THE GEOGRAPHY OF CREATIVE CLUSTERS AND FIRM PRODUCTIVITY: EMPIRICAL EVIDENCE FROM 20 METROPOLITAN STATISTICAL AREAS (MSAs) IN THE UNITED STATES

By

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Abstract

The burgeoning research on creative clusters and an increased rate of municipal investment in creative policymaking are becoming dominant global trends. Yet, the factors that help foster creative-friendly communities and how much they relate to creative firm productivity remain insufficiently understood. This dissertation is a step forward in our knowledge of the geography and typology of creative clusters and their association with productivity in the United States. In this research, creative clusters refer to meaningful and statistically significant agglomerations of creative firms.

This research demonstrates that creative clusters have an "urban nature" in most cases, meaning that there is a higher propensity for creative clusters to be found in the inner parts of larger cities, within the Metropolitan Statistical Areas (MSAs). While it shows that some creative firms (e.g., film and media and performing arts) tend to cluster more than the others, the number and geographic size of creative clusters do not reflect the general pattern of creative employment and creative sales volume in the 20 MSAs that are studied.

The Herfindahl-Hirschman Index (HHI) analysis in chapter three exhibits that in most clusters, there is a meaningful and significant co-location of creative firms from more than one category, while about 30% of the clusters show levels of monopoly in them. In other words, in the study area, %30 of all creative firms are located within creative clusters, among which, one-third are monopolistic, meaning only one or two industries have the most (if not all) shares of employment and sales volume in those clusters. Moreover, the location quotient (LQ) analysis in these clusters delineates that these co-locations have specific patterns. For example, clusters of film, television, and cinema tend to locate close to clusters of performing arts, while gaming and software programming clusters have a slightly different pattern. The gaming and software

programming firms locate farther from city centers and tend to create monopoly clusters for themselves. The suggested approach in this dissertation creates a systematic methodology that enables a comparative analysis across the country. It ranks creative clusters in terms of their size and regional competency while also identifying their particular specialization.

The analysis in chapter four demonstrates a positive and statistically significant relationship between the creative clusters and firm productivity for creative businesses, as is supported by the literature. The sales volume for creative firms within the clusters is significantly higher when compared to the non-cluster areas. While locating in creative clusters may be less affordable for creative firms, they may prefer these locations in the metropolitan areas due to different factors. The results of this research also show that it is not just some soft factors such as the creative image or local buzz (as discussed in chapter two) that may incentivize creative firms to cluster. Higher sales volumes are also related to creative firms in these clusters, highlighting the multi-dimensional benefits (one may be careful about the causal language here) of firm clustering for creative businesses. These clustering patterns confirm the theories that indicate access to the labor pool, the structure of consumption and technology, the need of face to face contact, urban buzz, and branding (Markusen and Gadwa 2010a; Currid and Williams 2010a; Vanolo 2008; Han and Hawken 2017; Scott 2006a; Evans 2009b) are some of the determinants of where creative and cultural firms tend to locate.

At the results of the logistic regression, it also appears that education, museum, and crafts are less clustering categories among creative firms. In other words, in tandem with the literature to some extent, the data shows that these three specializations of the creative economy are more dispersed, which is due to the nature of museums and collections, education (accessibility and

the location of schools) and crafts businesses. I expected the performing arts businesses to have a lower probability of being located within the clusters than most other categories, since performing arts employees, including singers and dancers, are expected to be located near the churches in communities. Nevertheless, the data shows that performing arts has the third-highest probability of being located in clusters, only after the film and media industry and visual arts firms. In fact, 44.88 percent of performing arts firms are located within clusters, which is the highest share among all other creative categories.

This dissertation concludes by offering some policy recommendations to identify the creative clusters within the urban areas and promote creative-friendly communities, by building upon the fact that they are positively associated with firm productivity and their potential to contribute to economic development in the neighborhoods. It also attempts to address some of the negative externalities related to creative clusters, such as inequality in production and consumption of creative products, as well as gentrification and displacement, through the use of policies, strategies, and investment in the existing clusters.

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Chapter One- Introduction

Introduction

Cultural and creative industries have generated considerable interests among scholars and urban policymakers. These industries are often viewed as economic catalysts and cultural intermediaries that serve livability, diversity, resilience, and sustainable development in local communities (Markusen and Gadwa 2010b; McCann 2007; Florida 2012; Roberts and Townsend 2016; Grodach 2017; Culver 2017; Andres and Round 2015; Vanolo 2015; Escalona-Orcao et al. 2016). Arts and cultural production services alone, as parts of creative industries, contribute to the United States' national GDP by 4.2%--higher than many other sectors such as construction, utilities, insurance, accommodation, and food services (National Endowment for the Arts 2018). Scholars often associate creative industries with the complex nature of cultural and creative economy (Scott 1997; 2000b; Markusen et al. 2008), cultural industries (O'Connor 2000; Scott 2004), and the recently constructed notion of the creative class (Florida 2002; 2005).

