-0000* (e.g., landscape architects, civil engineers, drafters, surveyors, engineer technicians),
- Life, physical, and social science occupations *SOC 19-0000* (e.g., microbiologists, physicists, chemists, geoscientists, urban planners, forestry technicians),
- Education, training, and library occupations *SOC 25-0000* (e.g., post-secondary teachers, secondary teachers, elementary and middle school teachers, teacher assistants, librarian, library technician),
- Arts, design, entertainment, sports, and media occupations *SOC 27-0000* (e.g., art directors, actors, umpires, media and communications workers, athletes),
- Management occupations *SOC 11-0000* (e.g., chief executive, legislators, financial managers, industrial production managers),
- Business and financial operations occupations *SOC 13-0000* (e.g., accountants, estimators, human resources, fundraisers, tax preparers, loan officers),

- Legal occupations *SOC 23-0000* (e.g., lawyers, paralegals, court reporters),
- Healthcare practitioners and technical occupations *SOC 29-0000* (e.g., medical doctors, veterinarians, dental hygienists, hearing aid specialists),
- High-end sales and sales management occupations *SOC not specifically defined by Florida or Bureau of Labor Statistics*.

Occupations Florida defines as creative might seem to require a certain amount of post-secondary education or, for many, an advanced degree, but many occupations within the arts, management, business, computer, or sales fields do not require any higher education (e.g., artists, computer programmers, estimators, dental hygienists). Creativity in the occupation is the only requirement that Florida uses to include an occupation. Creative-capital theory also categorizes the rest of the labor force including the working class, service class, and agricultural class.

Florida (2002, 2012a, 2012c) identified four interdependent characteristics that exemplify the areas where members of the creative class want to live and work — technology, talent, tolerance, and territorial assets — and calls them the four T's of economic development." Economic growth is the result of attracting the creative class, who then innovate and encourage economic development for an area, which requires all four T's (Florida, 2002 and 2012a).

2.1.1 Technology

Technological advancement is often considered the driving force for economic growth. Technology is the development of inventions like robotics, software, hardware, and pharmaceuticals as well as process innovation for the manufacturing and service

industries. For the creative capital theory, technology is any innovation that is an invention or makes a process more efficient and/or productive (Florida, 2012a). Technology is pervasive in our society but there are certain areas with a high disproportionate share of technology. How does one measure the technology of an area?

Florida measures technology for an area using Milken Institute's Tech-Pole Index of high-tech industries combined with patents per capita and annual patent growth (Florida, 2012a). This tech-pole index captures the technology industry information while the two patent variables capture actual innovation that occurs due to research universities, organizations, and entrepreneurs. The creative class was positively correlated to all the technology measures used by Florida in 2002 while the working class had a negative association (Florida, 2002). In 2012, ten years after the initial analysis, the creative class has even higher correlation rates to the technology measures and the working class remains negatively correlated (Florida, 2012a). The technology index does not capture all technology or innovation because unpatented innovation or innovation in non-technology industries are not included, but the technology index attempts to be comprehensive because it is derived from three variables that capture different nuances of innovation for an area.

2.1.2 Talent

Talent is the second "T" of Florida's four T's of economic development. The talent index directly captures the quality of the labor for an area with higher percentages of "talent" in an area suggesting a higher level of economic development. Some scholars measure the skills of the labor force while others focus on educational attainment.

Florida's original conceptualization of the talent index was based on earlier economic development literature that focused on the educational attainment of the workers: the "human capital" of a municipality. If a municipality has more workers with a bachelor degree from a college or university then it is expected to have higher rates of economic growth (Glaeser, 2005). Like many scholars, Florida initially measured "talent" for an area based on the educational attainment of the workforce; however, the talent index evolved from the initial conceptualization based on education (2002) to an index based on creative occupations (Florida, 2012a). Rejecting education as a measure for talent Florida (2012a) uses the percentage of the workforce in the creative class as the only variable in the talent index. In the United States, 72.2 percent of the college-educated workers are in creative occupations, while 59.3 percent of the creative class has a bachelor degree (Florida, 2012a).

Florida changed the variable used to define the talent index because he found that economic development arises due to creativity and not necessarily education. Florida argues that the talent variable that captures creative workers who provide economic input via innovation, regardless of education, best assesses the economic development of the area. Additionally, the creative class variable used as the talent measure had a bigger effect on wages for an area (Florida *et al.*, 2008). If creativity and innovation are the essences of the creative economy then the creative class must be the measure of "talent" as part of the four T's of economic development.

Florida's initial conceptualization subdivides the creative class into two subgroups based on how the workers in each occupation use creativity. The "highest

order of creative work [is] producing new forms or designs that are readily transferable and widely used" and attributable to the occupations were placed in the *super creative core*. Workers in "knowledge-intensive industries" were classified as members of the *creative professionals* (Florida, 2002, p. 69; Figure 1).

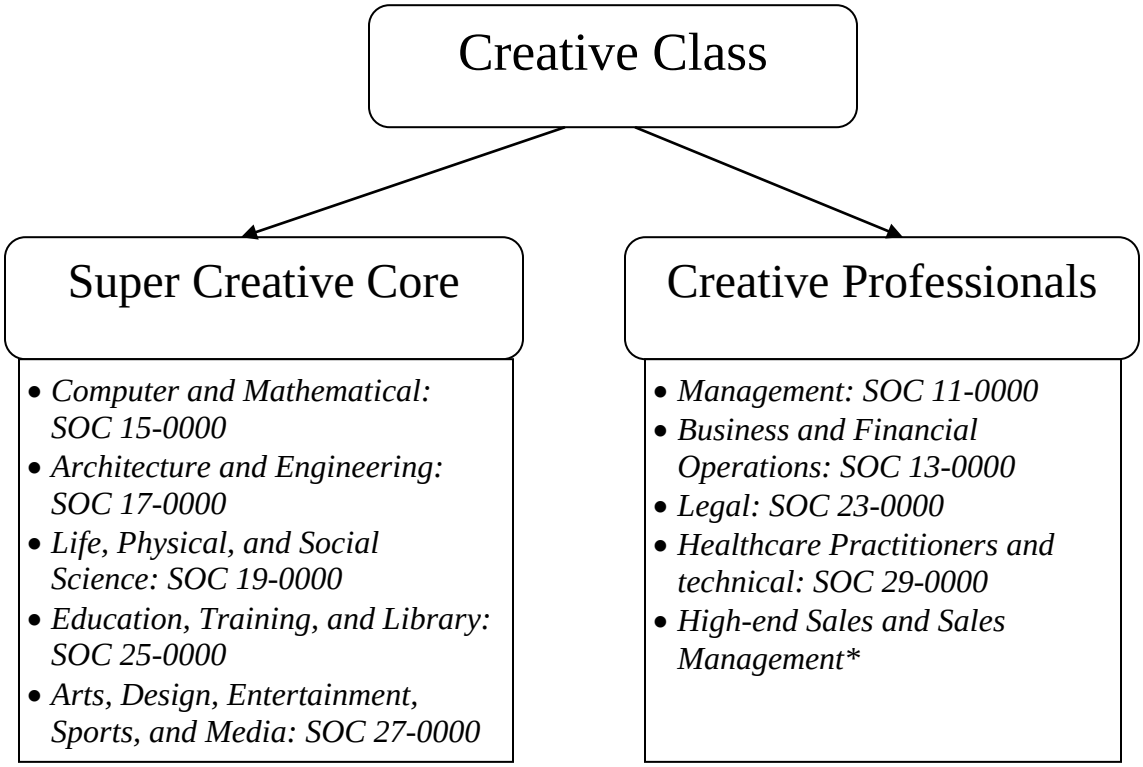

Figure 1. Creative Class Components, 2002.
Source: Florida, 2002. *High-end Sales and Sales Management does not have a corresponding SOC, therefore a SOC number is not assigned.

A different subdivision of the creative class evolved in the literature and Florida's second book (2012a) should be viewed as separate from the initial dichotomy of the *super creative core* and *creative professionals*. In this later effort, Florida (2012a) subdivides the creative class to find the portion of the creative class that has the greatest

effect on the economic development of an area. The four creative class occupational groups Florida targets included technology, arts, professional, and education and medical workers — "TAPE" for short (Figure 2). However, both the 2002 dichotomy of the super creative core and creative professionals of Figure 1 and the TAPE classification of Figure 2 amount to the same aggregate creative class because it is merely a different subdivision of the same aggregated creative class group.

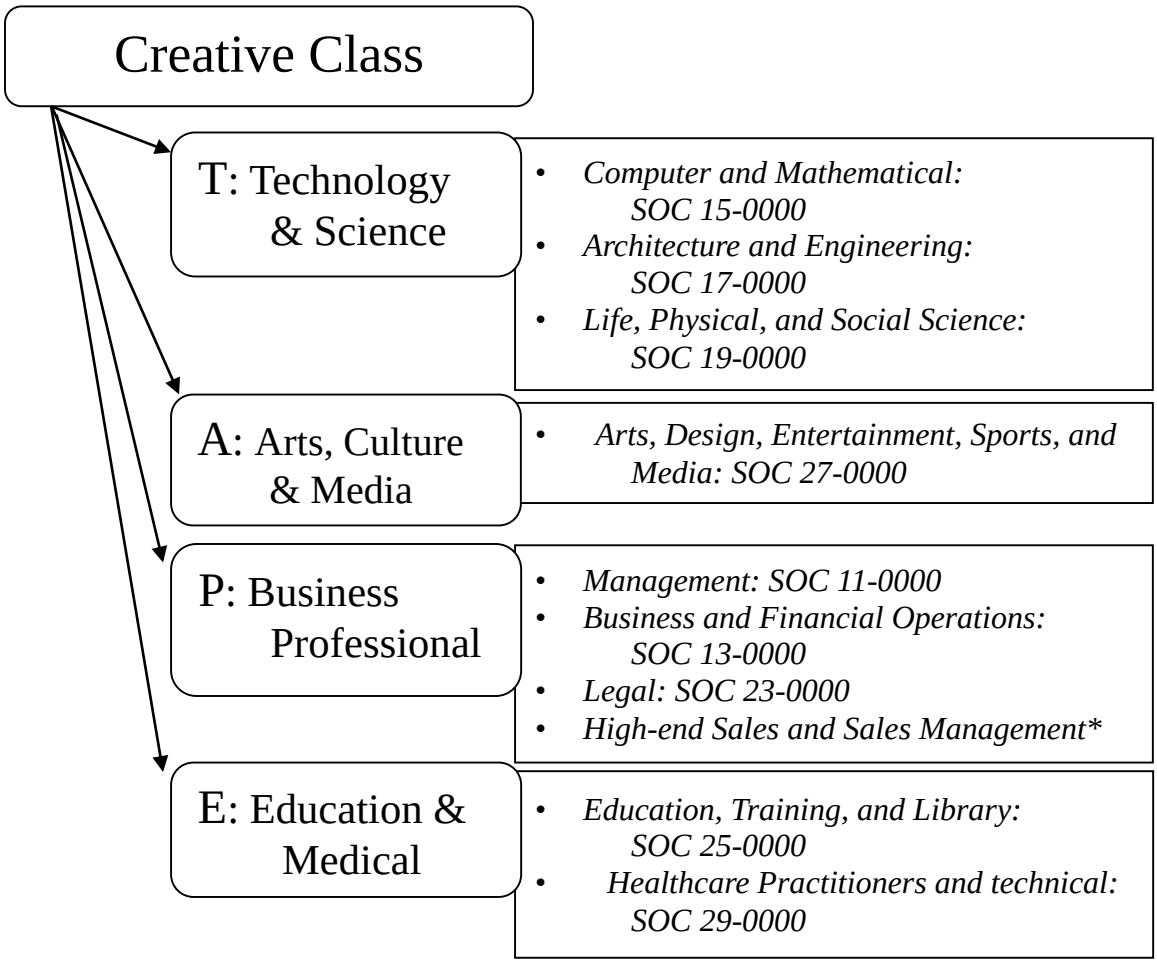

Figure 2. Creative Class Subdivisions, 2012.
Source: Florida, 2012a. *High-end Sales and Sales Management does not have a corresponding SOC, therefore a SOC number is not assigned.

Florida's conceptualization of the creative class is methodological with one major exception: there is no formal classification by SOC for the high-end sales and sales management occupations. The specificity of each of the other occupational titles and corresponding SOCs is diluted by the lack of clarity regarding which portion of the sales and related occupations (SOC 41-0000) is considered "high-end" and included in the creative class and which portion is considered "low-end" by Florida and included in the service class. Each of the other occupational titles corresponds to a Bureau of Labor Statistics SOC except the high-end sales and sales management subset defined by Florida (2002).

2.1.3 Tolerance

Openness to diversity, new ideas, and the different cognitive styles of other people is the essence of tolerance (Florida, 2012a). Florida is not the first to identify that diversity powers innovation. Jane Jacobs was one of the original urban scholars to realize that diversity of people and firms powered innovation and city growth (Jacobs, 1961). Innovation tends to only emerge in areas where people are receptive to new and different ideas and this openness (i.e., tolerance) is so critical that Florida made it the third 'T' of economic development. Tolerance is difficult to measure using nationally standardized data (e.g., Census Bureau or Bureau of Labor Statistics data) and instead several variables were used to develop an index that serves as a proxy for tolerance.

Florida attempted to measure tolerance in several ways for each metropolitan statistical area of the United States. Florida (2002) uses the *foreign-born* index (sometimes called the '*melting pot*' index) to measure the percentage of the population

that are immigrants or foreign-born residents to capture the relative tolerance that people might have for newcomers (Florida, 2012a). The *foreign-born* index can be an indicator of low (lower) barriers of entry for people in the community and Florida indicates this is crucial for innovation; places where people are quickly accepted have a creative advantage (Florida, 2002 and 2012a). Florida believes that if people are open and accepting to foreign-born residents then there is an increased openness to new ideas and innovation.

Another index, often considered controversial, devised by Florida is called the *gay-lesbian* index and measures same-sex unmarried partner relationships; the index is estimated to capture roughly 35 percent of all gay and lesbian partnerships (Florida, 2012a). Florida indicates that the "lack of societal acceptance of gays is the most significant remaining bastion of [overt] intolerance and discrimination" and if gay and lesbian people are comfortable in an area then the area is likely accepting of all different people (Florida, 2012a, p. 239). Despite capturing only a third of gay and lesbian people, the index serves as a method to measure the level or acceptance of openly gay and lesbian people in the area. Florida assumes that gay and lesbian people concentrate in areas where they feel more accepted with others like them visible in the community and considers a vibrant gay community as a leading indicator of a place that is "open" (Florida, 2012a). The gay-lesbian index is a proxy variable for actual gay and lesbian people and is added to the other proxy measures to comprise the tolerance index.

Florida assumes that those who are open and accepting to gays and lesbians are likewise open to new ideas and hence generate more innovation. The assumption is

similar to diversity among races, but just the presence of different races is not enough as there must be integration of the races (i.e., low segregation) throughout the municipality. Areas with greater levels of integration and low levels of segregation indicate openness and tolerance. "The *integration* index . . . measures the level of integration versus segregation of a metropolitan area; it compares diversity of race/ethnicities within the census tracts of a metropolitan region to the distribution of those same groups across the entire region" (Florida, 2012, p. 246 and 402, *emphasis added*). In essence, Florida generated location quotients for race/ethnicity by census tracts. The integration index does not measure diversity, but the degree in which groups are mixed within the metropolitan area. The extent of mixing among racial and ethnic groups indicates openness and likely results in higher rates of innovation. Racial integration shows tolerance, but segregation of groups has the opposite effect on creativity (McGranahan and Wojan, 2007). Non-white populations (i.e., Blacks and Hispanics) within a municipality have a negative correlation with the creative class (Florida, 2012a). Therefore, tolerance is measured by percentage of races that are intermingled. Diversity and the openness to others are only positive if groups are unsegregated throughout the municipality.

Another variable Florida originally used to define tolerant areas is the *bohemian factor*. The bohemian factor captures the artists, writers, designers, musicians, actors, and other art-based workers as a means to measure an area's cultural amenities (Florida, 2002 and 2012a). The bohemian factor was used in the original 2002 book as part of the *tolerance* index that combines all the different measures of tolerance into one aggregate

index; however, the bohemian factor was removed from Florida's (2012a) later work. Bohemians were already included in the creative class (i.e., the talent index) and therefore double counted, and the bohemian index was a proxy for territorial assets rather than tolerance, and the other measures used by Florida better captured diversity (2012a).

Tolerance is the most intangible variable identified by Florida as an indicator of economic development. Tolerance is captured by three proxies, an area's concentration of gays and lesbians, foreign born people, and how integrated the various race groups are throughout the area. These variables only capture some aspects of tolerance. There are many other variables that Florida could have included in the tolerance index; for example, the percentage of women in executive positions in government or business, percentage of Black or Hispanics in the creative class, or the concentration of historically black colleges or universities. When added to the three tolerance variables used by Florida, these measures could potentially generate a more nuanced tolerance index and a higher level of predictability.

2.1.4 Territorial Assets

Territorial assets and quality of place were given equal status as the fourth "T" of economic development in Florida's second edition (2012a) and subsequent articles (Florida, 2012d). Florida's original conceptualization of the creative class did not directly include "quality of place" or "territorial assets" as one of the "T" of economic development even though he used five chapters to discuss the importance of place (Florida, 2002). Florida's creative capital theory indicates that members of the creative class "insist they need to live in places that offer stimulating, creative environments," like

“cool” and “authentic” urban landscapes, the arts, access to exciting recreation options that provide outlets for creative enterprises (Florida, 2002, p. 95) while also avoiding what Jacobs called “the Blight of Dullness” (1961, p. 188).

Territorial assets generate a quality of place and are a combination of three dimensions. First, territorial assets identifies what is physically in a place; for example, natural and built environs that facilitate creative lives. Second, it includes who is there like diverse people who interact within the community. Finally, it comprises what is going on, like a vibrant culture, activities, and other creative endeavors (Florida, 2012a, p. 280-281; Florida, 2012d).

Despite the elevated status of territorial assets as the fourth “T” in Florida’s creative capital theory, there is no metric that measures an area’s quality of place in Florida’s analysis (2002, 2012a). When Florida initially included quality of place as a key factor (2002) and later territorial assets as the fourth “T” of economic development (2012), it was initially considered by some as a dismissible portion of his creative capital theory; however, recent multivariate research confirms that amenities and quality of place can be the most important predictor variable for cities to attract and retain highly educated creative workers in places like the Netherlands (Marlet and van Woerkens, 2013). A difficulty of quantifying quality of place is the wide variety of assets that make certain places attractive: nature, recreation, parks, art, night life, non-chain restaurants, and warm weather. Some scholars attempted to capture territorial assets but had so many variables to include the vast variety of territorial assets that few findings were significant (McGranahan and Wojan, 2007; McGranahan *et al.*, 2011; Wojan *et al.*, 2007).

The creative class consists of all demographics and all adult ages and some say that identifying the type of amenities that members of the creative class want is naïve. Florida does not suggest that all members of the creative class actually use all the quality of place amenities but that merely the existence of the amenities can draw the creative class to an area (Florida, 2012a and 2012d). Additionally, the range of creative activities is important as a member of the creative class transitions into different life stages: the area must provide creative experiences and amenities that are relevant for different age cohorts of the creative class. Urban restaurants and bars might be important to younger members of the creative class, high-quality school districts and lower-density housing are important when starting a family, and walkable communities are important to older members of the creative class. The most vibrant areas for the creative class areas provide a glut of varied creative amenities that yield a high quality of place.

2.1.5 Economic Impact of the Creative Class

Economic impact of the creative class can be substantive; the average annual creative class wage was $70,714 in 2010, while the average wage for a service and manufacturing worker was just $29,188 and $36,991, respectively (Florida, 2012a). Given the wage differentials, it is not surprising that the creative class account for nearly 50 percent of wages in the United States while the creative class represents only 30 percent of the workforce (Figure 3). Additionally, the creative class invariably has lower rates of unemployment during times of economic stress and the metropolitan areas with the higher percentages of creative class have lower rates of unemployment over all (Figure 4) (Florida, 2012b). There are areas that put all four T's of economic

development together; for example, San Jose/San Francisco, Boston, and Austin. These areas always rank high in each of the creative class variables (Florida, 2002 and 2012a).

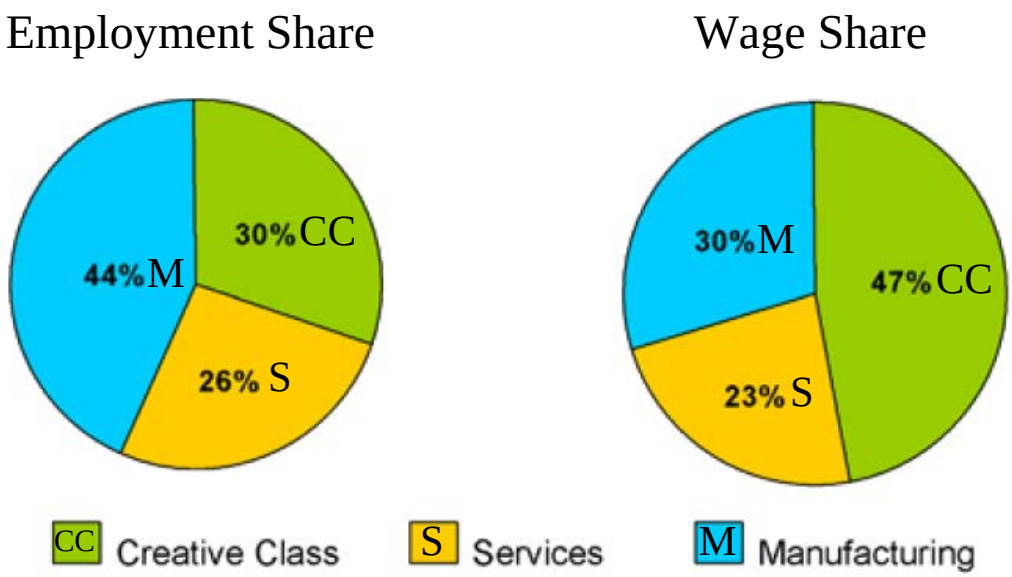

Figure 3. Share of Creative Class Employment and Wages Relative to Services and Manufacturing.
Source: Bakowska and Rudawska, 2011.

It is clear that the creative class can substantially affect the economy of an area by lowering unemployment and generating higher wages. There is a multiplier effect that the creative class has on the local economy. If an area can attract more members of the creative class, it is possible to generate a spiral of growth (Stolarick, 2012) because each additional creative worker generates nearly five more service industry jobs in the metropolitan area (The Economist, 2014). Florida and Stolarick argue that areas that offer higher levels of the four T's of economic development (technology, talent, tolerance, and territorial assets) will likely attract more creative class workers (Florida, 2002 and 2012a; Stolarick, 2012). Creative capital theory puts the focus on attracting

creative people and providing what is important to them and much less (or no) emphasis on the traditional economic development strategies of attracting sports teams, building infrastructure (e.g., roads, stadiums, convention centers, etc.), and/or "smoke-stack chasing" with tax incentives. According to Florida's creative capital theory, public policy that enables grants to poets, street festivals, and bike paths are more important than more traditional economic development tools because the events and amenities will more likely draw the creative class to the area than traditional schemes.

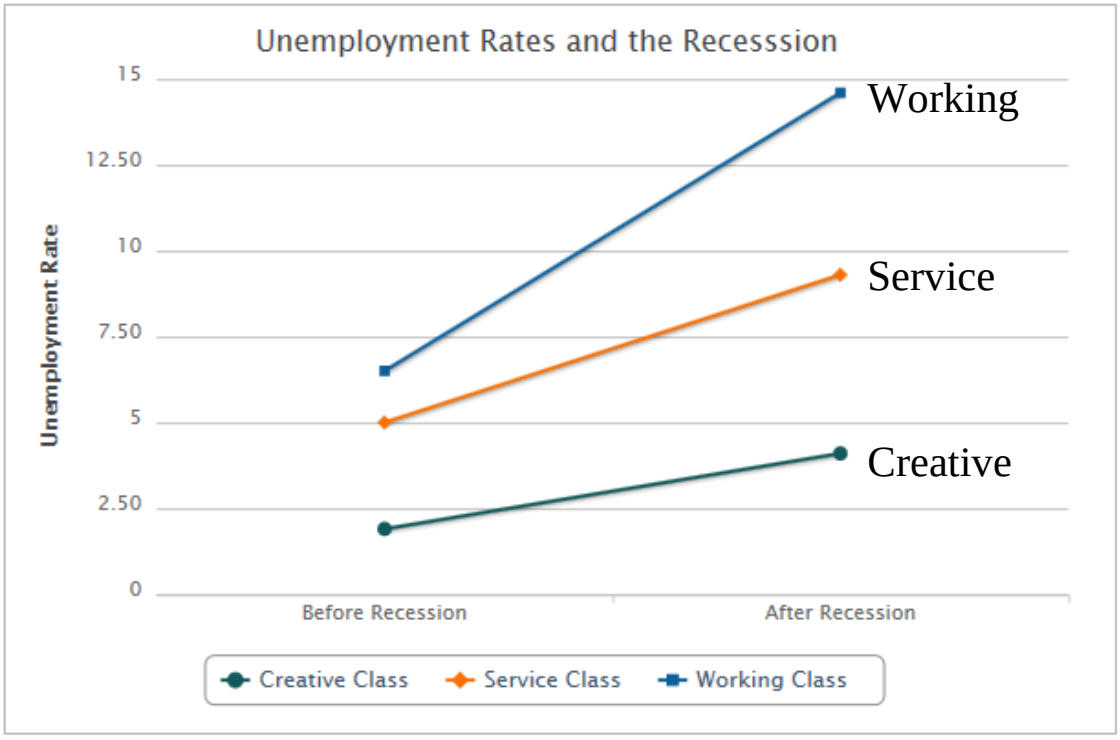

Figure 4. Unemployment Rate Before and After the Great Recession of 2008 by Class.
Source: Florida (2012b).

The creative class can be a strong indicator of various measures of economic growth. The creative class alone was found to be a significant factor in determining economic growth rates in the United States (McGranahan and Wojan; 2007; Lee *et al.*, 2004), the Netherlands (Stam *et al.*, 2008; Anderson *et al.*, 2010), Sweden (Mellander and Florida, 2007) and Canada (Reese *et al.*, 2010; Florida *et al.*, 2010). Each study found that the principal cities[1] and counties of metropolitan areas that have a higher percentage of the creative class tend to have higher rates of productivity, population growth, and job growth.

The creative class can be an effective predictor of many economic measures, at many scales, and in many different countries. The creative class was found to be positively associated with overall good "economic health" — an index that captures employment, earnings, income, and unemployment — when studying mid-sized Canadian urban areas (populations between 75,000 and 350,000) (Reese *et al.* 2010). In the Netherlands it was found that "the creative class actually predicts employment growth" in cities (Marlet and van Woerkens, 2004, p. 11). Marlet and van Woerkens findings are supported with United States based research on cities that experienced less unemployment as the percentage of creative class in the workforce increased (Figure 4 above) (Florida, 2012b). The creative class has proven to be a robust predictor of other economic variables since "employment growth within these [Dutch] urban areas is more strongly determined by the presence of the creative class" (Stam *et al.*, 2008, p 129). The

[1] Principal Cities are defined by the office of Management and Budget as the "largest incorporated place with a population of at least 10,000 in the CBSA [core based statistical area (i.e., combined statistical area, metropolitan statistical area or micropolitan statistical area]" (U.S. Census Bureau, 2014).

creative class has proven a strong predictor of economic growth in the Netherlands and Canada, and the creative class has proven useful in other countries.

Like the Netherlands, research in Sweden found that the creative class was the key predictor and more predictive than other variables in determining regional economic development growth rates (Mellander and Florida, 2007). Additionally, when innovation by U.S. metropolitan statistical area is used as the dependent variable, it was found that the density of the creative class was positive and significant (Knudsen *et al.*, 2007). Knowledge spillovers that come from the incalculable number of random interactions between different members of the creative class in dense urban areas enable higher rates of innovation (Jacobs, 1961; Knudsen *et al.*, 2007).

Clifton and Cooke (2009) correlated the creative class with unemployment rates for seven European countries and found that "the location of the creative class will be more likely to be significantly (and negatively) associated with unemployment in deregulated markets regimes [i.e., the United States and the United Kingdom] . . . the results support this hypothesis unequivocally" (p. 83). The United Kingdom is considered a more deregulated market compared to other European countries like Germany or Sweden; therefore, when Clifton and Cook found that the creative class was negatively associated with unemployment it likely resulted from the countries responding to the invisible hand of economics in a manner that enables the creative class to locate in areas where the unemployment was lower, or the creative class were enabled by decreased regulatory schemes to lower unemployment in countries with deregulated markets, or a combination of situations which seems the most likely. Furthermore, the

location of the creative class is positively and significantly associated with employment change in the United Kingdom from 1993 to 2002 (Clifton and Cooke, 2009). In the deregulated markets of the United Kingdom (like the United States), the creative class is positively associated with employment growth. Finally, there is a strong and significant correlation between new firm formation (i.e., start-ups) and the localization of the creative class in both deregulated and more regulated countries (Clifton and Cooke, 2009). Overall, the creative class has a positive impact on new firm formations for all seven European countries studied.

Boschma and Fritsch (2009) analyzed six of the seven European countries studied by Clifton and Cooke (2009) and used the creative class as a dependent variable in a multivariate regression. Population density — as a proxy for urban environment — has a "positive effect on the presence of the creative class in five of the six European countries [England and Wales, Finland, Germany, Norway and Sweden, but not the Netherlands]" (Boschma and Fritsch, 2009, p. 412). Boschma and Fritsch's findings indicate that members of the creative class localize in urban areas which supports earlier work by Florida (2002, 2012a). The urban environment is where interactions among people occur at higher rates due to proximity. Clifton and Cook (2009) and Boshcma and Fritsch (2009) have similar and supportive findings regarding the variables that predict the location of the creative class within all seven countries studied in Europe.

The creative class has proven very versatile in predicting different economic measures in different countries and at different scales. Other scholars examined the different predictor variables that indicate why the creative class clusters in certain areas.

A multivariate model developed for Spain and Italy with clustering of the creative class as the dependent variable showed the creative class agglomerations were best explained by the specialization of the local economy and the percentage of university graduates (Lazzeretti, *et al.*, 2012). It was already established that the creative class and bachelor degree variables are correlated at greater than 70 percent for the United States (Glaeser, 2005) so it is understandably similar for other countries.

The distribution of the creative class in rural and urban counties of the United States is explained by an association with several variables. Population density, business services, recreation, and college graduate variables had a positive association with the creative class while cropland, Blacks, and Hispanics variables had a negative association (McGranahan and Wojan, 2007). The recreation variable could be a proxy for creative amenities and territorial assets. Cropland is a proxy variable for the degree to which a county is rural and it understandably has a negative association with the creative class. McGranahan and Wojan's findings are unique because they compare rural, suburban, urban counties in the United States while most creative class research focuses on relatively few counties in metropolitan statistical areas.

2.1.6 Critiques of the Creative Class

Florida's notions of the creative class have been subjected to several criticisms. One of the foremost critiques of Florida's *The Rise of the Creative Class* (2002) is the assertion of originality. Florida names his thesis the "creative capital theory" of economic development but many consider it as a simple adaptation of the "human capital theory" of economic development (Glaeser, 2005). The human capital theory is based on

the role of the post-secondary education of workers (i.e., bachelor degrees), essentially analyzing a pre-condition for employment, while the creative capital theory focuses on actual employment. Glaeser argues that Florida's creative capital theory's measure of the creative class is nearly the same as the human capital theory's measure of bachelor degrees because they are correlated at 75 percent (Glaeser, 2005). However, the creative capital theory suggests that economic development comes from the creativity and innovation that people accomplish in their occupations, regardless of their educational attainment (Florida, 2002 and 2012a). In the end, Glaeser sees nuances of the creative capital theory and concludes that Florida's work is "fundamentally right" and suggests that Florida's analysis is "generally dead on" (Glaeser, 2005, p. 596).

Overall, it seems that the human capital theory and the creative capital theory are essentially interrelated and are more complementary than conflicting.

> [Research conducted] provided robust evidence of the productivity-enhancing role played by traditional education measures in unveiling the additional contribution of creativity . . . Glaeser's (2005) claim on education and Florida's (2002) intuition on creativity are consistent. Indeed the effects of creativity can unfold only when high levels of formal education [i.e., bachelor degree] are present . . . (Marrocu and Paci, 2012, p 392).

Marrocu and Paci (2012) seem to be asserting that the human capital theory and the creative capital theory are mutually supporting. This finding is not surprising and is supported by others who find that both human capital and creative capital are important for entrepreneurship in the United States (Lee *et al.*, 2004; Florida, 2003; Florida, 2012a).

Another critique of Florida's creative capital theory is the lack of academic rigor. Many claims made by Florida (2002) are based on focus groups and unspecified interviews with 43 references to unattributed sources (Marcuse, 2003). Additionally, Florida did not conduct any multivariate analysis (McGranahan and Wojan, 2007) and much of the findings are based on correlation rather than causation (Peck, 2005; McGuigan, 2009; Perry, 2011). Florida's less-than rigorous reporting in his books (2002, 2008a, and 2012a) yields non-repeatable results. One example of Florida's lack of rigor is when he uses standard occupational classifications (SOC) for all of his analysis except for one occupational group: high-end sales and sales management. This lack of specificity forces scholars to guess which specific SOC numbers are included (Wojan, 2012). Florida's reliance on unattributed and seemingly anecdotal data over rigorous statistical analysis leaves the creative capital theory vulnerable to critique.

Many scholars critique Florida for applying his creative class thesis to cities that do not have the scale to really achieve a creative economy (MacGillis, 2009). Many municipalities apply Florida's recommendations by focusing on the arts and other "bohemian" aspects in hopes of luring members of the creative class to the area, although these initiatives in small and medium-sized municipalities generally have had lackluster results (Kotkin, 2010). Many critics believe that Florida's creative capital theory applies only to cities and metropolitan areas of a certain scale (MacGillis, 2009) and are already post-industrial (Kotin, 2010). Municipalities transitioning to a post-industrial economy that focus too much on Florida's methodology of attracting the creative class at the

expense of traditional economic development strategies will not likely see expected benefits (Kotkin, 2010).

Florida (2002 and 2012a) ranks the metropolitan statistical areas (MSAs) by percentage of the workforce in the creative class but this can generate some interesting rankings that illuminate potential weaknesses in the methodology. For example, Corvallis MSA (home of Oregon State University) is ranked eighth for the highest density of creative workers with just 12,730 while Warner Robins, Georgia (home of Robins Air Force Base) is ranked 36th with 20,260 members of the creative class, just behind the New York City MSA (ranked 34th) that has over 2.9 million members of the creative class (Florida, 2012a, p. 404-405). Florida's rankings based on normalized data generate a low-population base phenomenon where smaller places can be overemphasized and denote little because despite smaller MSAs having higher densities of creative workers, they are actually very 'thin' creative markets despite their higher disproportionate share. New York City is potentially the most creative city in the world but ranked 34th in the United States according to Florida (2012a). Generally, there needs to be a certain mass and diversity of creative workers to make a place truly creative and some of Florida's rankings overlook this necessity.

Using the term "class" as part of the "creative class" has also generated some controversy. Some scholars critique Florida's use of the term "class" because the members have no common class interest (Markusen, 2006). However, Markusen's critique can apply to any group that typically has the term "class" applied to it, so this

critique is dismissible. Diversity of human opinion and interests assures that no single class has a universal "class interest." A class might have a common class interest of moving up to a higher class but this is likely a universal goal regardless of class. Each class is broad enough in geography and outlook that a common interest for any "class" is likely unidentifiable.

Other scholars use methodologies similar to Florida's but dismiss his broad definition of who is creative or remove occupations that do not provide economic development for an area. McGranahan and Wojan (2007) recast the creative class to include only those who actually are creative in their work and provide economic development for the area; both creativity and positive economic development must be present. This recasting removes uncreative jobs; for example, Florida (2002) includes healthcare occupations but McGranahan and Wojan (2007) exclude these because they are highly-paid service workers (i.e., like retail workers providing a service to customers). Certainly there are some non-service, creative work (e.g., medical research) conducted by healthcare workers but the vast majority of workers attend to patients thereby mainly providing services.

McGranahan and Wojan (2007) also remove occupations that do not provide economic development and only include an occupation if it can be considered basic in accordance to the economic base theory. Economic base theory assumes that a local economy can be divided into basic (i.e., non-local or exporting) or non-basic (i.e., local) sectors. Basic sectors typically include firms that export goods or services out of the

local economy (e.g., a General Electric factory making turbines for national and international clients) while non-basic or local firms provide goods or services mostly for the local population (e.g., dry cleaners). By this economic rationale, McGranahan and Wojan (2007) remove kindergarten through high school (K-12) teacher jobs that do not add an economic base despite being creative in nature.

Most creative occupations are basic but education and medical workers were removed because they have a decidedly local focus and do not provide an economic base for the municipality. Additionally, many healthcare and K-12 school teachers are generally distributed in densities that parallel general population distributions, "inclusion of [healthcare practitioners and school teachers] is likely to have little effect on the creative class ranking of the metropolitan areas, as their employment shares are likely very similar across cities" (McGranahan and Wojan, 2007, p. 202). The more narrowly defined creative class measure used by McGranahan and Wojan (2007) was found more predictive than Florida's original broader definition but, despite the narrower recast being more predictive, Florida's more expansive original creative class measure still proved to have a strong positive relationship with employment growth across both metropolitan and rural counties in the United States (McGranahan and Wojan, 2007). McGranahan and Wojan (2007) provide strong support for the creative capital theory; also they show that narrowing the set of occupations that makeup Florida's original creative class — specifically, the removal of some education and healthcare occupations, among others — provides greater predictive outcomes and is a valid research option.

Similarly to McGranahan and Wojan (2007), Florida reanalyzes the occupations included in the creative class. Florida (2012a) subdivided the creative class and analyzed the economic development benefit of each portion. As mentioned earlier, Florida's updated theory (2012a) divided the creative class into four occupational categories: technology, arts, professional, and "eds and meds" workers, ("TAPE" for short, see Figure 2). The occupational subdivision enabled analysis that found education and healthcare (i.e., "eds and meds") workers had a negative association to regional economic growth and wages while technology, arts, and professional workers have a positive influence (Mellander and Florida, 2007; Florida *et al.*, 2008; Florida 2012a).

The negative effect of education workers (i.e., "eds" workers) on regional economic development likely results from the majority of the workers in the education, training, and library occupations teach K-12 while only a minority are post-secondary teachers like college/university professors. As identified earlier, K-12 teachers generally do not provide any economic base for an area (McGranahan and Wojan, 2007). All teachers are included in Florida's original occupational classification (teacher assistances and tenured universities professors alike) and the vast majority of the workers in education occupations teach K-12 rather than the super-creative college/university professors who can provide an economic base for an area. In a sense, professors' economic inputs are diluted by the vast majority of K-12 teachers included in the education, training, and library occupational classification (Mellander and Florida, 2007; Florida *et al.*, 2008). Teachers in the K-12 systems are typically public servants and are distributed similarly to the population while post-secondary teachers (i.e.,

college/university professors) are generally more clustered. McGranahan and Wojan (2007) recast the creative class without K-12 teachers resulting in a more predictive creative class variable and this was substantiated by Florida's (2012a) finding that K-12 teachers do not have a positive economic affect. Similarly, health care workers (i.e., "meds" workers) are practitioners and technicians who can be considered high-skilled service providers similar to police and firefighters, serving the local population (i.e., non-basic), and have a distribution that is similar to the general population (McGranahan and Wojan, 2007; Mellander and Florida, 2007; Florida *et al.*, 2008). Florida's occupational subdivision of the creative class using the TAPE methodology (Florida, 2012a) indicates his own, subtle acceptance that the occupations included in the original creative class definition may have been too broad.

Florida's creative class includes all the TAPE subcomponents — technology, arts, professional, and education and medical occupations — but, as mentioned earlier, not all the subcomponents are associated with economic growth or wages. Therefore, a narrower definition of Florida's TAPE creative class is identified as the TAP creative class; it includes all the subcomponents that are positively associated with economic growth and wages. The TAP creative class is used as another dependent variable in this dissertation to determine if its distribution and predictor variables are similar to or different from the TAPE creative class.

Scholarly definitions of the creative class aside, the creative class is useful for policy makers as one tool among others to measure and encourage the economic

development of an area. As mentioned in the earlier critiques, the causality of Florida's creative capital thesis is difficult to exactly determine and it assuredly will continue to be a contested point in future academic work. Rather than a panacea, Florida's creative capital thesis should be considered as one of several ways to study the economic development of urban and suburban areas.

Florida's creative capital theory has greatly impacted the scholarly and public policy spheres. Despite the critiques, municipality officials across the world have widely embraced elements of the creative capital theory (MacGillis, 2009). Florida developed a consulting company, the Creative Class ® Group, to meet the rising demand to apply his findings to specific municipalities or develop marketing for companies eager to directly engage the creative class. Municipalities and government organizations contracting with Florida's company include the City of Newark, Fort Worth, Midtown Atlanta, Cape Town South Africa, Austin, the United Nations, and the United States Department of Labor, among many others.[2] Likewise, corporations contracting Florida's company include BMW, SAS, citigroup, IBM, Microsoft, Absolut Vodka, Johnson & Johnson, and Gallup Poll, among numerous others. Many municipalities, economic development groups, and corporations have bought into the notion of the creative class.

Notwithstanding the critics, Florida's theory is unique because it shifts the economic development strategies toward people and away from the traditional focus on infrastructure and smoke-stack chasing. Creative capital theory provides a methodology

[2] See http://www.creativeclass.com/ for full list of municipalities and companies who use Florida's consulting services.

for municipalities to employ to make the area potentially more desirable for members of the creative class. Pervasiveness of Florida's creative capital theory in scholarly, planning, and policy spheres of study indicates the demand for further research.

2.2 Megapolitan Areas

Scholars who study the creative class in the United States use either the metropolitan statistical area or county scale in their analysis. Most scholars use the metropolitan statistical area (MSA) scale used by Florida (2002 and 2012a) because metropolitan area boundaries are defined by government agencies based on commuter patterns and there is standardized data available by MSA. Counties have similar benefits as a scale of analysis as MSAS such as set boundaries and standardized data. However, MSAs and counties do not capture the scale of the economy for the 21st century, knowledge economy. Analysis of the creative class at a larger scale is evident since places like San Jose and San Francisco are in the top ten for the technology index (Florida, 2012) and are clearly two MSAs but have a shared labor market. Additionally, the Raleigh MSA and the Durham MSA are often listed separately but these two MSAs are so intertwined that they share the same airport: the Raleigh-Durham International Airport. Florida's "regions" based on metropolitan statistical areas are increasingly too small of a scale to accurately capture the dynamics of the creative class in an area. The massive polycentric, urban network of municipalities linked by shared labor markets reconfigured the landscape of the economy in the United States. A larger scale is needed

to better understand the geography of the creative class and the megapolitan area is the scale used in this dissertation.

2.2.1 Megapolitan Area Definitions

The creative class has been studied extensively by region in Europe (Brille, 2012; Marrocu and Paci, 2012) but this scale is often overlooked in the United States with the county or metropolitan statistical area (MSA) acting as scales of analysis for creative class research. Florida's initial conceptualization of the creative class was analyzed at the MSA scale. A MSA is officially delineated by the United States Office of Management and Budget (OMB) and includes urban areas with more than 50,000 people, the counties with these urban areas, and any adjacent counties that have a high degree of "social and economic integration" with the urban core as measured by commuting to work (Office of Management and Budget, 2010, page 37,251). The "social and economic integration" is determined using the employment interchange measure (EIM). The EIM is the percentage of residents of a county who commute to another for work and the percentage of residents of the other county who commute to the first or, simply, the shared bi-directional employment/residence exchange between two counties. When the EIM exceeds 25 percent, the grouping of counties into a MSA or CSA is automatic. If the EIM is between 15 and 25 percent then the combination of counties into a MSA or combined statistical area (CSA) is "based on local opinion as expressed through the Congressional delegations" (U.S. Census Bureau, 2007). The inclusion or exclusion of a

county in a MSA or CSA is sometimes left to the subjective ideas of locals and political officials.

The OMB has had a formal classification system for a metropolitan area since the 1950's and the definition is widely accepted. The MSA scale seems a logical beginning for Florida's research since many members of the creative class might not live in the county where they work even though he assumes they likely live and work in the same MSA, although this is less likely where MSAs abut. Split-commute households — where one worker from the household commutes to one MSA and the other worker commutes to a different MSA — exist where MSAs adjoin. For example, the City of Mebane in the Burlington MSA is one of the fastest growing cities in North Carolina from 2000 to 2012 because it is located on Interstate 40/85, near the midpoint between the Greensboro and Winston-Salem MSAs and the Durham and Raleigh MSAs. The city of Mebane is considered a split-commute city in Burlington County, North Carolina.

Some would argue that the CSA scale as defined by the OMB would be a better scale but even this is too small. For example, like many MSAs, many CSAs are already adjacent without a county as a buffer between other MSAs or CSAs; for example, the Greensboro -- Winston-Salem -- High Point CSA already adjoins and likely has shared economic flows and commuters with the Charlotte – Gastonia – Salisbury CSA and the Raleigh – Durham – Cary CSA. The MSA is too small, the CSA is too small as well, and there is very little research at the megapolitan area scale that actually captures the economically connected areas (Lang and Nelson, 2012).

As the United States' population continues to grow from natural increase and immigration, the OMB has no official classification for these large metropolitan areas that grow toward other large metropolitan areas resulting in mega, multi-metropolitan areas connected by various levels of interdependencies. These multi-metropolitan areas are sometimes called megaregions, megapolitan areas, or megas and are an important scale for several reasons. First, multi-metropolitan areas account for less than 17 percent of the landmass of the 48 contiguous United States but contained 63 percent of the population and 71 percent of the nation's gross domestic product in 2010 (Nelson and Lang, 2011; Kotkin, 2010). Second, the density of multi-metropolitan areas in the United States matches or exceeds the population density of many Western European countries (Nelson and Lang, 2011). Population density is what enables interactions and innovative spillovers (Jacobs, 1961; Knudsen *et al.*, 2007). Third, the continued population growth of the United States (the highest population growth rate of a developed country) will make multi-metropolitan areas increasingly important as the population continues to increase in the decades to come.

Due to the lack of an official classification or definition for multi-metropolitan areas by the OMB, a wide variety of conceptualizations for the multi-metropolitan areas exist in the literature. One of the earliest attempts to articulate multi-metropolitan regions was made by Gottman (1957) who coined the term *Megalopolis* in his attempt to capture the emerging megapolitan area that emerged from Boston, along the northeast seaboard of the United States to Washington D.C. (Figure 5).

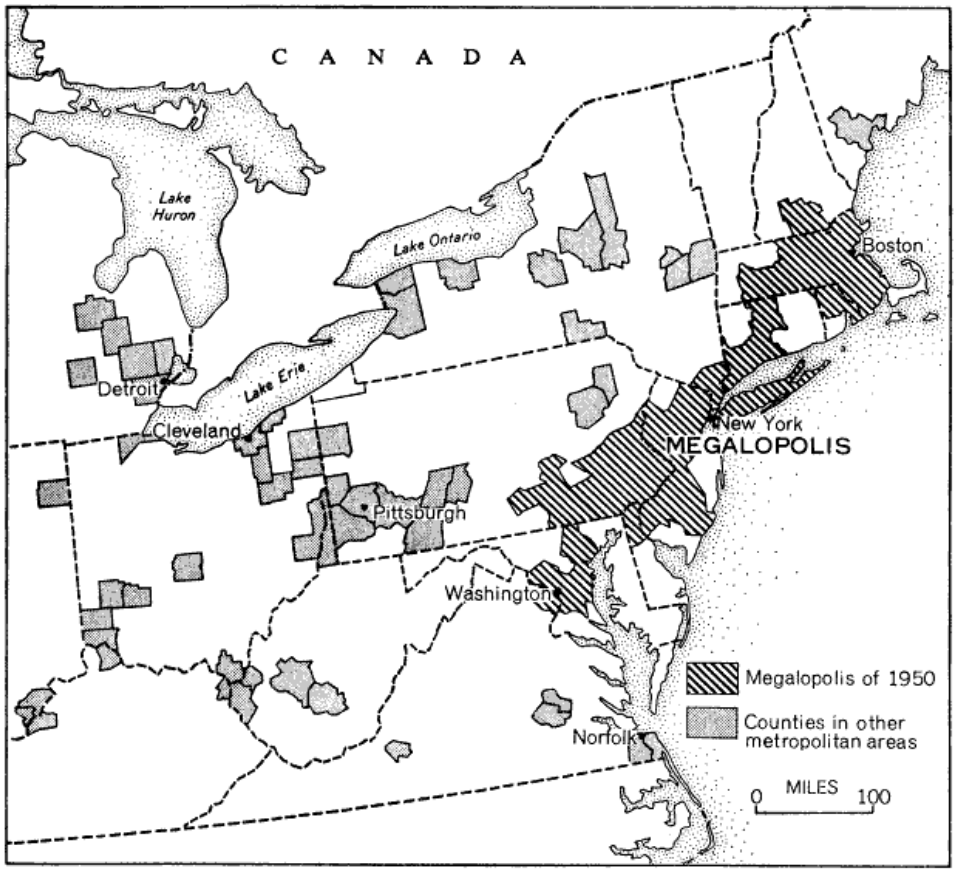

Figure 5. Bowash Megalopolis.
Source: Gottmann, 1957.

After Gottmann, many scholars applied many different methodologies to define the geographic extent of the multi-metropolitan areas in the United States. Gottmann (1957 and 1961) was one of the earliest scholars with the most recent efforts by Nelson and Lang (2011) who identified ten megapolitan clusters across the United States. Table 1 lists the evolving definitions and lexicons of the various conceptualizations of multi-metropolitan areas for the United States in the scholarly literature.

Table 1. Definitions of Multi-metropolitan Areas.

Author(s)	Definition	Megapolitans
Gottmann, 1957 and 1961	Counties in the northeast of the United States from Boston to Northern Virginia.	1 megalopolis, but more predicted (See Figure 5)
Kahn and Wiener, 1967	Megalopolis is defined by the examples: Boswash (Boston to Washington D.C.), Chipitts (Chicago to Pittsburgh), and Sansan (San Francisco to San Diego).	3 megalopolis
Lang and Dhavale, 2005a and 2005b	Megapolitan Area: • Combines at least two, but may include dozens of existing metropolitan areas. • Totals more than 10 million projected residents by 2040. • Derives from contiguous metropolitan and micropolitan areas. • Constitutes an "organic" cultural region with a distinct history and identity. • Occupies a roughly similar physical environment. • Links large centers through major transportation infrastructure. • Forms a functional urban network via goods and service flows. • Creates a usable geography that is suitable for large-scale regional planning. • Lies within the United States. • Consists of counties as the most basic unit.	10 megapolitan areas (See Figure 6 below)
Lang and Nelson, 2007	Megaregions are "super regions that combine at least two, often several, metropolitan areas." Megapolitan areas make megaregions (e.g. the Metroplex, Texas Corridor, and Texas Gulf megapolitan areas make up the Texas Triangle megaregion).	10 megaregions: 5 east, 5 west
Dewar and Epstein, 2007; *America 2050*, 2008	"As metropolitan regions continued to expand throughout the second half of the 20th century their boundaries began to blur, creating a new scale of geography now known as the megaregion. Interlocking economic systems, shared natural resources and ecosystems, and common transportation systems link these population centers together."	11 metropolitan regions

Georgia Institute of Technology, Center for Quality Growth & Regional Development	"[M]egaregions are extended networks of metropolitan centers and the surrounding areas. They often cross county and state lines and are linked by transportation and communication networks."	10 megaregions
Tim Gulden in Florida, 2008a and 2008b	Satellite images of the world at night are used to identify contiguous lighted areas combined with national and regional output data.	12 megapolitans (includes megapolitans that spillover into Mexico and Canada) (See Figure 7 below)
Lang and Knox, 2009	Megapolitan regions are mostly aligned with Lang and Nelson (2007a). Lang and Knox seemingly use "megapolitan regions" for what many others call "megaregions".	10 megapolitan regions
Ross and Woo, 2009	Megaregions are "networks of metropolitan centers and their areas of influence that have existing social, environmental, economic, and infrastructure relationships."	9 megaregions: Uses Georgia Institute of Technology definitions from 2008 that later identify 10 megaregions in 2014.
Innes, *et al.*, 2011	Megaregions have "multiple major cities, connected by a skein of suburbs, daily commuting, and economic linkages, along with a range of other interdependencies."	Not specific
Lang and Nelson, 2011	i) Megapolitan Areas: • projected to have four million people • at least one metropolitan area with over one million people, • connected to two or more other metropolitan areas with populations over 250,000 people via current or projected commuting patterns • megapolitan areas "resemble the U.S. Census Bureaus' Combined Statistical Areas (CSAs) that may emerge by 2040" ii) Megapolitan Cluster: • a group of megapolitan areas • no more than about 500 miles between the centers of the major metropolitan areas over one million people • "networked either by commuting, trucking, or commuter airline" • "historically composed an economically similar region such as the Great Lakes"	10 megapolitan clusters made up of 23 megapolitan areas (See Figure 8 below)

As mentioned earlier, the progression of academic thought on multi-metropolitan areas begins with Gottmann who was the first to recognize the merging of metropolitan areas that materialized in the United States during the 1950's (Baigent, 2004). The multi-metropolitan area was named the *Bowash Megalopolis* because it extended from Boston, Massachusetts to Washington D.C. (Gottmann, 1957) (Figure 5). Later in 1961 Gottmann refined his theory of the megalopolis in a book which became the foundation for the current megapolitan research: "*Megalopolis: the urbanized northeastern seaboard of the United States*." Identifying the original megalopolis might seem obvious now but Gottmann saw the fusion before any of the areas were connected by the Eisenhower Interstate Highway System via Interstate 95. Despite many perceiving Gottmann as the intellectual leader of megapolitan studies due to the success of his book, Gottmann's work was based on earlier research on state economic areas conducted by Bogue (1951) for the Bureau of the Census (Gottmann, 1957).

Gottmann's work on multi-metropolitan areas was followed by Kahn and Weiner (1967) who used Gottmann's method to identify two more regions that seemed to fit Gottmann's definition: the SanSan region (San Francisco to San Diego, California) and the ChiPitts region (Chicago, Illinois to Pittsburgh, Pennsylvania). These metropolitan areas were expected to connect via transportation corridors, develop overlapping suburban and exurban commuter sheds, and were easily identified because of their status as economic and population growth poles. Since these two initial conceptions, other scholars have analyzed various economic and demographic characteristics to define more multi-metropolitan areas.

Since Kahn and Weiner (1967), the academic race began to identify all the multi-metropolitan areas in the United States. Nelson and Lang (2011) emerged as the thought leaders of contemporary definitions of multi-metropolitan areas but there is a considerable evolution of thought that occurred from their initial work in 2005 to their book in 2011. Lang and Dhavale defined megapolitan areas as a forward looking, United States only, transportation/commuting centric model based on Census Bureau data (Lang and Dhavale, 2005a, 2005b). They used the term *megapolitan area* or *megas* to discuss the phenomenon and identified 10 megapolitan areas in the United States (see Figure 6) (Lang and Dhavale, 2005a and 2005b) but this lexicon soon changed as did the definition and geographic extent of the megapolitan areas.

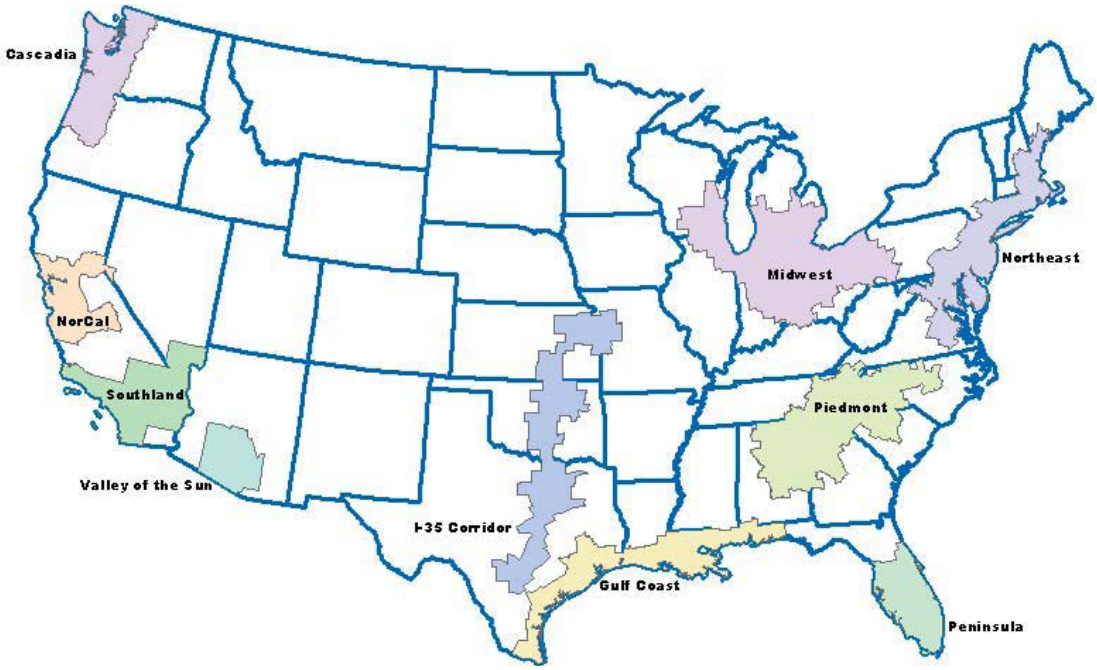

Figure 6. Megapolitans Defined by the Metropolitan Institute at Virginia Tech.
1) Northeast, 2) Piedmont, 3) Peninsula, 4) Midwest, 5) I-35 Corridor, 6) Gulf Coast, 7) Valley of the Sun, 8) Cascadia, 9) NorCal, 10) Southland. Source: Lang and Dhavale, 2005a and 2005b.

Two years later, Lang worked with Nelson and changed the definition and geographic extents of the megapolitan areas. Both Lang and Dhavale (2005a and 2005b) and Lang and Nelson's (2007a and 2007b) definitions for multi-metropolitan areas are based on the U.S. Census definition for a Combined Statistical Area (CSA) that projects geographical and demographic data forward to 2040 to forecast the counties that should be included in the CSAs at that time. The methodology used by Lang and Dhavale (2005a and 2005b) is very similar to the research by Lang and Knox (2009). The geographic extents of the multi-metropolitan areas changed considerably from when Lang worked with Dhavale in 2005 to when Lang worked with Nelson in 2007; for example, a quick comparison of Figure 6 and Figure 8 shows interesting changes: the Texas megapolitan area morphs from the "I-35 Corridor" to the "Texas Triangle," while the Gulf Coast mega is completely removed except for Houston, and the Mountain and Twin Cities megapolitan areas appear for the first time, as well as many other smaller changes.

About the same time Nelson, Dhavale, and Knox worked with Lang, Dewar and Epstein developed a megaregions classification for *America 2050* — a not-for-profit organization — based on current trends to determine America's needs in the year 2050 (Dewar and Epstein, 2007). *America 2050* specifically analyzed demographic trends, economic changes, and key infrastructure needs that America is likely to experience in the coming decades. *America 2050* specifically defined a megaregion as "large connected networks of metropolitan areas . . . [characterized by] environmental, cultural, infrastructure and functional characteristics" (2008, p.113). This definition is in contrast

with other scholars who defined megapolitan areas using the U.S. Census Bureau's CSA as a basis. Dewar and Epstein (2007) identify 11 megaregions in the United States. Unlike other definitions, Dewar and Epstein (2007) identified megaregions for *America 2050* that overlap; for example, Houston is in the Texas Triangle megaregion and the Gulf Coast megaregion. Additionally, the *America 2050* megaregions have fuzzy borders that are not consistent with a geographic scale for standardized data collection. Typically, a county is used in multi-metropolitan definitions because it is a geographic and political unit and the U.S. Census Bureau uses counties as the basis for its methodology for identifying core-based statistical areas (CBSAs) and combined statistical areas (CSAs).

Ross and Woo (2009) suggested that national-scale definitions for multi-metropolitan areas or megaregions should be based on county interactions similar to the Census Bureau's definition. The county-based method builds megaregions out of micropolitan areas, metropolitan statistical areas (MSA), and combined statistical areas (CSA). These statistical areas are based on population and shared commuter networks based on the EIM for the area. That said, Ross and Woo (2009) warn that a megapolitan definition based on two variables — population and commuter-sheds — could be too simplistic. Other criteria such as culture, development, and information flows should not be ruled out; however, these additional steps can be subjective.

The inconsistency of definitions for megapolitan areas is the only constant for all the definitions used in megapolitan research. These inconsistencies are explicitly identified in Ross and Woo (2009) who articulate the ever-changing definitions when

they indicate how the Georgia Institute of Technology's Center for Quality Growth and Regional Development initially identified nine megapolitan areas in 2008 but currently identify ten megapolitans. Identifying ten megapolitan areas indicates an alignment with other researchers on the total number of megapolitans but not necessarily on the exact definition or geographic extent of the megapolitans. Additionally, scholars cannot agree on what to call these geographic units; one scholar's "megaregion" is another scholar's "megapolitan area."

Gulden developed a novel methodology for identifying the megaregions of North America (Figure 7); Gulden used satellite imagery to identify continuously lighted areas combined with economic data to identify megapolitan areas (Florida, 2008a and 2008b). The novelty of Gulden's method is its applicability throughout the world but the borders of the Gulden's megapolitans areas are fuzzy and a standardized base unit for analysis (e.g., the county) is not enabled. Gulden's analysis of night lights identified the Gulf Coast as a megapolitan area while it did not meet the megapolitan threshold of most other scholars. Gulden's methodology seems to capture the actual geographic limits of the megapolitan areas; for example, the Great-Lakes megapolitan area (Tor-Buff-chester in Figure 7) spills into Canada. Many scholars dismiss the Canadian and Mexican portions of the megapolitan areas because the international borders confound research due to the difficulty of different datasets from other countries.

Besides Gulden and America 2050, the Census Bureau's definition of the core-based statistical area (CBSA) is the predominate method used as a basis to define multi-metropolitan areas. The Census Bureau's CBSA definition applied as a basis for the

megapolitan area definition has several advantages. First, it is a simpler method based on a long-held, federal definition and enables standardized data. Second, a comparison to other work based on the Census Bureau's definitions is more likely. Third, the CBSA definition is based on counties that have robust datasets from many public and private sources. Finally, the more nuanced the definition, the less likely it will be used by other scholars, planners, and policy makers.

Figure 7. Megaregions of the North America Defined by Lighted Areas by Tim Gulden.
Source: Florida, 2008a and 2008b.

Nelson and Lang's (2011) most recent work refines the definition of connected multi-metropolitan areas and generates a new set of megapolitan areas based on contiguous counties with commuting flows based on the employment interchange measure (EIM) for regions that are forecasted to have a population of over four million by 2040 (Figure 8). Specifically, they define *megapolitan areas* in the following way:

> [S]imilar to the combined statistical areas (CSAs) of the U.S. Census that may emerge by 2040 . . . anchored by at least one metropolitan area with a population more than one million connected by current or projected commuting patterns to two or more other metropolitan areas a population of 250,000 or more . . . [A] *megapolitan cluster* or groups of megapolitan areas each with no more than about 500 miles between centers of their major metropolitan areas (each of more than one million population) that historically composed an economically similar region. (Nelson and Lang, 2011, p. 23-24, *emphasis added*).

Merging of one CSA to another is accomplished using the same Office of Management and Budget (OMB) method used to build MSAs and CSAs: the employment interchange measure (EIM). The EIM (mentioned earlier regarding split-commute households) uses a simple gauge of bi-directional commuter statistics to determine if a county "has high degree of social and economic integration with the core as measured by commuting ties" (U.S. Census, 2007). The EIM quantifies the shared commute between counties. The EIM must be at least 15 percent in each direction for the county to be considered part of the MSA or CSA and is automatically part if the EIM exceeds 25 percent. Counties between MSAs or CSAs that enable split commuting — one household worker commutes to one MSA/CSA and another household worker commutes to a different MSA/CSA — is the beginning of the trend that shows an increase of the EIM that connects the MSAs and CSAs into one megapolitan area. For example, Douglas County, Colorado has split

commuters who commute north to the Denver CSA and while others commute south to the Colorado Springs CSA, connecting the two CSAs and yielding the Front Range megapolitan area.[3]

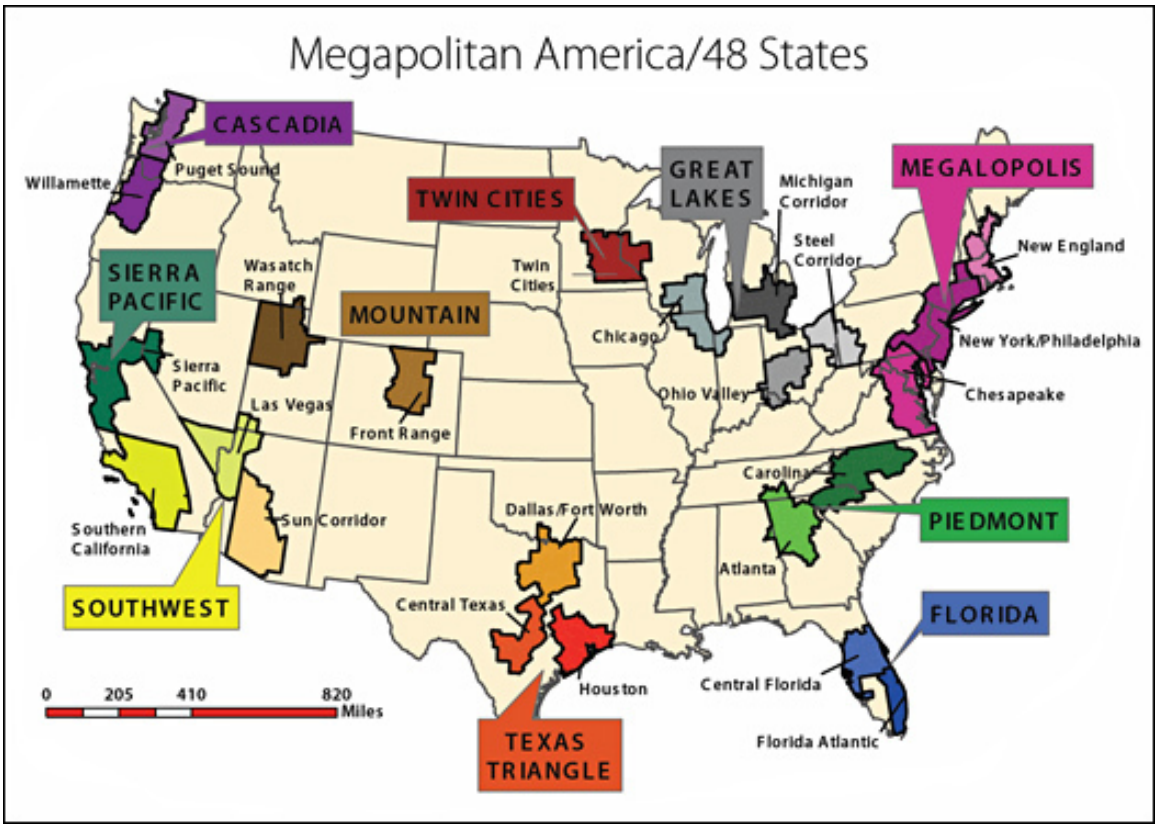

Figure 8. Megapolitan Areas and Megapolitan Clusters.
Nelson and Lang, 2011.

Nelson and Lang analyze a county's growth trends and connectivity to determine if a county or counties between CSAs have an EIM that is expected to meet or exceed 15 percent by 2040. If so, the county is used to connect the CSAs making a megapolitan

[3] "Residence County to Workplace county Flows" ACS 2006-2010. http://www.census.gov/population/metro/data/other.html Accessed November 29, 2013.

area (Nelson and Lang, 2011). Nelson and Lang's new methodology and definition creates a more nuanced hierarchy and lexicon where a *megapolitan area* is comprised of connected metropolitan statistical areas (e.g., the Central Texas megapolitan areas is made up of the Austin, San Antonio, Waco, and Killeen MSAs) and a *megapolitan cluster* is a network of megapolitan areas (Nelson and Lang, 2011).

These various definitions of the megapolitan areas of the United States all have positive and negative aspects. The general trend of the academic research on megapolitan areas implies that Nelson and Lang (2011) have the best (i.e. least bad) definition for megapolitan areas. The definition of the megapolitan areas used by Nelson and Lang (2011) includes no holes in a megapolitan area, no islands detached or noncontiguous with a megapolitan area, each megapolitan area is separate from each of the other megapolitan areas (i.e. no counties are in more than one megapolitan area), and each megapolitan area is made up of whole counties and independent cities. The technical and practical advantages of Nelson and Lang's (2011) definition are not the case in many of the other definitions, specifically the *American 2050* and the Georgia Institute of Technology definitions.

Nelson and Lang (2011) seem to have emerged as the thought leaders for this phenomenon and provide the megapolitan methodology, megapolitan map (Figure 8, above), and lexicon used in this dissertation. Additionally, database development is less complicated with the Nelson and Lang (2011) megapolitan area definition because it is based on Census Bureau definitions of CBSA and data for CBSA's are relatively robust. Florida (2002 and 2012a) provides the definition for the creative class and Nelson and

Lang (2011) provide the megapolitan area as the proper scale of analysis thereby enabling a socio-economic analysis of the spatial distribution of the creative class within the megapolitan areas of the United States.

2.2.2 Critiques of the Megapolitan Area

Nelson and Lang's (2011) definition is not perfect. The Census Bureau's core-based statistical area (CBSA) definition is the basis for their megapolitan area delineation but they overlook the current extent of some MSAs. For example, the Virginia Beach – Norfolk – Newport News MSA currently extends into North Carolina (U.S. Census Bureau, 2009) but Nelson and Lang's Chesapeake megapolitan area excludes the North Carolina counties. Nelson and Lang also overlook their naming convention when they identify the Sierra Pacific and Twin Cities as both a megapolitan area and a megapolitan cluster, the definition of a megapolitan cluster indicates they consist of "groups of megapolitan areas" (Nelson and Lang, 2011, p. 23). These critiques are not a basis for dismissing the whole work because it is really the strongest megapolitan definition currently published.

There are other weaknesses of the megapolitan construct. Of the abundance of scholars who research and define the different megapolitan constructs, few identify other areas of the United States as key areas that promote economic growth for the nation. Joel Kotkin is one of the few scholars who focus on non-megapolitan areas as economic growth areas. Kotkin has identified four growth corridors as part of his Resurgent Heartland theory. Kotkin's analysis focuses on the "Great Plains," the "Third Coast" or

America's Gulf Coast, the "Intermountain West" and the "Southeast Manufacturing Belt" (Figure 9) (Kotkin, 2013).

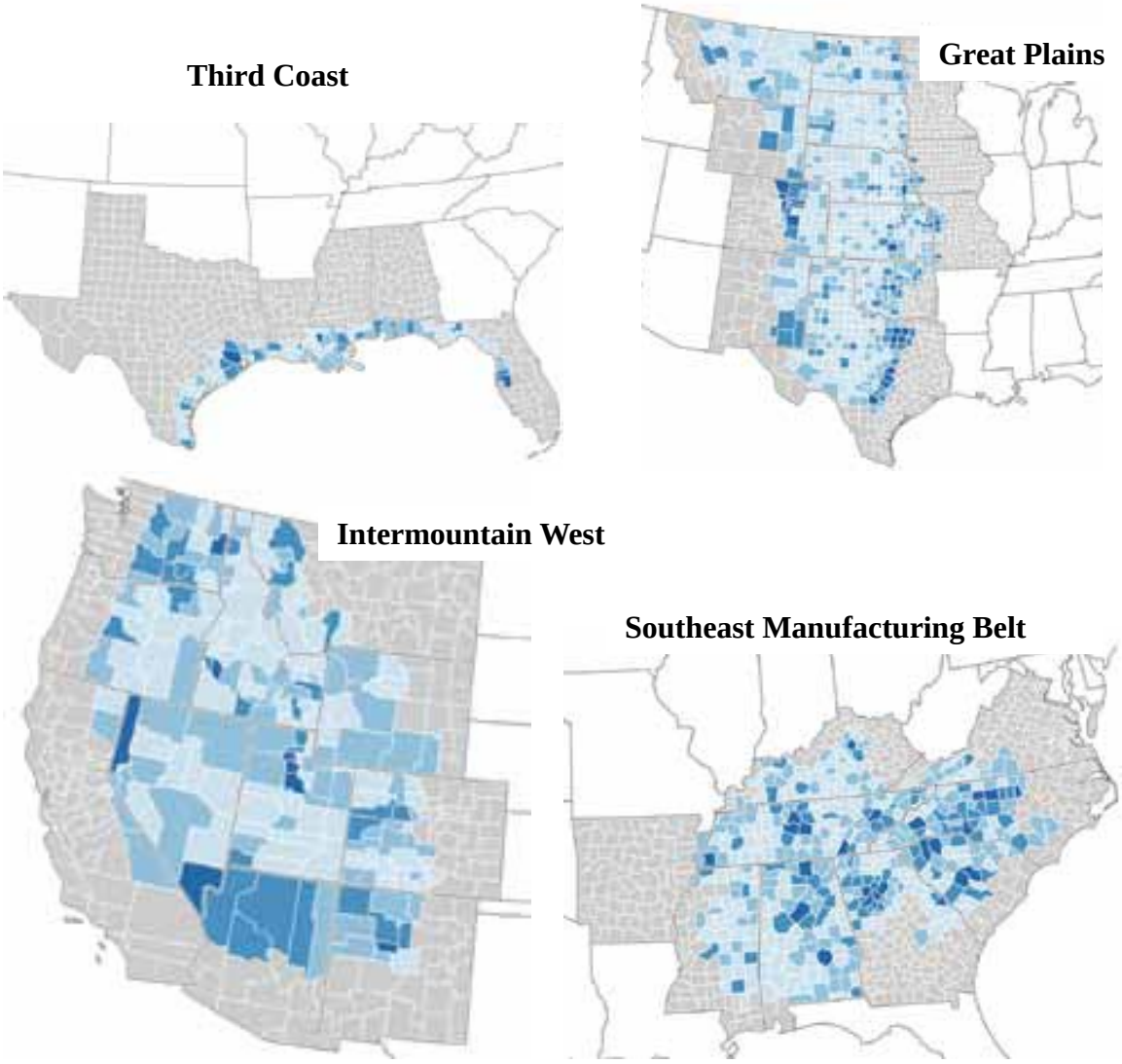

Figure 9. Kotkin's Four Growth Corridors.

While acknowledging the influence of the east coast, west coast, and Great Lake metropolitan areas, Kotkin identifies his growth corridors that include both megapolitan and non-megapolitan counties. Resurgent Heartland theory is in sharp contrast to the

megapolitan scholars and Richard Florida's creative capital theory as well. Florida focuses on metropolitan areas while Kotkin includes not only metropolitan counties but large swaths of rural counties as well. Inclusion of non-metropolitan or non-megapolitan areas in the growth corridors his Resurgent Heartland theory makes Joel Kotkin unique among economic geographers.

Finally, defining and delineating the geographic extent of megapolitan areas is purely an academic game for now. The literature review shows a long narrative of the evolving definition of what a megapolitan area is and where one is located. Some state, regional, or local governments or organizations have embraced the megapolitan idea but it remains an unofficial definition because the Office of Management and Budget (OMB), and by extension the U.S. Census Bureau, do not officially delineate a megapolitan area. As such, the different definitions will continue to have different users. Until the OMB develops a megapolitan definition and the U.S. Census Bureau collects and reports data for that geography, all the work is academic.

CHAPTER III

METHODOLOGY

3.1 Measuring the Creative Class

Florida's original definition of the creative class that includes each creative occupation (technical, arts, professional, "eds and meds" or TAPE) is used as the basis for our initial investigation and acts as the first dependent variable for the cluster and regression analysis. Florida defines the creative class using standardized occupational classifications (SOCs) from the U.S. Bureau of Labor Statistics (Table 2).

As mentioned earlier, Florida developed a separate and distinct subdivision of the creative class into four occupational subcomponents: technology, arts, professional, and "eds and meds" workers, or "TAPE" (see Figure 2). The creative class can be analyzed by each occupational subcomponent (e.g., "T" for technical, etc.) or altogether when each subcomponent is aggregated together to equate to Florida's original creative class; Florida's original creative class is equal to the combined TAPE occupational subcomponent.

Several scholars found that modifying the occupations included in the creative class definition or conducting analysis by further subdividing the creative class yields better predictive outcomes when studying economic development (McGranahan and Wojan, 2007; Mellander and Florida, 2007; Florida *et al.* 2008; Florida, 2012a). The "eds and meds" workers (the "E" in TAPE) had a negative association to economic

growth because these workers generally provide economic output that is considered non-basic — not exportable to another market therefore money generated come from within a community — rather than basic economic output exports goods or services and brings money into a community (Mellander and Florida, 2007; Florida *et al.*, 2008; Florida, 2012a).

Table 2. Standard Occupational Classifications Used to Derive the Creative Class Dependent Variables Using Florida's Original and TAP Methodologies.

Standard Occupational Classification (SOC)	**Dependent Variable 1 Florida's Original Creative Class (TAPE)**	**Dependent Variable 2 TAP Creative Class**
Computer and mathematical occupations (SOC 15-0000)	X	X
Architecture and engineering occupations (SOC 17-0000)	X	X
Life, physical, and social science occupations (SOC 19-0000)	X	X
Education, training, and library occupations (SOC 25-0000)	X	
Arts, design, entertainment, sports, and media occupations (SOC 27-0000)	X	X
Management occupations (SOC 11-0000)	X	X
Business and financial operations occupations (SOC 13-0000)	X	X
Legal occupations (SOC 23-0000)	X	X
Healthcare practitioners and technical occupations (SOC 29-0000)	X	
High-end sales and sales management occupations*		

* The "High-end sales and sales management" is not a specific SOC and cannot be accurately calculated, therefore it is excluded from both TAPE and TAP dependent variables.

Additionally, the education and medical worker distribution often matches the general population distribution (McGranahan and Wojan, 2007; Florida, 2012a). Consequently, healthcare and education occupations are removed making a separate, narrower definition of the creative class with only those occupation groups that have a positive influence on economic development: technology, arts, and professional workers or "TAP" (Table 2, above). The TAP creative class variable will be the second dependent variable for this dissertation to better understand the different economic development outcomes generated by these two different measures of the creative class by megapolitan area.

Creative class data used in Florida's second edition of "*The Rise of the Creative Class Revisited*" (2012) is available from Florida's Martin Prosperity Institute (MPI) but this county-level data is not directly used in this dissertation because a methodology was not provided that enabled repeatable data collection for repeatable analysis (Florida and Stolarick, 2012). To enable full analysis with a known, standardized data set this dissertation uses county-level data from the American Community Survey (ACS) five year estimates: 2006-2010 (United States Census Bureau, 2012). Occupational data is reported as total workers in each occupational classification. Occupations are aggregated into the components of the creative class: technology, arts, professional, and education and medical. The workers of each subcomponent are then aggregated into the TAPE and TAP creative class then normalized by the total labor force, 16 years of age and older, from the same occupational dataset. The result are the TAPE and TAP creative class dependent variables that are reported as percentage of the labor force.

ACS data is different from the decennial census data that attempts to collect data from everyone all at a specific "point-in-time;" rather, the ACS is a continuous sampling of the populace so that no particular month or year is over represented in the data, "These estimates reflect the characteristics of a geographic area over the entire 5-year period" (U.S. Census Bureau, 2009b). As a result, the five year estimates are not actually averages of each of the five years, rather they are the survey data from five years aggregated into one value. Considering the ACS five year estimates as averages is not functionally inappropriate; however, it is technically incorrect according to the Census Bureau methodology. The five year estimates are used because they are considered the most reliable of the ACS data and the only dataset available for all counties in the study area: ACS the three year estimates are only available for areas with a population greater than 20,000 (U.S. Census, 2013c).

Florida's data is also not suitable to act as a dependent variable because the TAP creative class variable is unavailable from MPI so a standardized data source for both dependent variables is only possible for the dependent variables if both are based on ACS data. Florida's creative class data from the MPI is correlated to the ACS derived TAPE and TAP creative class variable at greater than 0.93 for the megapolitan counties.

Dependent variables for this dissertation's analysis are Florida's original creative class definition that includes all TAPE occupations (Florida, 2002 and 2012a) and the recast that includes only the TAP occupations of the creative class (Florida *et al.,* 2008; Mellander and Florida, 2007; Florida, 2012a). As mentioned earlier, Florida's original creative class (i.e., TAPE) and the more narrow TAP creative class dependent variables

are the total workers in the occupations identified in Table 2 for each county that are then normalized by the workforce.

Florida's methodology does not use specific standardized occupational classification (SOC) numbers, rather he just uses the standardized occupation titles. The "high-end sales and sales management occupations" is the only portion of Florida's methodology for the creative class that is lacking specificity. All other occupation titles in the creative class correspond to a specific SOC number defined by the Bureau of Labor Statistics (BLS) for use in its Occupational Employment Statistics (OES) and used by other agencies, specifically the Census Bureau, when reporting occupational data. The American Community Survey (ACS) dataset is not fine enough to parse out the SOCs that could be considered "high end sales and sales management" and there is no official occupation title that is similar to the one used by Florida. The ACS does include "sales and related occupations" (SOC 41-000) but it includes cashiers, counter and retail clerks, travel agents, insurance agents, telemarketers, and real estate brokers, among other sales occupation titles. Some of these occupations could be considered "high-end" but there is no distinction for this in the ACS data. Inclusion of the whole "sales and related occupations" would add all sales workers into the creative class which is hardly the intent of the creative class definition. Other scholars attempted to overcome the nonspecific nature of Florida's definition by making arbitrary, and nonspecific divisions of SOC 41-000 (McGranahan and Wojan, 2007) but this methodology is not possible with ACS data.

The SOC 41-000, sales and related occupations, makes up 11.2 percent of the total workforce — a considerable portion that could skew findings toward non-creative

counties that had a disproportionate share of sales or warehousing workers. Therefore, it is necessary to remove the ambiguity that arises due to Florida's lack of specificity by classifying all sales workers as service class (i.e., non-creative class). In fact, the Pearson correlation coefficient between both the TAPE and TAP creative class and Florida's creative class increase when the sales workers are excluded. The TAPE and TAP creative class dependent variables with the "sales and related occupations" included are correlated to Florida's creative class at 0.928 and 0.929 ($p < 0.0001$, n=654 counties) but the TAPE and TAP creative class dependent variables without the "sales and related occupations" is correlated at 0.963 and 0.931, respectively. The correlation value increases are small but the increase shows that the TAPE and TAP creative class dependent variables used in this dissertation are closer to Florida's creative class with the "sales and related occupations" excluded rather than included.

3.2 The Creative Class and the Megapolitan Area

As mentioned earlier, the Nelson and Lang (2011) definition of megapolitan areas is used as the geographic scale in this dissertation (Figure 8). The two dependent variables used in this dissertation are based on Florida's original occupations (TAPE) that defined the creative class (Florida, 2002 and 2012a) and the recast creative class defined by a narrower set of occupations: technology, arts, and professional (TAP) occupations (Table 2; Florida *et al.*, 2008; Florida, 2012a). Workers in each of the specified occupations are summed and normalized by the total workforce yielding a creative class percentage for each megapolitan area. Florida's research is performed at the MSA scale in 2002 and 2012 with only limited analysis at the county scale in 2012. This research

will analyze the TAPE and TAP creative class by megapolitan and non-megapolitan counties.

Descriptive analysis will be used to show the general distribution of the TAPE and TAP creative class in the study area. To better understand where the creative class is clustered and where it is not, a Getis-ord Gi analysis will be used to identify the megapolitan and non-megapolitan counties with TAPE and TAP creative class clusters. Geographic analysis like the Getis-ord Gi is based on the spatial dependence of the dependent variables, meaning that the observation at one location is likely affected by the observation at a nearby location (Rogerson, 2006). The resulting "hot-spot" and "cold-spot" clusters for the TAPE and TAP creative class will enable a better understanding of the spatial distribution of the creative class in the study area.

Regression analysis of the creative class at the megapolitan area scale will answer the following research questions:

Research Question 1: How is Florida's original definition of the creative class (i.e., TAPE) distributed by megapolitan county and what socio-economic variables best explain this distribution?

Florida's original creative class definition of occupations (TAPE, Table 2) serves as the basis for all creative class analysis in this dissertation. It is important to understand how Florida's original creative class is distributed by megapolitan county and what are the predictor variables before proceeding with the regression analysis for the TAP creative class.

An ordinary least squares (OLS) regression will be used with the TAPE (i.e., Florida's) creative class percentage of the workforce as the dependent variable and 20 socio-economic variables that potentially affect the distribution of the creative class in the 654 megapolitan counties and county equivalents[4] in the study area.

Research Question 2: How is the newly evolved technical, arts, and professional occupations or TAP portion of the original creative class definition distributed by megapolitan county and how are the socio-economic variables that best explain this distribution different or similar to the explanations for a more conventional interpretation of the creative class?

Florida's original TAPE creative class included occupations that were not considered creative by some critics (McGranahan and Wojan, 2007). The TAP methodology (technical, arts, professional occupations only, without "eds and meds" occupations included in the original creative class) focuses specifically on the creative occupations identified by Florida that directly affect economic development (Florida *et al.*, 2008; Florida, 2012a).

A second OLS regression will be used with the TAP creative class percentage of the workforce as the dependent variable and the same 20 socio-economic variables used for analysis of Florida's original TAPE creative class. Regression models for Florida's TAPE creative class and the TAP creative class may yield different predictive outcomes

[4] A county equivalent is any area treated as a county when the U.S. Census Bureau reports data at the county scale. For example, Louisiana uses the term "parish" rather than "county" and certain states like Virginia, Missouri, and Maryland have independent cities; in each case they are treated as county equivalents and reported in county data by the US Census Bureau. For this dissertation, the term "county" has the same definition as the U.S. Census Bureau and includes all counties, parishes, and independent cities.

and spatial distributions because of the economic development focus of the TAP occupations. The R-square for both models will be compared as well as the independent variables that explain the variance.

Research Question 3) How do the predictors variables identified for the TAPE and TAP creative class for the megapolitan counties contrast with the socio-economic predictor variables for the non-megapolitan counties?

A method for understanding the distribution of the TAPE and TAP creative class for the megapolitan counties is by contrasting them with the non-megapolitan counties. Megapolitan counties contain 63 percent of the population and generate 71 percent of the total economy of the United States; however, understanding the difference between the 654 megapolitan counties and the 2,455 non-megapolitan counties will enable a better understanding of the creative class as a whole.

To understand the distribution of the creative class for the non-megapolitan counties, a third and fourth regression analysis will be conducted using the TAPE and TAP creative class as dependent variables for the same 20 independent variables for 2,455 non-megapolitan counties. It is expected that there will be a different set of predictor variables for the non-megapolitan counties and contrasting the earlier findings enable a better understanding of the creative class.

3.3 Data

As mentioned earlier, the dependent variables for the two regression models are the creative class defined by Florida (2002 and 2012a) and the TAP creative class identified by Florida (Florida *et al.,* 2008) as the creative occupations most linked to

economic development. The 654 counties and county equivalents within the megapolitan areas identified by Nelson and Lang (2011) are the base unit for the megapolitan analysis while the 2,455 non-megapolitan counties and county equivalents are the base unit for the non-megapolitan analysis.

Occupation data by county is from the American Community Survey, 5 year average estimates (2006-2010) for the civilian employed population 16 years and over (ACS dataset called S2401). The total workers in each occupation listed in Table 2 are used for each dependent variable and normalized by the total workforce. The only workers not included in this data are "people whose only activity consisted of work around the house or unpaid volunteer work for religious, charitable, and similar organizations; also excluded are people on active duty in the United States Armed Forces" (U.S. Census Bureau, 2010, page 62). The dependent variables are built using U.S. Census data based on where the respondents live, not where they work.

Many independent variables are used throughout the literature to analyze the creative class. Many of the creative class indices (e.g., gay/lesbian index, bohemian index, etc.) are used by Florida and others when analyzing the creative class but these indices are specifically left out of this dissertation to avoid skewing the models for the two dependent variables toward the Florida derived indices already shown as having strong correlations to the creative class. Scholars have included some version of some of Florida's creative class indices (Marlet and van Woerkens, 2004; Knudsen *et al.* 2007; Florida *et al.* 2008, Florida *et al.* 2010; Donegan *et al.*, 2008; Clifton and Cook, 2009; Hoyman and Faricy, 2009; Anderson *et al.* 2010; Martin-Brelot, *et al.* 2010; Reese *et al.*

2010; Marrocu and Paci, 2012; Lazzeretti *et al.* 2013) and others have excluded the indices (Glaeser, 2005; McGranahan and Wojan, 2007; Wojan *et al.* 2007; Stam *et al.* 2008; Asheim and Hansen, 2009; Boschma and Fritsch, 2009; Bille, 2010; McGranahan *et al.* 2011; Fagginn *et al.* 2012;).

When using geographic data there is the possibility of spatial dependence or spatial autocorrelation, meaning that a variable for one area is influenced by the value of the same variable in a nearby area (Rogerson, 2006). Spatial dependence of the geographic data is difficult to overcome due to the nature of the data: the data for the dependent and independent variables is reported for a specific location (i.e., a county and state). The nature of the geographic data does not allow total removal of the likely spatial autocorrelation but it is minimized by using data reported for the total population. Additionally, careful consideration is used when interpreting findings based on data that exhibits spatial autocorrelation.

3.3.1 Independent Variables and Hypothesis Testing

Independent variables selected for the regression analysis are based on previous scholarly work but also includes other independent variables that might capture the geography of the creative class that have not previously been analyzed. The source for each variable is the U.S. Census Bureau for 2010 unless otherwise specified. For each independent variable, a testable hypothesis and source is provided (Table 3).

It is important to understand the role of different counties within the megapolitan area. Several scholars have incorporated a core/periphery analysis with different

Table 3. Hypothesis Testing Summary.

	Independent Variable Name	Scholars	Influence	Predicted Influence
Geographic	Core/Periphery	Faggian *et al.*, 2012 Flew, 2012 McGranahan and Wojan, 2007	Positive Negative Negative	Positive
	Population Density	Asheim and Hansen, 2009 Knudsen *et al.*, 2007 McGranahan and Wojan, 2007 Wojan *et al.*, 2007 Boschma and Fritsch, 2009	Positive Positive Negative Negative Positive	Positive
Economic	Average Wages, $	Florida *et al.*, 2008	Positive	Positive
	Unemployed, %	Clifton and Cooke, 2009	Negative	Negative
	Poverty Rate, %			Negative
	Owner Occupied, %			Negative
	Gross Rent as Percentage of Income (GRAPI) , %			Positive
	Consumer Services, %	Florida *et al.*, 2008 Shapiro, 2006	Positive Positive	Positive
	Tourism, %	Wojan *et al.*, 2007 McGranahan *et al.*, 2011	Positive Positive	Positive
Demographic	In Migration Rate, %			Positive
	Population Growth Rate, %			Positive
	Hispanic, %	McGranahan and Wojan, 2007	Negative	Negative
	Black, %	McGranahan and Wojan, 2007	Negative	Negative
	Elderly, %			Negative
	Median Age			Negative
	Single Parent Head of Household, %			Negative
	Children in Housing Units, %	Martin-Brelot *et al.*, 2010 Flew, 2012	Negative Negative	Negative
Education	No High School or GED, %			Negative
	Bachelor's Degree, %	Marrocu and Paci, 2012 Asheim and Hansen, 2009 McGranahan and Wojan, 2007 Lazzeretti *et al.*, 2012	Positive Positive Positive Positive	Positive
	Professional or Graduate Degree, %			Positive

findings. In Australia, "the empirical mapping of where the creative workers are located in Australian cities does not match the imagined geography of 'creative cities' theories. Evidence simply does not match assumptions about a non-creative suburbia [i.e., periphery] coexisting with a vibrant and creative inner city [i.e., core]" (Flew, 2012, p. 239). In the United States "The creative class moves into less dense metropolitan counties in search of higher (more rural) quality of life . . . leading to further outward expansion of the creative class, perhaps into adjacent non-metropolitan counties [i.e., periphery]" (McGranahan and Wojan, 2007, p. 212). Conversely, in the United Kingdom it was found that the creative class have a harder time finding jobs in the periphery areas (Faggian, 2012).