Following the evolution of a global, service-oriented economy, arts, culture, and creative industries are economic assets that (by branding public spaces) help regenerate and revitalize particular places. Consecutively, cultural and creative policies aimed at enhancing local communities (Bianchini 1993; Kong 2000; Frith 1991; Zukin 1989; García 2004; Griffiths 1995; Gibson 2012; Grodach 2017). Accordingly, city officials and policymakers seek to achieve "creative-friendly communities," using creative clusters as catalysts to bring economic development, to regenerate communities, and to enhance the cultural identity of urban and rural areas.

To date, there is little consensus over the definition of cultural and creative industries (as well as creative clusters), let alone our knowledge of what makes a community creative-friendly and

the benefits of the creative clusters in agglomeration economies and firm productivity. There have been attempts by scholars and policymakers to identify the key features that influence the location patterns of creative clusters of both creative firms and the creative class (Florida 2002; 2003; 2014). These clusters seem to exist in both rural and urban contexts (e.g., Landry 2008; Comunian, Chapain, and Clifton 2010; Montgomery 2003a). The majority of these studies state that creative industries favor clusters (Scott 2000b; Turok 2003; Lorenzen and Frederiksen 2008; Grodach et al. 2014). These studies have often identified two predominant forces that influence the spatial location of creative industries: agglomeration economies and place-specific characteristics. Together, these two forces explain, for the most part, the location preference of creative industries and the creative class in the literature.

On the one hand, there are only limited holistic overviews as to what factors contribute to where creative clusters shape and locate (Chapain and Comunian 2010; Markusen and Gadwa 2010a; Grodach et al. 2014; Spencer 2015; M. N. Rantisi, Leslie, and Christopherson 2006). In other words, while the existing literature demonstrates that creative industries tend to cluster, the contributors to the geography of these clusters are still undecided. The effects of this clustering on firm productivity also remain understudied and need further empirical research. Very few studies within the United States try to identify the location patterns of creative clusters. Most empirical research focuses on specific case studies and particular industries, such as fashion, cinema, or music (Scott 2002a; Williams and Currid-Halkett 2011; Santagata 2002; Gibson and Gordon 2016; Grodach 2013).

On the other hand, despite efforts by planners and policymakers to attract cultural firms and the creative class to their community, there is still a growing debate on whether the creative

industries serve as catalysts or anticatalysts for communities. Some claim that cultural and artistic allure of cities and neighborhoods will bring economic development, revitalize communities, and strengthen cultural identity (Florida 2002; Lloyd 2002; Lloyd and Clark 2001). This causal and catalytic relationship is under the question itself (Markusen 2006; Glaeser 2005). It has been discussed that creativity 'cannot be simply imported into cities' (Scott 2010, 202) because instead, it encourages cities to develop consumption spaces.

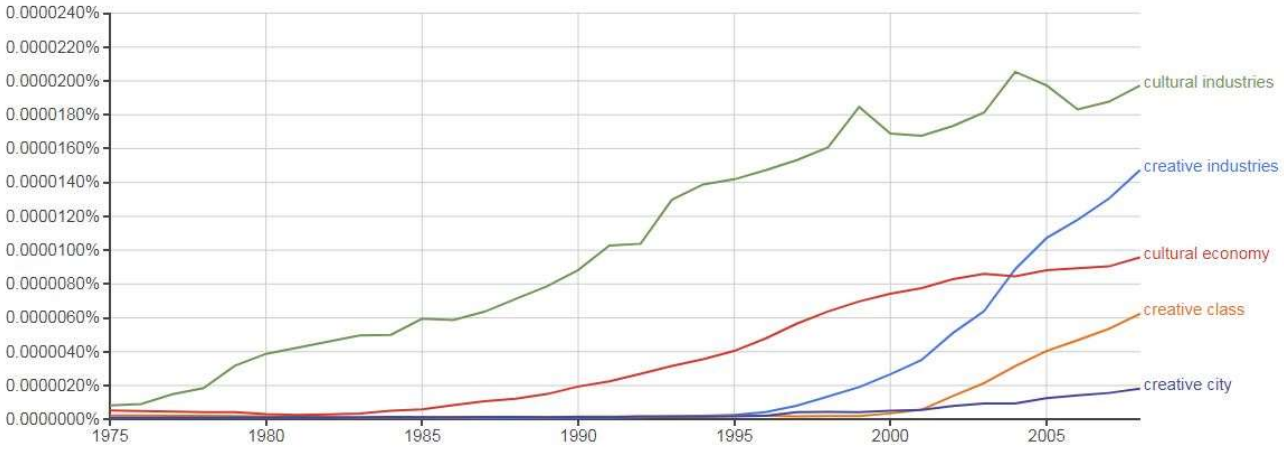
Other critics relate artists and creative industries to gentrification and displacement, since their moving to neighborhoods and upgrading decaying and aging industrial or residential buildings change the look and feel of the area. Some researchers have argued that cultural-led development would often attract higher income groups and displaces existing residents, businesses, and the artists themselves (Zukin and Braslow 2011; Pratt 2010; Ley 2003; Lloyd 2010; Deutsche and Ryan 1984). That being said, few empirical articles investigate these relationships. I will elaborate on this topic further since the economic outcomes of the creative clusters are part of this investigation.

In this dissertation, I seek to address the above gaps by investigating the geography of creative clusters, as well as firm productivity within them. I first provide a comprehensive literature review on what we know about the definition and the geography of creative clusters. Then I investigate and explore the typology and the geography of different creative clusters within the United States, and finally, I evaluate to what extent the creative clusters catalyze agglomeration dynamics related to firm productivity (and creative production) across those clusters.

Definition of the Concepts

Creative industries relate to a range of concepts including cultural and creative economies (Scott 1997; 2000b; Markusen et al. 2008), cultural industries (O'Connor 2000; 2010; Scott 2004; Pratt 2005), the creative class (Florida 2002; 2005), and the creative city (Landry 2008; Scott 2006b). Figure 1 depicts the fast-growing use of the term creative industries compared to related notions from the 1970s to 2008. The discourse on creative industries did not arise until the mid-1990s; Nevertheless, it has gained so much attention from scholars and policymakers in the past two decades that the discussion about the creative industries has surpassed the cultural economy. Creative and cultural industries inspired a flourish in research in economic geography (Scott 2014; 2006b; 2004; 2000b; Pratt 2011; 2008; Wojan, Lambert, and McGranahan 2007a; Gibson and Kong 2005), urban planning (Markusen 2014; Landry 2008; Grodach and Seman 2013; Currid 2009; M. N. Rantisi, Leslie, and Christopherson 2006), media and communications (Chapain, Clifton, and Comunian 2013; Cunningham 2002b; Hesmondhalgh 2008; O'Connor 2000), and sociology (Zukin and Braslow 2011; Zukin 1989; Gay et al. 2013). Figure 1 depicts the evolution of related word usage and trend.

Figure 1- The Google Books Ngram Diagram of the word trends, 1970-2008



Source: Google Books Ngram Viewer

Creative Industries

Replacing the older term "cultural industries," creative industries focus on collective and individual creativity, supply rather than mere consumption, and the commercial use of arts and culture. Together, they benefit from information and communication technology (ICT) and knowledge diffusion (Cunningham 2002a; Garnham 2005; Markusen and Schrock 2006). In this context, creative industries include, but are not limited to, advertising, architecture, the visual and performing arts, interactive media, music, film, and publishing, as well as software and computer services (non-high tech). One of the challenges in defining creative industries is deciding which firms and activities should be included in this category. Markusen et al. (2008) provide the most comprehensive list of industry classification and occupational data for cultural and creative industries in North America, similar to other attempts at defining these industries in different regions (see Fahmi, Koster, and Dijk 2016; KEA European Affairs 2006; Varbanova 2001; Jones, Lorenzen, and Sapsed 2015; Lazzeretti, Capone, and Boix 2012). However, as

fuzzy concepts (Markusen et al. 2008), creative and cultural industries are fluid in the definition. In essence, creative and cultural products and activities are situated in spaces and times (Pratt 2005), as they possess aesthetic and symbolic meanings (O'Connor 2000) that are different from one local/regional area to the other.