The Office of Management and Budget (OMB) has already defined core counties and periphery counties as part of the definition for the core-based statistical areas (CBSA). The OMB updated the core counties for the metropolitan area delineations in 2010 using the following definition:

> Each [Core Based Statistical Area] must have a Census Bureau delineated urbanized area of at least 50,000 population or a Census Bureau delineated urban cluster of at least 10,000 population . . . The central county or counties of a CBSA are those counties that: (a) Have at least 50 percent of their population in urban areas of at least 10,000 population; or (b) Have within their boundaries a population of at least 5,000 located in a single urban area of at least 10,000 population." "A county qualifies as an outlying county of a CBSA if it meets the following commuting requirements: (a) At least 25 percent of the workers living in the county work in the central county or counties of the CBSA; or (b) At least 25 percent of the employment in the county is accounted for by workers who reside in the central county or counties of the CBSA. (Office of Management and Budget, 2010).

For this research, the OMB definition of a "central county" for metropolitan statistical areas is used for the core counties and all other counties will use the "outlying county" definition and are classified as peripheral. A core county is assigned a dummy variable of one (1) while periphery counties are assigned a dummy variable value of zero (0). A core/periphery analysis between the central counties of a megapolitan area and non-central counties is difficult for the megapolitan areas in the west because some megapolitan areas only have a few counties (e.g., the Sun Corridor megapolitan area in Arizona has only four counties). It is hypothesized that the core counties will have a positive association with both creative class dependent variables.

The dummy variable methodology that defines core and periphery counties identified above might be too blunt a variable to capture the nuances of the core/periphery that is evident in megapolitan areas. The compactness of the people living in a city can generate greater population density: people per unit area, in this case, a square kilometer. The greater the population density, the more interactions and commerce there should be resulting in "exuberant diversity" that can enable optimal urban quality of life (Jacobs 1961, p. 196-7). Cities are where people come together and spontaneous face-to-face interactions can frequently lead to innovation and knowledge spillovers. Population density is used in the literature as a finer means to differentiate between the core and periphery. In Europe, "population density seems to have a positive effect on all types of creative class employment" (Boschma and Fritsch, 2009, p. 413). In the United States, "population density is a specific conception of geographic proximity

that better explains and accounts for the actual face-to-face interactions that underlie knowledge spillovers" (Knudsen, *et al.* 2007, p. 25).

Population density is also used to define what is rural in the study areas. A simple rural/urban dichotomy is easy to apply but rarely is effective because most counties have portions that are rural and urban. It is estimated that as few as 29 metropolitan counties are 100 percent urban (Miller, 2006). When disaggregated, counties can range from completely rural to fully urban. The U.S. Census Bureau has several different definitions for urban and rural including using population density: "Urban areas . . . must have a core with a population density of 1,000 persons per square mile and may contain adjoining territory with at least 500 persons per square mile. [Rural areas are] open countryside with population densities less than 500 people per square mile" (Department of Agriculture, 2013). If the 500 person per square mile (193.05 people per square kilometer) standard is applied to the dataset then 3,000 counties are considered rural. To enable nuanced analysis, 30 people per square mile (11.58 people per square kilometer) is a standard used by the Office of Rural Health Policy to define the most rural areas. The national average population density is 99.46 people per square mile (n=3,109 counties). The population density of 500 people per square mile will be used to determine the non-rural or urban/suburban counties in the study. Like the core/periphery variable, the population density is hypothesized to have a positive association with the TAP and TAPE dependent variables.

Measuring the economy of a county in the United States with traditional indicators of economic output can be difficult because gross domestic product (GDP)

data by county is not published although scholars often use proxies for county-level GDP. The wages variable includes salary disbursements and consist of the monetary remuneration to employees and are often used as a proxy for the county's economic situation (Florida *et al.*, 2008).

> [Wage disbursements include] corporate officers salaries and bonuses, commissions, pay-in-kind, incentive payments, and tips. It reflects the amount of payments disbursed, but not necessarily earned during the year. Wage and salary disbursements is measured before deductions, such as social security contributions and union dues. (Bureau of Economic Analysis, 2013b).

The wages variable is useful for analyzing the creative class because members of the creative class produce nearly 50 percent of the national wages while accounting for just 30 percent of the workforce (Figure 3, above). Other scholars have used wages to test the creative class thesis (Hoyman and Faricy, 2009). In the United States, "the creative class has a much stronger positive relationship with wages" (Florida *et al.*, 2008, p. 633). The wages variable is normalized by the total workforce yielding an average wage. Counties with higher average wages are assumed to have a stronger, more diverse economy. It is hypothesized that the averages wages variables is positively associated with both the TAP and TAPE creative class dependent variables. Source for the 2000 and 2010 average wages independent variable is the Bureau of Economic Analysis (2012c).

Percent unemployed is really a workforce indicator of the county's economic situation. Metropolitan areas in the United States with higher percentages of the creative class are more likely to have lower rates of unemployment (Florida, 2012) with similar findings for seven European countries (Clifton and Cooke, 2009). It is expected that the

creative class will cluster in counties with lower rates of unemployment. Based on the findings of earlier scholars, it is hypothesized that the unemployment variable will have a negative association with both the TAP and TAPE dependent variables.

The poverty rate is included in this research to determine if it is more predictive than other variables that typically are indicative of the low economic status of the populace. The poverty rate is defined by for the American Community Survey using different income levels for different family compositions, "The poverty thresholds vary depending upon three criteria: size of family, number of children, and, for one- and two-person families, age of the householder" (U.S. Census Bureau, 2010, page 104). For example, a family with two adults and one child have a lower income threshold ($7,765) to be considered in poverty than a family of two adult and two children ($9,783). Additionally, families over 65 years of age have lower income thresholds as well. The poverty rate of a county is likely highly correlated with the no high school diploma/GED variable. The poverty independent variable is hypothesized to have a negative association with both creative class dependent variables.

With regard to housing occupancy there is either "owner occupied" or "not owner occupied" (i.e., renters). The creative class is often considered "footloose" and ready to follow opportunities so they could likely live in areas where the percent owner occupied is lower because members of the creative tend to be highly mobile therefore less likely to own a home. Areas with lower concentrations of the creative class are expected to have higher percentages of owner-occupied housing. Therefore, the owner-occupied variable is expected to have a negative relationship with the creative class.

Gross rent as percentage of income (GRAPI) is simply rent divided by income and generally considered a measure of cost of living. The densest megapolitan counties are expected to have the highest GRAPI because the rents are so high and likewise expected to have the higher percentages of the creative class. A high GRAPI could also indicate counties with low incomes. GRAPI captures the relative cost of housing so GRAPI is hypothesized to have a positive relationship with the creative class.

A consumer service amenities variable can be considered a relatively crude measure but it is widely used in the literature (Shapiro, 2006; Florida *et al.*, 2008). The consumer service amenities variable is the number of retail and food workers represented at the county level. If more services are provided at the county level then it is assumed there are greater amenities available overall yielding a creative class cluster. Consumer services could be considered a proxy for quality of place (i.e., territorial assets). It is hypothesized that the consumer service amenities variable will have a positive association with the TAP and TAPE creative class dependent variables. The source for the consumer services independent variable is the 2010 North American Industrial Classification System (NAICS) industry data from the U.S. Census Bureau. The consumer services amenities variable is a summation of the food and beverage workers (NAICS 722) and retail workers (NAICS 44-45).

It is well established in the literature that certain tourist destinations have much higher amenities and could expect more members of the creative class to live in these areas. Tourism is used by other scholars (McGranahan and Wojan, 2007; Wojan *et al.*, 2007; McGranahan *et al.*, 2011) and captures business as well as leisure travel. The level

of tourism in an area is indicated by the number of traveler accommodation establishments defined by the NAICS. The number of accommodation workers is a preferable independent variable because it is a more effective surrogate for the number or tourists expected in the area but it is unavailable for all the counties in the study area. The tourism variable could also act as a proxy to capture many of the landscape and climate independent variables (e.g., January temperature, water area, forest area, etc.) used in other creative class research to capture territorial assets because it is assumed that an area that is nice enough to visit likely has many of the amenities that members of the creative class reportedly desire. In this sense, the tourism variable will likely act as a proxy for territorial assets (quality of place) and is hypothesized to have a positive association with the creative class dependent variables.

Positive in migration to a county is indicative of the economic opportunities available for the new residents. Additionally, megapolitan counties with larger rates of in migration are expected to have higher rates of tolerance. It is hypothesized that positive values for the in migration variable will have a positive relationship with both creative class dependent variables.

County population for 2000 and 2010 will be used to establish a population growth rate for each county. It is expected that counties with higher population growth rates will also have higher percentages of the creative class; therefore it is hypothesized that positive population growth will be positively associated with the two creative class dependent variables.

The Hispanic population and Black population variables are included as control variables (Hoyman and Faricy, 2009). As mentioned earlier in Chapter 2 when discussing tolerance, diversity is important for creative municipalities but segregated diversity within a municipality is negatively associated with the creative class (Florida, 2012a). Additionally, there is a "negative correlation between concentrations of high-tech firms and the percentage of nonwhite population [i.e., Black and Hispanic]" (Florida 2012a, p. 246). McGranahan and Wojan (2007) found that the creative class was negatively associated with higher percentages of Hispanics and Blacks. Based on earlier research, it is hypothesized that the variables for Blacks and Hispanics will have a negative association with the two creative class dependent variables.

A large concentration of elderly in a county is likely indicative of a retirement haven, an aged population, or both. Each situation could affect the distribution of the creative class within a megapolitan area and a negative coefficient is hypothesized for both dependent variables. There is a possibility for retirement communities in megapolitan areas in the south; specifically, the counties in the megapolitan area in the state of Florida are expected to have a negative impact on the creative class.

A more youthful population is often considered more likely to be innovative due to the open, more tolerant nature of young, footloose workers. The parallel and contrasting hypothesis is that counties with a large proportion of older or retired workers who are set in their ways can be less innovative. It is hypothesized that the younger the median age is for a county that the higher the concentration of the creative class and the older the median age the less innovative and the fewer members of the creative class.

Therefore, the median age independent variable is expected to have an inverse association with the distribution of the creative class.

The single parent head of household variable has not been used in other research but is included here to determine if this variable affects the distribution of the creative class. Concentrations of single parent households could indicate areas that have high poverty and/or low amenity. Members of the creative class typically reside in areas with high amenity or what Florida calls "quality of place," the fourth "T" of economic development (Florida, 2012a). The single parent head of household variable is hypothesized to have a negative association with both creative class dependent variables.

Children play a large role in the lives of parents and members of the creative class are no exception. "Footloose" creative class are less likely to relocate when a family is in tow. Additionally, children also make location decisions different. A member of the creative class without children might enjoy downtown amenities but children often change the desired amenities. A vibrant arts scene and unique restaurants can give way to demands for nice parks, good schools, big back yards, and other amenities generally more available in suburban areas. In Europe "Florida's model may work for single young professionals or bohemians looking for inspiration or a quick career move and ready to take off at any moment if they see a better chance. But it does not seem to apply to families with children of school age" (Martin-Brelot *et al.*, 2010, p. 868). In Australia, "children [are] a major factor behind decisions to locate in the suburban areas for all sections of the population, including creative workers" (Flew 2012, p. 239). Therefore, it

is hypothesized that higher concentrations of children will have a negative effect on the creative class.

There are several measures of education used in this dissertation. The percent of the workforce with a bachelor's degree is the basis of much human capital theory. McGranahan and Wojan (2007) found that only 56.2 percent of the creative class who live in a metropolitan area have a bachelor's degree in 2003 so creative work does not necessarily require a college degree. McGranahan and Wojan also found "the population of young adults with at least a college degree [i.e., bachelor's degree] is strongly related to the growth of the creative class" (2007, p. 210). Even though other scholars found the bachelor degree variable has as strong positive relationship with the creative class, it is important to include this variable to determine and contrast its effect on the creative class for the megapolitan and non-megapolitan counties. Besides, the research by McGranahan and Wojan (2007) in the United States, the bachelor degree variable had a positive association on the creative class in Spain and Italy (Lazzeretti *et al.*, 2012) and the European Union (Marrocu and Paci, 2012). It is hypothesized that the bachelor degree variable will have a positive association on the creative class in accordance with previous findings.

Another education variable used in this dissertation is the percentage of the populace with an advanced degree (i.e., master's degree, juris doctorate, medical degree, doctor of philosophy). Fewer people have advanced degrees but it will be insightful to see how advanced degrees affect the spatial distribution of the creative class especially when the "eds and meds" occupations are removed in the TAP creative class dependent

variable. Some of the "eds and meds" occupations are expected to have disproportionately higher percentages of advanced degrees because an advanced degree is more likely required in some medical and academic professions. The proportion of the workforce that possesses an advanced degree is hypothesized to have a similar positive relationship with both creative class dependent variables but will likely be more predictive with the TAPE dependent variable because of the inclusion of the "eds and meds" who frequently have advanced degrees.

To contrast with the bachelor and advanced degree variables, a variable that captures the proportion of the population that has no high school diploma/GED[5] is included to see how counties with a lower educated populace will affect the spatial distribution of the creative class. It is hypothesized that this variable will have the opposite relationship of the bachelor degree and advanced degree variables and have a negative association to the TAP and TAPE creative class dependent variables.

[5] A GED is a test that when passed is considered a high school diploma equivalent.

CHAPTER IV

FINDINGS

4.1 Study Area

The study area is made-up of the contiguous 48 state portion of the United States and has 3,109 county and county equivalents; Alaska and Hawaii do not have megapolitan areas and therefore are excluded from the study area. The 3,109 counties included in the study area were further classified in to 654 megapolitan counties (based on Nelson and Lang's methodology) and 2,455 non-megapolitan counties.

Although the 654 megapolitan counties are the central focus of this research, by including the other 2,455 non-megapolitan counties it becomes possible to make some comparative statements. What are the key similarities and differences between both types of counties and is the geography of the creative class explained by a different set of predictor variables at both the megapolitan and non-megapolitan areas? A focus on the megapolitan counties is warranted because they are collectively an important part of the U.S. economy. The 654 megapolitan counties comprise only 17 percent of the landmass of the 48 contiguous United States yet make up 63 percent of the population and 71 percent of the national GDP (Nelson and Lang, 2011; Kotkin, 2010).

4.2 Dependent Variables

There are two dependent variables for the creative class identified in the methods section: the TAPE and TAP creative class. The creative class dependent variable that

most closely follows Florida's methodology is the TAPE creative class that includes all four occupational typologies: technology, arts, professional, and education and medical ("eds and meds"), or TAPE for short (Florida, 2012a). The TAP creative class includes only the technology, arts, and professional occupations while excluding the education and medical workers because "eds and meds" are found to have a negative association with metropolitan economic development (Florida *et al.*, 2008; Florida *et al.*, 2010; Florida, 2012a). Education and medical workers are generally distributed nearly proportionally with the population (McGranahan and Wojan, 2007; Florida, 2012a) with few exceptions like counties with major universities or medical research facilities. Additionally, the education and medical worker subcomponent has an insignificant Pearson correlation to wage growth while the technology, arts, and professional creative class subcomponents have a positive and significant correlation.

The negative correlation between education and medical workers and wage growth is likely the result of several factors. First, a large portion of education workers are teachers in the kindergarten through 12th grade (K-12) public school systems therefore they are public employees who are not part of the private workforce or produce anything that is exportable; education workers at colleges or universities are exceptions due to federal and industry grants, out-of-state tuition, and other state or private funding. Second, with the exception of large research hospitals, medical workers serve the local population where they are providing medical services rather than economic base activities or innovation. Third, like police and firefighters, education and medical workers are considered basic necessities for every municipality (Florida 2012a) and are

distributed in each county in similar fashion; for example, every county has some law enforcement entity and likewise has some education and medical workers to serve the populace. The TAP dependent variable was developed for this dissertation to analyze only the creative class subcomponents that have a positive association to economic development.

The TAP and TAPE creative class dependent variables are normalized by the total workforce in each county for several reasons. First, normalizing the dependent variables mimics Florida's original methodology used to determine the spatial concentrations of the creative class in his own analysis of metropolitan areas (Florida, 2002, 2012a). Second, the normalization controls for county population enabling a comparison of large urban counties like New York County (i.e., Manhattan) to smaller urban, suburban, or even rural counties. The creative class is unevenly distributed through the United States (Florida, 2002, 2012a) and normalizing the total creative class by the workforce enables a study of why some counties have disproportionately large shares of the creative class.

4.2.1 Spatial Distribution of the TAPE Creative Class

Spatial distribution of the TAPE creative class is not uniform (Florida, 2002, 2012a) and many counties have disproportionate shares of the TAPE creative class (Figure 10).

4.2.1.1 TAPE Creative Class by Megapolitan County

The average megapolitan county has 35.62 percent of the labor force employed in the TAPE creative class occupations varying from a high of 65.8 percent in Arlington

County, Virginia to a low of 12.9 percent for Gallatin County, Kentucky (Table 4) with 278 megapolitan counties exceeding the mean.

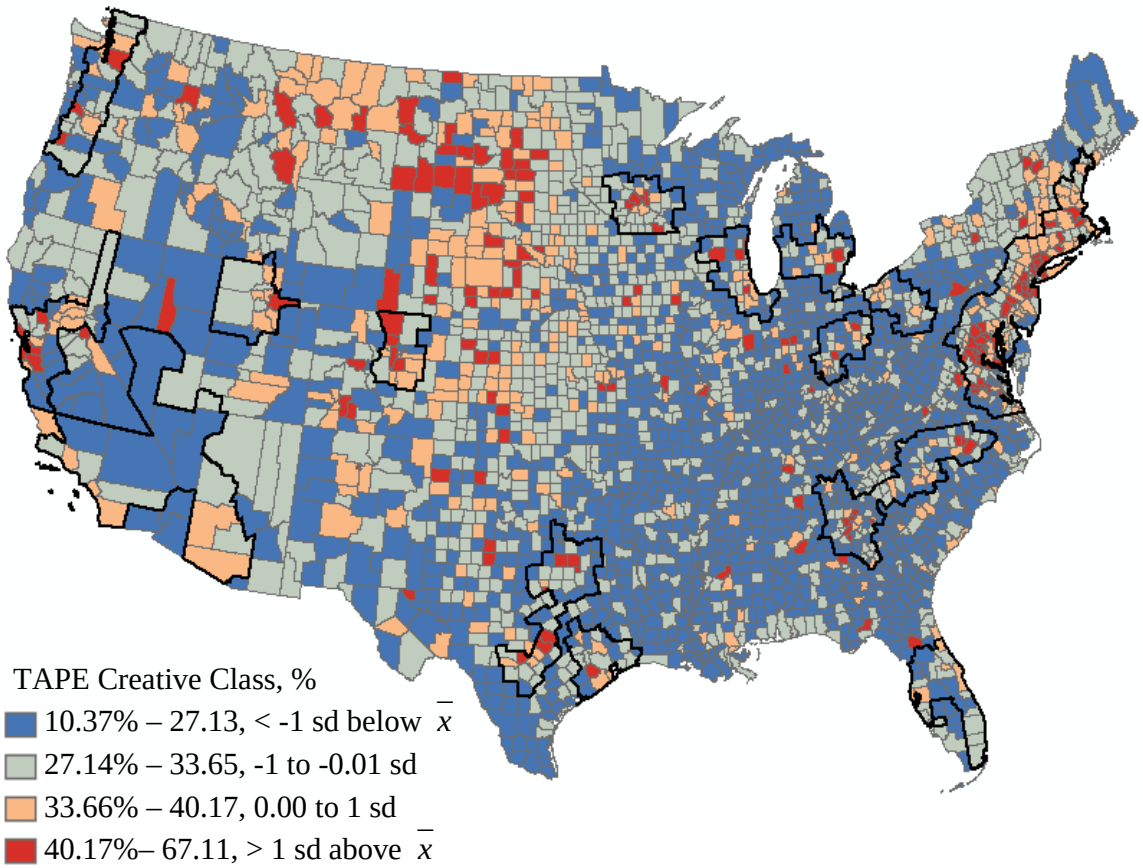

Figure 10. Distribution of the TAPE Creative Class by County.
Normalized by workers, 2005-2010. The mean ($\bar{x}$) for all counties (n = 3,109) is 33.66 percent; the standard deviation (sd) is 6.52 percentage points.

The first impression of the megapolitan counties' rankings for the TAPE creative class is that each of the top twenty counties listed in Table 4 has an above average value for at least two of the technology, arts, and professional creative class subcomponents. By contrast, most of these same top twenty counties have below average scores for the education and medical subcomponent. There are eight counties in the top twenty that are

Table 4. Megapolitan Counties Ranked by TAPE Creative Class. Percentage of the Total Workers in the Labor Force* (n=654).

	Megapolitan County	TAPE*	TAPE Total	Tech*	Arts*	Pro*	Ed& Med*
1	Arlington County, Virginia	65.8%	82,807	14.6%	4.9%	36.8%	9.4%
2	Falls Church city, Virginia	62.9%	3,884	13.3%	5.1%	35.4%	9.2%
3	Howard County, Maryland	57.8%	86,744	15.6%	2.2%	25.6%	14.3%
4	Alexandria city, Virginia	56.9%	47,441	12.5%	4.4%	31.3%	8.7%
5	New York County, New York	55.6%	471,652	5.6%	9.3%	29.3%	11.5%
6	District of Columbia	55.4%	164,600	9.1%	6.1%	30.3%	9.9%
7	Loudoun County, Virginia	55.0%	85,813	15.4%	2.5%	27.7%	9.4%
8	Fairfax County, Virginia	55.0%	313,965	14.0%	2.8%	28.1%	10.0%
9	Montgomery County, Maryland	54.5%	278,948	12.6%	3.8%	25.6%	12.4%
10	Fairfax city, Virginia	53.4%	6,187	13.5%	3.1%	25.0%	11.9%
11	Douglas County, Colorado	50.8%	72,809	11.2%	1.9%	27.8%	9.8%
12	Orange County, North Carolina	50.5%	33,097	9.3%	3.3%	16.8%	21.1%
13	Somerset County, New Jersey	50.3%	82,181	11.1%	2.1%	23.8%	13.3%
14	Boulder County, Colorado	50.2%	76,995	13.5%	3.9%	20.0%	12.9%
15	Delaware County, Ohio	50.0%	42,941	8.4%	2.0%	26.6%	13.0%
16	Middlesex County, Massachusetts	49.9%	391,285	12.0%	2.8%	21.0%	14.0%
17	Marin County, California	49.5%	62,025	7.0%	4.8%	25.1%	12.7%
18	Collin County, Texas	49.0%	187,862	11.5%	1.9%	24.1%	11.5%
19	San Francisco County, California	49.0%	217,791	9.6%	5.0%	24.1%	10.3%
20	York County, Virginia	48.9%	14,223	12.4%	1.6%	19.4%	15.5%
645	Okeechobee County, Florida	19.3%	3,067	1.6%	0.4%	8.5%	8.7%
646	Edgecombe County, North Carolina	18.7%	4,073	1.4%	0.8%	7.4%	9.0%
647	King and Queen County, Virginia	18.5%	596	2.2%	1.0%	10.2%	5.1%
648	Hampshire County, West Virginia	18.4%	1,790	2.6%	0.6%	7.6%	7.6%
649	Ohio County, Indiana	18.3%	579	1.3%	0.6%	8.1%	8.3%
650	Murray County, Georgia	18.1%	2,975	1.7%	0.3%	8.6%	7.6%
651	Chattooga County, Georgia	18.0%	1,784	1.3%	0.7%	6.9%	9.2%
652	Surry County, Virginia	17.9%	587	2.2%	1.4%	8.4%	5.9%
653	Sussex County, Virginia	17.4%	916	1.0%	0.9%	6.8%	8.7%
654	Gallatin County, Kentucky	12.9%	438	0.6%	0.0%	6.7%	5.5%
	Average	35.6%		5.9%	2.1%	16.6%	11.0%
	Standard Deviation	7.6pp		2.6pp	0.8pp	4.1pp	2.0pp

Red Highlight >= 1 standard deviation above megapolitan mean. Blue Highlight < 1 standard deviation below the megapolitan mean. Tech: Technology and Science subcomponent, Arts: Arts, Culture and Media subcomponent, Pro: Business Professionals subcomponent, Eds&Meds: Education and Medical subcomponent. "pp" is percentage points. Source ACS 2006-2010.

below the megapolitan mean for the percentage of the work force in education or medical occupations including Arlington County, Falls Church city, Alexandria city, District of Columbia (Washington D.C.), Loudon County, Fairfax County, Douglas County, and San Francisco County. Alexandria city (ranked 4th) is more than one standard deviation below the mean for the education and medical component (Table 4). Top-twenty megapolitan counties tend to have above average values for technology, arts, or professional occupation subcomponents but not necessarily workers in the education and medical subcomponent. It is not that education and medical workers are necessarily unimportant to the megapolitan counties but the top twenty counties generally have such a diverse, creative economy where education and medical workers play a reduced role.

Another trend for the top twenty megapolitan counties is the geographic proximity of nine of the top ten counties in the Chesapeake megapolitan area (Figure 11) including Arlington County (65.8 percent of the labor force is classified as creative), Falls Church city (62.9), Howard County (57.8), the city of Alexandria (56.9), the District of Columbia (55.4), Loudoun County (55.0), Fairfax County (55.0), Montgomery County (54.5), and the city of Fairfax (53.4). The only county in the TAPE creative class top ten that is not located in the Chesapeake megapolitan area is New York County (i.e., Manhattan) which is part of the New York/Philadelphia megapolitan area.

The Chesapeake megapolitan area features prominently in the creative class rankings for several reasons. First, the sheer volume of counties and county equivalents[6]

[6] A county equivalent is any area treated as a county when the U.S. Census Bureau reports data at the county scale. See footnote 4 for examples.

in the Chesapeake megapolitan area enables many smaller county equivalents to be over represented, such as Falls Church city and Alexandria city that are two and 15 square miles, respectively. Whereas other megapolitan areas frequently have one or two counties that comprise the whole urban/suburban core and generate the lion's share of the creative class occupations in that region, the unique political geography of the Chesapeake megapolitan area, particularly the cities and counties in Virginia, partly explain the proliferation of counties from this megapolitan area in the top-twenty TAPE creative class rankings.

Second, despite the unique political geography that creates many smaller county equivalents, the Chesapeake megapolitan area is undoubtedly a region with a disproportionately large share of the labor force composed of the TAPE creative class due to the high concentration of creative workers that support the federal government in the nation's capital. It is estimated that nearly 85 percent of all non-military, federal workers are in the Washington D.C. metropolitan area. Headquarters of many administrative departments and the judicial and legislative branches of government are collocated in the District of Columbia or nearby in Virginia or Maryland. While the U.S. Federal Government does employ multitudes of non-creative workers like administrative assistants and security guards, the vast bureaucracy of the numerous federal branches and agencies directly and indirectly employ many professional and technology workers.

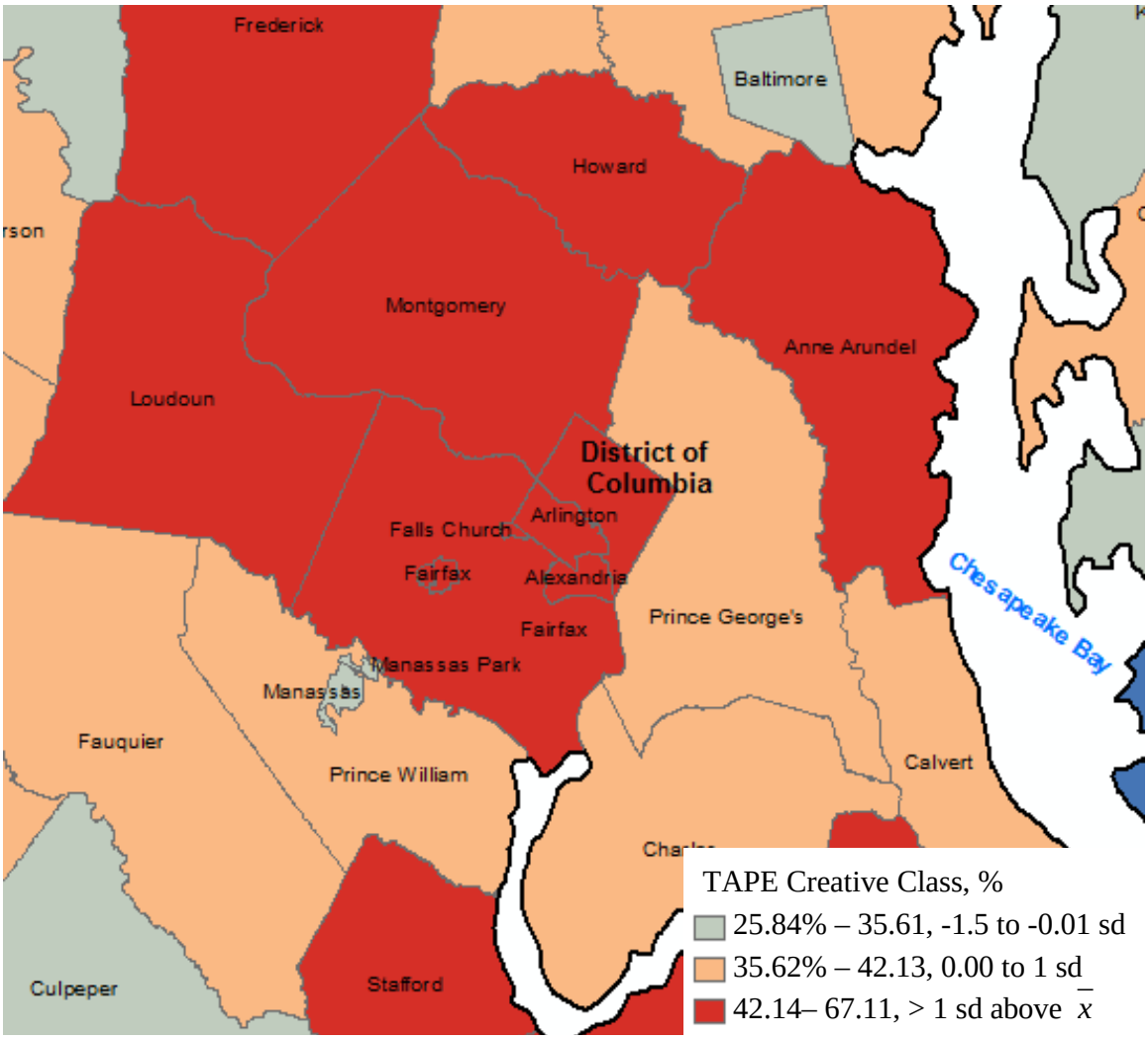

Figure 11. TAPE Creative Class by Megapolitan County, District of Columbia.

Third, Washington D.C. has several congressionally enacted laws that limit building heights thereby reducing the possible density and forcing a spreading of the population outside the federal district into the neighboring counties. As a result of the height restrictions, Washington D.C. has a lower population density than otherwise would be expected for a principle city of its size; 79 percent of its workers in-commute, the highest percent of all U.S. cities (U.S. Census Bureau, 2013a). Without these laws, it

would be expected that Washington D.C. would have very tall office and residential buildings akin to other major cities like Manhattan or Chicago. As a result of the height restrictions Washington D.C. has the lowest population density of any county or county equivalent in the megapolitan area in the top 10 for the TAPE creative class.

Density restrictive laws enabled a spreading of population from the principal city — Washington D.C. — into areas identified as "edge cities." An edge city is a phenomenon that has five characteristics: 1) at least five million square feet of leasable office space, 2) at least 600,000 square feet of leasable retail space, 3) has more jobs than bedrooms, 4) perceived by the population as one place, and 5) was nothing like a "city" as recently as the early 1960s (Garreau 1991, p. 6-7). Counties with edge cities or edge city clusters are common in the top twenty creative class counties.

Arlington County, Virginia — ranked first for the TAPE creative class — is an edge county that includes Crystal City and Rosslyn-Ballston (Garreau 1991), with others emerging like Pentagon City. Arlington County is also home to several major federal agencies' headquarters like the Department of Defense at the Pentagon, the Transportation Safety Administration, and the Drug Enforcement Administration. For all the federal government agencies in the area Falls Church city, Virginia — ranked second after Arlington County — has none. Falls Church city is an independent city adjacent to Arlington and Fairfax Counties, and it is only about two square miles in area but it is densely packed with residents in creative class occupations. Lack of an edge city or federal agency headquarters — like Arlington County — makes Falls Church city a bedroom or commuter community where the creative class disproportionately live and

then depart from for work elsewhere. Falls Church city also has the lowest absolute total creative class workers in the top-twenty because it is essentially a small town in a sea of larger counties. Like Arlington County, Falls Church city is over one standard deviation above the megapolitan average for the technology, arts, and professional subcomponents but has a below average percentage employed in the education and medical subcomponent. Both Arlington County and Falls Church city show a low-Eds&Meds trend that is pervasive throughout the Chesapeake megapolitan area counties in the top ten. Causes for the low-Eds&Meds trend for each county is different because Falls Church city has an above average percentage of children in housing units with 36.0 percent but Arlington County has just 20.8 percent. The low rate of education and medical workers in the counties indicate two possible causes. First, the education and medical workers are actually at the levels needed to support the local populace but the other creative class subcomponents are so massive that the education and medical subcomponent's percentage is artificially driven down by the other subcomponents' high values. Second, the education (e.g., teachers, teacher assistants) and medical workers (e.g., doctors and nurses) who work in these counties are more likely to commute into rather than live in the counties due to cost of living considerations.

Howard County, Maryland, is ranked third for the percent of the population employed in the TAPE creative class and is considered an edge county like Arlington County because it has at least one edge city (Garreau 1991). Despite being an edge county like Arlington County, Howard County's creative class subcomponent of education and medical workers is above the megapolitan county average by more than

one standard deviation (unlike any other in the top ten), along with the technology and professional subcomponents. The overall high percentage of creative class in Howard County results from the edge city that developed due to its relative location in the Chesapeake megapolitan area between Washington D.C. and the city of Baltimore. Additionally, the disproportionate share of education and medical workers in Howard County — a departure from the low-Eds&Meds trend pervasive for the other Chesapeake counties around Washington D.C. — likely results from the split commuting. Split commuting is where one household worker commutes to one metropolitan area (e.g., Baltimore) while the other household worker commutes to a different metropolitan area (e.g., Washington D.C.). Split commuting in the Chesapeake megapolitan area is likely common in the counties between the relative proximate principal cities of Baltimore and Washington D.C. Additionally, the low rates of education and medical workers in other counties could be enabled by Ed&Med out-commuters who live in Howard County but work in other counties. Of all the county and county equivalents around Washington and Baltimore, Howard County has one of the lowest poverty rates with just 4.1 percent or 1.5 standard deviations below the megapolitan mean and an exceedingly high percentage of housing units with children over 40 percent or over one standard deviation above the mean. Average wages for Howard County are relatively high at over $49,000, exceeding the megapolitan mean of $46,510 by nearly $2,500. The arts subcomponent is only slightly above the megapolitan average but within one standard deviation making it a relatively low value among the top twenty counties, it is fourth lowest overall. The

relatively low share of arts workers is unexpected for a county with such high average wages.

Alexandria city, Virginia, is ranked fourth for the TAPE creative class and is adjacent to Washington D.C. and is considered an edge city. In 2014, Alexandria had 22,659 government workers and 71,070 private workers (Alexandria Economic Development Partnership, 2013) and it is unique among the top twenty counties because the education and medical subcomponent is actually below the megapolitan mean by more than one standard deviation. The City of Alexandria's departure below the mean is the lowest for all the top twenty megapolitan counties and follows the low-Eds&Meds trend of Arlington County and Falls Church city. It is expected that Alexandria's low disproportionate share results from the lowest percentage of children in housing units for all the county and county equivalents around Washington D.C. in the Chesapeake megapolitan area with just 20 percent, or 2.4 standard deviations below the megapolitan county mean. With so few housing units with children, it is expected that there is a low disproportionate share of schools in the county equivalent to support the children, therefore fewer teachers. Alexandria city's average wages is even higher than Howard County, it exceeds $50,000, and twice the percentage of arts workers than Howard County. Howard County has relatively similar average wages but drastically different TAPE creative class makeup than Arlington city. This likely results from adjacency of Arlington city to Washington D.C., almost an extension of Washington D.C., while Howard County is an edge county between the principal cities that exhibits characteristics of a split-commute county.

New York County, New York is the borough of Manhattan in New York City and it is ranked fifth for the TAPE creative class, it is the only non-Chesapeake county in the top ten for the TAPE creative class (Table 4). New York County is unique among the top twenty because it has the lowest percentage of technology workers of all the top ten counties with a low but above average value of 5.6 percent. New York County also has the highest percentage of arts workers with 9.3 percent: nine standard deviations above the megapolitan county average.

New York County has a high percentage of TAPE creative class and a high absolute total of TAPE creative class unlike other counties in the top twenty; for example, Falls Church city is ranked second and ahead of New York County for the TAPE creative class with 62.9 percent but Falls Church City has only 3,884 total TAPE workers. New York County has over 120 times as many TAPE creative class workers with 471,652. Other counties that had high absolute values for the TAPE creative class did not have corresponding high percentages like New York County. Los Angeles County, California has the most total TAPE creative class workers with 1.5 million but comprised only 33.1 percent of the total workforce, with a corresponding rank of 239th among the megapolitan counties. Los Angeles County's low overall percentage for the TAPE creative class likely results from its size. Los Angeles County's land area is over 177 times the size of New York County. Peripheral areas with lower percentages of the TAPE creative class are in other counties around New York County but these areas are within Los Angeles County so its geographically large size reduces its percentage of the TAPE creative class despite the overall high value in absolute terms. New York

County's high percentage and high absolute values for the TAPE creative class make it unique among the top twenty.

The District of Columbia (Washington D.C.) is ranked sixth for the TAPE creative class and is considered a downtown from which edge counties and commuter/bedroom counties spread forth. Like New York County, Washington D.C. is a principal city therefore the two counties share similar TAPE creative class distribution characteristics. New York County and Washington D.C. both show the low-Eds&Meds trend. Washington D.C. has over two standard deviations below the megapolitan county mean for children in housing units with just 20.8 percent and New York County has even few with just 18.9 percent. The low-Eds&Meds trend is very likely explained by the second cause identified earlier: education and medical workers commute from lower-cost of living counties into New York County and Washington D.C. where cost of living is much higher. Both New York County and Washington D.C. have low disproportionate shares of the technology subcomponent; New York County has the least among the top twenty while Washington D.C. has the third least after Marin County. Of all the Chesapeake megapolitan counties in the top twenty, Washington D.C. has the highest percentage of arts workers with 6.1 percent, nearly five standard deviations above the megapolitan county average and second only to New York County that has 9.3 percent of its workforce in arts occupations. There are many similarities between the two principal counties in the top ten rankings for the TAPE creative class.

Loudoun and Fairfax Counties in Virginia are ranked seventh and eighth for the TAPE creative class. Loudoun County had an emerging edge city identified in 1991

while Fairfax County has the proto-typical edge city of Tyson's Corners that is frequently used as the primary example of an edge city. Fairfax County also has four other edge cities identified (Garreau 1991). Loudoun and Fairfax Counties share the economic development that results from the presence of the Washington Dulles International Airport that straddles the border between the two counties. Fairfax County is home to the headquarters for the Central Intelligence Agency, and several other federal intelligence agencies while Loudoun County has no major agency's headquarters. Loudoun and Fairfax Counties follow the general trend identified earlier with the technology, arts, and professional subcomponents have values above the megapolitan mean by at least on standard deviation but succumb to the low-Eds&Meds trend with a below average value for the education and medical subcomponent. Loudon and Fairfax Counties have similar causes for the low-Eds&Meds trend as identified earlier for Arlington County and Fairfax city. Both Loudon and Fairfax Counties have above average percentages for children in housing units but Loudon County exceeds the megapolitan mean by more than two standard deviations while Fairfax County is within one standard deviation. It is expected that Fairfax County is better explained by the education and medical workers in-commuting from areas with more affordable cost-of-living. Loudon County's low-Eds&Meds is better explained by the already high percentage of creative workers living in the county that drives down the education and medical occupation percentage. Loudon County's more fringe geographic position would suggest that it acted like Howard County, Maryland that had a high disproportionate share of education and medical

workers suggesting that they out-commuted to other high cost-of-living counties but this is not the case.

Montgomery County, Maryland, is adjacent to Washington D.C. and is ranked ninth for the TAPE creative class. Montgomery County had six edge cities within its borders in 1991 (Garreau, 1991) and certainly more have emerged. There are several federal headquarters in the county including the National Oceanic and Atmospheric Administration (NOAA), U.S. Department of Energy, and others. After Howard County — the only other Maryland county in the top ten — Montgomery County has the second highest percentage of workers in education and medical occupations with 12.4 percent, a relatively high and above average value for the top ten megapolitan counties but still within one standard deviation of the megapolitan mean. Like adjacent Howard County, discussed earlier, it is expected that Montgomery County is acting as a bedroom for education and medical workers who out-commute to the higher cost-of-living counties.

Fairfax city, Virginia, is an independent city that is an enclave in Fairfax County (Figure 11). Fairfax city is only 6.3 square miles and is most similar to Falls Church city because both are small independent cities, in close proximity to Washington D.C., have no federal agency headquarters, and are bedroom/commuter counties for the Chesapeake megapolitan area. Fairfax city's technology, arts, and professional creative class subcomponents are above the megapolitan average by at least one standard deviation while the education and medical subcomponent is above average but within one standard deviation of the mean.

Douglas County, Colorado, is ranked 11th in the TAPE creative class top twenty, in part, because of its location between the two most populous counties in Colorado — El Paso County (Colorado Springs) and Denver County — and is part of the Front Range megapolitan area. Douglas County's relative location enables it to function as a unique sort of bedroom/commuter county with split-commutes — one household worker commutes to one metropolitan area while the other household worker commutes to a different metropolitan area. The vast majority of Douglas County's out-commuters travel north to Denver County and its surrounding counties while a smaller portion commute south to El Paso County (i.e., Colorado Springs) (U.S. Census Bureau, 2013b). Douglas County is one of the fasting growing counties in the United States with a population increase over 60 percent between 2000 and 2010. Proximity to natural amenities and two major metropolitan areas are a few of the reasons why the TAPE creative class concentrations are high in Douglas County, Colorado.

The creative class distribution for Douglas County includes technology workers over two standard deviations above the mean while the professional workers are over 2.7 standard deviations above the mean. The arts workers percentage is above average but within one standard deviation while the education and the medical worker percentage are below average following the low-Eds&Meds trend for the other top TAPE creative class megapolitan counties like the Chesapeake counties already mentioned earlier. Despite the low-Eds&Meds trend identified for Douglas County and many of the previous counties, not all counties have below average education and medical workers. In fact,

some of the top-twenty megapolitan counties for the TAPE creative class have large percentage of the workforce in education and medical occupations.

Orange County, North Carolina, is ranked 12th in the top twenty TAPE creative class rankings and it is unique among the top 20 because it has 21.1 percent of its workforce in education and medical occupations, nearly twice the average for megapolitan counties and 5.1 standard deviations above the mean. Orange County is in the Carolina megapolitan area and home to the University of North Carolina at Chapel Hill (UNC), North Carolina's flagship university. The presence of UNC along with the local K-12 education system, combined with the UNC medical school and hospital creates a disproportionate share of education and medical occupations not otherwise seen in the top twenty rankings for the TAPE creative class. The next megapolitan county that approaches the twenty percent of the work force in education and medical workers is 21st ranked Washtenaw County, Michigan — the home to the University of Michigan at Ann Arbor — which has 19.2 percent of its workforce in education and medical occupations. Orange and Washtenaw Counties are identified as college counties: a county with at least one college/university and an education and medical workforce percentage that is at least two standard deviations above the mean (i.e., greater than 14.9 percent) suggesting that the college dominates the county economy. Of all the top twenty TAPE creative class megapolitan counties, Orange County has the lowest concentration of professional workers with just 16.8 percent, within one standard deviation of the mean while the other 19 counties in the top twenty for the TAPE creative class exceed the mean by at least one standard deviation. Orange County has 3.3 percent of its workforce in arts occupations

which is twice the average and over two standard deviations greater than the mean. Technology workers make up 9.3 percent of the workforce for Orange County. As with the arts occupations, the technology jobs are twice the mean and about two standard deviations more than the mean. The high disproportionate share of education and medical workers in Orange County is attributed to the major research university and hospital as well as its relative location to Raleigh, the capital of North Carolina that is about 30 minutes away driving (sans traffic).

New York County (Manhattan), mentioned earlier, is ranked fifth for the TAPE creative class but Somerset County, New Jersey is another county in the New York/Philadelphia megapolitan area that is in the top 20 for the TAPE creative class. Somerset County is ranked 13th and in northern portion of New Jersey, less than an hour driving distance to Manhattan (sans-traffic). The influence of New York City is so strong that one community located in Somerset County was identified in 1991 as one of New York City's original edge-cities at the confluence of Interstates 278 and 78 (Garreau 1991, p. 432-3). Somerset County has twice the percentage of workers in technology occupations (11.1 percent) than New York County but has less than a quarter of the percentage of arts worker with just 2.1 percent. Somerset County's largest employers include two telecommunications corporations: Verizon Brininess with 3,500 workers and Avaya Inc. with 2,500 employees, a software development company: Cegedim Dendrite with 2,000 employees, and two pharmaceutical companies with extensive research and development: Johnson & Johnson Research & Development and Sanofi-Aventis Us LLC with 2,000 and 1,800 employees, respectively (Somerset County Business Partnership,

2011). The edge city in Somerset County resulted from a confluence of technology and pharmaceutical companies, among other creative industries, in close proximity to New York City.

Douglas County is not the only Front Range megapolitan county in the TAPE creative class top twenty. Boulder County, Colorado is ranked 14th and is in the top twenty for completely different reasons than Douglas County. Douglas County was primarily a commuter county enabling split commutes to Colorado Spring and Denver, but Boulder County is considered separate enough from Denver to be its own metropolitan statistical area on the western edge of the Front Range megapolitan area. Although the state of Colorado has no formally defined downtowns or edge cities in Gareaus's 1991 original work, Boulder would likely be considered a downtown, akin to Orange County, North Carolina, because it has its own local economy that is not as reliant on Denver County. Boulder has had considerable population growth from 1950 to 2010 that ranged from 20 percent to 77 percent per decennial census. Boulder County is also home to the University of Colorado at Boulder. The creative class subcomponents indicate that Boulder County is ranked highly among the top twenty for technology, arts, and education and medical but relatively low for professional. This distribution of creative class seems to indicate that Boulder County's creative class concentration is attributable to the university-started, high-tech research that resulted in a mini-Silicon Valley technology cluster fueled by private and federal defense spending: Department of Defense spending in Boulder was $195.7 million in 2009 (Levinson *et al.*, 2011).

There are many ways that Boulder County mimics Silicon Valley in Santa Clara County, California. First, Boulder County has world renowned research at the University of Colorado at Boulder; Silicon Valley is in Santa Clara County with Stanford University, San Jose State University, and Santa Clara University. Second, when Silicon Valley began to emerge, it was near a major metro: San Francisco. Likewise, Boulder grew into a creative class node near Colorado's most populous city: Denver. Despite the presence of UC-Boulder and the 1,100 tenure or tenure-track faculty (University of Colorado at Boulder, 2014), Boulder County is not a college county because the percentage of the workforce in education and medical occupations is 12.9, only one standard deviation above the megapolitan county mean, not the required two standard deviations identified earlier. Notwithstanding the similarities between Boulder and Santa Clara Counties, Boulder is on a much smaller scale with just under one fifth the total population. Additionally, Boulder has nearly a standard deviation fewer technology workers than Santa Clara County, but twice the percentage for arts workers; the comparison is compelling but not all encompassing.

Delaware County, Ohio is a suburban county outside the beltway of Columbus, Ohio (Franklin County) and is ranked 15th for its TAPE creative class. Amenities of Delaware County seem unexceptional besides its proximity to Columbus. Like Douglas County, Delaware County appears to be another bedroom community or commuter county: a municipality that mainly servers as a location for workers to reside and the workers commute out to other counties for their job. Delaware County has more workers who commute to Franklin County (Columbus) for work (44,131) than workers who stay

within the county (33,468) (U.S. Census Bureau, 2013b). Franklin County (Columbus) has nearly five times as many members of the TAPE creative class as Delaware County but a much smaller percentage; however, Delaware County is 17 percentage points higher than Franklin County for percent of the labor force in the TAPE creative class, meaning that Delaware County has a higher disproportionate share of the TAPE creative class than the nearby downtown. Delaware County is within one standard deviation above the megapolitan county mean for technology and arts workers, greater than one standard deviation above the mean for education and medical workers, but 2.3 standard deviations above the mean for professional workers. The TAPE creative class workforce that lives in Delaware County is decidedly more in the management, legal, business and financial operations occupations of the professional subcomponent of the TAPE creative class, nearly the exact opposite creative class makeup of the previously discussed county of Boulder.

Middlesex County, Massachusetts, is a large county in the New England megapolitan area on the northwest side of Boston and is ranked 16th for its percentage of TAPE creative class workers. It includes cities like Cambridge that is connected to Boston by several bridges. The city of Cambridge is notably the home of major research universities such as Harvard University and the Massachusetts Institute of Technology (MIT). Cambridge's Kendall Square is considered the epicenter of a technology cluster that spreads to Route 128, Boston's equivalent to Silicon Valley. Of the five bio/technology clusters that are in the Boston metropolitan area today, three are in Middlesex County: Waltham (Route 128), Kendall Square, and Somerville (Ramos,

2014). Middlesex County has over 2.3 standard deviations more technology workers than the average megapolitan county. Likewise, professional and arts workers are over one standard deviation above the mean for megapolitan counties. Middlesex is ranked 39th for education and medical workers among the megapolitan counties. It only exceed the mean by 1.5 standard deviations, not the required two standard deviations needed for the college county designation, and nowhere near the five standard deviations for Orange County, North Carolina (the only college county in the top twenty for TAPE creative class identified earlier). Middlesex County is home to three edge cities and two emerging edge cities (Garreau, 1991) therefore it is considered an edge county: a county with an edge city.

Marin County, California, is ranked 17th for the TAPE creative class and is in the Sierra Pacific megapolitan area. Marin County is famously known for being connected to San Francisco County via the Golden Gate Bridge. Marin County is home to Muir Woods National Monument, Mount Tamalpais (where mountain biking is said to be invented), and many other natural and majestic places. Marin County has the second lowest percentage for technology workers among the top twenty TAPE creative class counties with just 7.0 percent, only New York County has fewer. However, by contrast, Marin County is the sixth highest for arts workers with 4.8 percent: 3.4 standard deviations above the megapolitan county mean. Professional workers make up a considerable portion of the workforce with 25.1 percent, which is over 2.1 standard deviations above the megapolitan county mean, but is only the twelfth highest among the top twenty counties for the TAPE creative class. Education and medical workers have an

above average value of 12.7 percent of the workforce but are within one standard deviation above the megapolitan county mean. The city of San Rafael in Marin County was identified as an emerging edge city in 1991 so Marin County is considered an edge county (Garreau, 1991). Marin County is ranked 19th among all 3,109 counties for its average wages with $42,059 per worker but is still below the megapolitan mean of $46,510.

Collin County, Texas, is ranked 18th for the TAPE creative class and is on the northern side of the Dallas/Fort Worth megapolitan area. Collin County had 49 percent of its workforce in TAPE occupations, effectively tied with San Francisco County, California. Collin County is home to the city of Plano that was originally identified as an emerging edge city (Garreau, 1991). The emergence of Plano is still evident as Toyota selected the city as its new North American headquarters in early 2014 (Toyota, 2014). The creative class distribution by subcomponents indicates that Collin County has one of the lowest concentrations of arts workers in the top twenty, only York County, Virginia and Douglas County, Colorado have a lower percentage of arts workers. Collin County slightly above average education and medical workers but slightly below average for arts workers but it is nearly 2.2 standard deviations above the mean for technology and professional workers.

San Francisco County, California, is ranked 19th for the TAPE creative class and is the downtown for the Marin County's edge city. Of the top twenty creative class counties, Marin and San Francisco are the only two non-Chesapeake megapolitan counties that are adjacent. San Francisco County has only 9.6 percent of its workforce in

technology occupations; this is 15th among the top twenty and lower than expected due to its adjacency to Santa Clara County, the home of Silicon Valley. San Francisco was also 15th among the top twenty for professional workers with 24.1 percent. Education and medical workers are 0.7 percentage points below the megapolitan mean of 11.0 percent, within one standard deviation, and follows the low-Eds&Meds trend. San Francisco is disproportionately represented in arts occupations among the top twenty counties for the TAPE creative class; five percent of the work force is in arts occupations, fourth among the top twenty counties and 3.6 standard deviations above the megapolitan county mean.

York County, Virginia, is ranked 20th for the TAPE creative class. York County is in the Chesapeake megapolitan area but it is located in southern Virginian near the port cities of Hampton and Norfolk, relatively removed geographically from Washington D.C.'s but not its economic influence. York County has two military bases that reside within the county: Camp Peary and the Naval Weapons Station Yorktown. The NWS Yorktown was reported to have 2,500 military and civilian workers (Rockett, 2014) but Camp Peary's economic impact and total number of workers is undeterminable because it is one of the Central Intelligence Agency's training bases and information regarding its operations are not released. These NWS Yorktown facilities provides logistics for the Navy while the Camp Peary provides training for other government agencies.

Besides the two government bases that reside within York County, there are two other facilities immediately adjacent to it and York County acts as a gateway: NASA Langley Research Center and Langley Air Force Base (now known as Joint Base Langley-Eustis). There is a higher demand for education and medical workers that arises

from the military bases in and adjacent to York County. Additionally, the York County workforce consists of 15.5 percent education and medical workers and exceeds the megapolitan mean for this sub-component by more than two standard deviations; this would otherwise indicate that it was a college county but there is no college or university within the county. The College of William and Mary and Christopher Newport University are near to York County in the adjacent county equivalents of Williamsburg city and Hampton city; but York County is not considered a college county despite its high percentage of education and medical workers because there is no university within the county. The presence of the large percentage of education and medical workers likely results from the bedroom/commuter county nature of York County. York County ranks 526th of 3,109 counties for percentage of medical workers but it ranks 126th for percentage of education workers indicating that York Counties has a higher disproportionate share of education workers than medical workers, although both are relatively high. The high disproportionate share likely comes from the education and medical workers needed to support the school-aged military dependents that work at the four governmental bases in and adjacent to York County as well as educators and medical workers who live in York County and commute to other counties and county equivalents, similar to Howard County, Maryland mentioned earlier. Of the top twenty, York County ranks 19th for professional workers (only Orange County — the only true college county in the top 20 — has a lower percentage) and 20th for arts workers, 0.5 percentage points below the megapolitan mean of 2.1 percent. The arts sub-component of the TAPE

creative class is likely low due to the numerous military bases in and adjacent to York County.

The Virginian counties around Washington D.C. have higher percentages of the TAPE creative class; however, other counties in Virginia are not as high on the list. Sussex County, Virginia, is ranked 653rd of 654 counties, second from the bottom of the megapolitan counties. It is an inland county that is not considered a central county by the OMB. It is on the extreme southern fringe of the Richmond MSA and adjacent to Surry County, ranked 652nd for the TAPE creative class. Sussex County's population is just 12,000 people, roughly the same population total as it had for census year 1900. This small county on the fringe of a small MSA in the Chesapeake megapolitan area — the same megapolitan area as Washington D.C. — is still likely to grow more than non-megapolitan counties of the same circumstances, but still only modestly. Sussex County has only one percent of its workforce in technology occupations, 1.9 standard deviations below the megapolitan mean. All the creative class subcomponents — technology, arts, professional, and education and medical occupations — are below the megapolitan mean by one standard deviation or more except the arts which is within one standard deviation. Sussex County is mostly rural with a population density of 9.6 people per square kilometer, well below the population density standard set by the U.S. Census Bureau for rural areas.[7] Economic growth for Sussex County will likely result from interstate 95 and the five interstate exits that are within the county boundaries. The dearth of creative class in this county is hard to overcome but its relative location to Richmond and along the I-

[7] See rural definition in methodology discussion of population density.

95 corridor will likely keep it from shrinking while other rural counties decline, especially rural counties far from megapolitan areas and transportation corridors.

The megapolitan county with the lowest percentage of TAPE creative class is Gallatin County, Kentucky. Gallatin County is located along the Indiana/Kentucky border on the southern edge of the Ohio Valley megapolitan area. While not adjacent to another county in the bottom ten for the TAPE creative class rankings for the megapolitan counties, Gallatin County is one county away from Ohio County, Indiana (ranked 649, Table 4). Gallatin County is only one of three megapolitan counties that have no workers (zero) in arts occupations, Cumberland County, Virginia (ranked 641st) and Delta County, Texas (584th) are the two others. Gallatin County's education and medical workers are 2.75 standard deviations below the mean and the professional workers are 2.4 standard deviations below the megapolitan county average.

The TAPE creative class county ranking is informative regarding what type of county has the highest disproportionate share of the TAPE creative class and what is the subcomponent mix that enables the concentrations. The low-Eds&Meds trend identified earlier is unique to the top twenty TAPE megapolitan counties that otherwise have at least an above average value for each of the other subcomponents of the creative class: technology, arts, and professional subcomponents but not the education and medical subcomponent. Below average values for the education and medial workers among the top-twenty megapolitan counties supports the earlier findings that education and medical workers do not contribute to economic development (Florida *et al.*, 2008; Florida *et al.*, 2010, Florida, 2012a) and is another reason to evaluate the creative class without the

education and medical occupations using the next dependent variable: the TAP creative class.

4.2.2 Spatial Distribution of the TAP Creative Class

There are 47,414,175 TAPE creative class workers and 31,659,330 TAP creative class workers — about 66.8 percent of the TAPE total (U.S. Census Bureau, 2012). The TAP creative class does not include the 15,754,845 education and medical workers included in TAPE. The education and medical workers are shifted into the service class suggesting a different overall distribution of the TAP creative class. Most of the TAP creative class is made up of professional (68.7 percent) and technology workers (23 percent) (Table 5).

Table 5. The Portion of the TAPE and TAP Creative Class in Each Subcomponent.

Creative Class Subcomponent	Percent of TAPE*	Percent of TAP*
Technology	15.4%	23.0%
Arts	5.6%	8.3%
Professional	45.9%	68.7%
Education and Medical	33.2%	N/A

* n=3,109

The two creative class dependent variables, TAP and TAPE, are also correlated at 0.96 ($p<0.001$, n=654) using the Pearson correlation coefficient. The TAP and TAPE creative class variables are likewise highly correlated to Florida's creative class measure with R-square values greater than 0.93 for both (Table 6). The TAPE creative class dependent variable's high correlation with Florida's original creative class is expected because Florida's original methodology is closely followed in this dissertation although

the American Community Survey dataset (see methodology, chapter 3) rather than the Bureau of Labor Statistics Occupational Employment Survey data used by Florida. Education and medical workers are moved from the creative class to the service class classification because, under the TAP creative class methodology, these workers provide educational courses and medical procedures (i.e., services) to paying students and/or patients rather than creating "meaningful new forms," the essential element that defines creative workers (Florida, 2002, page, 68). The TAP creative class dependent variable's high correlation to Florida's creative class and the TAPE creative class is surprising; it seems the reduction of the workers included in the TAPE creative class definition by one third has only a small marginal effect on the correlation (Table 6).

Table 6. Creative Class Correlations.

	Florida Creative Class	**Florida Creative Class:** data from Florida's Institute (Florida and Stolarick, 2012)
Creative Class TAPE	**0.96** $p < 0.0001$ $n = 654$	**TAPE**: TAPE Creative Class from ACS data, normalized by total workers
Creative Class TAP	**0.93** $p < 0.0001$ $n = 654$	**TAP**: TAP Creative Class from ACS data, normalized by totals workers

Despite the second dependent variable — the TAP creative class — having a correlation with the TAPE creative class that exceeds 0.96, the spatial distributions are different (Figure 12). Counties with an undiversified county economy with a high disproportionate share of education and/or medical workers had a lower percentage of the

TAP creative class. College counties are an example of where relatively undiversified counties that relied on the education and medical workers for a disproportionate share of the economic base have a much lower creative class percentage when using the TAP creative class methodology compared to the TAPE creative class methodology. For example, Orange County, North Carolina, is a college county due to the presence of the University of North Carolina at Chapel Hill and is ranked 12th among megapolitan counties for the TAPE creative class but drops to 68th for the TAP creative class. Additionally, other less-populated counties that rely on the local K-12 education system and the local hospital for a large portion of their TAPE creative class likewise had a substantial reduction of creative class using the TAP method to measure the creative class (e.g., Brooke County, West Virginia on the western fringe of the Steel Corridor megapolitan area and Kerr County, Texas on the northwest fringe of the Central Texas megapolitan area). As a result of the more narrow definition that removes about a third of the TAPE creative class workers, the TAP creative class mean is 17.6 percent for the megapolitan and non-megapolitan counties (n=3,109), lower than the TAPE creative class average of 33.66 percent.

The spatial distribution of the TAP (Figure 12) and TAPE (Figure 10) creative classes are similar but have interesting differences. For example, Mecklenburg County, North Carolina — home of Charlotte — is much less substantial as a TAP creative class hub in the Piedmont megapolitan area as it was for the TAPE creative class. Orange County, California also has a share of the TAP creative class that is closer to Los Angeles County than it did when using TAPE methodology.

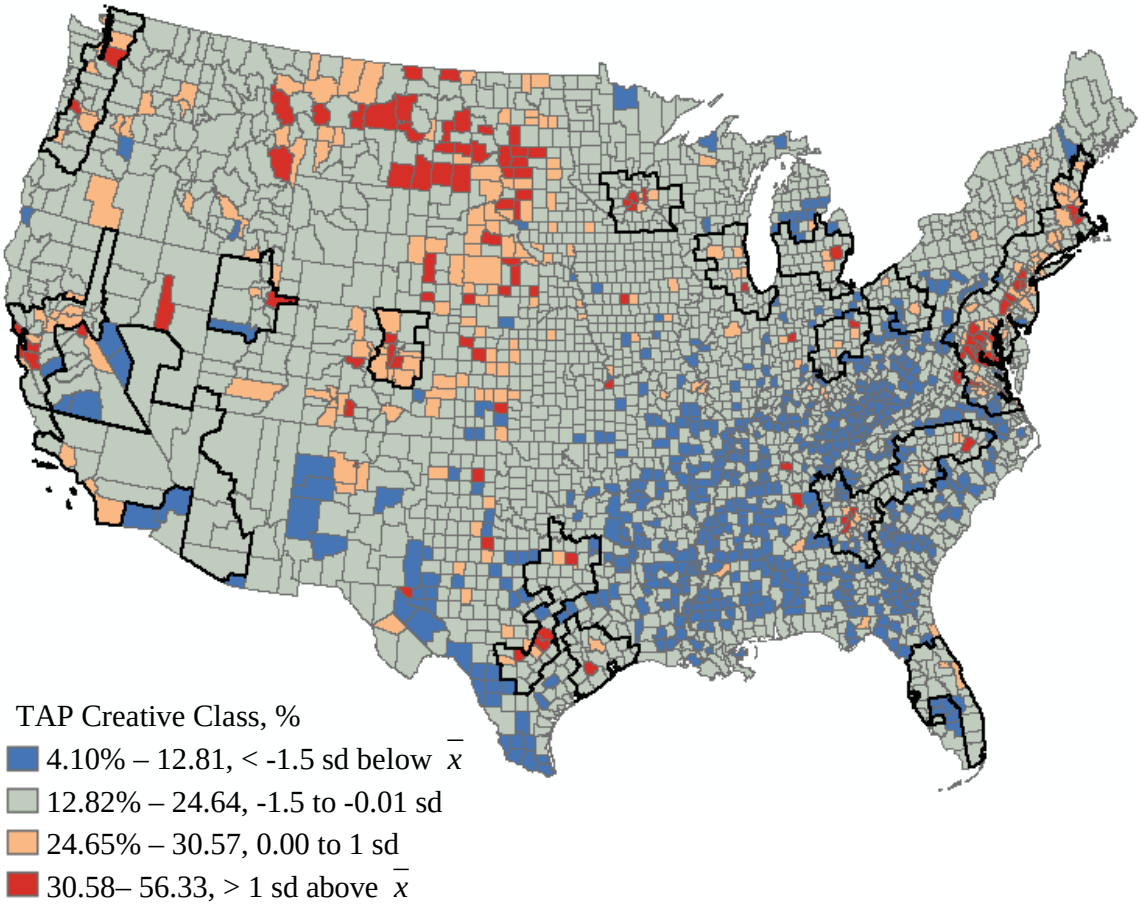

Figure 12. Distribution of the TAP Creative Class by County.
Normalized by workers (n = 3,109). Standard deviation (sd) = 6.86 percentage points, mean ($\bar{x}$) = 24.65 percent. Megapolitan counties are outlined in black.

4.2.2.1 TAP Creative Class by Megapolitan Counties

The percentage of TAP creative class ranges from 56.3 percent in Arlington County, Virginia, to just 7.4 percent for Gallatin County, Kentucky (Table 7). The megapolitan county average (n=654) is 24.7 percent of the workforce in the TAP creative class occupations (over ten percentage points lower than TAPE creative class megapolitan average of 35.6 percent) with 276 megapolitan counties exceeding the mean

Table 7. Megapolitan Counties Ranked by TAP Creative Class. Percentage of the Total Workers in the County Labor Force. (n=654).

	Megapolitan County	TAP	TAP Total	Tech	Arts	Pro	Eds& Meds
1	Arlington County, Virginia	56.3%	70,927	14.6%	4.9%	36.8%	9.4%
2	Falls Church city, Virginia	53.8%	3,319	13.3%	5.1%	35.4%	9.2%
3	Alexandria city, Virginia	48.3%	40,227	12.5%	4.4%	31.3%	8.7%
4	Loudoun County, Virginia	45.6%	71,121	15.4%	2.5%	27.7%	9.4%
5	District of Columbia	45.5%	135,130	9.1%	6.1%	30.3%	9.9%
6	Fairfax County, Virginia	45.0%	257,052	14.0%	2.8%	28.1%	10.0%
7	New York County, New York	44.1%	374,335	5.6%	9.3%	29.3%	11.5%
8	Howard County, Maryland	43.4%	65,210	15.6%	2.2%	25.6%	14.3%
9	Montgomery County, Maryland	42.1%	215,359	12.6%	3.8%	25.6%	12.4%
10	Fairfax city, Virginia	41.5%	4,811	13.5%	3.1%	25.0%	11.9%
11	Douglas County, Colorado	41.0%	58,777	11.2%	1.9%	27.8%	9.8%
12	San Francisco County, California	38.7%	172,146	9.6%	5.0%	24.1%	10.3%
13	Santa Clara County, California	38.5%	325,298	16.3%	2.0%	20.2%	9.4%
14	Collin County, Texas	37.5%	143,638	11.5%	1.9%	24.1%	11.5%
15	Boulder County, Colorado	37.3%	57,252	13.5%	3.9%	20.0%	12.9%
16	Delaware County, Ohio	37.0%	31,761	8.4%	2.0%	26.6%	13.0%
17	Somerset County, New Jersey	37.0%	60,433	11.1%	2.1%	23.8%	13.3%
18	Marin County, California	36.9%	46,143	7.0%	4.8%	25.1%	12.7%
19	Hunterdon County, New Jersey	36.5%	23,676	9.4%	2.5%	24.7%	11.4%
20	Middlesex County, Massachusetts	35.9%	281,600	12.0%	2.8%	21.0%	14.0%
645	Murray County, Georgia	10.5%	1,729	1.7%	0.3%	8.6%	7.6%
646	Upson County, Georgia	10.4%	1,129	2.4%	0.7%	7.2%	9.8%
647	Polk County, Georgia	10.3%	1,753	1.7%	0.6%	7.9%	10.6%
648	Ohio County, Indiana	10.0%	316	1.3%	0.6%	8.1%	8.3%
649	Nottoway County, Virginia	9.8%	659	1.2%	1.1%	7.5%	10.7%
650	Edgecombe County, North Carolina	9.7%	2,112	1.4%	0.8%	7.4%	9.0%
651	Anson County, North Carolina	9.5%	946	0.5%	0.5%	8.5%	11.3%
652	Chattooga County, Georgia	8.9%	879	1.3%	0.7%	6.9%	9.2%
653	Sussex County, Virginia	8.7%	459	1.0%	0.9%	6.8%	8.7%
654	Gallatin County, Kentucky	7.4%	251	0.6%	0.0%	6.7%	5.5%
	Average	24.7%		5.9%	2.1%	16.6%	11.0%
	Standard Deviation	6.9 pp		2.6pp	0.8pp	4.1pp	2.0pp

Red Highlight >= 1 standard deviation above megapolitan mean. Blue Highlight < 1 standard deviation below the megapolitan mean. Tech: Technology and Science subcomponent, Arts: Arts, Culture and Media subcomponent, Pro: Business Professionals subcomponent, Eds&Meds: Education and Medical subcomponent. "pp" is percentage points. Source ACS 2006-2010.

and 378 below the mean. The standard deviation for the TAP creative class in the megapolitan counties is 6.86. Although the top twenty TAP rankings largely mimic the TAPE rankings, counties that moved up in the ranking have a higher relative concentration of technology, arts, and professional workers while those counties that moved down likely have higher concentrations of medical and education workers that, once removed from the creative class definition, thrust the county down the hierarchy. Counties of the Chesapeake megapolitan area around the District of Columbia (Washington D.C.) that were well represented in the TAPE creative class top 20 rankings continue to hold nine of the top ten positions for the TAP creative class rankings, albeit in different positions. These counties generally had the low-Eds&Meds trend of below average shares of the education and medical workers so the TAP creative class methodology had little effect. Like the TAPE creative class rankings, New York County — home to the borough of Manhattan — is the only county in the top ten for TAP creative class that is not located in the Chesapeake Megapolitan area.

The top twenty TAP creative class megapolitan counties include most of the same counties as the TAPE creative class with a few notable exceptions. Santa Clara County, California moved up from 23rd for TAPE to 13th for the TAP creative class. The presence of Santa Clara County, California in the TAP creative class top 20 rankings (Table 7) is not surprising. Santa Clara County is home to the city of San Jose where Silicon Valley is located. Santa Clara County moved up to 13th place for the TAP creative class because it seems the education and medical workers are at lower concentrations in Santa Clara County than other counties in the rankings. Additionally, Santa Clara County has 16.3

percent of its workforce in technology occupations — ranked second overall among megapolitan counties — additionally it is ranked second overall for total technology workers with 137,891. Like New York County was for the TAPE creative class, Santa Clara County has a high percentage and high absolute quantities of the TAP creative class as well as the technology workers.

Hunterdon County, New Jersey, moved from 24th for the TAPE creative class to 19th for the TAP creative class. Hunterdon County is on the western side of Somerset County, New Jersey that was 13th for the TAPE creative class and 17th for the TAP creative class. Due to the adjacency to Somerset County and the proximity to New York City (75 minutes by car, sans traffic), Hunterdon County is an edge county in the top twenty for the TAP creative class for many of the same reasons. Hunterdon is also geographically situated along the Pennsylvania/New Jersey boarder, only 45 minutes (sans traffic) to Lehigh and Northampton Counties of Pennsylvania that make up the Allentown-Bethlehem metropolitan area on the western fringe of the New York/ Philadelphia megapolitan area.

While Hunterdon and Santa Clara Counties now appear in the TAP creative class top twenty, two counties had to move down and off the list to accommodate the new counties. Orange County, North Carolina — the only college county identified in top twenty megapolitan counties — was 12th for TAPE but slid to 68th when using the TAP methodology to measure the creative class. Likewise, York County, Virginia, slipped from 20th to 31st for TAP creative class. Orange and York Counties moved down due to their high disproportionate share of education and medical workers. Orange County was

higher than York County in the TAPE creative class measure but fell further than York County due to the higher proportion of the TAPE creative class that was made up of education and medical workers.

The top twenty counties remained relatively stable and the bottom ten did likewise. Of the ten counties with the lowest percentage of the TAPE creative class, six are also in the bottom ten for the TAP creative class. Gallatin County and Sussex County are ranked second to last and last overall for both the TAPE and TAP creative class rankings. Similarities identified for the top and bottom of the of the TAPE and TAP creative class rankings seem to indicate that there is substantial uniformity between the measures, but there are many counties that had sizeable rank changes resulting from the different methodologies used when measuring the TAPE and TAP creative class.

4.2.2.2 Megapolitan Counties that Rank Changed When Education and Medical Workers are Removed

As one of the four creative class subcomponents, the education and medical workers made up over 33.2 percent of the TAPE creative class for the average megapolitan county and 11.0 percent of the whole workforce for each megapolitan county, on average; however, removing these workers have different effects on each county. Some megapolitan counties had a disproportionately high share of education and medical workers as part of the TAPE creative class (Table 8) while some counties had a low disproportionate share of education and medial workers. Megapolitan counties with a diversified workforce configuration of TAPE creative class are affected less than counties that have a high (or low) disproportionate share of the creative class in education

Table 8. Megapolitan Counties with the Largest Rank Changes When Education and Medical Workers are Removed.

Megapolitan County	Rank Change	EdsMeds / TAPE	Tech	Arts	Pro	Eds& Meds
Rains County, Texas	+179	26.1%	3.3%	0.1%	15.0%	6.5%
Manassas Park city, Virginia	+175	15.7%	**8.6%**	0.6%	16.7%	4.8%
Adams County, Colorado	+168	24.9%	5.2%	1.3%	13.4%	6.6%
Dawson County, Georgia	+163	27.1%	2.2%	1.5%	14.9%	6.9%
Crawford County, Georgia	+152	24.7%	5.6%	0.1%	15.2%	6.8%
Buffalo County, Wisconsin	+150	27.2%	2.0%	0.7%	16.6%	7.2%
Ionia County, Michigan	+129	30.6%	3.5%	1.1%	12.1%	7.4%
San Benito County, California	+128	29.5%	4.0%	0.9%	13.7%	7.8%
Charles City County, Virginia	+125	24.3%	2.1%	0.3%	13.2%	5.0%
Linn County, Oregon	+123	31.1%	3.4%	1.2%	12.2%	7.6%
Clark County, Nevada	+122	30.8%	2.8%	2.2%	12.7%	7.9%
Perry County, Pennsylvania	+121	30.7%	4.4%	0.9%	12.5%	7.9%
San Jacinto County, Texas	+117	29.5%	3.5%	0.7%	11.7%	6.6%
Manassas city, Virginia	+105	23.8%	7.3%	1.3%	15.9%	7.6%
Warren County, Virginia	+105	29.2%	5.8%	1.5%	12.5%	8.2%
Osceola County, Florida	+103	32.5%	2.6%	1.8%	12.2%	8.0%
Barry County, Michigan	+102	32.6%	3.2%	1.4%	11.8%	7.9%
Caroline County, Virginia	+98	26.7%	4.5%	0.9%	16.6%	8.0%
Allegan County, Michigan	+98	32.7%	3.9%	1.3%	12.0%	8.4%
King William County, Virginia	+98	33.2%	4.9%	1.3%	10.4%	8.2%
Kerr County, Texas	-134	**45.1%**	2.5%	1.2%	13.4%	**14.0%**
Ohio County, West Virginia	-141	**46.0%**	2.9%	1.4%	12.1%	**13.9%**
Brooke County, West Virginia	-148	**56.1%**	1.9%	0.7%	9.0%	**14.8%**
Lamar County, Texas	-150	**52.7%**	2.2%	1.0%	9.6%	**14.2%**
Bell County, Texas	-155	**46.9%**	3.3%	0.9%	11.6%	**14.0%**
Hampshire County, Massachusetts	-163	**47.0%**	5.8%	2.7%	13.3%	**19.4%**
Olmsted County, Minnesota	-167	**48.7%**	**8.8%**	1.9%	12.2%	**21.7%**
Brazos County, Texas	-174	**47.3%**	6.5%	1.2%	12.1%	**17.8%**
Clarke County, Georgia	-177	**48.1%**	5.0%	2.6%	12.4%	**18.5%**
White County, Georgia	-192	**49.4%**	3.1%	0.6%	11.6%	**14.8%**
Average		30.8%	5.9%	2.1%	16.6%	11.0%
Standard Deviation		6.9pp	2.6pp	0.8pp	4.1pp	2.0pp

Red Highlight >= 1 standard deviation above megapolitan mean. Blue Highlight < 1 standard deviation below the megapolitan mean. Tech: Technology and Science subcomponent, Arts: Arts, Culture and Media subcomponent, Pro: Business Professionals subcomponent, Eds&Meds: Education and Medical subcomponent. "pp" is percentage points. Source ACS 2006-2010. n=654

and medical occupations. For example, a county with proportional allocations of technology, arts, and professional workers is affected less when education and medical workers are removed from the creative class is one reason why the TAP and TAPE creative class top 20 rankings are remarkably stable. The workforce of the counties at the top of the TAPE and TAP creative class rankings are generally a diversified configuration of the TAPE creative class so that removing the education and medical workers only had minor changes. However, other megapolitan counties had considerable changes in rank when the education and medical workers were removed from the TAPE measure of the creative class.

4.2.2.2.1 Megapolitan Counties that Rank Increased When Education and Medical Workers are Removed

For those megapolitan counties with the largest rank increase when the education and medical workers are removed, many of these counties can be categorized into two general types: 1) counties on the megapolitan fringe, and/or 2) bedroom or commuter counties. Counties that do not fit into these two categorization have unique geographic, economic, or demographic explanations for the dramatic shifts in rank.

Rains County, Texas, is ranked first for the greatest rank increase when the education and medical workers are removed. It jumps from 549th to 370th, from the fourth quartile to the third. Rains County fits the first typology because it is a rural county (defined using population density) on the eastern fringe of the Dallas/ Fort Worth megapolitan area. San Jacinto County — ranked 13th — is another county in Texas that is like Rains County except it is on the north side of the Houston megapolitan area. Both counties have neither a hospital nor any sort of a college. Education and medical workers

made up just 6.5 and 6.6 per cent of the workforce, respectively, well below the megapolitan average of 11.0 percent. This already small portion of the labor force made up just 26.1 and 29.5 percent of the TAPE creative class (EdMed/TAPE column of Table 8, above).

The percentage that the education and medical subcomponent makes up of the TAPE creative class is telling for how a county's ranking will change depending on which methodology is used to measure the creative class, be it TAPE or TAP. The distribution shows the megapolitan counties generally have a low-disproportionate share of the education and medical as a percentage of the TAPE creative class (Figure 13); this likely results from the diversified, creative economies of the megapolitan areas. Counties in the southeast have a general trend of high percentages of the TAPE creative class in the education and medical subcomponent while the counties in the Mountain and Great Plains counties seem to have lower percentages. Interestingly, Orange County, North Carolina — the quintessential college town in the TAPE top twenty for megapolitan counties — is within one standard deviation of the Eds&Meds/TAPE when using the mean for all the 3,109 counties. There are counties where the education and medical workers are over 50 percent of the TAPE creative class and even some with over 70 percent.

The second largest overall rank increase was Manassas Park City, Virginia, which jumped from 310th out of 654 counties to 135th. Manassas Park City is an independent city (i.e., a county equivalent) of only 2.5 square miles but has few economic base entities and serves as a bedroom community for Washington D.C. Manassas Park City

has a low disproportionate share of educational and medical workers so the county equivalent moved substantially higher in the TAP rankings.

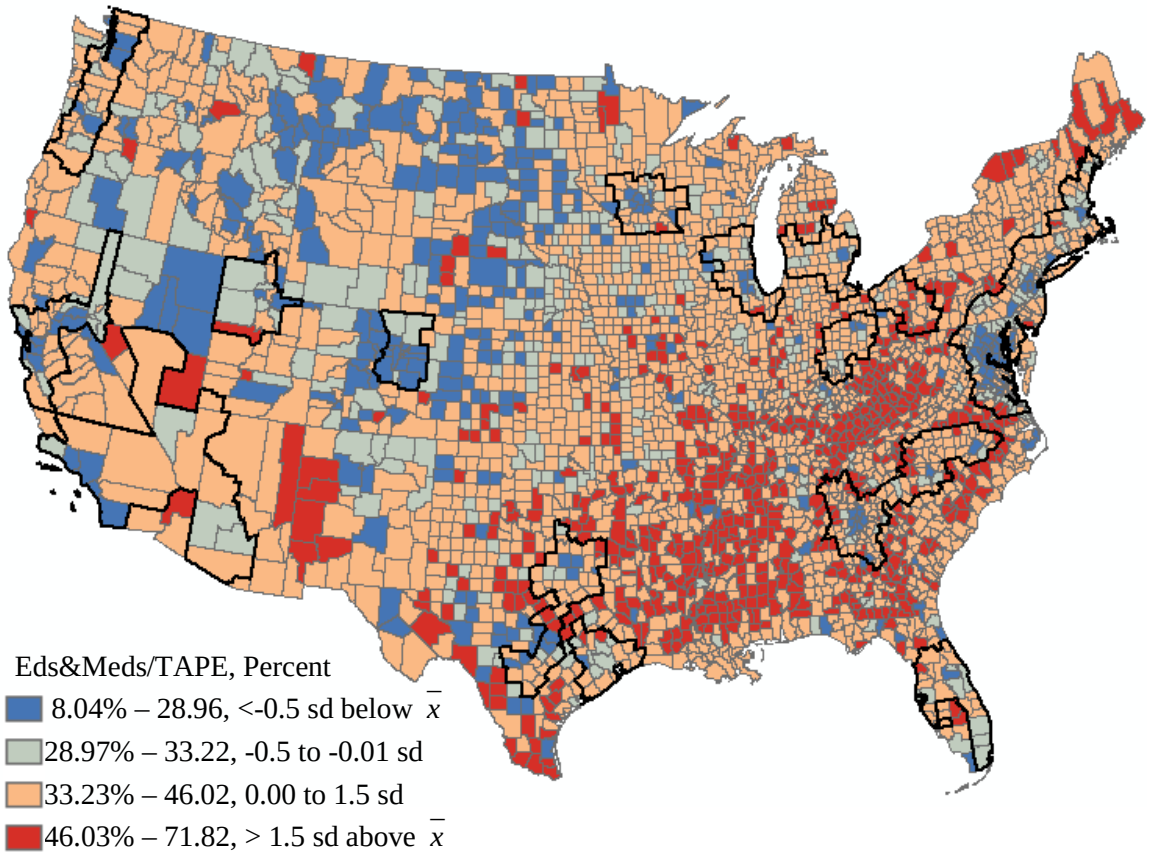

Figure 13. Education and Medical Subcomponent as Percentage of the TAPE Creative Class.
The standard deviation (sd) is 8.53 percentage points and the mean ($\bar{x}$) is 33.23 percent (n=3,109). Megapolitan counties outlined in black.

Manassas Park city, Virginia, is adjacent to Manassas city that is ranked 14th in Table 8 and both fit the second typology of a commuter county or bedroom community. Besides the adjacency and large rank increase, these county equivalents also have low overall TAPE creative class rankings compared to the other counties of northern Chesapeake megapolitan area around Washington D.C. (see Figure 11). Manassas Park

city and Manassas city are the only county equivalents that jumped to the first quartile of counties for the TAP creative class indicating that, among the counties with the largest rank increase, these counties have the highest overall TAP creative class rank: 135 and 162, respectively. Other counties with lower percentages of education and medical workers — Arlington County and Falls Church city, Virginia have 14.3 and 14.5 percent, respectively — are already highly ranked for both TAPE creative class so removing education and medical workers has little or no affect the TAP rankings of these counties.

Adams County, Colorado is ranked third and is similar to Manassas Park city because it is a bedroom community on the northeast side of Denver County in the Front Range megapolitan area. Adams County has multiple two-year and four-year colleges and several hospitals. Despite the presence of the education and medical institutions, Adam's County has the 8th lowest percentage of education and medical workers among all the megapolitan counties (n=654) and these workers makeup the third lowest percentage of the TAPE creative class (EdMed/TAPE column in Table 8, above). The lower percentage of education and medical workers as a portion of the TAPE creative class enables counties to rise in the TAP creative class rankings; conversely, higher percentages enable a decrease in the TAP rankings.

Other counties follow the typology of the fringe county similar to Rains County discussed above. Dawson and Crawford County, Georgia — ranked fourth and fifth, respectively — are on the periphery of the Atlanta megapolitan area. Dawson County is north of the city of Atlanta while Crawford County is southwest of the city of Macon. Dawson and Crawford Counties, like Rains and San Jacinto Counties in Texas mentioned

above, do not have a hospital but both have a two-year technical college. These two Georgia counties are at least two standard deviations below the megapolitan mean for education and medical workers. While Dawson and Crawford County have a similar relative location on the rural fringe in the Atlanta megapolitan area and both have major rank increases when using the TAP dependent variable, there the similarities end. Crawford County's population is over 23 percent Black or African American (BAA) while Dawson County has almost no BAA residents: the Dawson County BAA percentage is less than a tenth of one percent (0.06 percent). Dawson County is below the megapolitan mean for percent of the population without a high school diploma/GED with 15.4 percent while Crawford County above average with 21.3 percent. Comparison of Dawson and Crawford County suggests that there are many socio-economic differences among the counties that caused their substantial rank increase, even for counties within the same megapolitan area.

There are some counties that are anomalies for their striking change in ranking. Buffalo County, Wisconsin, is ranked sixth and is on the southeast fringe of the Twin Cities megapolitan area that is around Minneapolis and St. Paul. It is difficult to assess the underlying characteristics that enabled Buffalo County to move from 476th for TAPE to 326th for megapolitan counties but over 52 percent of the 6,997 workers out-commute. This high level of out-commuting indicates that Buffalo County acts as a commuter county/bedroom community not only for the urban and suburban counties closer to the megapolitan area core but also for other fringe counties. Of the 6,997 workers, 1,283 or 18 percent commute just across the Mississippi River to Winona County, Minnesota —

another fringe county — while just 46 total commuters go the opposite direction (U.S. Census Bureau. 2013b). Additionally, over 10 percent out-commute to non-megapolitan counties like Trempealeau County, Wisconsin that is the adjacent county to the east but not included in the defined megapolitan area (U.S. Census Bureau. 2013b). The out-commuting trend of little economic vitality in the county is also evident in the negative population growth from 2000 to 2010. People are out-commuting from Buffalo County for jobs as well as moving out for better opportunities.

Ionia, Barry, and Allegan Counties form a cluster of adjacent counties in the Michigan Corridor megapolitan area that have substantial rank increases when the education and medical workers are removed. Ionia County is ranked 7th and is considered a split commute county, the more specific form of a bedroom community that lies between two major urban centers enabling commuters in that county to commute to either or both. Ionia County straddles Interstate 96 between the cities of Grand Rapids and Lansing, the state capital. Barry County is ranked 16th and Allegan County is ranked 19th among the counties with the greatest rank increase. Both counties are south of Grand Rapids and are bedroom communities for the city. It seems that each of the three counties have only one hospital which could indicate a lower level of medical workers. Ionia County has only 3.1 percent of the workforce in medical occupations, a whole standard deviation below average for medical workers (average = 4.9 percent, standard deviation = 1.5 percentage points, n=3,109) and Barry County has only 3.9 percent of its workforce in education occupations, a standard deviation below average for education workers (average = 5.9 percent, standard deviation = 1.8 percentage points, n=3,109).

Allegan County has below average values of 4.2 percent for both the medical workforce and the education workforce; while both values are low, they are within one standard deviation of the mean. The cluster of counties in the Michigan Corridor megapolitan area is unexpected and the causes of low concentrations of both medical and education workers is difficult to directly decipher.

There are counties that do not fit into the typology of fringe or commuter counties. Clark County, Nevada is a prime example of this. Clark County is ranked 11th for its rank increase among the megapolitan counties and is home to the major international tourist destination of Las Vegas. Clark County has over 163,467 workers in the accommodations subsector,[8] four times more than the next megapolitan county (Los Angeles County, California), and fifth highest percentage of accommodations workers among megapolitan counties with 19.5 percent. Clark County has a low percentage of education and medial workers despite the presence of several hospitals and major state universities in the county including the University of Nevada, Las Vegas (UNLV) and Nevada State University. The Clark County school district is the fifth largest school district in the United States by enrollment (U.S. Department of Education, 2014). However, despite the large K-12 education system, universities, and hospitals in Clark County, the education and medical workers account for only 7.9 percent of the workforce and 30.8 percent of the TAPE creative class. Clark County's economy is focused on the service class who support its tourist industry. The overall low position of Clark County

[8] North American Industry Classification System (NAICS) 721. The accommodation subsector consists of these industry groups: Traveler Accommodation: NAICS 7211, RV (Recreational Vehicle) Parks and Recreational Camps: NAICS 7212, and Rooming and Boarding Houses: NAICS 7213 (Bureau of Labor Statistics. 2014).

in the TAPE creative class rankings — 517 out of 654 counties — was improved by the TAP creative class methodology that removed the small percentage of education and medical workers that were otherwise underrepresented in the county.

Another set of counties where the rank increased by nearly 100 positions when education and medical workers were removed from the TAPE creative class includes King William County and adjacent Caroline County, Virginia — home of U.S. Army training base Fort A.P. Hill. These counties increased by nearly 100 positions in the TAP rankings because much of the economic base comes from the federal government, specifically the Department of Defense, with a focus on research and development (R&D) or training rather than housing large maneuver units. Counties with military bases focused on R&D or training have three factors that likely explain their rank increase when education and medical workers are removed. First, federal civilian workers and contractor are included in the creative class definition used by Florida and this dissertation, but military personnel are not. Second, training and R&D bases have a smaller military component of the workforce than bases with maneuver units. Finally, training and R&D bases are more likely to have a higher percentage of the workers in technology or professional occupations than the service workers that typically support the large number of people at maneuver bases. King William and Caroline County had a substantial rank increase due to the unique local economic circumstances that arise from the military base focused on training and R&D.

4.2.2.2.2 Megapolitan Counties that Rank Decreased When Education and Medical Workers are Removed

Counties that fell in the creative class ranking when the education and medical workers are removed fit into three general categories: 1) college town/medical town, 2) counties with a high disproportionate share of education and medical workers, or 3) fringe counties with a small population and little economic base where the communities' workforce of education and medical occupations approaches half of the total TAPE creative class. Of course there are exceptions to the classifications but the typology is surprisingly consistent.

There are six counties that are considered college or medical towns: Clarke County, Georgia which is the home of the University of Georgia in the city of Athens; Brazos County, Texas home to Texas A&M University; Olmstead County, Minnesota which hosts the Mayo Clinic; Hampshire County in Western Massachusetts home to the Five College Consortium; and Ohio and Brooke Counties, West Virginia that are lesser populated counties with several small colleges/universities.

Clarke County, Georgia's economic base is the state's flagship university; the education and medical workers makeup 18.5 percent of the total workforce but nearly half (48.1 percent) of the TAPE creative class. With such a high percentage, it is understandable why Clarke County would drop from 127th for the TAPE creative class to 304th for the TAP creative class when the education and medical workers are removed, making it the county with the second largest drop because it is decidedly over represented with education and medical workers.

Brazos County, Texas is another county that is affected by its disproportionate share of education workers resulting from an undiversified, college-town workforce. It is home of Texas A&M's main campus at College Station. Texas A&M University is a "research-intensive, flagship" institution with 2,700 faculty and more than 50,000 undergraduate and 10,000 graduate students (Texas A&M University, 2014). Brazos County was ranked 140th for the TAPE creative class but dropped to 314th for the TAP creative class. Education and medical workers makeup 17.8 percent of the workforce (3.4 standard deviations above the megapolitan mean) and 47.3 percent of the TAPE creative class. Brazos County is another college county with an undiversified workforce that fell in rank when using the TAP creative class methodology.

Olmsted County, Minnesota is south of Minneapolis on Interstate 90 in the Twin Cities megapolitan area. Olmsted County was ranked 36th for the TAPE creative class but dropped to 203rd for the TAP creative class, a reduction of 167 places. The city of Rochester is its county seat and it is home to the Mayo Clinic making Olmsted County the only medical town identified in the study. The Mayo Clinic is world famous for its medical education, treatment, and research. Olmstead County is unique because it is the only county that has a much lower ranking due primarily to the loss of medical workers rather than education workers. There are other locations for Mayo Clinics in the United States but they do not share the same unique context of Olmstead County. There is a Mayo Clinic in Jacksonville, Florida but its county (Duval) is not in a defined megapolitan area. The two Arizona Mayo Clinic campuses are in the very large and economically diverse Maricopa County and therefore its rank is affected much less than

Olmstead County. Olmstead County is also unique among the counties with the highest rank reduction because the technology subcomponent is above average by more than one standard deviation while the rest of the counties are within one standard deviation of the mean, and some are even below average by more than one standard deviation.

Hampshire County is in the western Massachusetts portion of the New England megapolitan area. Amherst College, Mount Holyoke College, Smith College, the University of Massachusetts Amherst, and Hampshire College makeup the Five College Consortium in the county. The combined faculty of the consortium is 2,200 with 30,000 students (Five College Consortium, 2014). Education and medical workers comprise 47 percent of the total TAPE workforce for Hampshire County. When the TAP methodology is used, Hampshire County had a substantial reduction of its rank among megapolitan counties, from 78th for the TAPE creative class to 241st for the TAP creative class.