One debate over the definition of cultural and creative industries derives from the differences between establishment and occupational data (Markusen et al. 2008). While establishment data includes mostly those who do creative tasks (as well as other workers) within creative firms, cultural occupations can incorporate self-employed creative individuals. Another dissimilarity stems from the diverse viewpoints about the impacts of creative industries on cities and neighborhoods. These viewpoints include neoliberalism and place branding (Pratt 2011), the role of the creative milieu in presenting creative processes (Cohendet, Grandadam, and Simon 2010; Currid 2006), as well as creative policy-making (Markusen et al. 2008; Flew 2002; Grodach 2017). Finally, some problematic concepts among cultural and creative industries still need further investigation. These include formal and informal, public and private, and the distinctiveness of individual sectors in arts and culture.

Creative Class

The term *creative class* was coined by Richard Florida (2002) to describe the talented and educated people who, in his theory, help boost creative and high-tech industries. Here, because of the shift from manufacturing towards the creative age, cities and regions must develop, attract, and retain talented and creative people who, as a collective group, can generate innovation, develop technology-intensive industries, and power economic growth. This study focuses more on the clusters of creative firms rather than the creative class.

Creative Clusters

In the creative economy field, cultural quarters, cultural districts, and creative clusters are the most predominantly used terms. The creative clusters are generally associated with the Porter initiated rhetoric of economic clusters (Porter 1998; 2011), related to the notion of economies of agglomeration and value chain (Evans 2009a; Ponzini and Rossi 2010; O'Connor 2009; Stern and Seifert 2010). Since I am focusing on creative clusters in this dissertation, I will investigate both the spatial clustering of cultural activities and the existence of actual economic relationships between them. Acknowledging the fact that artists are more mobile than businesses in general (Markusen 2013), one of the assumptions in this dissertation is that by looking at the location of creative clusters (here the creative firms based on NAICS codes), I can provide an understanding of the creative-friendly communities. The research investigates the creative clusters' typology and geography and analyses firm productivity inside and outside of these clusters.

As explained above, the creative industries focus on collective and individual creativity, supply rather than mere consumption, and the commercial use of arts and culture, which altogether benefit from information and communication technology (ICT) and knowledge diffusion. Despite the diversity and differences among creative industries and creative workers and a lack of a cohesive definition, there is a consensus about similarities in creative processes, size, scope, overall clustering patterns, and general creative sectors among scholars and policymakers (Flew and Cunningham 2010). This consensus sets the basis for this research, aiming to clarify the geographical similarities of creative clusters in urban communities. The next section discusses the positive and negative externalities of creative clusters.

Understanding the geography of creative industries could lead to the formulation and adoption of more pragmatic, evidence-based approaches towards creative economic policies. More often, an assumption on where these industries are or will be is made based on our current understanding of where they cluster. In the following, I investigate how much we know about the geography of cultural and creative clusters.

Why the Geography of Creative Clusters?

Locational Attributes of Creative Industries in Rural Areas

Creativity and innovation have been known to happen in sizable, global, dense, and diverse urban settings in Western countries. However, recent studies show that the geographical patterns of creative industries and occupations do not follow this logic thoroughly (Bell and Jayne 2010; Fang 2015; Wojan, Lambert, and McGranahan 2007b; Waitt and Gibson 2009; Lewis and Donald 2010). In 'Creativity in peripheral places,' Gibson (2014) considers this picture 'partial' at best, suggesting that an urban bias influenced and directed researchers to investigate big cities for culture, find it there, and then theorize it in those dense urban settings.

The relocation of creative industries in rural areas is partially a result of the substantial economic shift towards the cultural and service industries that needs further attention and more in-depth investigations in this field. There are several reasons why creative individuals and businesses are located in non-urban settings. Some of these reasons include personal preferences for a strong regional creative network and economy (Chapain, Clifton, and Comunian 2013), the quality of life (Duxbury and Campbell 2011; Gibson and Gordon 2016), affordability, and the

heterogeneity of non-urban communities (Gibson et al. 2012; Collis, Freebody, and Flew 2013; Duxbury and Campbell 2011). However, it is clear that the biggest challenge rural and suburban areas face is to sustain and retain the creative talent with their dearth of adequate infrastructure, effective leadership and policies, as well as artistic clustering (Roberts and Townsend 2016; Bain and McLean 2013; Donald, Gertler, and Tyler 2013). Scholars who look more closely into rural creative economies suggest a different set of methodologies, such as ethnographic mapping, intrepid snowballing, and interviews for studying rural, vis-à-vis urban creative industries (Bennett 2010; Felton, Emma, Christy Collis 2010; Brennan-Horley 2010).