Ohio and Brooke Counties comprise two of the four counties that make up the northern panhandle of West Virginia. Counties in the panhandle are influenced more by the city of Pittsburgh in the Steel Corridor megapolitan area than they are by any place in adjacent Ohio or even West Virginia. At first glance neither county looks like a college town but they are to a certain extent. Ohio County is home to West Liberty University and Wheeling Jesuit University with a total enrollment of over 2,800 students and 1,500 students, as well as a community college (West Liberty University, 2014; Wheeling Jesuit University, 2014). Brooke County has Bethany College with more than 900 full-time enrolled students and Franciscan University of Steubenville is just across the Ohio

River with over 2,400 undergraduate and graduate students (Bethany College, 2014; Franciscan University of Steubenville, 2013). Despite the presence of these small universities, both counties lack a hospital of any size. Small colleges and universities in each county, combined with the local K-12 public school system are the reason why Ohio and Brooke Counties have such a high disproportionate share of education and medical workers and dropped so many places in the TAP rankings.

Bell County, Texas, is in the second type of county that had a substantial rank reduction because it has a disproportionately high percentage of education and medical workers for a very unique reason. Bell County has several major maneuver units residing at the U.S. Army's Fort Hood with an estimated 58,000 civilian and military workers; however, rather than moving up in the rankings like Caroline County, Virginia with its Army training base, Bell County fell from 341 for TAPE to 456 for TAP creative class, a reduction of 115 places. Counties with a large military base focused on housing maneuver units like an Army or Marine Division are rarely associated with a metropolitan area. Counties will likely fall in the TAP rankings because of the disproportionate share of the workforce in education and medical needed to support the military personnel — who are not included in either the TAPE or TAP creative class — and their dependent families.

The explanation for why Bell County lost position while another military county increased likely resides in the nature of the work done at each base. The county that rose in rankings was identified as a specialized training base. Bell County's Fort Hood is home to large maneuver units and counties with these large military bases generally have

young populations due to the high concentrations of young men and women who serve in the military starting families. Young families require higher concentrations of K-12 teachers and medical workers causing them to be ranked high when the "eds and meds" are included but drop in substantially in rank when they are removed for the TAP creative class. Additionally, military service members are not included in any creative class measure while federal civilians and contractors are included, therefore a substantial portion of Bell County's workforce is not included. Finally, Bell County's economy — like other counties with military bases supporting maneuver units — is service based rather than creative based.

The third type of counties that moved down the creative class rankings when the education and medical workers are removed are those counties that are at the extreme fringe of the megapolitan areas. Fringe counties generally have the local K-12 school district and the local hospital as the two most significant employers. These fringe counties included White County, Georgia and Lamar County, Texas that are the fringe counties around the Atlanta and Dallas/Fort Worth megapolitan areas, respectfully. White County dropped from 334th to 526th (the largest drop by a megapolitan county: 192 places) and Lamar County dropped from 461st to 611th (150 places). White County has no hospital but Lamar County has one. Lamar County has more medical workers than education workers, 7.7 percent medical to 6.5 percent education, as does White County despite the lack of a hospital, 8.2 percent of the workforce are in medical occupations and 6.6 percent are education workers. Fringe counties have dynamics that could cause the counties to increase in the TAP rankings or decrease; it is important to understand the

different occupational distributions that affect the overall rankings for both the TAP and TAPE creative class.

The megapolitan county descriptive analysis provide an understanding of where the creative class are distributed in the most dense and economically dynamic counties of the megapolitan areas of the United States; however, a full understanding of the creative class requires further investigation into the non-megapolitan counties to contrast with the megapolitan counties and enable a nuanced comparison.

4.2.3 TAPE Creative Class, Non-megapolitan Counties

Non-megapolitan counties have a lower average for the TAPE creative class compared to the megapolitan counties. The non-megapolitan average TAPE creative class is 29.9 percent of the labor force, compared to 35.6 percent for the megapolitan counties, with 706 counties exceeding the non-megapolitan county average and 1,749 counties at or below average (Table 9). The maximum value of TAPE creative class is in King County, Texas (population of 286 and 152 total workers) with 67.1 percent and the lowest concentration is in Quitman County, Georgia (population of 2,528 with just 897 total workers) with just 10.4 percent of the labor force in creative occupations.

Counties that dominate the top twenty TAPE creative class rankings for the non-megapolitan counties (Table 9) fall into three rough categories: 1) counties with really small population bases (e.g., King or Loving County, Texas), 2) counties that have unique circumstances that cause them to be non-megapolitan creative class nodes (e.g. Los Alamos County, New Mexico with a federal research facility and Tompkins County, New York with Cornell University), or 3) counties that are near major non-megapolitan

Table 9. Non-megapolitan County Rank by Percentage TAPE Creative Class of the Labor Force.

	Non-megapolitan County	TAPE	TAPE, Total	Tech	Arts	Pro	Eds& Meds
1	King County, Texas	67.1%	102	0.0%	0.0%	45.4%	21.7%
2	Los Alamos County, New Mexico	65.6%	6,183	34.2%	2.6%	16.5%	12.3%
3	Judith Basin County, Montana	61.0%	526	2.3%	2.2%	41.9%	14.5%
4	Loving County, Texas	58.3%	21	0.0%	0.0%	38.9%	19.4%
5	Carter County, Montana	56.7%	423	0.7%	0.9%	50.5%	4.6%
6	Dundy County, Nebraska	52.7%	534	0.0%	1.9%	30.6%	20.2%
7	Wheeler County, Nebraska	52.2%	264	0.0%	0.0%	40.9%	11.3%
8	Harding County, South Dakota	51.5%	335	0.2%	1.4%	39.2%	10.8%
9	Albemarle County, Virginia	50.8%	24,358	8.4%	3.1%	19.5%	19.9%
10	Billings County, North Dakota	50.2%	252	2.6%	1.8%	40.0%	5.8%
11	Williamson County, Tennessee	49.9%	42,503	6.2%	3.6%	25.6%	14.4%
12	Grant County, North Dakota	49.8%	662	1.1%	0.2%	34.5%	14.0%
13	McCone County, Montana	49.6%	468	2.5%	0.5%	38.3%	8.3%
14	Hamilton County, Indiana	49.5%	66,898	8.9%	2.2%	24.3%	14.2%
15	Keya Paha County, Nebraska	49.3%	198	0.2%	0.0%	40.0%	9.0%
16	Arthur County, Nebraska	49.1%	109	0.0%	0.9%	40.1%	8.1%
17	Banner County, Nebraska	48.7%	191	5.6%	0.0%	29.8%	13.3%
18	Petroleum County, Montana	48.6%	136	0.0%	1.8%	37.1%	9.6%
19	Tompkins County, New York	48.2%	24,342	9.6%	3.1%	13.4%	22.1%
20	Slope County, North Dakota	47.1%	190	1.0%	0.5%	38.5%	7.2%
2,446	Atkinson County, Georgia	14.8%	478	1.4%	0.7%	5.0%	7.7%
2,447	Zavala County, Texas	14.5%	559	0.4%	0.0%	4.7%	9.4%
2,448	Webster County, West Virginia	14.3%	485	0.1%	0.0%	6.8%	7.3%
2,449	Charlton County, Georgia	14.2%	640	0.9%	1.4%	8.0%	3.9%
2,450	Hendry County, Florida	13.3%	2,044	1.1%	0.4%	6.6%	5.2%
2,451	Kinney County, Texas	12.7%	122	1.0%	0.0%	8.8%	2.9%
2,452	Clay County, Georgia	12.4%	112	0.0%	0.0%	4.1%	8.3%
2,453	Bath County, Virginia	10.6%	255	0.0%	0.8%	4.7%	5.1%
2,454	Warren County, Georgia	10.4%	229	1.7%	0.0%	4.9%	3.8%
2,455	Quitman County, Georgia	10.4%	93	0.9%	1.8%	3.2%	4.5%
Average		29.9%		3.8%	1.4%	13.2%	11.6%
Standard Deviation		5.9pp		1.7pp	0.8pp	4.8pp	2.4pp

Red Highlight >= 1 standard deviation above megapolitan mean. Blue Highlight < 1 standard deviation below the megapolitan mean. Tech: Technology and Science subcomponent, Arts: Arts, Culture and Media subcomponent, Pro: Business Professionals subcomponent, Eds&Meds: Education and Medical subcomponent. "pp" is percentage points. Source ACS 2006-2010. n=2,455

metropolitan areas (e.g. Hamilton County, Indiana near Indianapolis and Williamson County, Tennessee near Nashville).

The top twenty rankings for the non-megapolitan counties include smaller, suburban counties such as Hamilton County and Williamson County, missing from the any of the rankings is a non-metropolitan county with the principal city for the urban center principal city like Marion County with the city of Indianapolis (ranked 438th) or Davidson County with Nashville (ranked 214th). The top-twenty TAPE creative class rankings for the megapolitan counties had two such principal cities: New York County with Manhattan and Washington D.C. (District of Columbia). It could be assumed that non-megapolitan counties have much less potential to generate a disproportionate share of creative workers than megapolitan counties however the majority of the megapolitan county top twenty for the TAPE creative class is made up of suburban type counties indicating that the megapolitan and non-megapolitan rankings actually have more in common than not.

A difference between the megapolitan and non-megapolitan top twenty counties for the TAPE creative class is the distribution of the creative class subcomponents that makeup the workforce for each county. While the top twenty megapolitan counties were above average in technology, arts, and professional subcomponents and mixed for the education and medical subcomponent, the non-megapolitan top twenty counties are only consistently above average in the professional subcomponent. The other three subcomponents have various degrees of above and below average percentages with some

counties even featuring zero percent of the workforce in some subcomponents: the technology or arts subcomponent, or both.

The first non-megapolitan typology identified for the TAPE creative class includes counties with a low-population base which includes 15 of the top 20 counties. This is an example of the *law of small numbers* where extreme outcomes, both high and low, are more likely found in small populations (Kahneman, 2011); as a result, the high TAPE creative class percentages for the small, rural counties are artifacts of the methodology. As will be show, the artifact is also evident for the counties at the bottom of the list.

King County, Texas is first in the TAPE creative class rankings for non-megapolitan counties and is the prime example of the low-population base phenomenon affecting the TAPE rankings. King County is the second least populated county in the study area (ranked 3,108th of 3,109) while Judith Basin County, Montana is ranked third in the TAPE creative class with a population of just 1,967 and 863 total workers. Loving County, Texas — the least populous county in the study area — ranks fourth in the TAPE creative class ranks. Many of the other counties in the top twenty have this pattern; for example, Carter County, Montana (ranked 5th), Dundy County and Wheeler County, Nebraska (6th and 7th), Harding County, South Dakota (8th), and Billings County, North Dakota (10th), among others, are all in the top ten for the TAPE creative class rankings for non-megapolitan counties with TAPE creative class worker totaling under 600 in aggregate.

The second typology identified for the non-megapolitan counties in the top twenty for the TAPE creative class are counties that have unique circumstances that generate a higher TAPE creative class concentration than might otherwise be expected. Los Alamos County, New Mexico is ranked second for the TAPE creative class among non-megapolitan counties. Los Alamos County has the smallest geographic area of any county in New Mexico but it is home to the Los Alamos National Laboratory — the western home of the Manhattan Project that developed nuclear weapons during World War II. The Lab employs over 9,000 people directly, and many of them are well paid federal researchers and managers. Los Alamos County has the highest technology percentage of all 3,109 counties at 34.2 percent of the labor force, nearly twice the percentage of the second highest county — King George County, Virginia — and more than twice Santa Clara County, California, home to Silicon Valley.

Albemarle County, Virginia is ranked ninth and is another non-megapolitan county with unique circumstances that enables a high percentage of the residents to be in TAPE creative class occupations. Albemarle County surrounds the independent city of Charlottesville, home to the University of Virginia among other, smaller colleges. While Albemarle County is not technically a college county because it does not have a college or university within its political borders, the relative location of UVA enables the county to mimic the characteristics of a college county. Albemarle has a high percentage of education and medical workers (3.7 standard deviations above the non-megapolitan mean) and a high overall TAPE creative class percentage. Albemarle County is unique among the top 20 because each TAPE subcomponent is above average by at least one

standard deviation, only two other counties in the top twenty are like this: Williamson County, Tennessee and Hamilton County, Indiana.

Tompkins County, New York is another unique non-megapolitan county; it is ranked 19th and is a true college county. Tompkins County is home to Cornell University and Ithaca College and has an education and medical worker percentage that is 4.7 standard deviations above the non-megapolitan mean. Tompkins County has all four creative class subcomponents above average but, like the college county in the megapolitan TAPE top twenty: Orange County, the professional subcomponent is within one standard deviation of the mean. Counties with large R&D institutions or college towns rank highly for the TAPE creative class for both megapolitan and non-megapolitan areas and represent unique circumstances that enable these counties to rank so highly among non-megapolitan counties for the TAPE creative class.

There are several large cities in the United States that do not fall inside a megapolitan area; for example, Indianapolis, Indiana, Nashville, Tennessee, and Kansas City, Missouri and each of these function as major cities within large metropolitan areas. This sort of non-megapolitan area can still make major contributions socially and economically but, due to their relative location, are excluded from the megapolitan area analysis. Counties near these large cities in non-megapolitan areas can still have large concentrations of creative workers. For example, Williamson County's relative position on the south side of Nashville, along Interstates 65 and 40, seem to indicate that it acts as a bedroom community for the urban county. Likewise, Hamilton County, just outside the northern edge of Indianapolis's beltway and along Interstate 69 mimics some of the

characteristics of those megapolitan counties that have a high creative class concentration. If Williamson County, Ohio or Douglas County, Indiana were ranked as megapolitan counties they would be 16th and 17th, respectively. As it is, Williamson and Hamilton County have a non-megapolitan ranking of 11th and 14th for the TAPE creative class for non-megapolitan counties.

The non-megapolitan counties with the lowest disproportionate share of the TAPE creative class seem to have four common traits: low population bases, largely rural settings, locations set far from any major city, and likely far from an interstate highway. The low population of the counties at the bottom of the list shows the law of small numbers (Kahneman, 2011), mentioned earlier; the extreme high percentages and extreme lows percentages of Table 9 are generally explained by the small populations of the counties. Despite the similarities of the highest ranked and lowest ranked counties, there are some interesting differences.

Quitman County, Georgia is the lowest ranked non-megapolitan county for the TAPE creative class. It is a rural county located along the Georgia/Alabama state line that is located in the middle of the triangle formed by Interstate 75 (a north/south highway in Georgia that leads to Atlanta), Interstate 65 (a north-east/south-west highway in Alabama that leads to Atlanta), and Interstate 10 (an east/west highway in Florida). Quitman County is in the south-west part of Georgia while the economic centers of the state are in the north-west with Atlanta and Macon, the Atlantic coast with Savannah, or Florida's Gulf Coast. In fact Georgia is well represented in the bottom of the TAPE creative class rankings for non-megapolitan counties with Quitman and adjacent Clay

County in southern-western Georgia along with Warren County in the rural area between Augusta and Atlanta, and Charlton and Atkinson Counties in the southwest. The four characteristics for the low-TAPE creative class non-megapolitan counties — low population, rural, far from any major city, and likely far from an interstate highway — continue for the other non-Georgia counties at the bottom of the TAPE rankings.

4.2.4 TAP Creative Class, Non-megapolitan Counties

Counties that are in the top twenty for the TAPE creative class and the TAP creative class are generally consistent. The top twenty non-megapolitan counties remained largely unchanged but other non-megapolitan counties had some interesting reordering when the creative class was measured without the education and medical workers (TAP instead of TAPE). On average, 18.3 percent of the labor force in non-megapolitan counties were employed in the TAP creative class, compared with 24.7 percent for the megapolitan counties, with 1,064 counties exceeding the non-megapolitan county mean, and 1,391 that are below average. The range of the TAP creative class varied from a high of 53.3 percent in Los Alamos County, New Mexico to a low of 4.1 percent in Clay County, Georgia (Table 10).

The three counties to enter into the TAP creative class top twenty for non-megapolitan areas that were not included in the TAPE creative class top twenty are Prairie County, Montana (rose from 21st for the TAPE creative class to 12th for TAP creative class), Pitkin County, Colorado (from 36th to 15th or the TAP creative class), and Powder River County, Montana (from 43rd to 20th). These three counties share the

Table 10. Non-megapolitan County Rank by Percentage TAP Creative Class of the Labor Force.

	Non-megapolitan County	TAP	TAP Total	Tech	Arts	Pro	Eds& Meds
1	Los Alamos County, New Mexico	53.3%	5,020	34.2%	2.6%	16.5%	12.3%
2	Carter County, Montana	52.1%	389	0.7%	0.9%	50.5%	4.6%
3	Judith Basin County, Montana	46.5%	401	2.3%	2.2%	41.9%	14.5%
4	King County, Texas	45.4%	69	0.0%	0.0%	45.4%	21.7%
5	Billings County, North Dakota	44.4%	223	2.6%	1.8%	40.0%	5.8%
6	McCone County, Montana	41.4%	390	2.5%	0.5%	38.3%	8.3%
7	Arthur County, Nebraska	41.0%	91	0.0%	0.9%	40.1%	8.1%
8	Wheeler County, Nebraska	40.9%	207	0.0%	0.0%	40.9%	11.3%
9	Harding County, South Dakota	40.8%	265	0.2%	1.4%	39.2%	10.8%
10	Keya Paha County, Nebraska	40.3%	162	0.2%	0.0%	40.0%	9.0%
11	Slope County, North Dakota	40.0%	161	1.0%	0.5%	38.5%	7.2%
12	Prairie County, Montana	39.3%	209	0.0%	1.9%	37.4%	7.5%
13	Petroleum County, Montana	38.9%	109	0.0%	1.8%	37.1%	9.6%
14	Loving County, Texas	38.9%	14	0.0%	0.0%	38.9%	19.4%
15	Pitkin County, Colorado	36.7%	3,840	4.5%	8.3%	23.8%	7.0%
16	Grant County, North Dakota	35.8%	476	1.1%	0.2%	34.5%	14.0%
17	Banner County, Nebraska	35.5%	139	5.6%	0.0%	29.8%	13.3%
18	Williamson County, Tennessee	35.5%	30,214	6.2%	3.6%	25.6%	14.4%
19	Hamilton County, Indiana	35.4%	47,753	8.9%	2.2%	24.3%	14.2%
20	Powder River County, Montana	35.3%	313	2.3%	3.2%	29.9%	7.8%
2,446	Hardin County, Illinois	6.7%	102	0.3%	1.2%	5.2%	17.0%
2,447	Warren County, Georgia	6.6%	146	1.7%	0.0%	4.9%	3.8%
2,448	Telfair County, Georgia	6.4%	326	0.2%	0.3%	5.9%	13.3%
2,449	Quitman County, Georgia	5.9%	53	0.9%	1.8%	3.2%	4.5%
2,450	Calhoun County, West Virginia	5.9%	158	0.0%	0.0%	5.9%	9.3%
2,451	Lake County, Tennessee	5.8%	112	2.3%	0.9%	2.6%	9.8%
2,452	Bath County, Virginia	5.5%	133	0.0%	0.8%	4.7%	5.1%
2,453	Clarke County, Mississippi	5.5%	347	0.7%	0.5%	4.3%	13.7%
2,454	Zavala County, Texas	5.1%	197	0.4%	0.0%	4.7%	9.4%
2,455	Clay County, Georgia	4.1%	37	0.0%	0.0%	4.1%	8.3%
Non-megapolitan Average		18.3%		3.8%	1.4%	13.2%	11.6%
Non-megapolitan Standard Deviation		5.3pp		1.7pp	0.8pp	4.8pp	2.4pp

Red Highlight >= 1 standard deviation above megapolitan mean. Blue Highlight < 1 standard deviation below the megapolitan mean. Tech: Technology and Science subcomponent, Arts: Arts, Culture and Media subcomponent, Pro: Business Professionals subcomponent, Eds&Meds: Education and Medical subcomponent. "pp" is percentage points. Source ACS 2006-2010. n=2,455.

characteristic of the education and medical subcomponent being at least one standard deviation below the non-megapolitan mean.

Like the TAPE creative class, the TAP creative class top twenty are only consistently above average for the professional subcomponent while the other three sub-components have both above and below average values. Like the TAP creative class rankings for the megapolitan counties, the college counties fell out of the top twenty rankings. Tompkins and Albemarle County are the two college/quasi-college counties that lost rank when using the TAP creative class. The TAP creative class removes education and medical workers from the creative class definition thereby removing most of the university's workers so Tompkins County fell from 16th for the TAPE creative class to 128th for the TAP creative class and Albemarle County dropped from 9th to 48th. This reduction shows the power of colleges and universities on small counties that have an undiversified workforce. College towns, both inside and outside megapolitan areas, are adversely affected by the removal of education and medical workers from the creative class definition.

Dundy County, Nebraska was the third county to in the TAPE creative class top twenty but not the TAP top twenty. Dundy County is ranked 33rd for the TAP and fell because of its high percentage of education and medical workers: 20.2 percent; King and Loving Counties had an equally high percentage of workers in education and medical occupations (21.7 and 19.4 percent, respectively) but did not fall nearly as much in the rankings due to the high percentage of professional workers that Dundy County does not have.

It is worth noting that there are nearly as many low-population counties in the top twenty for the TAP creative class rankings following the *law of small numbers* (Kahneman, 2011) as there are for the TAPE creative class for non-megapolitan counties. Only four counties have more than 3,000 members of the TAP creative class while the other 16 have less than 500. The TAPE creative class had only one additional county with more than 3,000 workers. The low-population base phenomenon was less evident when analyzing the megapolitan counties but it has a more meaningful role when studying the non-megapolitan counties that include the most unpopulous counties. It is difficult to control for this artifact without removing a substantial and potentially significant portion of the data.

Another interesting aspect of the TAP creative class top twenty is that there are three counties where the TAP creative class consists only of professional workers; the percentage of technology and arts workers is zero (0.0) percent for King and Loving Counties, Texas and Wheeler County, Nebraska. Likewise, Keya Paha County, Nebraska has just 0.2 percent of the workforce in technology occupations and none in the arts. Without the education and medical workers, the TAP creative class measure for non-megapolitan counties is often dominated by the professional occupations resulting in a much less robust measure that elevates counties, especially low-population counties, into appearing as bastions of the TAP creative class.

4.2.4.1 Non-megapolitan Counties that Rank Changed When Education and Medical Workers are Removed

Like the megapolitan counties before, some non-megapolitan counties had considerable rank changes when the education and medical workers were removed. It is understandable that this would occur to some extent because the education and medical workers represent 33.2 percent of the TAPE creative class and removing a third of the workers will enable counties with a high disproportionate share to move down and counties with a low disproportionate share to move up. Counties with the greatest rank change are listed in Table 11. Non-megapolitan counties that have a high value for education and medical subcomponent as a percentage of the TAPE creative class (EdMed/TAPE) fell in the TAP creative class rankings while those counties that had low values rose in the rankings (Figure 13).

4.2.4.1.1 Non-megapolitan Counties that Rank Increased When Education and Medical Workers are Removed

Counties that rose in the TAP creative class rankings benefitted from the removal of education and medical workers therefore it is expected that the counties with the biggest rank increase had a large portion of workers in the technology (T), arts (A), and/or professional (P) occupations or, conversely, a smaller portion of their labor force in the education and medical sectors (E), or a combination of both factors. A county with a small portion of its labor force in the education or medical sectors has fewer members of the creative class to lose compared to other counties when measuring the creative class by the TAP methodology; therefore, as counties have fewer education and medical

Table 11. Non-megapolitan Counties with the Largest Rank Changes When Education and Medical Workers are Removed.

Non-megapolitan County	Rank Change	EdsMeds/ TAPE	Tech	Arts	Pro	Eds& Meds
Crockett County, Texas	+1,364	14.3%	0.4%	0.0%	16.7%	2.9%
McMullen County, Texas	+1,173	13.6%	0.0%	0.0%	**21.8%**	3.4%
Highland County, Virginia	+1,140	21.2%	2.6%	1.5%	14.4%	5.0%
Colusa County, California	+1,087	22.0%	2.5%	0.3%	15.8%	5.2%
Taylor County, Georgia	+1,062	24.0%	2.9%	0.0%	14.1%	5.4%
Lake of the Woods County, Minnesota	+1,061	21.1%	2.8%	1.8%	11.0%	4.2%
Robertson County, Kentucky	+1,036	12.2%	0.9%	0.0%	14.2%	2.1%
Lafayette County, Florida	+1,028	23.1%	0.7%	**2.3%**	15.4%	5.5%
La Salle County, Texas	+1,019	21.6%	0.0%	0.0%	15.3%	4.2%
Grand County, Colorado	+1,006	23.0%	2.8%	1.9%	14.0%	5.6%
Kenedy County, Texas	+983	25.0%	**6.1%**	0.0%	9.6%	5.2%
Franklin County, Iowa	+912	27.6%	1.8%	1.2%	13.7%	6.3%
Sullivan County, Missouri	+905	26.0%	2.0%	1.0%	14.9%	6.3%
Lander County, Nevada	+905	23.9%	4.8%	0.0%	10.0%	4.7%
Archuleta County, Colorado	+900	26.0%	3.5%	1.2%	13.2%	6.3%
Candler County, Georgia	+887	24.7%	3.8%	0.8%	10.2%	4.9%
Evans County, Georgia	+864	27.3%	3.1%	0.2%	14.1%	6.5%
Henry County, Kentucky	+859	28.8%	2.2%	1.4%	12.7%	6.6%
San Augustine County, Texas	+844	27.5%	1.1%	1.5%	14.9%	6.6%
Mercer County, North Dakota	+830	28.9%	4.1%	0.7%	12.0%	6.8%
Limestone County, Texas	-1,182	**57.4%**	1.4%	1.1%	9.9%	**16.7%**
La Salle Parish, Louisiana	-1,211	**57.4%**	1.2%	0.5%	10.8%	**17.0%**
Wheeler County, Oregon	-1,214	**61.2%**	0.8%	0.0%	9.9%	**16.9%**
Rowan County, Kentucky	-1,218	**57.0%**	2.7%	1.1%	10.6%	**19.0%**
Russell County, Kentucky	-1,236	**63.0%**	0.6%	0.2%	9.4%	**17.3%**
Wolfe County, Kentucky	-1,242	39.0%	0.3%	0.2%	7.3%	**19.0%**
Harlan County, Kentucky	-1,246	**59.1%**	1.1%	0.3%	10.3%	**17.0%**
Shannon County, South Dakota	-1,311	**60.4%**	1.0%	1.6%	12.2%	**22.5%**
Johnson County, Illinois	-1,577	**64.8%**	0.8%	0.4%	9.3%	**19.3%**
Knott County, Kentucky	-1,593	**62.0%**	1.8%	1.5%	9.5%	**20.8%**
Average		38.7%	3.8%	1.4%	13.2%	11.0%
Standard Deviation		8.7pp	1.7pp	0.8pp	4.8pp	2.4pp

Red Highlight >= 1 standard deviation above megapolitan mean. Blue Highlight < 1 standard deviation below the megapolitan mean. Tech: Technology and Science subcomponent, Arts: Arts, Culture and Media subcomponent, Pro: Business Professionals subcomponent, Eds&Meds: Education and Medical subcomponent. "pp" is percentage points. Source ACS 2006-2010. n=2,455.

workers it is expected that they are more likely to have an increase in TAP rank over the TAPE creative class rankings. For example, Crockett County, Texas was ranked 2,319th in the TAPE creative class but was now 955th in the TAP creative class rank: the largest rank increase of all the non-megapolitan counties. It has a population of 3,756 in 2010 with just 1,716 workers. The rank increase is partially attributed to the small portion of the workforce in education or medical occupations, just 2.9 percent or the third lowest percentage for all non-megapolitan counties. Crockett County had just 22 workers in education occupations and just 27 workers in medical occupations. The dearth of education and medical workers can be attributed to the lack of a hospital within the county and many of the K-12 educators residing in nearby counties and commuting in.[9]

Crockett County had low totals for both workers in medical occupations and education occupations but it had more medical workers than education workers. Lack of medical workers affects the rise or fall of a county in the TAP rankings more than the education workers because it seems that most counties have some sort of K-12 education systems whereas some counties do not have a hospital. It is understandable that some counties would have no hospital given the low population base, but it seems that all counties have one or more school districts for the county's children. Education and medical workers were assumed to be evenly distributed with the population; this is accurate for education workers and mostly true for medical workers but there are exceptions in the smaller, more remote counties. For example, the county that had the

[9] The Crockett County School District (based in the city of Ozana) has more than 22 teachers employed in the three schools: elementary, middle and high; there are at least 30 educators in the elementary school alone, not counting the middle and high schools suggesting that the remainder of the K-12 educators commute in from other counties. www.Ozonaschools.net (Accessed: June 27, 2014).

second largest rank increase was McMullen County, Texas was ranked 1,530th for the TAPE creative class in non-megapolitan counties but jumped 1,173 places to the rank of 357th for the TAP creative class. McMullen County has a population of only 707 with 496 members of the workforce, no hospital, and only five workers in medical occupations and 12 workers in education occupations. The five workers in medical occupations represent just about one percent of the workforce when the average percent of the workforce in medical occupations is 4.9 and ranges from 0 to 16.8 percent (n=3,109). As the percentage of the workforce in the medical sector approaches zero the greater the rise in the TAP rankings because the county loses very few creative workers when "eds and meds" are removed from the calculations.

Counties that rank at the top of the list with Crocket and McMullen Counties likewise had low populations with low or no medical workers. Highland County, Virginia had the third largest rise in ranking but has no hospital for it population of 2,321. The dearth of medical workers seems to be the main contributing factor found that affects the overall rank change when education and medical workers are removed to make the TAP creative class.

Another contributing factor in the rank changes from TAPE to TAP creative class measures is the population of the county. The five counties with the largest rank increase from their TAPE ranking to their TAP ranking all had county populations below 2,700 people. The low-population phenomenon parallels the county's low or no medical workers because there needs to be a certain number of people in a locale to necessitate

certain medical infrastructure like a hospital. This finding is consistent with the megapolitan counties that had the greatest rank increase (Table 8).

4.2.4.1.2 Non-megapolitan Counties that Rank Decreased When Education and Medical Workers are Removed

Knott County, Kentucky, had the biggest rank reduction for all the non-megapolitan counties: it was 324th for the TAPE creative class and 1,917th for the TAP. Knott County is near the North Carolina border in the Appalachia portion of Kentucky. It has a small college called Alice Lloyd College with a full-time enrollment of about 600 students for 203-2014 (Bailey, 2014). Despite the low enrollment, the college makes Knott County a college county: the college dominates the local economy. There is no hospital in Knott County so the Alice Lloyd College and the local K-12 education system makeup the majority of the education and medical workers that comprise 62 percent of the TAPE creative class (EdsMeds/TAPE). When the education and medical workers are removed from the TAPE creative class, Knott County lost 62 percent of its creative class thereby thrusting it down the hierarchy. Like Knott County where the local creative class is dominated by a small college, Rowan County, Kentucky is dominated by a large public university: Morehead State University (MSU). MSU has more than 11,000 students in the 2012 academic year (Morehead State University, 2014). When education and medical workers are removed, Rowan County lost 57.0 percent of its creative class.

There is a cluster of Appalachian Mountain counties in Kentucky that had substantial rank reductions when the education and medical workers are removed. Harlan, Wolfe, and Russell Counties along with Knott and Rowan Counties discussed above are all in the bottom ten counties located in the eastern mountains of Kentucky.

These counties are part of the geographic cluster in Appalachia that have high values for the education and medical percentage of the TAPE creative class (Figure 13).

Wolfe County, Kentucky had the fifth largest rank drop, from 1,186 to 2,107 when the creative class is measured without the education and medical workers. Education workers alone make up 9.7 percent of the workforce in Wolfe County and workers in medical occupations make up 9.3 percent of the workforce. The large total percent of the education and medical workers is 19.0 percent, 3.1 standard deviations above the non-megapolitan mean enabled Wolfe County's considerable rank reduction when using the TAP creative class measure.

The distribution of the TAPE and TAP creative classes have been analyzed at the megapolitan and non-megapolitan scale and some clusters have been identified but now a formal cluster analysis for all the counties is needed to find just to what degree the creative class is clustered (or dispersed) in the United States.

4.2.5 Cluster Analysis with Getis-ord Gi

To better understand the distribution of the TAPE and TAP creative class, a cluster or hot-spot analysis was conducted. A Getis-ord Gi cluster analysis was conducted with the TAPE and TAP dependent variables as the weighted data based on the spatial dependence of the dependent variable data (Rogerson, 2006). Cluster analysis helps to identify clusters of counties with values higher (and lower) in magnitude than you might expect to find by random chance. Output of the Gi function is a z score for each feature; "a high z score for a feature indicates its neighbors have high attribute values, and vice versa. The higher (or lower) the z score, the stronger the association. A

z score near zero indicates no apparent concentration" (ESRI, 2013). The Getis-ord z scores are then mapped by standard deviation, if a county has a z score that exceeds ± 1.96 standard deviations it statistically significant at the 0.05 level. Getis-ord Gi provides not just clustering or hot spot identification but also counties that generate a cold spot due to the dispersion of the creative class. Cold spots can be considered clusters of non-creative class workers or clusters without creative class.

A weakness of the Getis-ord Gi is that the function turns all the counties into point features at the geometric centroid. The inverse-distance method is used to determine the influence of neighboring counties and the distance calculation method is Euclidean (i.e., straight line from one county centroid to another). This function is based on point data, then represented on the map as polygon data. This polygon to point, back to polygon manipulation of the data could skew some of the relationships, especially in areas with big counties or long counties like southern California, Nevada, or Arizona. The larger counties might not have hot-spot or cold-spot clusters as readily identified as smaller counties.

4.2.5.1 TAPE Creative Class Getis-ord Gi Cluster Analysis

Getis-ord Gi cluster analysis confirms hot-spot clusters of TAPE creative class in certain megapolitan areas; for example, the New England, New York/Philadelphia, Chesapeake (Washington D.C.), Chicago, Twin Cities (Minneapolis), Sierra Pacific (San Francisco), Wasatch Range (Salt Lake City), Front Range (Denver), and Puget Sound (Seattle) megapolitan areas have TAPE creative class hot-spot clusters (Figure 14). Other megapolitan areas have minimal hot-spot clustering in a small portion of their

counties; for example, Southern California, Central Texas, and the Willamette megapolitan areas have just a few counties identified as hot spots. The remaining megapolitan areas are considered cold spots or lack significance for either a hot-spot or a cold spot. For example, the Atlanta and Piedmont megapolitan areas — the economic bastions of the "New South" — are considered TAPE creative class cold-spot clusters or do not show any TAPE creative class clustering that can be considered more than random. The Atlanta megapolitan area is virtually surrounded by counties with a dearth of the creative class. Much of the states that are considered part of the South have a statistically significant absence of TAPE creative class clusters. Other megapolitan areas that do not show a statistically significant clustering of the TAPE creative class are Dallas/Fort Worth, Houston, Florida Atlantic (Miami), Central Florida (Tampa), Steel Corridor (Pittsburgh), Ohio Valley (Columbus), Michigan Corridor (Detroit), Sun Corridor (Phoenix), and Las Vegas.

Another interesting aspect is the large hot-spot cluster in the Great Plains made up of mostly non-megapolitan counties. Nearly the whole states of North Dakota, South Dakota, Montana, and Nebraska are part of the Great Plains TAPE creative class hot-spot cluster with major portions of Colorado and New Mexico attached as well. These non-megapolitan counties are likely statistical significant clusters of the TAPE creative class due to the relatively well-educated, homogenous populations of these states. The creative class deficiency in the South is confirmed when the hot-spot analysis is conducted using un-normalized TAPE creative class data. It was expected that there would be small hot-

spot clusters in the non-megapolitan counties around the major urban centers like Nashville or Saint Lois; however, this was not the case.

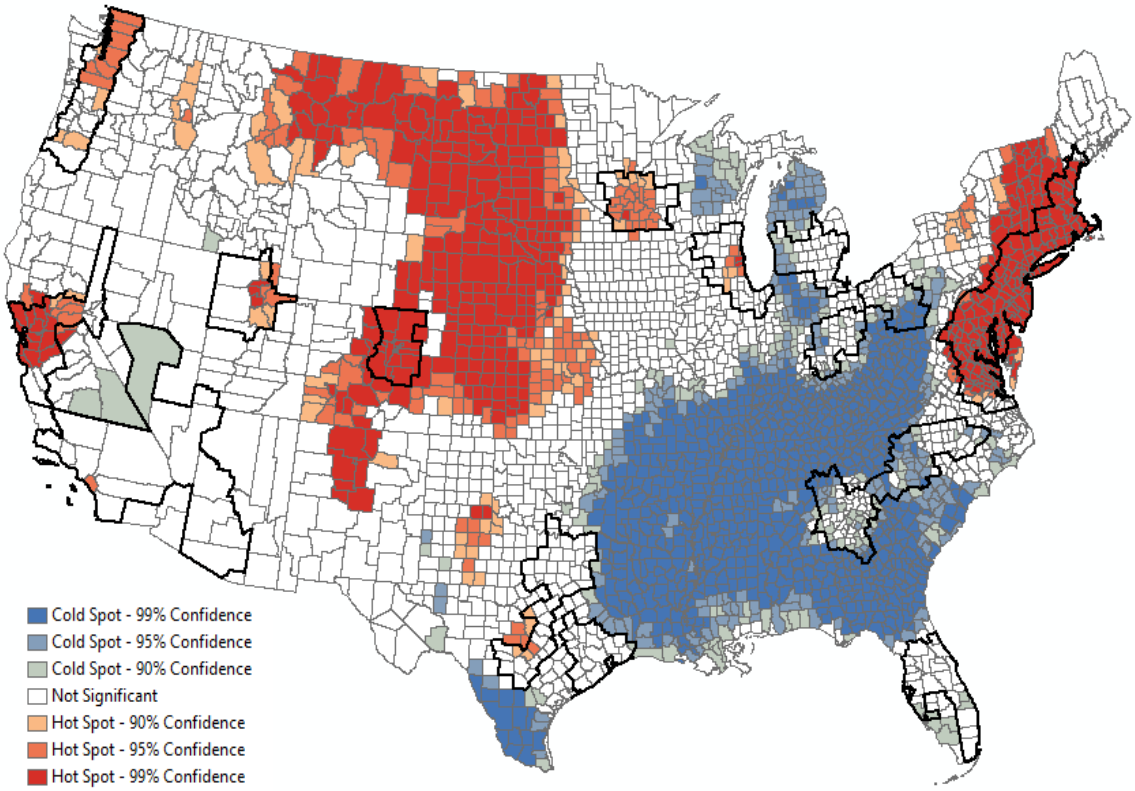

Figure 14. Getis-ord Gi Hot-Spot Analysis for the TAPE Creative Class.
Reds indicate "hot" with a 0.90 confidence interval or greater indicating statistically significant TAPE clustering. Blues indicate "cold" with a 0.90 confidence interval or greater indicating statistically significant counties without TAPE clustering. White counties are not statistically significant. n=3,109

The Great Plains creative class hot-spot cluster supports the Great Plains growth corridor of the resurgent heartland theory of Joel Kotkin (Figure 9) (Kotkin, 2014). Resurgent heartland theory suggests that high-speed communication infrastructure, resource rich, low cost of living, relatively well-educated and relatively homogenous populace, and robust transportation infrastructure will enable the Great Plains region of

the United States to thrive economically in the coming decades. Kotkin's theory runs counter to Richard Florida's central thesis that major cities, especially those along the east and west coasts of the United States, will be the main driver of the economy for the United States.

Kotkin's resurgent heartland theory suggests that the Great Plains are already providing increased employment opportunities in the energy and technology sectors and will increasingly play an important role in the economy for decades to come (Kotkin, 2010) and the TAPE creative class clustering map supports this assertion. However, the other three regions of Kotkin's theory — the Third Coast along the gulf coast of Louisiana and Mississippi, the Inter-mountain West region west of the Great Plains but not including Pacific Coast, and Southeast Manufacturing Belt (Figure 9) — are not substantiated. Only the Great Plains and adjacent portions of the Inter-Mountain West identified by Kotkin are substantiated by this research. The Southeast Manufacturing Belt might be resurgent for its job growth in the working and service classes but it was not found as a place where the creative class cluster. Likewise, the Third Coast had no significant TAPE creative class hot-spot clusters and is adjacent to the Southeast cold-spot cluster. The Third Coast might have job growth resulting from increased container movement at its ports or the recovering off-shore energy industry but the creative class and the creative economy are not prevalent according to the cluster analysis.

Kotkin's analysis of the Great Plains is substantiated by the cluster analysis for the TAPE but he overlooks the substantial clusters in the northeast and the west coast while some of his growth corridors actually are cold-spot clusters for both the TAPE

creative class. Kotkin's resurgent Heartland theory is limited in its explanation of the United States' economic growth patterns. Suggesting that the economic growth will come from the Heartland while dismissing the economic power of the creative economies of the Northeast and west coast is myopic. The Heartland, regardless of the economic growth, is still relatively small and with dispersed pockets of creative enterprises.

While there seems to be two great TAPE creative class clusters in the United States — the Great Plains and the Northeast —they are actually at vastly different scales. The Great Plains TAPE creative class cluster has fewer total workers in creative class occupations than the hot-spot cluster in the Northeast. The 216 counties that makeup the Northeast TAPE hot-spot cluster have 27.8 million total workers with 10.7 million TAPE creative class workers representing 28.5 percent of the workforce, and $1.4 trillion for total wages for 2010. Conversely, the Great Plains cluster is made up of 335 counties, 4.5 million people in the labor force with just 1.6 million workers in TAPE creative class occupations and only $0.18 trillion in total wages for 2010.

Florida's creative capital theory suggest that the cities that provide the most economic and social amenities for the creative class will have the greatest economic growth. Cluster analysis supports Florida's premise because many major cities on the east and west coasts of the United States did have creative class clusters like the New York/Philadelphia and the Sierra Pacific (San Francisco) megapolitan areas. However, Florida's assertion overlooks the rise of the Great Plains TAPE creative class hot-spot cluster. Most of Florida's research overlooks the possibility of a creative class hot-spot cluster that is not associated with a major city. His focus on cities and the metropolitan

areas surrounding the cities prevents him from looking at the creative class hot-spot clusters that are located outside the bounds of metropolitan areas.

Results of the TAPE and TAP cluster analysis indicate that both Florida's and Kotkin's theories are actually correct to a certain extent and even mutually supporting. Florida's theory supports the TAPE and TAP creative class cluster in the megapolitan areas on the east and west coasts while Kotkin's theory supports the hot-spot cluster in the Great Plains. Conversely, neither Florida nor Kotkin's theory fully explains the clustering of the TAPE and TAP creative class in the United States, especially in the Southeast.

When examining the essential socio-economic differences between the hot-spot and cold-spot counties, it is clear that stark distinctions rapidly emerge (Table 12). Average wages for the hot-spot counties (i.e., $49,984) is higher than the average wages for the megapolitan counties (i.e., $46,510). Similar trends are evident for the unemployment rate, poverty rate, GRAPI, percent single parent households, percent bachelors, and percent TAPE creative class where the hot-spot counties out-perform even the megapolitan counties. One exception to the rule is the population growth rate (i.e., 5.98%) which is the lower than the population growth rate for the megapolitan, non-megapolitan, and cold-spot counties.

Florida has commented that population growth is not always tied to economic growth, "Many regions that grow population experience little or no economic growth. In fact, there is no correlation between the two" (Florida, 2012a, page 41). Population growth is often considered a proxy for economic growth, but this is often not the case. In

addition, many of the hot-spot counties are located in the Great Plains where population growth rates have been, at best, sluggish while many of the Southeastern counties in the TAPE creative class cold spot experienced substantive population growth.

Table 12. Descriptive Statistics for the TAPE Hot-Spot and Cold-Spot Counties

Independent Variable Name	Mega Mean	Non-mega Mean	Cold-Spot Mean*	Hot-Spot Mean**
Population Density, people per square kilometer	1,658	16.95	38.00	59.39
Average Wages, $	$46,510	$35,946	$36,403	$49,984
Unemployed, %	7.86%	7.41%	9.21%	5.52%
Poverty Rate, %	12.55%	15.86%	16.99%	11.04%
Gross Rent as Percentage of Income (GRAPI), %	29.88%	27.49%	29.41	26.62%
Population Growth Rate, %	9.01%	6.16%	7.16%	5.98%
Median Age, years	38.40	40.29	39.21	41.1%
Single Parent Head of Household, %	15.84	15.17	17.71	13.19%
Bachelor's Degree, %	26.83%	20.83%	20.57%	28.36%
TAPE Creative Class, % of labor force	35.62%	29.89%	29.56%	38.21%

* Cold-Spot mean is for the counties with a Gi z-score less than -1.96 (n=1030).
** Hot Spot mean is for the counties with a Gi z-score greater than 1.96 (n=629).

4.2.5.2 TAP Creative Class Getis-ord Gi Cluster Analysis

The TAP cluster analysis yields a similar clustering and non-clustering of the creative class as the TAPE findings above; however, there are differences. For example, when the TAP creative class measure is used without the education and medical workers, the scarcity of the creative class in the Southeast is exacerbated (Figure 15). TAP creative class clusters are made up of more counties in the 95 percent confidence interval

(Gi z-score ± 1.96). There are 33 more counties in the hot-spot for the TAP creative class for a total of 662 and 18 more counties in the TAP cold spot for a total of 1,048 counties.

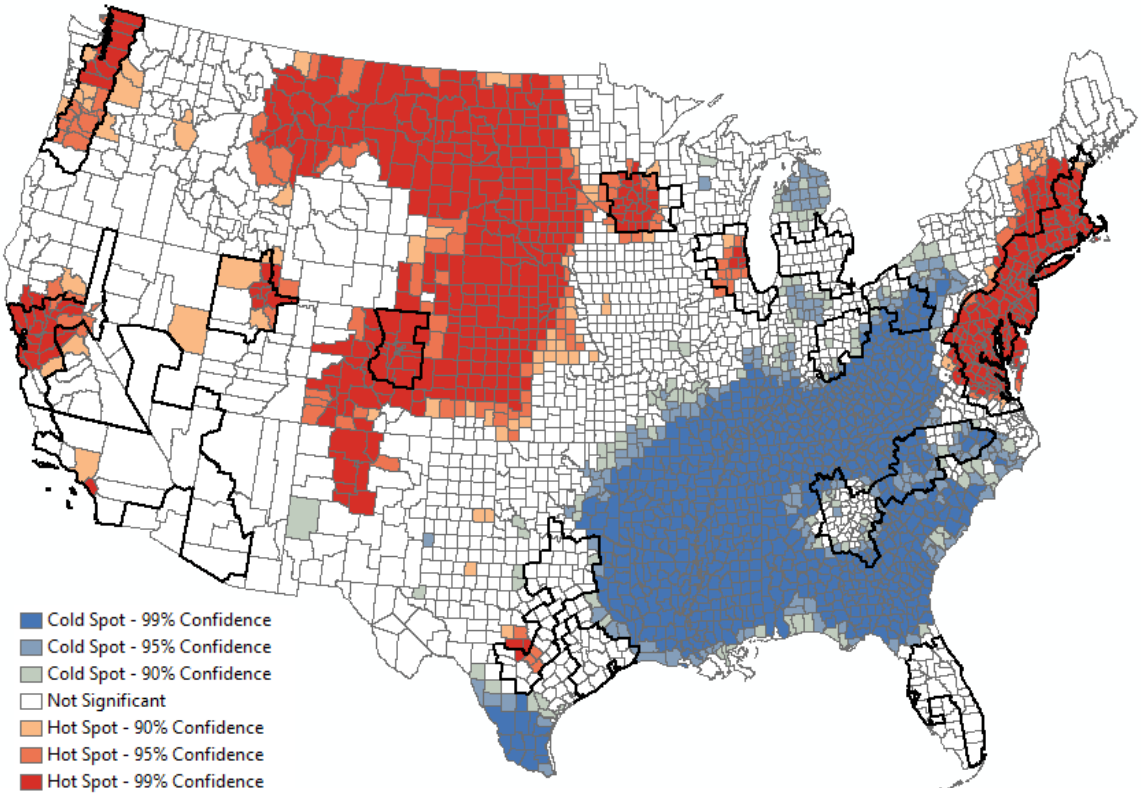

Figure 15. Getis-ord Gi Hot-Spot Analysis for TAP Creative Class.
Reds indicate "hot" with a 0.90 confidence interval or greater indicating statistically significant TAP clustering. Blues indicate "cold" with a 0.90 confidence interval or greater indicating counties without statistically significant TAP clustering. White counties are not statistically significant. n=3,109.

Other differences include the Twin Cities (Minneapolis) and Chicago megapolitan areas' TAP creative class cluster are larger and more significant than the TAPE creative class. The Great Plains creative class cluster in North Dakota, South Dakota, Nebraska and Kansas is more pronounced for the TAP creative class, covering more of each state.

Like the TAPE creative class cluster analysis, the New York/Philadelphia, New England, and Chesapeake megapolitan areas of the Northeast, the Sierra Pacifica (San Francisco), Southern California, the Twin Cities (Minneapolis), Front Range (Denver), and the Chicago megapolitan areas have some sort of hot-spot creative class clusters. Conversely, Las Vegas, Sun Corridor (Phoenix), Michigan Corridor, Steel Corridor (Pittsburgh), and Ohio Valley (Columbus) megapolitan areas do not have a significant creative class hot spot. Additionally, the seven megapolitan areas south of the North Carolina/Virginia line do not have a statistically significant TAP creative class cluster; the Atlanta and Carolinas megapolitan areas are surrounded by a scarcity of the TAP creative class.

Descriptive statistics for counties in the TAPE creative class hot and cold spots (Table 13) follow the trend established by the TAPE creative class cluster analysis. Like the TAPE creative class, most of the socio-economic variables examined indicate a strong economy where average wages and percent bachelor's degrees are higher for the TAP creative class hot-spot cluster counties than the megapolitan counties. Socio-economic variables that suggest a strong economy with low values (e.g., unemployment, poverty) are likewise lower than the mean for the megapolitan counties. The exception to this generality is the population growth variable.

Like with the TAPE hot spot, the population growth rate is still low compared to the megapolitan county average of over nine percent but its relative increase to the TAPE creative class is surprising. The low population growth rate for the TAP creative class hot-spot counties likely has a similar explanation as the TAPE creative class. The

Northeast and especially the Great Plains where the TAP creative class hotspots are most pronounced have had lower population growth than the southeast where the TAPE creative class cold spot is located.

Table 13. Descriptive Statistics for the TAP Hot-Spot and Cold-Spot Counties.

Independent Variable Name	Mega Mean	Non-mega Mean	Cold-Spot Mean*	Hot-Spot Mean**
Population Density, People per square kilometer	1,658	16.95	39.92	56.59
Wage and Salary, $	$46,510	$35,946	$36,570	$49,676
Unemployed, %	7.86%	7.41%	9.15%	5.63%
Poverty Rate, %	12.55%	15.86%	17.06%	11.06%
Gross Rent as Percentage of Income (GRAPI), %	29.88%	27.49%	29.42%	26.71%
Population Growth Rate, %	9.01%	6.16%	7.52%	6.40%
Median Age, years	38.40	40.29	39.19	41.00
Single Parent Head of Household, %	15.84%	15.17%	17.92%	13.11%
Bachelor's Degree, %	26.83%	20.83%	20.91%	28.28%
TAP Creative Class, % of labor force	24.65%	18.31%	18.16%	26.64%

* Cold-Spot mean is for counties with a Gi z-score less than -1.96 (n=1,048).
** Hot Spot mean is for counties with a Gi z-score greater than 1.96 (n=662).

Hot-spot and cold-spot clusters for the TAP creative class mimic the TAPE creative class clusters. The Great Plains TAP creative class cluster is supported by Kotkin's resurgent heartland theory discussed earlier and the megapolitan based hot-spot clusters are supported by Florida's creative capital theory of economic development.

Spatial clustering of the TAPE and TAP creative class in all the counties, megapolitan and non-megapolitan alike, is insightful and enables a better understanding of distribution of the TAPE and TAP creative class. The creative class cluster analysis

indicates that studying the creative class in the megapolitan areas alone will overlook the substantial creative class cluster in the non-megapolitan areas like the Great Plains hot-spot cluster and, possibly, over-emphasize megapolitan areas that do not have identified creative class hot-spot clusters like the Carolinas and Atlanta megapolitan areas. Non-megapolitan counties still have hot-spot clusters of workers in creative occupations that will be further enabled by the low-cost of living and abundant natural resources of the Heartland. The regression analysis that follows will identify the socio-economic variables that best explain the distribution of the TAPE and TAP creative class in both the megapolitan and non-megapolitan counties.

4.3 Regression Analysis

The purpose of this regression analysis is to specify and test the functional relationships that exist between the percent of the workforce that is classified as part of the creative class and various independent variables. Regression analysis will include four separate regression models: two models for both the TAPE creative class and two for the TAP creative class for both megapolitan and non-megapolitan counties. Independent variables listed in Table 14 were largely obtained from the American Community Survey.

A simple understanding of the relationship between the independent variables and the dependent variables is the first step of a regression analysis. One way to determine the relationship is by using covariance, or the average of two variables respective deviation from their mean (Rogerson, 2006). A variable's covariance with another is standardized by dividing the result by the standard deviation to yield a unit-less correlation coefficient with a value from negative one to one (-1 to 1). The correlation

Table 14. Independent Variables Used in Regression Analysis.

	Independent Variable	Independent Variable Definition*
Geographic	Core/Periphery	Core/periphery: Dummy Variable, 1: Central County, 0: Not Central County, OMB definition
	Population Density	Population Density: People per Square Kilometer
Economic	Average Wages, $	Wage and Salary, average per worker
	Unemployment Rate, %	Unemployed percentage of the labor force, percent
	Poverty Rate, %	Poverty, percent
	Owner Occupied, %	Owner Occupied, percent of Housing Units
	Gross Rent as Percentage of Income (GRAPI), %	Gross Rent as Percent of Income, median, percent
	Consumer Services Employment	Consumer Amenities workers (Retail and Food, NAICS 44-45, 721), total
	Tourism Accommodation Establishments	Accommodation Establishments, NAICS 721, total
Demographic	In Migration Rate, %	Migration into the county, percent of Population
	Population Growth Rate, 2000-2010, %	Population Growth 2000-2010, percent of Population
	Hispanic, %	Hispanic, Percent of Population
	Black, %	Black/African American, percent of Population
	Elderly, %	Elderly, percent of population
	Median Age	Age, median
	Single Parent Head of Household, %	Single Parent, percent of Households
	Housing Units with Children, %	Housing Units with children, percent of Housing Units
Education	No High School or GED, %	Education, No High School or GED, percent
	Bachelor's Degree, %	Education, Bachelor Degree, percent
	Professional or Graduate Degree, %	Education, Professional Degree or Graduate Degree, percent

*All values for 2010 unless specified.

coefficient between the two variables — in this case, the TAPE or TAP creative class and each independent variable — can be greater than zero indicating a positive relationship or the value can be negative indicating a negative or inverse relationship. "The correlation coefficient is a measure of the strength of the *linear* association between variables" (Rogerson, 2006, page 155). Closer the correlation coefficient is to one or negative one (1 or -1) then the strength of the association is relatively stronger than correlation coefficients that approach zero. Correlation coefficients between the dependent variables and the independent variables are reported in Table 15.

A regression analysis has several assumptions that must be addressed and this is the second step of the regression analysis. The first assumption is the errors (i.e., residuals) have a mean of zero (0), and constant variance: the assumption of homogeneity of variance, also called homoscedasticity. The second assumption is that the residuals are independent, meaning that values of one observation's error is not affected by the value of another observation's error: the assumption of independence. The Getis-Ord Gi analysis showed the spatial dependence of the data but is generally unavoidable with spatial data and limited by using data reported for the whole population. The third assumption is that for each independent variable (x), the errors have a normal distribution and are centered around the regression line: the assumption of normality. The final assumption is the independent variables have a low correlation: the assumption of no multicollinearity. (Rogerson, 2006). Each model is tested using SAS procedures and SAS plots and each of the models chosen for the four dependent variables met the assumptions of homoscedasticity, independence, normality, and non-multicollinearity.

Table 15. Pearson Correlation Coefficients of Potential Predictor Variables with the Creative Class Dependent Variables.

	Independent Variable Name	TAPE Mega	TAP Mega	TAPE Non-Mega	TAP Non-mega
Geographic	Core/Periphery	0.280**	0.237**	0.099**	0.024
	Population Density	0.222**	0.240**	0.146**	0.085**
Economic	Wages, Average, $	0.802**	0.836**	0.404**	0.409**
	Unemployment Rate, %	-0.502**	-0.494**	-0.433**	-0.483**
	Poverty Rate, %	-0.509**	-0.543**	-0.354**	-0.453**
	Owner Occupied, %	-0.144**	-0.130**	-0.115**	-0.025
	GRAPI, %	0.034	-0.012	-0.211**	-0.309**
	Consumer Services Employment	0.202**	0.226**	0.17308	0.127**
	Tourism Establishments	0.253**	0.273**	0.210**	0.172**
Demographic	In Migration Rate, %	0.249**	0.283**	0.028	0.023
	Population Growth Rate, 2000-2010, %	0.148**	0.185**	-0.024	-0.027
	Hispanic, %	0.072	0.108*	-0.094**	-0.060*
	Black, %	-0.057	-0.059**	-0.230**	-0.290**
	Elderly, %	-0.313**	-0.351**	0.089**	0.163**
	Median Age	-0.158**	-0.157**	0.092**	0.198**
	Single Parent Head of Household, %	-0.329**	-0.324**	-0.390**	-0.454**
	Housing Units with Children, %	0.092*	0.122**	-0.204**	-0.225**
Education	No High School or GED, %	-0.637**	-0.601**	-0.560**	-0.578**
	Bachelor's Degree, %	0.914**	0.900**	0.700**	0.671**
	Professional or Graduate Degree, %	0.910**	0.866**	0.525**	0.391**

*Correlation is significant at the 0.05 level (2-tailed).
**Correlation is significant at the 0.01 level (2-tailed).

The assumption of no multicollinearity indicated that two independent variables should not be used in the regression modeling. Education variables — bachelor degree, graduate/professional degree, no high school/GED — are highly correlated with each other. The bachelor degree variable is more rooted in the literature and has a higher

correlation with the TAPE and TAP dependent variables than either the graduate/professional degree or the no-high-school/GED independent variables so the bachelor degree variable is retained and the other two education variables are removed from the modeling. As a result, 18 independent variables remain for the regression analysis. Any multicollinearity in the model is assessed using the variance inflation factor (VIF).

There are several different methods that can be used to determine a regression model. In this dissertation, the overall goal is to generate the most parsimonious model: a model with the fewest variables that explains a substantive portion of the variance in the dependent variable. A stepwise linear regression analysis was performed to assess quantitatively the relationships between the TAPE and TAP creative class reported from the 2006-2010 American Community Survey and the selected socio-economic variables by megapolitan and non-megapolitan county.

The model diagnostic technique examined each significant independent variable identified by the stepwise selection procedures until the newly added independent variable generated a negligible increase in the R-Square. In this dissertation, the minimum partial R-Square increase considered worth the added complexity of an additional independent variable was an increase of about 0.02. The model diagnostics techniques used to identify the most parsimonious model included an acceptable root mean square error, condition index, VIF score, and correspondingly high R-square scores for the megapolitan and non-megapolitan models for both the TAPE and TAP creative class.

Regression assumptions of normality, homoscedasticity, independence, and non-multicollinearity (mentioned earlier) were met for each of the four models. The variance inflation factor (VIF) and condition number (CN) are two key diagnostic tools. A low VIF indicates acceptable multicollinearity. Generally, VIF values under five (5) are considered a sign of acceptable multicollinearity (Rogerson, 2006). In practice, the VIF for all the models would ideally be about three or less, although a weakness of the VIF is "the lack of a meaningful boundary to distinguish between values of VIF that can be considered high and those that can be considered low" (Belsey *et al.*,2004, page 93). The TAPE and TAP creative class models both have a VIF above three but this is determined acceptable because it is below five and other measures of multicollinearity are also acceptable.

Condition numbers (CN) between five and 10 indicate that weak dependencies might start affecting the regression model and moderate to strong relations are associated with condition numbers between 30 and 100. When a model has a CN value approaching 100 then there is an increasing amount of numerical error (Belsey *et al.*, 2004). The CN for each of the models is above 10 but well below 100. The largest CN is for the TAP creative class model for non-megapolitan counties suggesting the numerical error is the largest for this model, but still within acceptable standards; the model also has the lowest VIF for all four models. All models and all selected independent variables were significant at the $p<0.001$ level.

4.3.1 TAPE Regression Analysis, Megapolitan Counties

It is important to understand the various statistical ranges and values for the 18 variables used in the regression analysis; the descriptive statistics for the megapolitan counties are reported in Table 16. The 654 megapolitan counties have different averages, standard deviations, minimums, and maximums for the independent variables than the 2,455 non-megapolitan counties. The TAPE and TAP creative class megapolitan averages are 35.62 and 24.65, respectively. Interestingly, the population growth rate ranges from a low of negative 11 percent to over 90 percent. The megapolitan county range for average wages is $9,703 to $56,429. Likewise, the ranges for the percent Hispanic and Black range from zero or nearly zero to 64 and 79 percent, respectively.

The final regression model for the percent of the workforce in TAPE creative class occupations by megapolitan county explained 86.8 percent of the variation based on two predictor variables: the population aged 25 years and over with a bachelor's degree as a percentage of the labor force (bachelor's degrees) and average wages (Model 2, Table 17).

Overall, the final model suggests that for every percentage point increase in the percent of the population aged 25 or older with at least a bachelor's degree, the percentage of the workforce classified as part of the TAPE creative class by megapolitan county will increase by 0.008 percent. By contrast, for every dollar increase in the average wages of a megapolitan county, the TAPE creative class will increase by 0.0000034 percent; by extrapolation, for every $1,000 increase in the average wages of a megapolitan county the TAPE creative class will increase by 0.00034 percent.

Table 16. Descriptive Statistics for Megapolitan County Variables.

	Variable	Mean	sd	Min	Max
Dependent Variable	TAPE, %	35.62%	7.60	12.91	65.76%
	TAP, %	24.65%	6.86	7.40	56.33%
Geographic	Population Density	1,658	1,408	0.93	26,771
Economic	Average Wages, $	$46,510	$7,470	$9,703	$56,429
	Unemployment Rate, %	7.86%	2.37	1.40%	16.20%
	Poverty Rate, %	12.55%	4.75	1.09%	33.40%
	Owner Occupied, %	64.73%	9.34	20.70%	91.33%
	GRAPI, %	29.88%	3.05	16.70%	49.80%
	Consumer Services Employment	2,019	4,442	32	73,683
	Tourism Establishments	46.47	85.69	0.00	1,196
Demographic	In Migration Rate, %	6.15%	3.05	0.00%	27.60%
	Population Growth Rate, 2000-2010, %	9.01%	13.84	-11.38%	93.61
	Hispanic, %	19.01%	10.45	0.20%	64.00%
	Black, %	13.05%	12.57	0.00%	79.14%
	Elderly, %	12.13%	3.81	5.40%	40.68%
	Median Age	38.40	4.24	23.10	61.40
	Single Parent Head of Household, %	15.84%	3.76	4.50%	38.50%
	Housing Units with Children, %	33.66%	5.62	12.80%	51.10%
Education	No High School or GED, %	20.10%	6.08	2.40%	38.62%
	Bachelor's Degree, %	26.83%	6.17	3.57%	37.15%
	Professional or Graduate Degree, %	16.06%	5.12	1.20%	40.60%

One way to understand the relative strength of each predictor variable in the selected model is to analyze the value of the standardized estimate, also called the standardized coefficient, Beta or β in the table. "The standardized estimates are the parameter estimates that result when all variables are standardized to a mean of 0 and a variance of 1" (SAS, 2014). Higher the absolute value of the standardized estimate, the stronger the relative relationship is with the dependent variable. Standardized estimates enable a more easily understandable comparison of the relative strength of the independent variables in the model regardless of the units used to measure the variables.

Table 17. Regression Models Indicating Associations between Socio-economic Variables and the Percent TAPE Creative Class by Megapolitan County.

	Variable	Model R^2	b	SE b	β	p-value	VIF	CN*
Model 1	Constant	0.835	0.138	0.003		0.000		5.32
	Bachelors, %		0.011	0.0001	0.91	0.000	1	
Model 2	Constant	0.868	0.109	0.004		0.000		13.6
	Bachelors, %		0.008	3.20E-04	0.63	0.000	3.34	
	Average Wages, $		3.40E-06	2.64E-06	0.33	0.000	3.34	
Model 3	Constant	0.877	0.146	0.007		0.000		19.2
	Bachelors, %		0.007	3.24E-04	0.58	0.000	3.66	
	Average Wages, $		4.16E-06	2.81E-07	0.41	0.000	4.01	
	Housing Units with Children, %		-0.001	2.05E-04	-0.10	0.000	1.22	

*CN is the condition number that is equal to the highest condition index for the model. Final model is highlighted.

The standardized estimate is used to determine which predictor variable has a relatively stronger effect for the two predictor variables in the model: percent bachelor's degrees and average wages. The percent bachelor's degree predictor variable was the dominant variable with a standardized estimate of 0.63 compared with the average wages predictor variable's standardized estimate of 0.33. A one standard deviation (6.17 percent) increase in percent bachelor's degree leads to a 0.63 standard deviation or 4.79 percent increase in predicted TAPE creative class, with all other variables held constant. And, a one standard deviation or $7,470 increase in average wages, in turn, leads to an increase of 0.33 standard deviations or 2.51 percent in the TAPE creative class, with the other variables in the model held constant.

The bachelor's degree variable was already considered dominant because it was in the one variable model (i.e., Model 1, Table 17) that already explained 83.5 percent of the variance. The average wages predictor variable increases the R-Square slightly

(about 0.033) but its inclusion generated a relatively strong standardized estimate indicating that it offers additional explanatory power beyond the marginal R-Square increase.

The percent of housing units with children independent variable was the third variable added by the stepwise procedure to the TAPE creative class regression model for megapolitan counties (Model 3, Table 17). However, this model was not selected because the marginal R-Square increase was less than 0.01 and the added complexity of the additional predictor variable was deemed not worth the negligible R-Square increase. Additionally, the standardized estimate of the housing units with children independent variable was considerably lower than other two predictor variables; just 0.10 compared to 0.58 and 0.41 for percent bachelor's degree and average wages predictor variables.

The distribution of the population, 25 years and over, with a bachelor's degree as a percentage of the labor force in the megapolitan areas shows a clear core/periphery dynamic (Figure 16). Most megapolitan areas have a county or set of counties that have above average percentages of the labor force with a bachelor's degree but the New York/Philadelphia, Chesapeake, Atlanta, and Carolina megapolitan areas are exemplars.

To better understand the distribution of bachelor's degree predictor variable in the megapolitan areas it is important to understand the relative differences among the megapolitan areas (Table 18). The minimum and maximum values tell as much about the distribution of the population with a bachelor's degree as a percentage of the labor force as does the megapolitan area average. The Atlanta megapolitan area has the county with the lowest value of bachelor's degrees with 3.6 percent (Murray County, Georgia, which

is north of Atlanta and just southeast of Chattanooga, Tennessee) yet the Atlanta megapolitan area is still just below the overall megapolitan average of 26.8 percent. The Las Vegas megapolitan area has the lowest average of all the megapolitan areas likely resulting from a decidedly service oriented economic base focused on the tourism industry enabled by gambling. The city of Las Vegas is in Clark County which is ranked first overall for total workers in the tourist accommodation sector (NAICS 721) and fifth among megapolitan counties with 19.5 percent of its workforce in the accommodation sector.

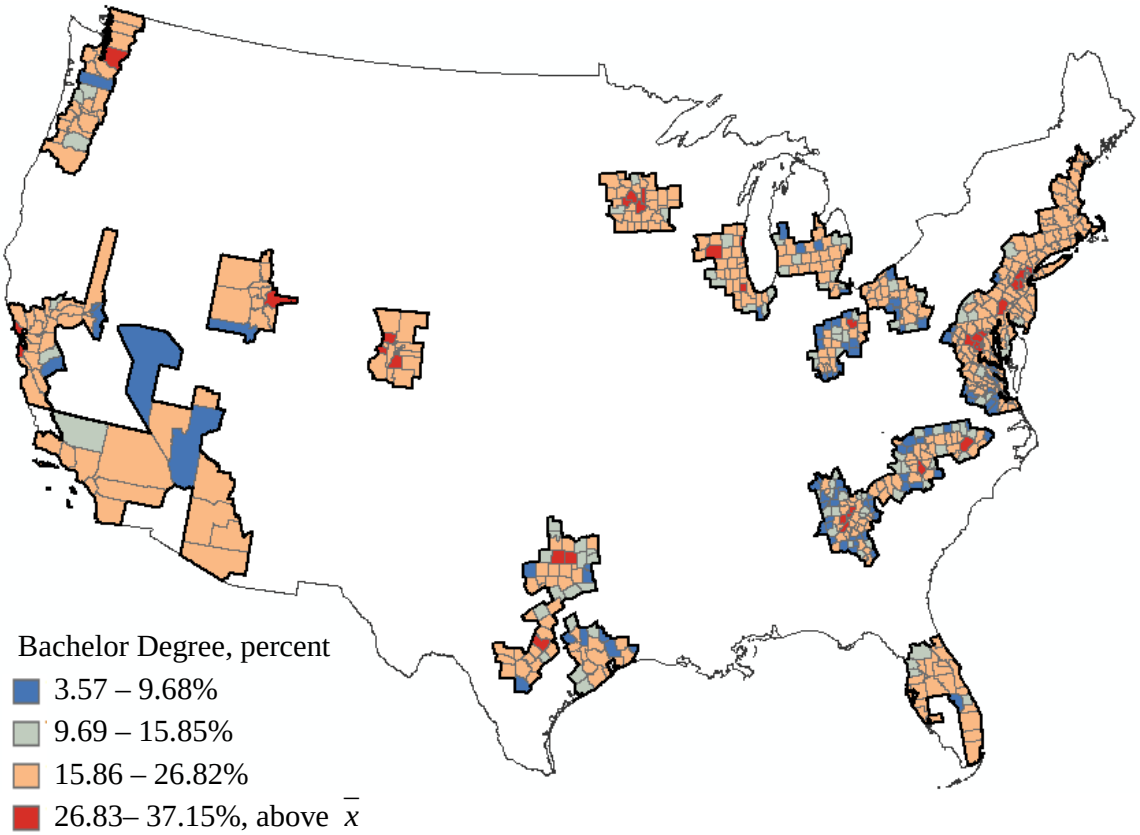

Figure 16. Percent Bachelor Degree by Megapolitan County.
The average ($\bar{x}$) for the 654 megapolitan counties is 26.83 percent of the labor force with a bachelor's degree, ACS 5 year estimates: 2006-2010.

Table 18. Descriptive Statistics for Percent Bachelor's Degree by Megapolitan Area.

Counties	Megapolitan Area	Mean	Min	Max
15	Front Range	31.1%	14.5%	37.2%
27	Sierra Pacific	30.6%	8.4%	31.5%
10	Puget Sound	30.6%	9.2%	28.8%
22	New England	29.1%	12.5%	26.5%
35	Twin Cities	28.5%	10.6%	30.3%
65	New York/Philadelphia	27.9%	9.3%	29.8%
91	Chesapeake	27.4%	5.8%	35.5%
14	Willamette	27.1%	9.9%	25.6%
7	Florida Atlantic	26.9%	8.5%	20.1%
654	*Megapolitan Area*	*26.8%*	*5.8%*	*37.2*
35	Chicago	26.8%	6.7%	28.1%
68	Atlanta	26.7%	3.6%	31.1%
17	Central Texas	26.4%	7.3%	27.5%
8	Southern California	25.9%	9.8%	23.5%
18	Central Florida	25.9%	10.1%	22.5%
29	Dallas/ Fort Worth	25.8%	7.8%	32.4%
53	Carolinas	25.7%	6.2%	31.4%
4	Sun Corridor	25.5%	12.0%	18.8%
12	Wasatch Range	24.7%	8.8%	31.7%
37	Ohio Valley	24.1%	5.9%	32.5%
21	Houston	24.0%	6.3%	26.6%
30	Steel Corridor	23.7%	7.2%	21.2%
32	Michigan Corridor	23.6%	8.2%	24.6%
4	Las Vegas	19.7%	7.8%	16.1%

The New York/Philadelphia, Chesapeake (Washington D.C.), and New England (Boston) megapolitan areas that form the original Megalopolis in the northeast United States all have large proportions of their population's with a bachelor's degree as percent of the workforce. Arlington County, Virginia and Loudon County, Maryland in the Chesapeake megapolitan area are second and third overall for highest percentage of bachelor's degrees.

Surprisingly, the Front Range was the highest overall megapolitan area average. Equally telling, it has the highest minimum among all the megapolitan areas with its lowest county having a surprisingly high 14.5 percent of its labor force with a bachelor's degree. Additionally, Douglas County, Colorado which featured prominently in the TAPE and TAP creative class top twenty (Tables 4 and 7) has the highest overall percentage of bachelor's degrees with 37.2 percent.

Based on the literature, the bachelor degree variable was certainly expected to play a major role but just not at the level found in this dissertation. To understand the dominance of the bachelor degree independent variable in the model, the history of evolving theories of economic development and the transformation of the economy from agricultural to manufacturing to creative based must be fully appreciated.

In pre-industrial America, the economic base of most counties was largely agricultural where average workers needed little education to sustain themselves. As the United States transitioned to working class jobs in manufacturing, basic education (e.g., a high school education) became more essential. Geographers and economists used various education indicators for what is called the "human capital" of a municipality or, simply, the general level of education of the populace for an area. However, with the dawn of the information/knowledge economy, the human capital variable shifted from a basic education measure like a high school diploma or equivalent to the percentage of the population with a bachelor's degree from a college/university.

The *human capital theory* of economic development uses the percent bachelor's degree as the key predictor variable of economic development because the economic

factors that lead to economic development began to veer from the traditional factors of production: land, labor, capital, and natural resources. A well-educated populace, measured by percent of the population with a bachelor's degree, seemed more predictive of the economic success of an area than the other factors of production. College-educated workers generally earn more, spend more, and increasingly entice companies to relocate to the area to take advantage of the well-educated workforce (Stolarick, 2012).

Previously, the economic development of a certain location was a function of its location to the factors of production and transportation routes. Traditional factors of production influenced where and how a town developed but the human capital theory suggests that well-educated workers are the key to economic development that make a town what it is today and likely will be in the future. The human capital theory using bachelor degrees as the key labor indicator was the basis for a lot of research on economic development before Florida introduced the creative capital theory in 2002. Human capital theory is used as the basis for much of the comparative analysis and criticism of Florida's creative capital theory.

Human capital theory has several limitations. First, human capital theory only measures one variable: the education of the population, not the actual jobs in a given area. Second, education is just one precondition (of many) for employment. Third, one's education does not necessarily lead to a job that increases the economic development of an area like creative class occupations are thought to do. Fourth, Bill Gates, Mark Zuckerburg, and other successful non-college graduates are capable of triggering substantive innovations that spur economic development suggesting that education is not

synonymous with creativity (Florida, 2002 and 2012a; Markusen, 2006). We should recall that "nearly three-quarters (72.2 percent to be exact) of adults with college degrees [i.e., bachelor's degrees] are members of the Creative Class. But less than 60 percent (59.3 percent) of the members of the Creative Class have college degrees" (Florida, 2012, page 40). Fifth, the human capital theory has proven useful in academic work but has had lesser success when applied to public policy because it is difficult to enable more college graduates to locate in an area by local legislation alone. One example of legislative incentives for college-educated workers to locate in a municipality is the city of Niagara Falls. The city funded a program to offer student loan repayment for college graduates who moved downtown for a period of years. Effectiveness of the Niagara Falls policy remains undetermined but it is one of a few policies that directly apply the human capital theory.

Human capital theory is so rooted in economic development theory that even Florida used the percentage of the population with a bachelor degree as the only variable to measure an area's "talent index", one of the four "T's" of his creative capital theory (Florida, 2002). The talent index was revised in Florida's second edition to measure only members of the creative class, "In the original edition of this book, I found a close association between the Creative Class share, [and] the talent index [i.e., bachelor degree]" (Florida 2012a, p. 231). Inclusion of the bachelor degree variable in Florida's original conceptualization of the creative class indicates his attempt to ground his work in the human capital economic development research that preceded his work as well as the overall importance of college-educated workers to the creative class. Removal of the

bachelor degree variable from Florida's talent index seems to show the parallel relationship between the two measures.

Several question arise when a variable dominates a model like the bachelor's degree predictor variable in the TAPE creative class model for the megapolitan counties. Does college give people more creative potential or do many creative occupations require a degree (e.g., lawyer, doctor, etc.)? Artists can get a bachelor's degree or even an advanced degree but it is not necessarily required. Likewise, managers, business, and financial workers, among others, could have a bachelor's degree but it is not mandatory. Conversely, architects, doctors, teacher, and lawyers require a bachelor's degree and, in many cases, an advanced degree is required for these professions.

Creative capital theory was considered more robust than human capital theory despite 72.2 percent of college educated workers having creative occupations because only 59.3 percent of the creative class has a bachelor degree (Florida, 2012) meaning that the human capital theory misses over 40 percent of the workers that are considered most important for the area's economic development — this is a key difference in the human capital and the creative class theories. That said, other scholars also found a positive association existed between bachelor degrees and the creative class (Glaeser 2005; Faggian *et al.*, 2012; Flew, 2012; McGranahan and Wojan, 2007; Hoyman and Faricy, 2009). The bachelor's degree independent variable might capture nearly 80 percent of the variance for both the distribution of the TAPE creative class but measuring degrees alone would oversimplify the complex nature of the labor factor of production and economy as a whole.

Glaeser's original critique of Florida's creative capital theory found that the human capital theory was more predictive of population growth than the creative capital theory and several other creative class indices like the gay index and Bohemian index (Glaeser, 2005). Population growth is often considered synonymous with economic growth but this is not always the case. The "growth without growth" concept explains how economic growth can and does occur without population growth, real growth comes from increases in economic productivity rather than simply more people working; the metaphor of "better cooking, not just more cooking" is used to explain the concept (Florida, 2012a). Glaeser begins to show his understanding of the disconnect between population growth and economic growth in his most recent book when he recognizes that eight of the most economically dominant cities in the United States have actually lost population since the 1950s (Glaeser, 2011). There are several causes of the depopulating of cities since the 1950's but it is an example where population growth is not the same as economic growth, or vice versa. Additionally, a college-educated worker will earn about 50 percent more than a worker without a college education, but having a creative class occupation adds an additional 16 percent premium (Florida, 2012), so that a college-educated worker in a creative occupation earns higher wages for being in a creative occupation than what college education garners alone. The two theories of economic development — human capital theory and creative capital theory — are found not necessarily contrasting but rather supporting. It was expected that the percent of bachelor degrees independent variable would be positively associated with the TAPE creative class (Table 3) and the regression analysis confirms the prediction.

The second predictor variable for the TAPE creative class megapolitan county model is average wages. The average wages independent variable is likely positive and significant for more than one reason. First, members of the creative class earn more than members of the service, working, or agricultural classes (Bakowska and Rudawska, 2011; Stolarick, 2012). Additionally, the creative class has shown a positive effect on the average wages of an area suggesting that "membership in the Creative Class adds to wages and salaries over and above the returns to education" (Florida, 2012a, p.261). Florida also suggested that the creative class has a bigger effect on wages which is a key indicator of regional economic productivity while education has a greater effect on income. Income includes all monies received including rents, interest, and transfer payments from the government while wages is just remuneration from work. The difference between wages and income is important because wages measures actual remuneration for work while income includes wages and all the other forms of revenue as well. Therefore, workers in creative occupations are more predictive of a highly productive local economy but not necessarily the wealthiest economy, as measured by income, which is more associated the percent bachelor's degree variable.

The TAPE creative class seem to cluster in the megapolitan counties that have higher average wages, or conversely, the average wages are higher where the TAPE creative class cluster. There are certainly both elements at play for most, if not all, megapolitan counties. The average wages independent variable was not significant for either the TAPE or TAP non-megapolitan county models.

Second, the average wages predictor variable can be used as crude measure of the urban hierarchy and a county's economic ability to sustain a concentration of creative workers. Most counties have some creative workers like lawyers, teachers, and doctors to support the local population, but the average wages need to be high enough to sustain other creative occupations like artists, media, architecture, and engineering occupations that need a certain minimum disposable income and/or population size to support their occupations. The average wages predictor variable can be a method to measure a county's ability to support the more artistic or specialized creative class occupations. This shows the indirect way which the average wages predictor variable affects the distribution of the TAPE creative class, specifically the artist subcomponent of the TAPE creative class.

Third, there is a geographic component to the average wages predictor variable: urban and suburban counties typically have higher costs of living. Average wages should likewise be higher for urban/suburban counties due to the cost of living of in the megapolitan counties (Figure 17). Distribution of the average wages by county shows that each megapolitan area has one or more counties serving as the highest average wage core and decrease as the distance from the core county increases: an inverse distance relationship (Figure 17). Each megapolitan area exhibits this phenomenon to a certain extent but Atlanta, the Carolinas, and Twin Cities megapolitan areas are exemplars. Figure 17 shows well the Chesapeake (Washington D.C.), New York/Philadelphia, and New England (Boston) megapolitan areas — the areas that most closely resemble Gottmann's original Megalopolis — have the most counties that exceed the megapolitan

county mean for average wages. Tellingly, only one county in the top 14 megapolitan counties for average wages is from outside the Bowash Megalopolis: Douglas County, Colorado, is ranked eighth and in the Front Range megapolitan area. The northeast Megalopolis dominates the rest of the megapolitan counties with high average wages.

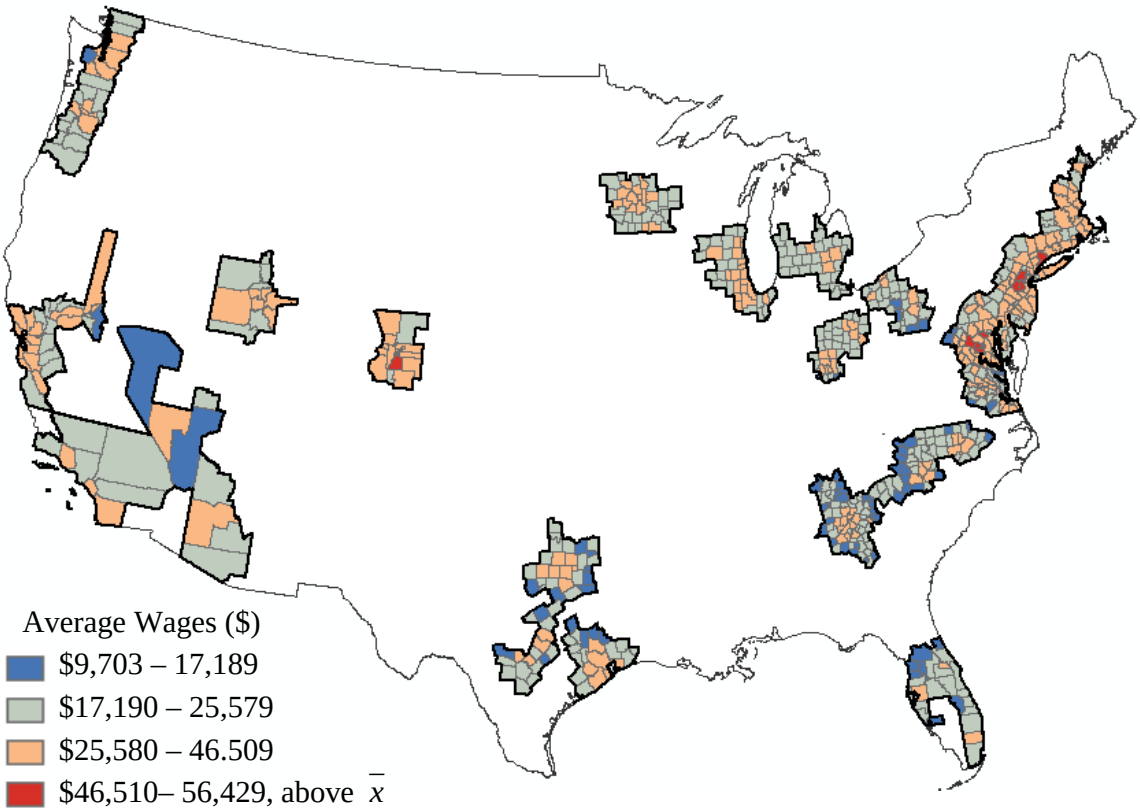

Figure 17. Average Wages by Megapolitan County.
U.S. Dollars. The average ($\bar{x}$) wages for the 654 megapolitan counties is $46,510, ACS 5 year estimates: 2006-2010.

Chesapeake (Washington D.C.), New York/Philadelphia, and New England (Boston) megapolitan areas in the Northeast portion of the United States that made the original megalopolis are ranked first, second, and fourth, respectively, for highest average wages (Table 19). The Central Florida megapolitan area has the county with the lowest

average wages for all the megapolitan counties: Sumter County with average wages of just $9,703. The Central Florida megapolitan area also has the second lowest average wages, after the Wasatch Range megapolitan area (i.e., Salt Lake City).

Table 19. Descriptive Statistics of Average Wages by Megapolitan Area.

Count	Megapolitan Area	Mean	Min	Max
91	Chesapeake	$53,527	$11,407	$56,429
65	New York/Philadelphia	$52,463	$16,959	$50,912
27	Sierra Pacific	$51,765	$17,112	$42,059
22	New England	$49,747	$21,066	$41,155
10	Puget Sound	$49,561	$16,206	$36,491
35	Chicago	$47,021	$18,215	$38,966
15	Front Range	$47,020	$23,422	$48,909
654	*Megapolitan*	*$46,510*	*$9,703*	*$56,429*
35	Twin Cities	$45,910	$18,687	$41,429
21	Houston	$44,574	$11,514	$36,286
8	Southern California	$44,503	$19,590	$32,425
29	Dallas/ Fort Worth	$44,240	$15,042	$41,966
68	Atlanta	$43,860	$12,084	$40,228
4	Sun Corridor	$43,193	$17,494	$27,399
32	Michigan Corridor	$42,578	$17,833	$35,095
4	Las Vegas	$42,112	$14,699	$26,866
37	Ohio Valley	$41,783	$16,178	$44,722
14	Willamette	$41,271	$19,189	$31,131
17	Central Texas	$41,005	$15,380	$31,890
7	Florida Atlantic	$40,796	$14,053	$26,847
53	Carolinas	$40,563	$12,763	$34,215
30	Steel Corridor	$40,054	$14,864	$31,795
18	Central Florida	$39,555	$9,703	$28,174
12	Wasatch Range	$38,879	$18,105	$41,569

The Florida Atlantic and the Central Florida megapolitan areas are below the megapolitan average wages of $46,510. It is possible that the low wages of these

megapolitan areas are low because of the increased percentage of retirees in these areas who do not work and their income largely comes from interest, rent, and transfer payments, and not wages.

The average wages predictor variable and the bachelor's degree predictor variable could be seen as reinforcing each other because, generally, workers with bachelor's degrees generally earn higher wages than workers without a degree. However, the literature indicates that percent bachelor's degree variable — the human capital variable — is generally more predictive of population growth and income while the creative class is more predictive of average wages growth (Florida *et al.*, 2008; Florida, 2012a). Additionally, as indicated earlier, working in a creative job has an additive effect to wages beyond education taken alone. So, finding that bachelor's degree and average wages variables are both predictive for the TAPE creative class for the megapolitan counties was not surprising. The relatively high magnitude of the bachelor's degree predictor variable over the average wages predictor variable was unexpected.

The Cooks D procedure was performed to identify outlier counties that could affect the model. The District of Columbia (Washington D.C.) was found to be the largest outlier in the model. To check to see if the model would change with the removal of the largest outlier another regression analysis was performed without the District of Columbia (n=653) and it appears that the original models (Table 17) and the new models without the outlier are not significantly different. Removing the outlier has no significant effect on the chosen model.

4.3.2 TAP Regression Analysis, Megapolitan Counties

Like the TAPE creative class model for megapolitan counties above, the goal for the TAP dependent variable was to generate the most parsimonious model. Like the TAPE creative class model for megapolitan areas, the bachelor degree independent variable alone had a very high R-Square: 0.806 (Table 20). The second independent variable of average wages increased the R-Square to 0.874 with a marginal R-Square increase of 0.068 or a marginal increase of 6.8 percentage points of explained variance of the TAP creative class dependent variable. After the addition of the third or fourth independent variable, the R-Square increase was below the 0.02 threshold and therefore considered not substantial enough to justify a more complex model. Just like with the TAPE model, the TAP model development used the same diagnostics tools to identify the best model: root mean square error, condition index, VIF, and the highest possible R-square.

Table 20. Regression Models Indicating Associations between Socio-economic Variables and the Percent TAP Creative Class by Megapolitan County.

	Variable	Model R^2	b	SE b	β	p-value	VIF	CN*
Model 1	Constant	0.806	0.050	0.003		0.000		5.32
	Bachelors, %		0.010	0.0002	0.90	0.000	1	
Model 2	Constant	0.874	0.012	0.003		0.000		13.57
	Bachelors, %		0.006	2.82E-04	0.498	0.000	3.34	
	Average Wages, $		4.48E-06	2.33E-07	0.477	0.000	3.34	
Model 3	Constant	0.885	-0.004	0.004		0.305		15.66
	Bachelors, %		0.005	2.72E-04	0.471	0.000	3.41	
	Average Wages, $		4.44E-06	2.23E-07	0.483	0.000	3.34	
	In Migration, %		0.003	4.07E-04	0.108	0.000	1.05	

Highlight indicates the selected model.
*CN is the condition number that is equal to the highest condition index for the model.

The result is a two variable model (i.e., Model 2, Table 20) with an R-square of 0.874, meaning the two predictors explained over 87 percent of the variance in the TAP creative class, slightly higher than the R-Square for the TAPE creative class. The larger R-Square for the TAP creative class is likely explained by the narrower and more specific definition of TAP. Like the selected model for the TAPE creative class for the megapolitan counties, the TAP creative class model's independent variables are significant at <0.0001, and each has a variance inflation factor below five and a condition number below 20.

The b coefficients for Model 2 indicate that a megapolitan county would generate a 0.006 percent increase in the TAP creative class (%) for every one percent increase in the proportion of the population aged 25 years or older with a bachelor's degree. Each megapolitan county would also generate a 0.0000044 percent increase in the TAP creative class for every dollar increase in the average wages in the county (0.44 for every $1,000 dollar increase in the average wages for the county).

The TAP creative class final regression model by megapolitan county features the same two independent predictors as the TAPE model, but there are some notable differences with how each independent variable affects the model. The difference is most noticeable when analyzing the standardized estimate (i.e., Beta or β in the table) for each predictor variable in the model. A one standard deviation (6.17 percent) increase in percent bachelor's degree leads to a 0.498 standard deviation or 3.41 percent increase in predicted TAP creative class, with all other variables held constant. And, a one standard deviation or $7,470 increase in average wages, in turn, leads to an increase of 0.477

standard deviations or 3.27 percent in the TAP creative class, with the other variables in the model held constant. Standardized estimate values for the TAPE creative class indicated that the bachelor degree independent variable explained much more of the variance than the average wages predictor variable; however, in the TAP creative class model for megapolitan counties, the standardized estimate are nearly the same: approaching 0.50.

The reduction of the importance of the bachelor degree variable and the increased strength of the average wages predictor variable in the TAPE creative class model for megapolitan areas is likely explained by the removal of the "eds and meds" portion of the creative class. The education and medical subcomponent of the TAPE creative class includes occupations that usually require a minimum of a bachelor's degree such as teachers and teacher aids in the K-12 education systems and medical occupations that mostly require a bachelor's degree but often an advanced degree. Other subcomponents such as technology, arts, and business professional subcomponents have occupations that do not necessarily require a bachelor's degree. While scientist, researchers, curators, lawyers, and engineers need a bachelor's degree or higher, there are many other occupations in the arts and technology and science occupations that generally have no education requirements like computer programmer, artist, or musician. This is supported by the slight decrease in correlation for the TAP creative class dependent variable with the percent bachelor's degree independent variable compared to the TAPE creative class dependent variable: from a correlation of 0.701 for the TAPE creative class to 0.671 for the TAP creative class.

Additionally, the education and medical subcomponent is a substantial portion of the TAPE creative class making up 33.2 percent of the workforce (Table 5) thereby removing the subcomponent that mostly requires a bachelor's degree. By contrast, the professional subcomponent is a larger percentage of the TAPE creative class (45.9 percent) but also includes occupations that are decidedly more business focused and generally do not require a bachelor's degree to the same extent as the education and medical subcomponent. Removal of the education and medical portion of the creative class reduces the reliance of the model on the bachelor degree independent variable but the overall explanatory power of each model was comparable to the TAPE creative class model. Distribution of the percentage bachelor's degree predictor variable, discussed earlier (Figure 16), shows a core/periphery distribution for most megapolitan areas.

Appearance of the bachelor's degree predictor in the TAP model was not unexpected but gives support to the earlier finding for the TAPE creative class model for megapolitan counties. The fact that the human capital variable is the main predictor variable for the TAPE and the TAP creative class is telling. Florida's creative capital theory and Glaeser's human capital theory are clearly linked. As mentioned earlier for the TAPE creative class model, a worker with a bachelor's degree earns about 50 percent more than a worker without a degree, but a worker with a bachelor's degree in a creative occupation earns 16 percent more (Florida, 2012a). Increased wages from workers in creative occupations, regardless of education attainment, is likely why the average wages independent variable was selected as the second predictor variable for the TAP creative class megapolitan model.

Like the TAPE creative class model, the average wages variable was identified as the second predictor for the TAP creative class. As mentioned earlier for the TAPE creative class model, average wages can be a measure of a county's ability to sustain certain creative occupations. Counties with lower average wages are not likely able to support certain portions of the creative class like artists. This is easily seen in the megapolitan county rankings of the TAP creative class where the counties at the top of the list had a diverse set of creative workers in each subcomponent but the counties down the TAP creative class rankings, and down the urban hierarchy, have less economic capability to support each subcomponent of the creative class. Some counties had zero or nearly zero percent for the arts and/or technology subcomponent.

Correlations between the four subcomponents and average wages independent variable are also telling about the increased strength of the average wages predictor variable in the TAP creative class megapolitan model. The average wages independent variable is correlated to the technology subcomponent at 0.78, arts at 0.56, professional at 0.883, but the education and medical subcomponent is correlated at just 0.21 ($p<0.0001$ for all correlations). While the TAPE and the TAP creative class are correlated to the average wages independent variable at values that are not substantially different (0.80 and 0.84, respectively) the correlations of the subcomponents indicated that removing the lower-correlated education and medical subcomponent is likely another reason that the average wages predictor variable is relatively stronger in the TAP creative class model than the TAPE creative class model.

The District of Columbia (Washington D.C.) was once again identified as the largest outlier for the TAP creative class using the Cook's D procedure, just like it was for the TAPE creative class. A separate regression analysis was conducted without Washington D.C. in the model, but the two sets of models were not found to be significantly different so the influence of the outlier was not found significant.

The TAPE and the TAP creative class models for the megapolitan counties have the same predictor variables, albeit at different relative strengths in the models as indicated by the standardized estimates. The megapolitan counties used as the study area for the first two models are in sharp contrast to the non-megapolitan counties used in the TAPE and TAP models to come. Besides the numerical difference, 654 megapolitan counties compared to 2,455 non-megapolitan counties, the non-megapolitan counties makeup the majority of the landmass of the contiguous 48 states and are not identified by clear boundaries like those used in the megapolitan county study above. Additionally, the non-megapolitan counties generally have greater spreads of values for the independent variables. While the population density and average wages independent variables are generally lower, other independent variables have a much larger range of values such as gross rent as percentage of income (GRAPI), percent poverty, unemployment rate, in migration percent, population growth rate, single parent percent, housing units with children percent, and bachelor's degree independent variables. The wide range of values for the generally less populated non-megapolitan counties can cause modeling and model interpretation to be more difficult.

4.3.3 TAPE Regression Analysis, Non-megapolitan Counties

The TAPE creative class dependent variable has a mean 35.62 percent for the megapolitan counties but just 29.89 percent for the non-megapolitan counties. The non-megapolitan average is lower due to the lower overall totals of creative workers in the mostly rural counties.

Like the regression models for the megapolitan counties, the goal for the non-megapolitan TAPE creative class was to generate the most parsimonious model. Just like with the regression models for the megapolitan counties, the non-megapolitan TAPE model development used the traditional diagnostic techniques to identify the most parsimonious model that had an acceptable root mean square error, condition index, VIF, and the highest possible R-square. Descriptive statistics for the independent variables and the TAPE creative class dependent variable for the non-megapolitan counties are reported in Table 21.

The TAPE creative class model for non-megapolitan counties was similar to the TAPE model for megapolitan counties with some exceptions. The percent of the labor force with a bachelor's degree remained the dominant variable in the model (Model 3, Table 22) but the average wages independent variable that featured prominently in the megapolitan county model was replaced with population growth rate from 2000-2010 and the median gross rent as percentage of income (GRAPI) predictor variables. Both these variables had an unexpected inverse relationship with the TAPE creative class dependent variable for the non-megapolitan counties.

Table 21. Descriptive Statistics for Non-megapolitan County Variables.

	Variable	Mean	sd	Min	Max
Dependent Variables	TAPE, %	29.89%	5.91%	10.37%	67.11%
	TAP, %	18.31%	5.33%	4.10%	53.27%
Geographic	Population Density	16.95	89.44	0.024	1,988
Economic	Average Wages, $	$35,946	$4,420	$6,323	$45,009
	Unemployment Rate, %	7.41%	3.48	0%	30.9%
	Poverty Rate, %	15.86%	6.41	0%	53.18%
	Owner Occupied, %	69.98%	7.08	28.63%	91.28%
	GRAPI, %	27.49	5.00	10.9	50
	Consumer Services Employment	309.85	579.14	4	10,134
	Tourism Establishments	13.01	21.81	0	226
Demographic	In Migration Rate, %	5.61%	2.82	0%	46%
	Population Growth Rate, 2000-2010, %	6.16%	9.82	-58.73%	71.10%
	Hispanic, %	9.84%	13.45	0%	98.3%
	Black, %	11.67%	15.18	0%	86.14%
	Elderly, %	13.89%	4.05	0%	34.14%
	Median Age	40.29	4.94	21.7	58.6
	Single Parent Head of Household, %	15.17	5.37	0%	56.7%
	Housing Units with Children, %	31.00	5.65	5.1%	65%
Education	No High School or GED, %	23.12%	7.52	0.7%	52.1%
	Bachelor's Degree, %	20.83%	4.70	1.9%	42.2%
	Professional or Graduate Degree, %	11.56%	3.13	0%	36.8%

The b coefficients for Model 3 indicate that the percent TAPE creative class in the non-megapolitan counties will increase 0.0091 percent for each percentage increase of the county's population with a bachelor's degree while the TAPE creative class will decrease 0.00092 for each percent the population grows and decrease 0.0017 as the percentage increases for the median gross rent as a percent of income (GRAPI) predictor variable.

Table 22. Regression Models Indicating Associations between Socio-economic Variables and the Percent TAPE Creative Class by Non-megapolitan County.

	Variable	Model R^2	b	SE b	β	p-value	VIF	CN*
Model 1	Constant	0.490	0.173	0.002		0.000		5.17
	Bachelors, %		0.009	1.81E-04	0.700	0.000	1	
Model 2	Constant	0.521	0.169	0.002		0.000		5.41
	Bachelors, %		0.009	1.80E-04	0.739	0.000	1.05	
	Population Growth, %		-0.001	8.60E-05	-0.181	0.000	1.05	
Model 3	Constant	0.541	0.218	0.005		0.000		14.5
	Bachelors, %		0.009	1.70E-04	0.725	0.000	1.06	
	Population Growth, %		-9.20E-04	8.59E-05	-0.153	0.000	1.09	
	GRAPI, %		-0.002	1.65E-04	-0.140	0.000	1.04	
Model 4	Constant	0.549	0.230	0.005		0.000		16.64
	Bachelors, %		0.009	1.88E-04	0.689	0.000	1.22	
	Population Growth, %		-0.001	8.55E-05	-0.144	0.000	1.10	
	GRAPI, %		-0.001	1.72E-04	-0.113	0.000	1.16	
	Single Parent, %		-0.001	1.70E-04	-0.102	0.000	1.29	

*CN is the condition number that is equal to the highest condition index for the model.
Highlight indicates the selected model.

The bachelor's degree independent variable consistently has the greatest effect on the megapolitan and non-megapolitan counties for the TAPE dependent variable. If taken alone, the bachelor's degree independent variable would predict 83.5 percent of the variance for the megapolitan counties and 49.0 percent for the non-megapolitan counties. The diminished explanatory power of college educated workers in the non-megapolitan counties may parallel the lower overall percentage of bachelor's degrees for non-megapolitan counties. Megapolitan counties have an average of 26.83 percent of the workforce with a bachelor's degree while non-megapolitan counties have 20.83 percent.

The distribution of the bachelor's degree percent of the labor force predictor variable has some unique spatial distribution trends (Figure 18). The spillover effect of

the counties around the northeast megapolitan areas — New York/ Philadelphia and New England (Boston) — with the high percent bachelor degree's labor pools seems to influence the geography of bachelor's degree in nearby upstate New York and New England. There are also spillover effects for the counties around the Chesapeake (Washington D.C.) megapolitan area but to a lesser extent.

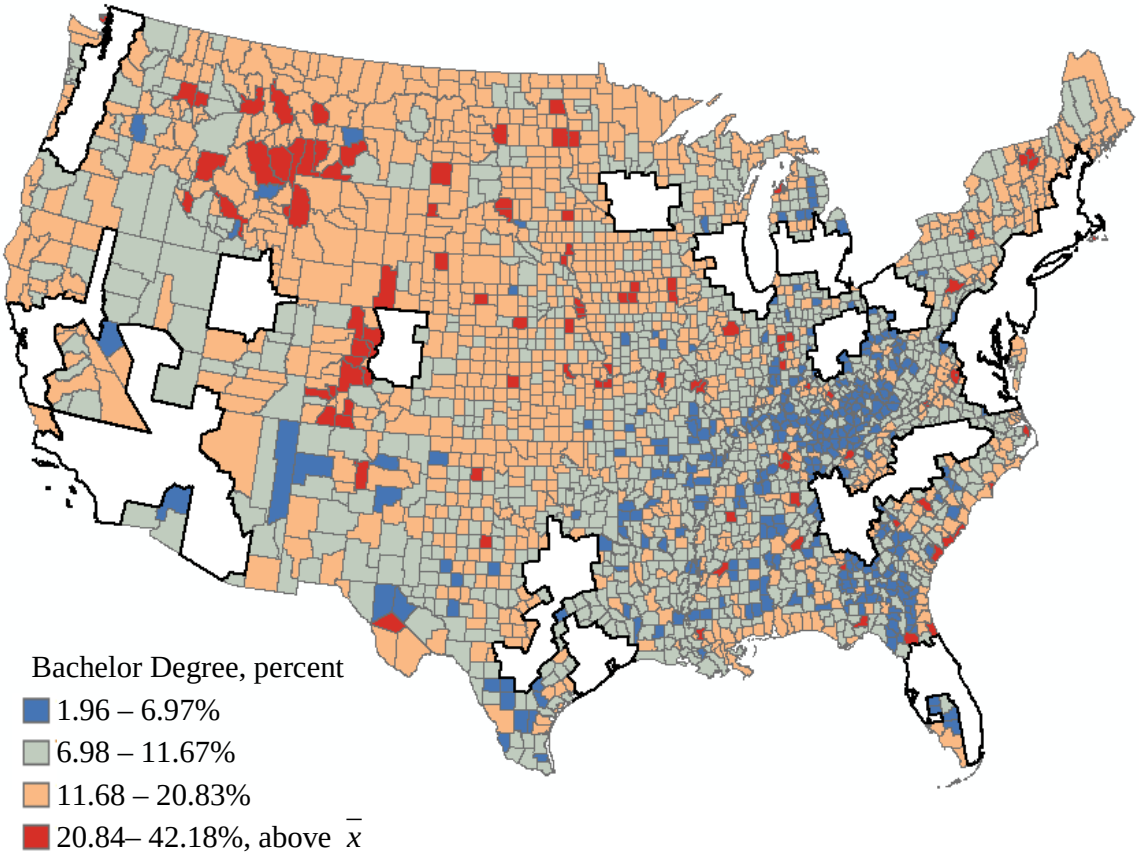

Figure 18. Percent Bachelor Degree by Non-megapolitan County.
The non-megapolitan county average ($\bar{x}$) is 20.83 percent, ACS 5 year estimates: 2006-2010.

Other spatial trends include the below average region in the southeast regarding percent bachelor's degrees. Although some southeastern counties exceed the non-

megapolitan average for bachelor's degrees, the majority of the counties below the Ohio Valley and Steel Corridor megapolitan areas in the Appalachian and Southeast regions are well below average. Conversely, many of the counties in the Great Plains and Mountain regions of the central United States have above average values. Counties around the Front Range (Denver) megapolitan area show considerable positive spillover effects. These geographic trends for the non-megapolitan counties generally follow the cluster analysis (Figures 14 and 15).

The megapolitan and non-megapolitan models for the TAPE creative class are similar with regard to the importance of the bachelor's degree independent variable but there the similarities end. The TAPE creative class non-megapolitan model has two other independent variable that have an unexpected inverse association with the creative class.

The population growth rate was generally expected to be positively associated with economic growth and, therefore, the creative class because it was expected that counties growing in population could only grow, in part, with the economic engine of creative workers as a key driver. However, the population growth independent variable has a negative association with the TAPE creative class in the non-megapolitan counties and this might seem counter intuitive. Taken at face value, this would suggest that the TAPE creative class are distributed where non-megapolitan counties' populations are getting smaller, but this is not what is likely happening.

A comparison of the county map of the TAPE creative class (Figure 10) or the TAPE cluster analysis (Figure 14) with a map of the positive and negative population growth (Figure 19) shows that the TAPE creative class is generally not clustered in the

southeast where the population in generally growing while the TAPE creative class is well represented in the Great Plains region were many of the non-megapolitan counties generally have below average population growth or even population decline. The population growth independent variable is included in the final model, in part, because it captures the unique clustering of the TAPE creative class in the non-megapolitan counties in the Great Plains region as well as the dearth of creative workers in the Southeast region, especially the counties immediately outside the Atlanta and Carolinas megapolitan areas, where the population in non-megapolitan counties are generally growing.

One possible explanation of the negative relationship between the population growth rate predictor variable with the TAPE creative class is the southeastern non-megapolitan counties that had population growth due to an, in part, lower cost of living and a manufacturing base without any corresponding increase in the TAPE creative class. According to the Resurgent Heartland theory of Kotkin (2013), the economic growth in the southeast is attributed to the manufacturing jobs, and manufacturing is not the basis for a creative economy. Additionally, the Resurgent Heartland theory finds the unique economic growth of the Great Plains also supports the negative relationship of population growth predictor variable and the TAPE creative class because the Great Plains has low or negative population growth but the economy is slowly transforming into a non-megapolitan creative economy.

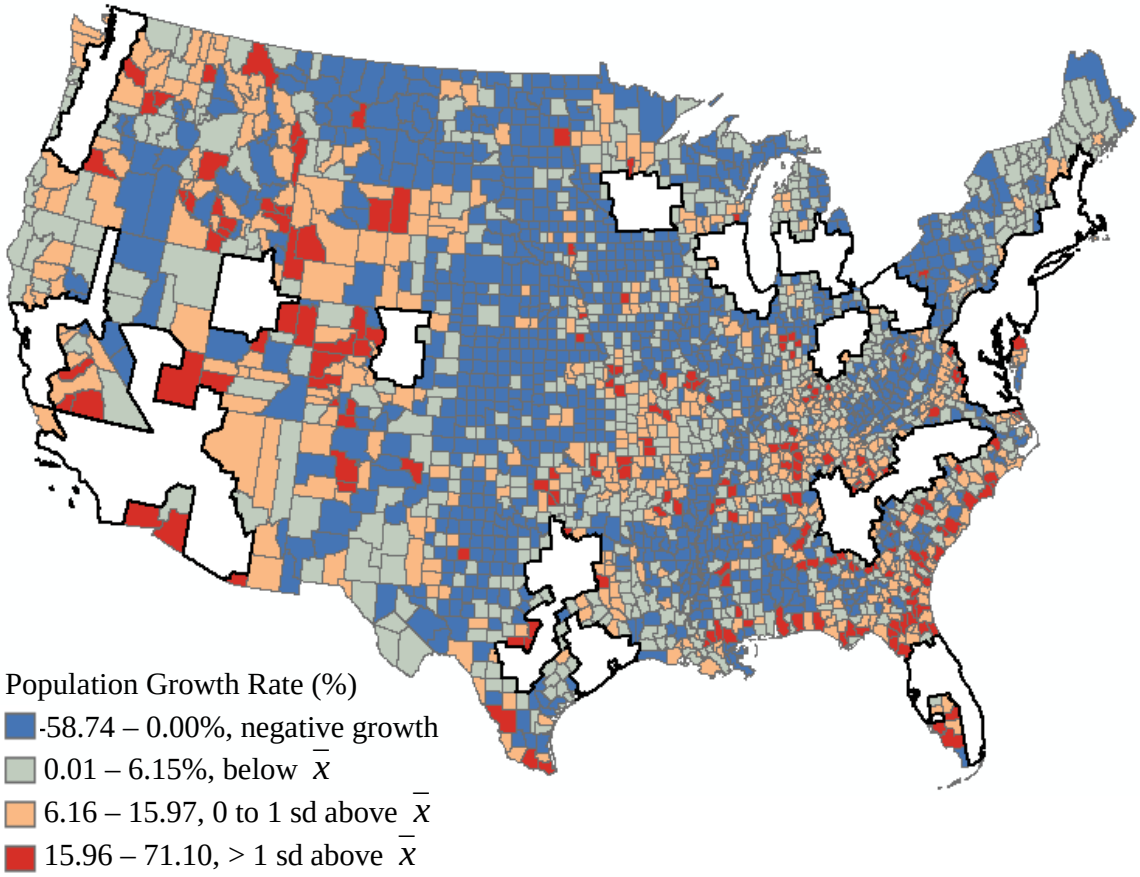

Figure 19. Population Growth Rate by Non-megapolitan County.
The average ($\bar{x}$) non-megapolitan growth is 6.16 percent, the standard deviation (sd) is 9.81 percentage points, ACS 5 year estimates: 2006-2010.

This inverse relationship between the population growth and the TAPE creative class for non-megapolitan counties is a prime example of the "growth without growth" phenomenon (Florida, 2012a) identified earlier. Population growth is not always correlated to economic productivity which is measured instead by growth in average wages which spur additional innovations that in turn grow wages. Non-megapolitan counties that have growing populations frequently have neither corresponding growth in

the percent of the TAPE creative class nor resulting increased economic productivity in higher wages.

Non-megapolitan counties with a negative population growth are also the counties where the creative class is more prominent, like in the Great Plains and Mountain states (Figure 19). Conversely, where the population growth is positive, like much of the southeast non-megapolitan counties, there is a relative scarcity of creative workers. The population growth predictor variable could also be a proxy for the geographic distribution of the TAPE creative class because the population growth rate predictor variable closely parallels counties that have population growth yet have a low disproportionate share of creative works and counties with shrinking/no population growth but have a high disproportionate share of the TAPE creative class.

Additionally, the population growth rate predictor variable has a very low correlation coefficient between it and the dependent variable (Table 15). That said, the population growth predictor variable has a very different correlation with the various subcomponents of the creative class. Population growth is significantly correlated with the technology subcomponent at 0.31, the arts subcomponent at 0.23, and the professional subcomponent at -0.17, but the education and medical subcomponent correlation coefficient was just 0.002. All this suggests a series of confounding effects that might warrant additional research that is more focused on the creative class/ population growth dynamic in the non-megapolitan counties.

The third variable in the TAPE creative class model for non-megapolitan counties was the median gross rent as percentage of income (GRAPI). Inclusion of the GRAPI

predictor variable increased the R-Square approximately 0.02 and has a standardized estimate that is similar to the population growth predictor variable: -0.153 for population growth and -0.140 for GRAPI, with a relatively unchanged 0.725 for bachelor degrees. The standardized estimate is allows a comparison of the influence of predictor variables regardless of units. A one standard deviation (4.70 percent) increase in percent bachelor's degree leads to a 0.725 standard deviation or 3.41 percent increase in predicted TAPE creative class, with all other variables held constant. A one standard deviation or 9.82 percent population growth leads to a decrease of 0.153 standard deviations or 0.90 percent of the TAPE creative class, with the other variables in the model held constant. And, a one standard deviation or 5.00 percent increase in GRAPI leads to a decrease of 0.140 standard deviations or 0.82 percent of the TAPE creative class, with the other variables in the model held constant.

GRAPI is a function of two variables: median rent and median income. Two counties could have the same percentage for the GRAPI variable but have different causes; for example, in a county that is mostly urban the GRAPI could be high because of the high rents while, conversely, a mostly rural county could have a high GRAPI because of low income. GRAPI is more a function of the relative cost of living for the county rather than actual rent or income.

Low GRAPI percentages (Figure 20) in the Great Plains indicates a low cost of living because the median gross rent is generally one standard deviation below the non-megapolitan average (Figure 21) and the median gross rent is generally below the average. The Southeast non-megapolitan county region of the United States is more

difficult to assess because the rents are relatively high along the Atlantic Coast. The non-megapolitan coastal counties along the Atlantic and Gulf of Mexico have high median gross rents and are likely high as a result of the high natural amenities and tourist attractions that relate to the water-front nature of these counties. Non-megapolitan counties around the Atlanta and Carolinas megapolitan areas generally have high GRAPI and lower median gross rents indicating low overall income.

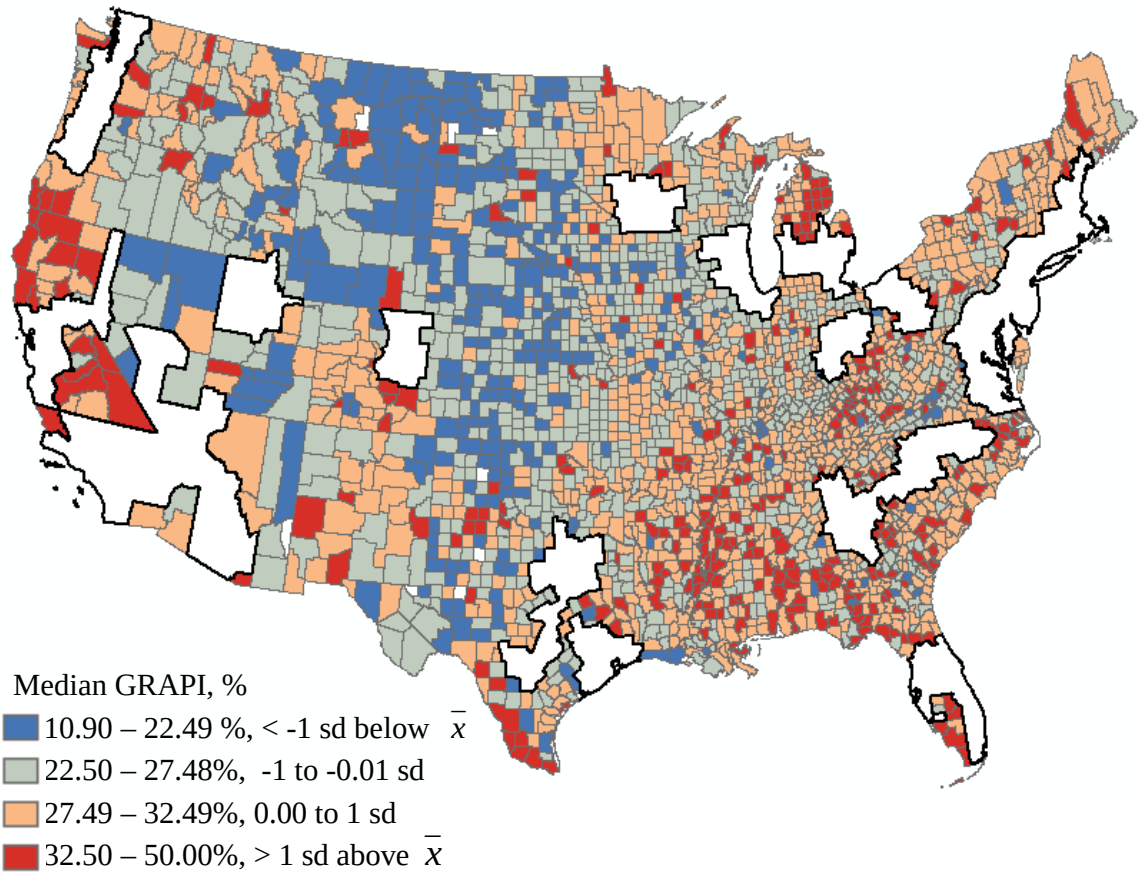

Figure 20. Median Gross Rent as Percent of Income (GRAPI) by Non-megapolitan County.
The standard deviation (sd) is 4.55 percentage points, the average ($\bar{x}$) megapolitan county has a GRAPI of 27.49 percent, ACS 5 year estimates: 2006-2010.

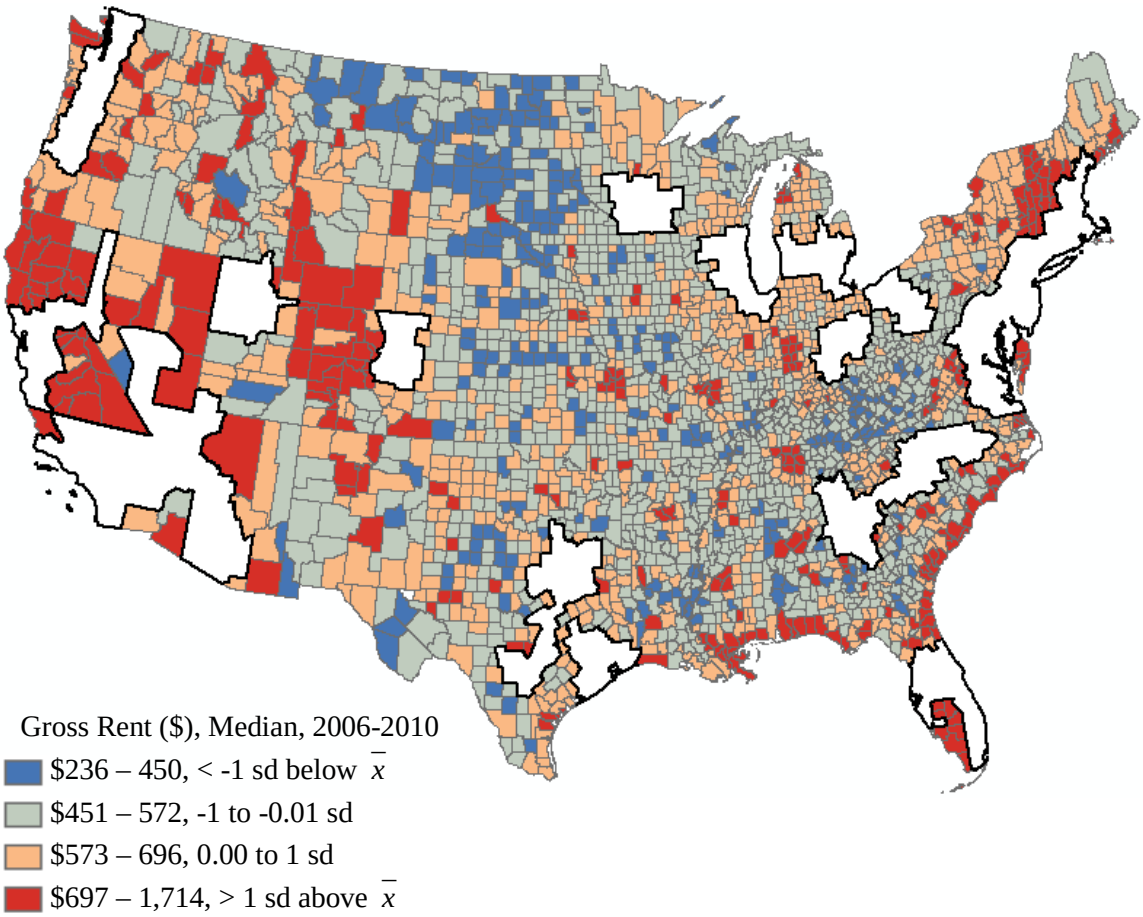

Figure 21. Median Gross Rent by Non-megapolitan County.
The standard deviation (sd) is $123, the average ($\bar{x}$) non-megapolitan county has a median Gross Rent of $573. ACS 5 year estimate, 2006-2010, renter-occupied housing units paying rent.

Like the high natural amenity counties along the Atlantic and Gulf Coasts, the non-megapolitan counties in Colorado have very high median gross rents but relatively low median GRAPI as a result of the ski resorts and arts culture in the mountains. One of the highest rent counties (ranked 27th overall among both megapolitan and non-megapolitan) is Pitkin County, home of the city of Aspen, is ranked third overall for arts

workers as a percentage of the labor force, after New York County (Manhattan) and San Juan County, Colorado: another, much smaller ski/art county.

The GRAPI independent variable is significant in the non-megapolitan models for the TAPE and TAP creative class. The GRAPI independent variable was predicted to have a positive relationship with the TAPE and the TAP creative class because creative workers were expected to generally live in high-rent counties but the relationship is unexpectedly negative for all dependent variables. The negative relationship of the GRAPI predictor variable and the TAPE creative class suggests that, at times, the creative class choose to live in places where their cost of living with respect to their housing cost choice is more affordable. The GRAPI variable shows a weakness of the data, the creative class is reported by county where they live, not where they work. This could be the result, in part, of the creative class commuting from suburban counties with a lower GRAPI to work in counties with a higher GRAPI. This is likely at work for some of the non-megapolitan counties but is just one contributing factor because most of the non-megapolitan counties are rural.

The majority of non-megapolitan counties, 1,321 of 2,455, are rural (below 30 people per square mile)[10] and an additional 1,068 non-megapolitan counties are not considered dense enough to be either suburban or urban based on the U.S. Census Bureau threshold of a minimum of 500 person per square mile for these designations. Consequently, only 16 of the 2,455 counties have population densities high enough to be

[10] See the definition of "*rural*" in the population density portion of the "Data" section of chapter 3.

considered suburban or urban. Rents in the rural and non-suburban/urban counties are generally lower than megapolitan counties that are more commonly urban and suburban.

Cook's D outlier analysis indicates that the largest non-megapolitan county outliers are King County, Texas, Billings County, South Dakota, and Los Alamos County, New Mexico. None of these outliers generated many creative class workers in the absolute sense (e.g., King County generated 100 creative class workers). Removal of one or all three outlier counties does not greatly affect the total creative class workers and has a small effect on such a large number of observations. Another regression analysis was performed for the TAPE non-megapolitan counties without the three outlier counties and there is no statistical difference from the final model.

4.3.4 TAP Regression Analysis, Non-megapolitan Counties

Like the TAPE creative class in the non-megapolitan counties, the percent TAP creative class for the non-megapolitan counties had a lower mean. The TAP creative class mean was 24.65 percent for the megapolitan counties and only 18.3 percent for the non-megapolitan counties. Like the TAPE creative class, the TAP creative class percentage for the non-megapolitan counties are lower due to the lower overall number of creative workers.

Like all previous model development, the goal for the non-megapolitan TAP dependent variable was the most parsimonious model based on a stepwise selection procedure. After the third independent variable of median age was added to the model, each additional independent variable added increased the R-Square very little (<0.0075 R-Square increase). Like the three previous models, the non-megapolitan TAP creative

class model development used the model diagnostics technique to identify the most parsimonious model that had an acceptable root mean square error, condition index, VIF and the highest possible R-Square (Table 23).

Table 23. Regression Models Indicating Associations between Socio-economic Variables and the Percent TAP Creative Class by Non-megapolitan County

	Variable	Model R^2	B	SE b	β	p-value	VIF	CN*
Model 1	Constant	0.450	0.078	0.002		0.000		5.17
	Bachelors		0.008	1.70E-04	0.671	0.000	1	
Model 2	Constant	0.524	0.160	0.005		0.000		13.97
	Bachelors, %		0.007	1.58E-04	0.656	0.000	1.00	
	GRAPI		-0.003	1.49E-04	-0.272	0.000	1.00	
Model 3	Constant	0.559	0.064	0.008		0.305		27.72
	Bachelors, %		0.008	1.53E-04	0.669	0.000	1.05	
	GRAPI, %		-0.002	1.46E-04	-0.233	0.000	1.01	
	Median Age		0.002	1.48E-04	0.191	0.000	1.05	
Model 4	Constant	0.566	0.079	0.009		0.000		31.42
	Bachelors, %		0.007	1.68E-04	0.627	0.000	1.25	
	GRAPI, %		-0.002	1.60E-04	-0.192	0.000	1.27	
	Median Age		0.002	1.51E-04	0.170	0.000	1.11	
	Unemployment, %		-0.002	2.55E-04	-0.108	0.000	1.57	

*CN is the condition number that is equal to the highest condition index for the model. Highlight indicates the selected model.

The b coefficients indicate that the TAP creative class for non-megapolitan counties will increase 0.008 percentage points for each additional percent of the population that has a bachelor's degree, it will decrease 0.0025 percentage points for each percent increase in the county's gross rent as percent of income (GRAPI), and it will increase its TAP creative class 0.0020 percentage points as the median age increases by one year.

The TAP creative class for the non-megapolitan counties is very similar with the other models but also has some key differences. The bachelor degree independent variable is still very dominant in the model explaining 45 percent of the variance in the one variable model (i.e., Model 1, Table 23). Additionally, the standardized estimate of 0.67 for the bachelor's degree variable Model 3 is substantial compared to the standardized estimate of -0.23 for the median gross rent as percent of income (GRAPI) and 0.19 for median age.

The negative association with the TAP creative class and median GRAPI for the non-megapolitan areas is likely similar to the rationale for the TAPE creative class model for non-megapolitan counties discussed earlier. In non-megapolitan counties where people pay a higher portion of their income for rent there will be lower percentages of the creative class because in the non-megapolitan counties high GRAPI is more likely a function of lower income than higher rents. The relationship between the creative class and GRAPI was predicted to be positive for megapolitan counties because the creative class were expected to cluster in counties with a high cost of urban living (i.e., rent); however, for the non-megapolitan counties, the higher median GRAPI is likely an indicator of poorer counties where people live closer to the poverty line. Non-megapolitan counties with a high median GRAPI likely indicate those counties where incomes are lower and residents pay a higher percentage of their low income to rents.

The median age independent variable is the third predictor variable selected by the stepwise procedure and seems to be included in the non-megapolitan TAP model for reasons similar to the population growth rate predictor variable for the TAPE creative

class non-megapolitan model. The median age predictor variable seems generally above average in the non-megapolitan counties in the Great Plains (Figure 22) where many individuals "age in place" and where the TAP creative class is also found to be clustered (TAPE creative class cluster analysis, Figure 14, above) while the southeast portion of the United States generally has an below average median age but fewer clusters of TAP creative classes.

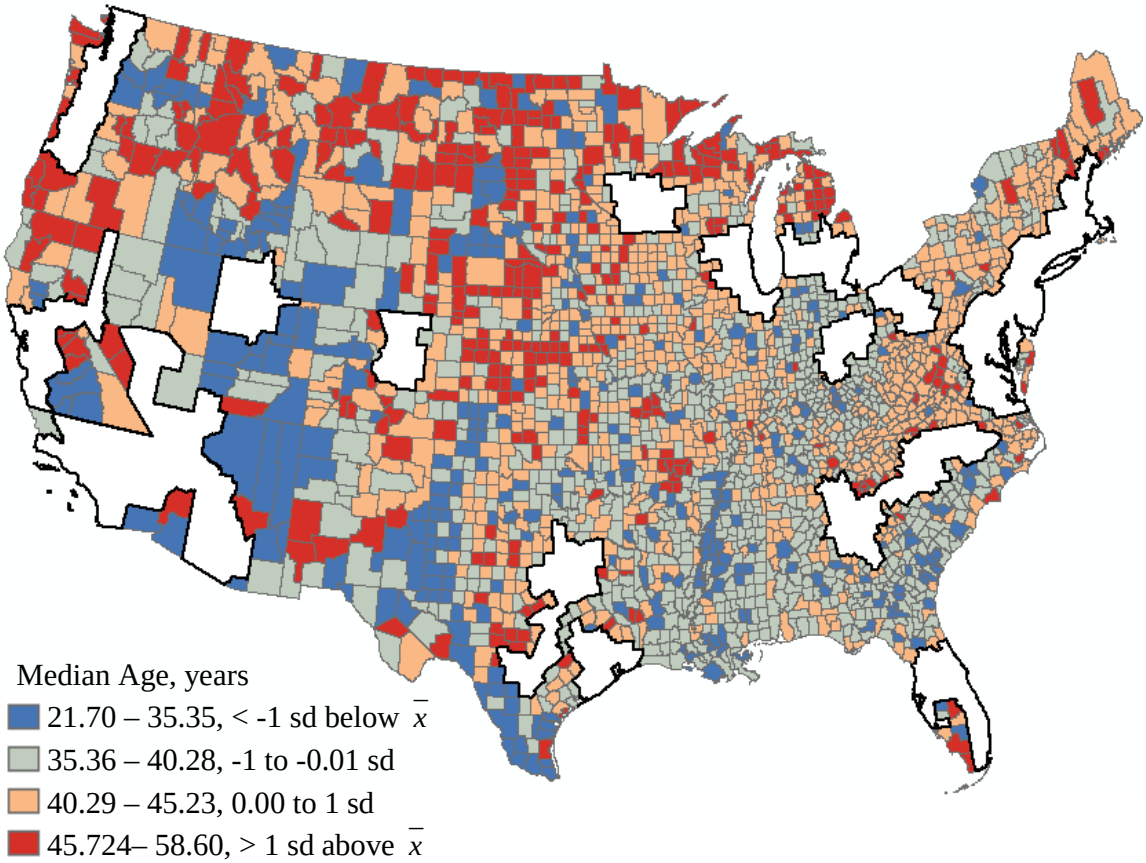

Figure 22. Median Age by Non-megapolitan County.
The average non-megapolitan county ($\bar{x}$) has a median age of 40.29 years; and the standard deviation (sd) of 4.94 years, ACS 5 year estimates: 2006-2010.

The median age independent variable was originally included to identify counties that may have younger or older populations that could affect the distribution of the creative class. It is often conceptualized that places with a younger population would be more innovative; however, the positive association of the median age with the TAP creative class model for non-megapolitan counties (Table 23) contrasts with this general assumption. As mentioned earlier, this finding does not necessarily debunk the idea that the younger the county the more innovative it is. It does raise the question, why is the TAP creative class distributed in a way that parallels the distribution of the population by age in the non-megapolitan areas of the United States? The map of the median age of the population (Figure 22, above) suggests that it could be acting as a proxy that matches the distribution of the creative class in the non-megapolitan counties in many ways, similar to the population growth independent variable for the TAPE creative class non-megapolitan model.

Cook's D for the TAP creative class non-megapolitan counties shows similarities with the TAPE creative class outliers. Billings County, South Dakota is the largest outlier non-megapolitan county followed by Loving County, Texas and Carter County, Montana. Los Alamos County, New Mexico was the third ranking anomaly for the TAPE creative class is now fourth for the TAP creative class. To test to determine if these outliers had an effect on the model, the four counties were removed from the dataset (n=2,451) and the regression analysis was performed again. The resulting model is not statistically different from the model that included the outlier counties.

4.4 Explanation of the "Other" Variables

While the bachelor degree, average wages, gross rent as percentage of income (GRAPI), and population growth rate all featured prominently in one or more of the regression models, many of the independent variables did not feature in the final models for any dependent variable. What follows is an explanation of the variables that were not included in the selected models.

4.4.1 Poverty Rate

The poverty rate independent variable was predicted to be negative because it was expected to be an indicator of a depressed county and other indicators (e.g., the unemployment rate and percent single parent head of household) were also likewise anticipated to have a negative relationship with the TAPE and TAP creative class. Correlation coefficients for the poverty rate with each of the dependent variables substantiate this prediction of a negative relationship (Table 15). The poverty rate correlation coefficients with TAPE and TAP were among the very highest of all the independent variables.

All indications from the spatial distribution of the poverty rate (Figure 23) show that the major urban and suburban counties in the megapolitan counties — especially in the Northeast Megalopolis and the Twin Cities megapolitan area — tended to have much lower rates of poverty. Additionally, the non-megapolitan counties of the Great Plains had lower rates of poverty while much of the Southeast had elevated poverty rates. Despite this general trend of megapolitan counties having lower rates of poverty, exceptions to this include Washington D.C. which had a 18.4 percent poverty rate, over

one standard deviation above the megapolitan mean, while the commuter and edge counties adjacent all have lower rates: most counties are less than half Washington D.C.'s poverty rate. Counties for Boston and New York City megapolitan areas have similar cores of high poverty rates with peripheries of lower poverty rates. Despite a trend that seems to parallel the distribution of the TAPE and TAP creative class, the poverty rate was not selected for any of the four regression models.

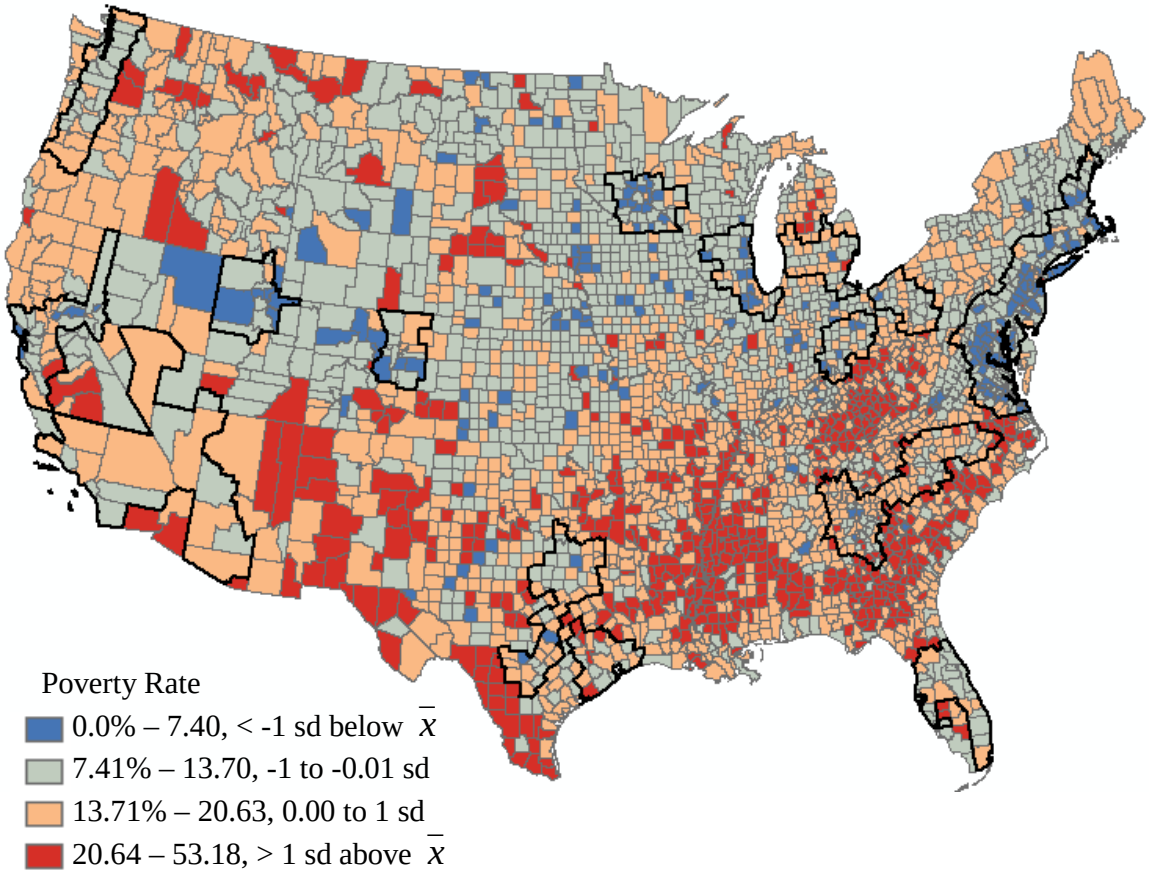

Figure 23. Poverty Rate by County.
The average ($\bar{x}$) county (n=3,109) has a poverty rate of 13.71 percent; and the standard deviation (sd) of 6.32 percentage points, ACS 5 year estimates: 2006-2010. Megapolitan counties outlined in black.

4.4.2 Unemployment Rate

The unemployment rate had a large negative, statistically significant, and consistent relationship with each of the dependent variables for both the megapolitan and non-megapolitan counties (Table 15); other scholars have found similar relationships (Clifton and Cooke, 2009). The negative relationship suggests that when unemployment is lower, the creative class percentage is higher. This relationship was identified earlier by Florida when he found that areas with higher concentrations of creative workers generally had lower unemployment rates for the service and working classes compared to areas with lower concentrations of creative workers (Figure 4). The unemployment rate was expected to be included in the regression modeling based on the literature and the high correlation with the dependent variables but, in each case, the R-Square increase was so small that the model was not significantly different when it was included. The spatial distribution of the unemployment rate (Figure 24) follows trends identified earlier for other variables like the education and medical occupations as a percentage of the TAPE creative class (Figure 12). The unemployment map indicates high unemployment in the Southeastern non-megapolitan counties as well as a low unemployment rate in the Great Plains and Mountain non-megapolitan regions. The megapolitan counties of the Northeast Megalopolis, Wasatch Range (Salt Lake City), Front Range (Denver), Twin Cities (Minneapolis), and the three Texas megapolitan areas have lower rates of unemployment while Florida Atlantic, Central Florida, Michigan Corridor, Puget Sound (Seattle) and Southern California have higher rates of unemployment. This spatial

distribution of the unemployment rate for the megapolitan counties is one possible explanation why it was not selected as a predictor variable in any of the models.

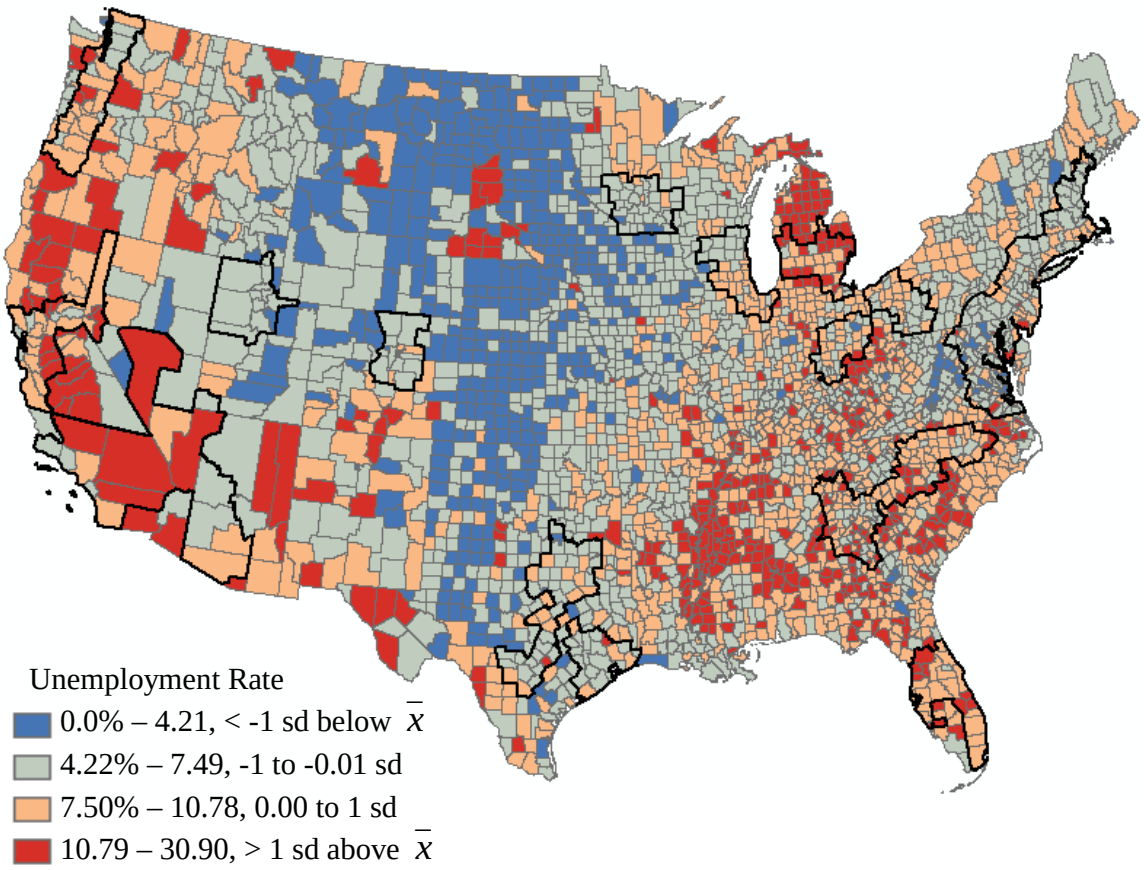

Figure 24. Unemployment Rate by County.
The average county ($\bar{x}$) has an unemployment rate of 7.50 percent; and the standard deviation (sd) of 3.29 percentage points, ACS 5 year estimates: 2006-2010. Megapolitan counties outlined in black.

4.4.3 Other Variables

Core/Periphery: The core/periphery variable had a mixed association with the creative class in the literature. Peripheral areas in the United Kingdom disadvantaged creative graduates (Faggian *et al.*, 2012), while rural (peripheral) counties mimicked the

metropolitan (core) counties when explaining the distribution of the creative class according to McGranahan and Wojan (2007), and still others suggest the creative class has a preference for inner cities and suburbs (core and adjacent to the core) but much less to the more peripheral, rural areas (Flew, 2012).

The core/periphery independent variable was a dummy variable that captured the central (i.e., core) counties as defined by Office of Management and Budget (1 is assigned to central counties and 0 for all other counties). The core/periphery dummy variable had strong, positive and significant correlations with three of the four dependent variables (Table 15) but the core/periphery independent variable proved not predictive of the geography of the creative class although the more nuanced population density independent variable was expected to be more predictive in the modeling.

Population Density: The population density variable had positive and significant correlation coefficients with each of the dependent variables (Table 15) although less so for the megapolitan counties. It was expected that higher population densities would lead to higher disproportionate shares of both the TAPE and TAP creative class based on the logic that densely packed, agglomerated economies will have more creative workers. However, the TAPE and TAP creative class rankings for the non-megapolitan counties (Tables 9 and 10) show that some of the counties with the lowest population densities had the highest percentages of the creative class. For example, 16 of the TAPE creative class top twenty and 15 of the TAP creative class for the non-megapolitan counties had very low populations and correspondingly low population densities. Loving and King Counties in Texas both had TAPE and TAP creative class percentages in the top twenty

for non-megapolitan counties but their corresponding population densities were the first and third lowest, respectively, for all 3,109 counties in the study area with less than 0.1 person per square kilometer. These two counties, among others, were counties with small absolute populations (and small population densities) that unexpectedly had high percentages of the creative class. For example, Loving County has just 21 TAPE creative class workers so just one more creative worker would increase the TAPE creative class percentage over one percentage point from an already high 58.3 percent to over 59.4 percent.

Megapolitan counties had a similar situation, albeit to a lesser degree. The top twenty rankings for both the TAPE and TAP creative class for the megapolitan counties (Tables 4 and 7) generally show that more suburban/less dense commuter counties and edge cities had the largest disproportionate share of the creative class relative to those counties with large principal cities (the District of Columbia and New York County, New York, among others, are exceptions). With a general trend of higher densities and average creative class distributions in the principal city counties, high disproportionate shares of the creative class in the bedroom/commuter counties that generally had lower population densities, combined with fringe counties with the lowest density frequently featuring the lowest percentage of creative class, there was an understandably weak relationship between the population density and the distribution of both the TAPE and TAP creative class for the megapolitan counties.

The spatial distribution of the population density independent variable (Figure 25) shows clearly the range of values that likely affect the utility of the population density

independent variable, especially for the non-megapolitan counties. There are just too many counties at the low end of the density scale (below 11.57 people per square kilometer) to enable a strong predictive relationship to emerge.

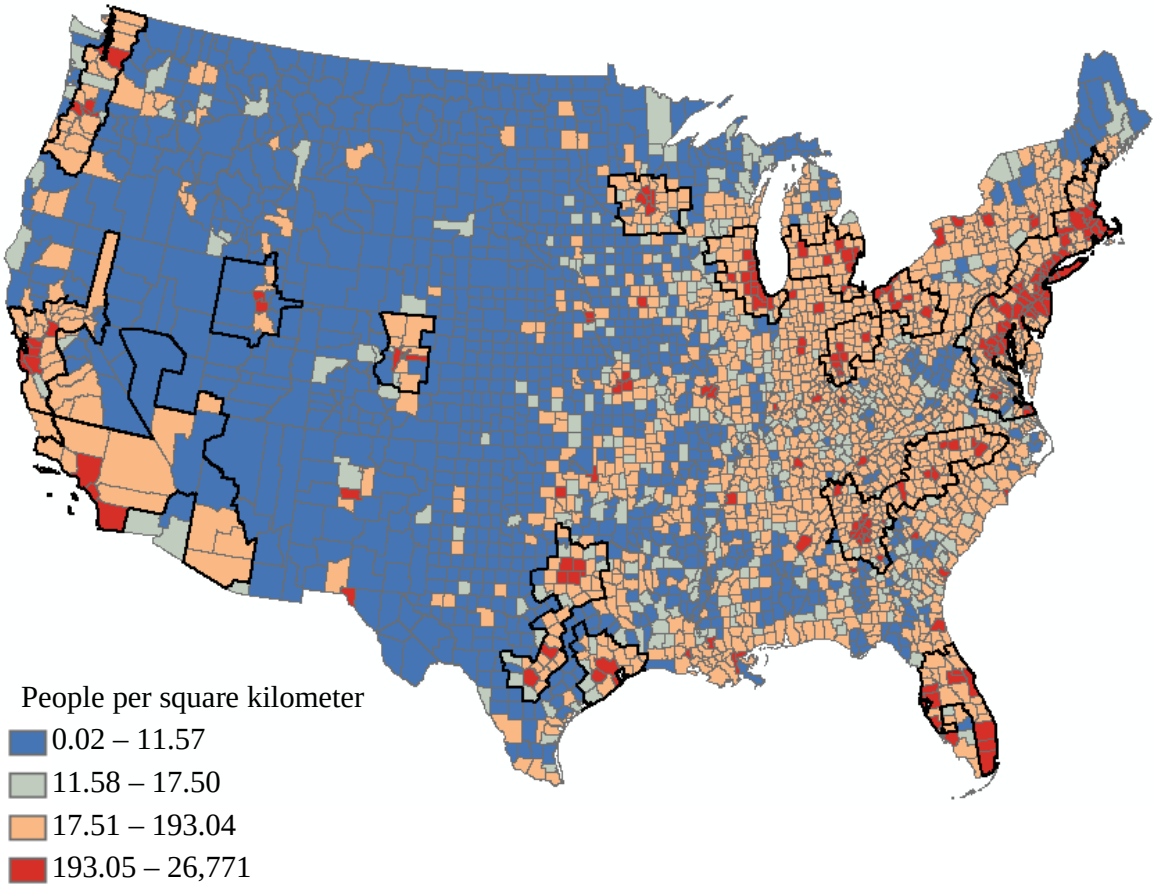

Figure 25. Population Density by County.
Megapolitan Counties outlined in black. Least dense counties in dark blue are below 11.58 people per square kilometer (30 people per square mile) indicating rural counties according to The Office of Rural Health Policy. Light blue counties have a higher population density than 11.58 people per square kilometer but are below the median of 17.51. Light red counties are above the median but below the threshold density of suburban/urban: 193.05 people per square kilometer (500 people per square mile) defined by the U.S. Census Bureau. The red counties are suburban or urban and above 193.05 people per square kilometer. ACS 5 year estimates: 2006-2010.

Scholarly literature regarding population density and its relationship to the creative class also has mixed findings. Population density was found to have a positive association with the creative class (Asheim and Hansen, 2009; Knudsen *et al.*, 2007; Boschma and Fritsch, 2009), while others found a negative association existed (McGranahan and Wojan, 2007; Wojan *et al.*, 2007). Creative class populations in Sweden were found clustered in the most densely populated cities but the population density variable was not specifically used in the statistical analysis (Asheim and Hansen, 2009). Additionally, population density had a positive and significant relationship to the creative class in five of six European countries: Finland, Germany, the Netherlands, Norway, Sweden, but not England/Wales (Boschma and Fritsch, 2009). The population density variable was found to have both positive and negative relationships for many different measures of creativity and the creative class. The mixture of scholarly findings and the insignificant findings of this research suggest that the population density variable should be used in limited ways, if at all.

Percent Owner Occupied: Percent owner occupied was anticipated to have a negative association with the two dependent variables because it was expected that the counties where the creative class cluster would be more footloose: a situation where renting was more common. The correlations for percent owner-occupied were all negative and significant for three of the four dependent variables (Table 15) and positive yet insignificant for the TAP creative class by non-megapolitan county. Much of this is understandable when analyzing the top twenty tables for the TAPE and TAP creative class (see Tables 4 and 7). The tables suggest the creative class live in different types of

counties, be it counties with principal cities like New York County and Washington D.C. where owner occupied rates are low or commuter counties and edge counties like Delaware County and Somerset County with higher percentages of owner occupied housing units. There is a high disproportionate share of creative workers in megapolitan counties with high and low rates of owner occupancy suggesting why it is not significant for any of the regression models.

Consumer Services: Other scholars found the consumer services — retail and food service occupations of the service class — were positively associated with the creative class (Florida *et al.*, 2008; Shapiro, 2006). It was recently found that, "[i]n innovative industries [i.e., creative industries], one new position might yield four to five new service-sector jobs within a metropolitan area" (The Economist, 2014) so a relationship between the creative class and the supporting service workers is well established. Additionally, the creative class is generally hypothesized to rely on the consumer services more than other classes of workers for two reasons. First, creative class workers generally earn more (Bakowska and Rudawska, 2011) and can spend more on these types of services. Second, creative class workers rely on service workers to enable them to have more time to be creative and to enable more of their highly coveted leisure time (Florida 2002, 2012a); that is, service workers are needed to enable a creative economy. Despite the established relationship, the positive but relatively weak correlation between consumer services employment and the TAP creative class dependent variables for megapolitan and non-megapolitan counties as well as for the TAPE creative class for non-megapolitan counties confirms these earlier findings — it

was positive but insignificant for the TAPE creative class for the non-megapolitan counties (Table 15). A possible explanation is that service workers, specifically consumer service workers, are ubiquitous in the megapolitan and non-megapolitan economics of the United States while the distribution of the creative class is not, so the relationship between them and the creative class is understandably weak. Consumer services, like the education and medical workers, are more evenly distributed with the population limiting a strong relationship with the creative class.

Tourism Establishments: The tourism establishment independent variable measures the total number of enterprises providing lodging services. Tourism was found to be positively associated with the creative class growth from 1990 to 2000 (McGranahan and Wogan 2007) and small lodging establishments were predictive of the distribution of artist occupations (Wojan *et al.*, 2007). The tourism independent variable was meant to capture economic and non-economic aspects of the county like proximity to natural/cultural amenities and business nodes; for example, coastal counties have beach amenities that result in more tourism and New York City is a major financial and cultural node for the world, therefore it has business and non-business tourism. The tourism independent variable had a positive correlation coefficient score with each of the four dependent variables but was weakest for the non-megapolitan counties (Table 15).

In Migration: The in-migration rate measures the amount of people that move into the county. It was expected that the in migration rate would have a positive effect on the distribution of the creative class because people choosing to move to a county was a strong indicator of economic growth. This positive relationship with the in migration rate

was found to be generally true for the megapolitan counties because the TAPE and the TAP creative class for the megapolitan counties had a positive and significant correlation but the in migration rate was not significant for both the TAPE and TAP creative class for non-megapolitan counties (Table 15). In migration was identified as a significant variable for the TAP creative class model for the megapolitan counties (Model 3 of Table 20) but it was not included in the final model because the marginal R-square increase was less than 0.02 for a model that already predicted over 87 percent of the variance with the two predictor variables already included in the model.

Percent Black or Hispanic: The percent Black and Hispanic independent variables were expected to have a negative association with each of the dependent variables based on the literature (McGranahan and Wojan, 2007; Florida, 2002, 2012b); however, those findings are only partially substantiated by this study. In this dissertation, percent Black had an inverse relationship with the creative class and was significant for three of the four dependent variables while percent Hispanic had no real statistically significant association with correlations scores close to zero (Table 15).

Percent Elderly: The percent elderly had a negative, statistically significant correlation with both the TAPE and TAP creative class for the megapolitan counties (Table 15) but a positive and significant correlation coefficient for the TAPE and TAP for the non-megapolitan counties. The different relationships between percent elderly and the creative class for megapolitan and non-megapolitan counties suggests that the distribution of the elderly is different for each. The distribution of the elderly (Figure 26) shows that the megapolitan areas generally have very low percent elderly although the

Central Florida and Florida Atlantic megapolitan areas are exceptions to the rule. Megapolitan counties show a greater range of values for elderly percentages with considerable geographic clustering. The Great Plains non-megapolitan counties tend to feature more counties with a high percent elderly as do the counties outside the Northeast Megalopolis. Many of these counties tend to have a large number of individuals that "age in place." Unexpectedly, the non-megapolitan counties that make up the Southeast Manufacturing Belt generally have low percentages of elderly. It was expected that the counties that compose the "Sun Belt" would have more elderly but this is not substantiated.

Percent Single Parent Household: Percent single parent household had a negative and significant correlation for the TAPE and TAP creative class for both the megapolitan and non-megapolitan counties (Table 15) meaning that as the percentage of single parent households went up, the percentage of the creative class went down. The percent single parent household variable was identified in the TAPE creative class model for the non-megapolitan counties (Model 4 of Table 22) with a correspondingly negative relationship; however, the marginal R-square increase was less than 0.02 so it was excluded from the final model.

Percent of Housing Units with Children: Children are a major factor when deciding where to live for both the creative class worker and non-creative class worker alike (Flew, 2012). The percent of housing units with children had a negative correlation coefficient with the TAPE and TAP creative class for the non-megapolitan counties (Table 15) and a positive, yet weak and insignificant correlation with the TAPE and TAP

creative class for the megapolitan counties. The negative relationship between the creative class and children in housing units is substantiated by work by other scholars; it was found that Florida's creative capital theory holds less well for workers with children (Martin-Brelot *et al.*, 2010). The percent of housing units with children was identified as a predictor variable for the TAPE creative class for the megapolitan counties (Model 3 of Table 17) but the marginal R-square increase was less than 0.001 so it was not included in the model.

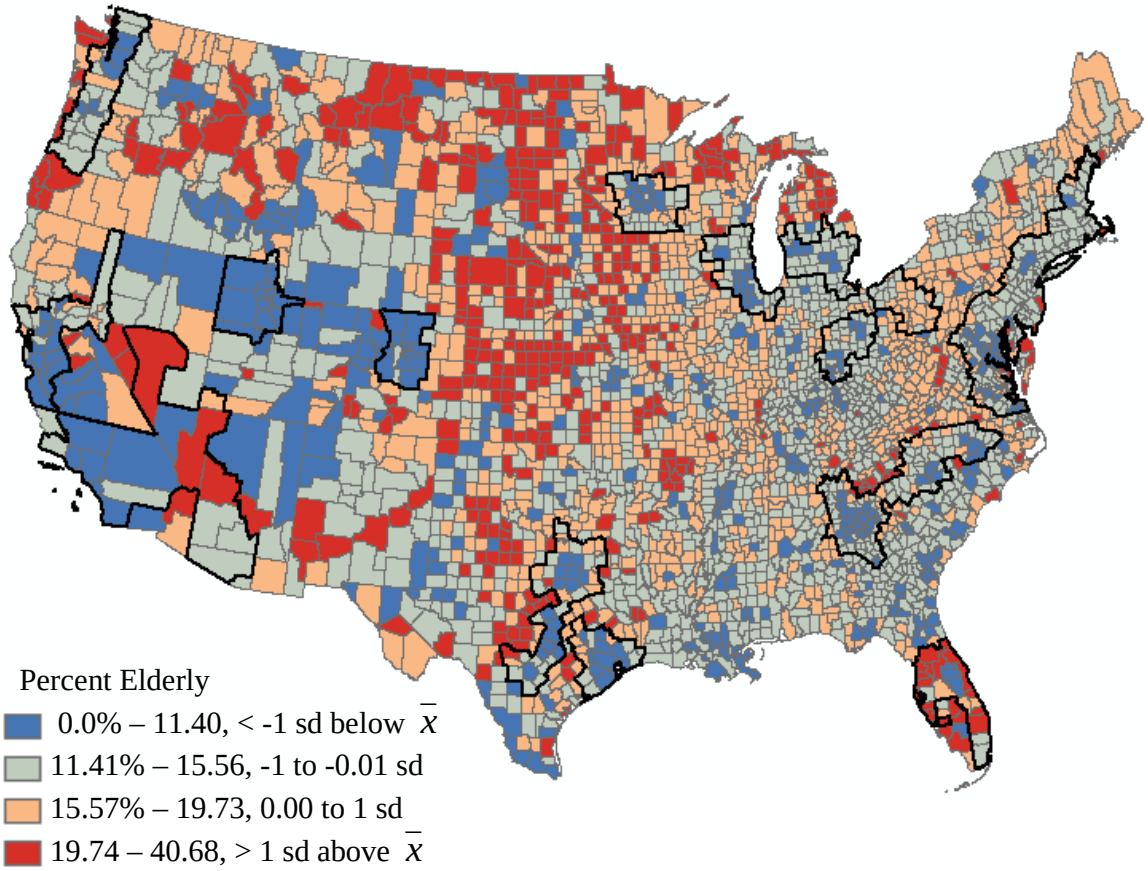

Figure 26. Percent Elderly by County.
The average county ($\bar{x}$) has 15.57 percent elderly; and the standard deviation (sd) of 4.16 percentage points. Megapolitan counties outlined in black, ACS 5 year estimates: 2006-2010.

CHAPTER V

CONCLUSION

The purpose of this dissertation was threefold: 1) to evaluate Florida's original definition of the creative class (Florida, 2002 and 2012a) that includes technology, arts, professional, and education and medical occupations (TAPE) to determine how it is distributed by megapolitan county (Nelson and Lang, 2011) and to identify what socio-economic variables best explain this distribution, 2) to understand how the newly evolved technology, arts, and professional (TAP) creative class (Florida 2012a) is distributed by megapolitan county and which socio-economic variables best explain this distribution, and then to contrast these findings with the TAPE creative class, and 3) to analyze the predictor variables identified for the TAPE and TAP creative class for the megapolitan counties and contrast this with the socio-economic variables that best explain the TAPE and TAP creative class distribution in the non-megapolitan county.

Descriptive findings suggest that the megapolitan counties with the highest percentages of the TAPE and the TAP creative class are more likely bedroom counties or edge counties than major, urban core counties. The top twenty megapolitan counties for the TAPE and TAP creative class rankings largely featured counties that had either edge cities or bedroom commuter communities. The creative class might work in a county with a principal city downtown but they are more likely to live in the counties around the downtown where they make up a high disproportionate share of the workforce. Non-

megapolitan county rankings support this trend because no counties in the TAPE or TAP creative class top twenty featured a major urban core center.

Another important finding was the dominance of the Northern Virginia and Washington D.C. area as a creative class node. The southern end of the Bowash megalopolis (i.e., the Chesapeake megapolitan area) featured large disproportionate shares of both the TAPE and TAP creative class and each of the occupational subcomponents: technology, arts, professional, and education and medical.

The TAP creative class methodology removed the education and medical workers from the creative class definition because such workers are generally considered to be "non-basic" meaning they do not export goods or services therefore bring no money into the local economy since they function mostly as local services. Megapolitan and non-megapolitan counties that were most affected by the removal of the education and medical subcomponent were counties that generally had an undiversified creative workforce that had a high disproportionate share of education and medical workers. Sometimes these counties were college counties like Orange County, North Carolina, with the University of North Carolina at Chapel Hill or Tompkins County, New York, with Cornell University but most of these counties had a high percentage share of their TAPE workers in the K-12 education system or the local hospital. As a result, the counties with high percentages of education and medical workers as part of their overall TAPE creative class were reduced in the rankings for the TAP creative class; conversely, counties with low percentages of "eds and meds" rose in the TAP rankings.

Getis-Ord Gi cluster analysis found TAPE and TAP creative class “hot-spot” clusters in the Northeast where Gottmann’s original Megalopolis was identified as well as in the Sierra Pacific (San Francisco), and Puget Sound (Seattle) megapolitan areas, among other smaller hot-spot clusters. However, unexpectedly, a large creative class hot-spot was found in the Great Plains region of the United States. The Great Plains creative class hot-spot cluster confirms a portion of Kotkin’s Resurgent Heartland theory that identified that region as one of four growth corridors in the United States; the other three growth corridors — the Third Coast (Gulf Coast), the Southeast Manufacturing Belt, and the Intermountain West — are not substantiated as growth corridors by this research. Additionally, rather than confirming Kotkin’s Southeast Manufacturing Belt as a growth corridor, a creative class “cold-spot” was identified indicating that despite all the population growth of this region, there is no corresponding increase in the percent creative class.

Socio-economic descriptive statistics for the creative class hot-spot clusters suggest that the hot-spot counties have higher average wages and percent bachelor’s degree than the 654 megapolitan counties while the poverty and unemployment rates are lower for these same hot-spot counties. By contrast, the population growth rate for the hot-spot counties is lower as well but this is not unexpected because economic growth and population growth are not directly related in many cases (Florida, 2012a). For example, the New England (Boston) and New York/ Philadelphia megapolitan areas along with the Great Plains creative class hot-spots all have low or below average population growth but have high disproportionate shares of the creative class.

Using stepwise regression, significant associations were observed between the percent TAPE creative class and the percent of the workforce, aged 25 years and older, with a bachelor's degree and the average wages of the workforce for the megapolitan counties. Likewise, the more narrowly defined TAP creative class that excludes the education and medical occupations has the same two predictor variables. That said, the TAP creative class model is slightly more predictive than the TAPE creative class model.

By contrast, the geography of the creative class by non-megapolitan county also had a positive relationship with the percent bachelor degree's but featured additional predictor variables. Gross rent as a percent of income (GRAPI) — an expression of cost of living — was found to be negatively related with both the geography of the TAPE and TAP creative classes for the non-megapolitan counties. The Great Plains non-megapolitan counties have a low GRAPI while the Southeast has high GRAPI. Population growth rate was also found to have a negative association with the TAPE creative class for non-megapolitan counties while median age was found to have a positive association with the TAP creative class for the non-megapolitan counties.

During the completion of this dissertation research, a number of additional avenues of investigation were identified regarding the creative class and the various socio-economic predictor variables. For example, additional analysis of each creative-class subcomponent would enable a better understanding of the creative class and its spatial distribution. What predictor variables best explain the distribution of the technology or arts subcomponent and how are they different from the professional

subcomponent, or the educational/medical occupational subcomponent? A separate regression model and cluster analysis for each of the creative class subcomponents could augment the creative class findings and enable a better overall understanding of the individual predictors.

Another avenue for further investigation is the effect of scale on the analysis. If a scale smaller than the county is selected, perhaps at the census sub-county or tract level, would the analysis yield similar predictive findings? A robust analysis of one representative megapolitan area at a smaller scale could reveal more nuances regarding the relationships that might exist between the TAPE and TAP creative class and the socio-economic variables used in this dissertation.

Additionally, a more focused comparative analysis of the non-megapolitan creative class hot-spot cluster of the Great Plains and the non-megapolitan cold-spot cluster of the Southeast is needed. How have the lesser-populated counties of the Great Plains managed to retain creative workers despite a general loss of population while similarly rural counties in the Southeast that generally have growing populations cannot do the same? Better understanding how the Great Plains is able to promote a creative economy despite the largely rural nature of the location might enable other counties in similar circumstances to emulate their success.

The final area of additional research is the international aspect of the creative class in North America. The United States is not a closed economic system. Is the geography of the creative class in Canadian megapolitan areas and joint U.S./Canada

megapolitan areas that spill-across the border explained by the same predictor variables? Further research could include a more detailed international analysis to determine if the creative class hot-spot clusters of America extend into Canada.

Perhaps the biggest finding of the dissertation is the strong, positive relationship that exists between both the TAPE and TAP creative class and the percent bachelor's degree. This finding was not necessarily unexpected but the dominance of the predictive nature of the bachelor's degree independent variable and its overshadowing of the other variables in the megapolitan and non-megapolitan analysis was unanticipated. Some have vigorously contested which theory of economic development is most predictive: the human capital theory supported by Glaeser based on education attainment or Florida's creative capital theory based on creative occupations. This research tested different definitions of the creative class but seemingly found that both the creative-class theory and the human capital theory are much more mutually supporting than previously assumed.

Overall, the theoretical foundations of Florida's creative capital theory, Kotkin's Resurgent Heartland theory, and the human capital theory promoted by Glaeser are generally supported by this research because it is found that these theories are more mutually supporting than contradictory. Glaeser may be right when he encourages doing "a bit of each vision" and not being too focused on what promotes one specific theory (Glaeser, 2011, page 261). Doing so, may well lead to a more complete understanding of the geographic patterns of the creative class.

The importance of education on the creative economy of the United States is reinforced with each level of analysis in this dissertation. If the creative class are the key component to the economic future of the United States in the 21st century knowledge economy, then education is the key to fulfilling the creative class's potential. Therefore, any policy advocacy that promotes education and specifically college attendance and affordability is supported by this research. States should invest in education as a long-term economic development strategy. Of late, states have divested from the state universities and K-12 systems due, in part, to the requirement to balance budgets during the Great Recession. The repercussion of this short-sighted strategy of decreased levels of funding for education during years of recession but not raising investment post-recession will arise in the years and decades to come. Reenergized state and local education systems will nurture future creative workers enabling a more robust creative economy in the United States.

BIBLIOGRAPHY

Alexandria Economic Development Partnership. 2013. *Economic Indicators.* Alexecon.org/data-reasearch/demographics-statistics/economic-indicators (Accessed: June 12, 2014).

America 2050. 2012. http://www.america2050.org/megaregions.html. (Accessed: February 22, 2012).

Andersen, K., Hansen, H., Isaksen A., and Rauino, M. 2010. Nordic City Regions in the Creative Class Debate – Putting the Creative Class Thesis to a Test. *Industry and Innovation* 17(2). 215-240.

Asheim, B., and Hansen, H. 2009. Knowledge Bases, Talents, and Contexts: One the Usefulness of the Creative Class Approach in Sweden. *Economic Geography* 85(4), 425-442.

Bailey, R. Assistant to the Director of Admissions at Alice Lloyd College. Phone conversation on June 30, 2014.

Baigent, E. 2004. Patrick Geddes, Lewis Mumford and Jean Gottmann: divisions over 'megalopolis'. *Progress in Human Geography* 28(6), p. 687-700.

Bakowska, S., and Rudawask, I. 2011. Creative Class and Its Input in Regional Economic Development. *International Journal of Management Cases* (13)4, 466-475.

Belsey, D., Kuh, E., and Welsch, R. 2004. *Regression Diagnostics.* John Wiley and Sons. New York.

Bethany College. 2014. *Student Enrollment Information*. http://www.bethanywv.edu/about-bethany/fast-facts/ (Accessed May 14, 2014).

Bogue, D. 1951. *State economic areas: a description of the procedure used in making a functional grouping of the counties of the United States.* U.S. Government Print Office, Washington D.C.

Boschma, R., and Fritsch, M. 2009. Creative Class and Regional Growth: Empirical Evidence from Seven European Countries. *Economic Geography* 85(4), 391-423.

Burton, M., Nesiba, R., and Bruce, B. 2010. *An Introduction to Financial Markets and Institutions, 2nd edition.* M.E. Sharpe. Armonk, New York.

Bureau of Economic Analysis. 2012a. *Glossary*. http://www.bea.gov/glossary/glossary.cfm (Accessed September 28, 2012).

Bureau of Economic Analysis. 2012b. *Regional Definitions*. http://www.bea.gov/regional/definitions/ (Accessed October 26, 2012).

Bureau of Economic Analysis. 2012c. Data: http://www.bea.gov/iTable/index_regional.cfm (Accessed October 02, 2012).

Bureau of Labor Statistics. 2012. *Standard Occupational Classification, Crosswalks between the 2010 SOC and systems used by other Federal and international statistical agencies.* http://www.bls.gov/soc/crosswalks.htm (Accessed, October 12, 2012).

Bureau of Labor Statistics. 2014. *Industries at a Glance, Accommodation: NAICS 721*. http://www.bls.gov/iag/tgs/iag721.htm (Accessed May 16, 2014).

Brille, T. 2010. Cool, funky and creative? The creative class and preferences for leisure and culture. *International Journal of Cultural Policy* 16(4), 466–496.

Clifton, N., and Cooke, P. 2009. Creative knowledge workers and location in Europe and North America: a comparative review. *Creative Industries Journal* 2(1) p. 73-89.

Department of Agriculture. 2013. *What is Rural* (Dated: December 30, 2013). http://www.ers.usda.gov/topics/rural-economy-population/rural-classifications/what-is-rural.aspx#.U9JCxPldWSp (Accessed July 25, 2014).

Dewar, M., and Epstein, D. 2007. Planning for "Megaregions" in the United States, *Journal of Planning Literature,* 22.

Donegan, M., Drucker, J., Goldstein, H., Lowe, N., and Malizia, E. 2008. Which Indicators Explain Metropolitan Economic Performance Best? *Journal of the American Planning Association* 74(2), 180-195.

Economist, The. 2014. Home Economics: Sky-high house prices in the most desirable cities are holding back growth and jobs. *The Economist, Special Report: The World Economy.* October 4, 2014. http://cdn.static-economist.com/sites/default/files/sponsorships/jl06/20141004_World_economy_WF.pdf (Accessed October 7, 2014).

ESRI. 2013. *Hot Spot Analysis (Getis-Ord Gi*) (Spatial Statistics).* http://edndoc.esri.com/arcobjects/9.2/net/shared/geoprocessing/spatial_statistics_tools/hot_spot_analysis_getis_ord_gi_star_spatial_statistics_.htm (Accessed December 6, 2013).

Faggian, A., Comunian, R., Jewell, S., and Kelly, U. 2012. Bohemian Graduates in the UK: Disciplines and Location Determinants of the Creative Careers. *Regional Studies* 47(3), 183-200.

Five College Consortium. 2014. https://www.fivecolleges.edu/ (Accessed May 14, 2014)

Flew, T. 2012. Creative suburbia: Rethinking urban cultural policy – the Australian case. *International Journal of Cultural Studies* 15(3), 231-246.

Florida, R. 2002. *The Rise of the Creative Class And How It's Transforming Work, Leisure, Community, and Everyday Life*. Basic Books, New York.

Florida, R. 2003. Entrepreneurship, Creativity, and Regional Economic Growth. *The Emergence of Entrepreneurship Policy: Governance, Start-ups, and Growth in the US Knowledge Economy.* ed. Hart, D. Cambridge University Press, Cambridge.

Florida, R. 2008a. *Who's Your City? How the Creative Economy is Making Where to Live the Most Important Decision of Your Life.* Basic Books, New York.

Florida, R. 2008b. Whosyourcity.com (Accessed May 1, 2012).

Florida, R. 2012a. *The Rise of the Creative Class--Revisited: 10th Anniversary Edition--Revised and Expanded*. Basic Books, New York.

Florida, R. 2012b. Creatives and the Crisis. *The Atlantic* (October 22, 2012) http://www.theatlanticcities.com/jobs-and-economy/2012/10/creatives-and-crisis/1727/# (Accessed October 26, 2012).

Florida, R., 2012c. What Critics Get Wrong About Creative Class and Economic Development *The Atlantic* (July 03, 2012).

Florida, R., 2012d. What Draws Creative People? Quality of Place. *Urban Land* http://urbanland.uli.org/Articles/2012/Oct/FloridaCreative (Accessed May 7, 2013).

Florida, R., Mellander, C., and Stolarick, K. 2008. Inside the Black Box of Regional Development. *Journal of Economic Geography* 8, 615-649.

Florida, R., Mellander, C., and Stolarick, K. 2010. Talent, technology and tolerance in Canadian regional development. *The Canadian Geographer* 54(3), 277-304.

Florida, R., and Stolarick, K. (2012), "Rise of the Creative Class, Revisited", http://hdl.handle.net/10864/10164 Version5 Data.

Franciscan University of Steubenville. 2013. *Enrollment Summary: Fall 2013.* http://www.franciscan.edu/About/FactBook/Students/#EnrollmentSummary (Accessed May 14, 2014).

Georgia Institute of Technology, Center for Quality Growth & Regional Development (CQGRD). 2009. http://www.cqgrd.gatech.edu/program_areas/megaregions/index.php (Accessed February 22, 2012).

Glaeser, E. 2005. Review of Richard Florida's The Rise of the Creative Class, *in Regional Science and Urban Economics* 35, 593-596.

Glaeser 2011. *Triumph of the city: how our greatest invention makes us richer, smarter, greener, healthier, and happier.* The Penguin Press, New York.

Gottmann, J. 1957. Megalopolis or the urbanization of the northeast seaboard. *Economic Geography* 33(3), 189-200.

Gottmann, J. 1961. *Megalopolis: The Urbanized Northeastern Seaboard of the United States.* New York: Twentieth-Century Fund.

Hoyman, M., and Faricy, C. 2009. It Takes a Village: A Test of the Creative Class, Social Capital, and Human Capital Theories. *Urban Affairs Review* 44(3), 311-333.

Innes, J., Booher, D., Di Vittorio, S. 2011 Strategies for Megaregion Governance. *Journal of the American Planning Association,* 77(1), 55-67.

Jacobs, J. 1961 (1993) *The Death and Life of Great American Cities*. The Modern Library, New York.

Kahn, H., and Wiener, A. 1967. *The Year 2000: A Framework for Speculation on the Next Thirty-Three Years.* The MacMillian Company, New York.

Kahneman, D. 2011. *Thinking, Fast and Slow.* Farrar, Straus and Giroux, New York.

Kim, Q. 2014. *The education benefits in the VA Reform Bill.* http://www.marketplace.org/topics/education/education-benefits-va-reform-bill (Accessed August 4, 2014).

Knudsen, B., Florida, R., Gates, G., and Stolarick, K. 2007. *Urban Density, Creativity, and Innovation.* creativeclass.org: http://creativeclass.com/rfcgdb/articles/Urban_Density_Creativity_and_Innovation.pdf (Accessed February, 2013).

Kotkin, J. 2010. *The Next Hundred Million, America in 2050.* The Penguin Press, New York.

Kotkin, J. 2013. *America's Growth Corridors: The Key to National Revival.* Center for State and Local Leadership at the Manhattan Institute. Number 75. http://www.manhattan-institute.org/pdf/cr_75.pdf (Accessed September 9, 2014)

Levinson, R., Shah, S., and Connor, P. 2011. *Impact of Defense Spending: A State-by-State Analysis.* Bloomberg LP. http://forbes.house.gov/uploadedfiles/bloomberg.pdf (Accessed: May 07, 2014).

Lang, R., and Dhavale, D. 2005a. *Beyond megalopolis: Exploring America's new "megapolitan" geography.* Census Report 05:01. Alexandria, VA: Metropolitan Institute at Virginia Tech (June), http://america2050.org/pdf/beyondmegalopolislang.pdf (Last Accessed February 22, 2012).

Lang, R., and Dhavale, D. 2005b America's Megapolitan Areas. *Land Lines*, 17(3), 1-4.

Lang, R., and Nelson, A. 2007a. The Rise of the Megapolitans. *Planning* 73(1), 7-12.

Lang, R., and Nelson, A. for Lincoln Institute of Land Policy. 2007b. *Beyond the Metroplex: Examining Commuter Patterns at the "Megapolitan" Scale,* working paper. http://www.lincolninst.edu/pubs/1241_Beyond-the-Metroplex (Accessed September 4, 2012).

Lang, R., and Knox, P. 2009. The New Metropolis: Rethinking Megalopolis. *Regional Studies* 43(6), 789-802.

Lang, R. (video uploaded November 29, 2011). *Megapolitan America: A New Vision for Understanding America's Metropolitan Geography.* Baker Institute presentation. http://youtu.be/Rgya-EzvDLo, http://www.planning.org/apastore/meet/2011/megapolitan.htm

Lanigan, J., ed. (2000) *Economics, Volume 5: Economic Theory.* Grolier Educational, Danbury Connecticut.

Lazzeretti, L., Capone, F., and Boix, R. 2012. Reasons for Clustering of Creative Industries in Italy and Spain. *European Planning Studies* 20(8) p. 1243-1262.

Lee, S., Florida, R., and Acs, Z. 2004. Creativity and Entrepreneurship: A Regional Analysis of New Firm Formation. *Regional Studies*, 38:8, 879-891

MacGillis, A. 2009. The Ruse of the Creative Class: http://prospect.org/article/ruse-creative-class-0 (Last Accessed October 10, 2012).

Marcuse, P. 2003. Review of *The rise of the creative class* by Richard Florida. *Urban Land* 62, 40-41.

Markusen, A. 2006. Urban Development and the Politics of the Creative Class. *Environment and Planning A* 38, 1921- 1940.

Marlet, G., van Woerkens, C. 2004. Skills and Creativity in a Cross-section of Dutch Cities. *Utrecht School of Economics, Tjalling C. Koopmans Research Institute, Discussion Paper Series*.

Marrocu, E., and Paci, R. 2012. Education or Creativity: What Matters Most for Economic Performance? *Economic Geography* 88(4), 369-401.

Martin-Brelot, H., Grossetti, M., Eckert, D., Gritai, O., and Kovacs, Z. 2010. The Spatial Mobility of the 'Creative Class': A European Perspective. *International Journal of Urban and Regional Studies* 34(4), 854-870.

McGranahan, D., and Wojan, T. 2007. Recasting the Creative Class to Examine Growth Processes in Rural and Urban Counties. *Regional Studies*, 41(2), 197-216.

McGranhan, D., Wojan, T., and Lambert, D. 2011. The rural growth trifecta: outdoor amenities, creative class, and entrepreneurial context. *Journal of Economic Geography* 11, 529-557.

McGuigan, J. 2009. Doing a Florida thing: the creative class thesis and cultural policy. *International Journal of Cultural Policy*. 15(3).

Mellander, C. and Florida, R. 2007. The Creative Class or Human Capital? Explaining Regional Economic Development in Sweden. *Royal Institute of Technology: Centre of Excellence for Science and Innovation Studies in its series Working Paper Series in Economics and Institutions of Innovation.*

Miller, K. 2006. *Urban / Rural Areas and CBSAs*, August 15, 2006 revision. Rural Policy Research Institute. http://www.rupri.org/Forms/WP2.pdf (Accessed July 25, 2014).

Morehead State University. 2014. *About MSU.* http://www.moreheadstate.edu/aboutmsu/ (Accessed June 30, 2014).

Nelson, A., and Lang, R. 2011. *Megapolitan America: Megapolitan Areas are changing how we live.* American Planning Association, Washington D.C.

Office of Management and Budget. 2010. 2010 Standards for Delineating Metropolitan and Micropolitan Statistical Areas; Notice. *Federal Register,* 75(123), 37,246-37,252.

Peck, J. 2005. Struggling with the Creative Class. *International Journal of Urban and Regional Research* 29(4), 740-770.

Perry, M. 2011. Finding Space for the Creative Class: A Review of the Issues. *Urban Policy and Research* 29(4), 325-341.

Reese, L., Faist, J., and Sands, G. 2010. Measuring The Creative Class: Do We Know It When We See It? *Journal of Urban Affairs* 32(3), 345-366.

Ramos, D. 2014. "In Boston area, tech colonies bloom" *The Boston Globe*. April 27, 2014. http://www.bostonglobe.com/opinion/columns/2014/04/26/which-boston-area-tech-cluster-are-you/9NYHNjNZEjx5TkK8FZS21J/story.html (Accessed April 28, 2014).

Rockett, A. 2014. *Naval Weapons Station Yorktown gets new CO.* Daily Press. http://articles.dailypress.com/2014-02-06/news/dp-nws-york-naval-change-0207-20140206_1_naval-weapons-station-yorktown-lowell-crow-commander (Accessed July 29, 2014).

Rogerson, P. 2006. *Statistical Methods For Geography, 2nd edition.* Sage Publications Ltd. Thousands Oaks, California.

Ross, C., and Woo, M. 2009. Identifying Megaregions in the United States: Implications for Infrastructure Investment, in *Megaregion: planning for global competitiveness*, C. Ross editor. Island Press, Washington.

SAS. 2014. *SAS/STAT® 9.2 User's Guide, Second Edition*. http://support.sas.com/documentation/cdl/en/statug/63033/HTML/default/viewer.htm#statug_reg_sect033.htm (Accessed July 3, 2014)

Shapiro, J. 2006. Smart Cities: quality of life, productivity, and the growth effects of human capital. *The Review of Economics and Statistics*, 88(2), 324-335.

Somerset County Business Partnership. 2011. *Community Profile, March 22, 2011*. http://www.scbp.org/images/uploads/file/Comprehensive%20Data%20Report.pdf (Accessed May 07, 2014).

Stam, E., de Jong, J., and Marlet, G. Creative Industries in The Netherlands: Sturcutre, Development, Innovativeness and Effects on Urban Growth. *Human Geography* 90 (2): 119–132.

Stolarick, K. 2012. Video of presentation in Peterborough, Ontario: http://youtu.be/-n9xf8FOY0A.

Texas A&M University. 2014. *Texas A&M University Facts.* https://www.tamu.edu/about/facts/index.html (Accessed May 14, 2014)

Toyota. 2014. *Pursuing Our Vision of One Toyota*. http://www.toyota.com/usa/careers/articles/toyota_announcement.html (Accessed June 16, 2014).

University of Colorado at Boulder. 2014. *Just the Facts, 2014.* http://www.colorado.edu/sites/default/files/attached-files/JusttheFacts2014_opt2.pdf (Accessed April 24, 2014).

U.S. Census Bureau. 2007. *Metropolitan and Micropolitan areas.* http://www.census.gov/econ/census07/www/geography/metropolitan_and_micropolitan_areas.html (Accessed March 03, 2014).

U.S. Census Bureau. 2009. *Metropolitan and Micropolitan Areas for the United States and Puerto Rico, December 2009.* http://www.census.gov/geo/www/maps/msa_maps2009/msa2009_previews_html/cbsa_us_wall_1209.html (Last Accessed October 18, 2012).

U.S .Census Bureau. 2009b. *A Compass for Understanding and Using American Community Survey Data: What Researchers Need to Know.* http://www.census.gov/acs/www/Downloads/handbooks/ACSResearch.pdf (Accessed September 08, 2014).

U.S. Census Bureau. 2010. *American Community Survey, Puerto Rico Community Survey, 2010 Subject Definitions*. http://www.census.gov/acs/www/Downloads/data_documentation/SubjectDefinitions/2010_ACSSubjectDefinitions.pdf (Last Accessed September 13, 2014).

U.S. Census Bureau. 2012. American Community Survey, 5 year estimates, 2006-2010. http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml (Last Accessed November 2, 2012).

U.S. Census Bureau. 2013a. *Cities among the Top 20 for Commuter-Adjusted Population.* ACS 2006-2010 http://www.census.gov/hhes/commuting/ (Accessed November 29, 2013).

U.S. Census Bureau. 2013b. *Residence County to Workplace county Flows.* ACS 2006-2010. http://www.census.gov/population/metro/data/other.html (Accessed November 29, 2013).

U.S. Census Bureau. 2013c. *When to use 1-year, 3-year, or 5-year estimates.* http://www.census.gov/acs/www/guidance_for_data_users/estimates/ (Accessed June 25, 2013).

U.S. Census Bureau. 2014. *Geographic Terms and Concepts - Core Based Statistical Areas and Related Statistical Areas*. http://www.census.gov/geo/reference/gtc/gtc_cbsa.html (Accessed September 11, 2014).

U.S. Department of Education. 2014. *Digest of Education Statistics: Table 104.* http://nces.ed.gov/programs/digest/d12/tables/dt12_104.asp (Accessed: May 12, 2014).

West Liberty University. 2014. *Fast Facts*. http://www.westliberty.edu/admissions/learn-more/fast-facts/ (Accessed May 14, 2014).

Wheeling Jesuit University. 2014. *Fast Facts About WJU.* https://www.wju.edu/about/facts.asp (Accessed May 14, 2014)

Wojan, T. Personal correspondence: October 16, 2012.

Wojan, T., Lambert, D., and McGranahan, D. 2007. Emoting with their feet: Bohemian attraction to creative milieu. *Journal of Economic Geography* 7, 711-736.