It is worth mentioning that utilizing digital technologies and information and communication technologies (ICT), rural creative industries have been able to extend their 'reach' and work across broader geographies (Herslund 2012; Roberts and Townsend 2016). ICT has empowered the creative practice to access regional and global networks through the Internet, which in turn is a capable force for the creative industries to be more mobile. The literature on the benefits of the Internet and digital tools for creative industries is still limited, especially in the rural creative economy, due to poor broadband connectivity, and even weaker adoption as opposed to urban areas (Bell and Jayne 2010; Roberts and Townsend 2016; Duxbury and Campbell 2011).

Locational Attributes of Creative Industries in Urban Areas

Research on the geography of creative industries in the urban context focuses extensively on firm clustering. Following Alfred Marshall's clustering theory that argues firms cluster in "agglomerations" to gain productive efficiencies (Gilligan 2014), Michael Porter (2011) suggests that regional development within specific industries is becoming more concentrated. In other words, similar firms tend to cluster together (Porter 1998; 1996). Firms benefit from the positive externalities of clustering in general. These happen through knowledge spillovers across companies, proximity, and access to labor, and entrepreneurial and serendipitous networking opportunities that act as catalysts for potential growth (Duranton and Puga 2004; Storper and Venables 2004; Puga 2010). Increasing returns to scale in production (aka external economies of agglomeration), cross-industry, or supplier relationships are other reasons for firms clustering in more compact areas (Chatman and Noland 2011).

Creative industries are also known to cluster, as is well discussed (Lorenzen and Frederiksen 2008; Currid and Williams 2010b; Lazzeretti, Boix, and Capone 2008; Scott 2002a; Grodach et al. 2014; Hutton 2006; Mack, Talen, and Koschinsky 2017). The contemporary media-entertainment cluster of Los Angeles, for example, Scott (2002a), suggests it owes its genesis to geographic proximity. While cultural and creative products are distributed and consumed globally, it is mostly modern capitalism's heartlands (global cities such as London, Los Angeles, Paris, New York) that generate these cultural products (Scott 1997; Lorenzen and Frederiksen 2008).

Extant studies have found that the location of creative industries tends to follow the positive externalities of two key factors. They include agglomeration economies (e.g., knowledge

spillovers or labor pool) (Currid and Williams 2010b; Lazzeretti, Boix, and Capone 2008; Scott 2002a) and place-based characteristics (Currid and Connolly 2008; Mack, Talen, and Koschinsky 2017; Grodach et al. 2014). Economic externalities – referred to as localization and urbanization (Lorenzen and Frederiksen 2008)-, place-branding and strong consumer bases (Currid and Williams 2010a) are the main contributors to the clustering of creative industries. By mapping creative local production systems in Italy and Spain, Lazzeretti and colleagues (2008) demonstrate that there is a difference between traditional cultural industries (performing arts, music, architecture, and publishing) and technology-related creative industries (advertising, ICT, and research and development (R&D)) and how both cluster within the two countries (Lazzeretti, Boix, and Capone 2008). Similarly, Lazzeretti et al. (2012) found that creative industries in Spain and Italy tend to concentrate around medium to large metropolitan areas, where localization economies (firm size in the LPS; firm size in creative industries; internal creative filiere; share of qualified jobs in creative industries) explain about 39% of the differentials of concentration (the location quotient or LQ for creative employment) in Italy and 52%, in Spain.

An outcome of this concentration of cultural and creative industries (as well as creative individuals) in different geographies is considered to be firm productivity and economic growth (Oakley 2004; Currid 2009), leading to a rise in housing prices, along with gentrification and displacement, which later brings economic and racial polarization to some areas (Zimmerman 2008). While most research provides a narrative of arts-led gentrification (Zukin 1989; Zukin and Braslow 2011; Borrup 2015; Pratt 2011; Atkinson and Eeasthope 2012; Makagon 2010), a recent study (Grodach, Foster, and Murdoch 2018) shows that this relationship depends heavily on the context and type of art and that arts establishments tend to concentrate more in affluent and gentrified—vis-à-vis gentrifying— neighborhoods. Whatever the relationship, and whether

creative industries bring gentrification to local neighborhoods or merely follow it, there are negative externalities regarding the changes they bring to cities and neighborhoods. These externalities require further attention from policymakers as well as researchers.

Research Gap

The evolution of urban economic development has shifted to a global and service-oriented economy based on talent and human capital (Florida 2002; Markusen 2006; Lucas 1988; Jacobs 1969; "The Arts and Economic Development" 1985). Arts, culture, and creative industries have become valuable economic assets that (through branding public spaces and strengthening the sectors where design and content form the basis of competitive advantage) help regenerate and revitalize particular places (Flew 2002). In this context, while cities and regions have become a magnet for local and regional growth (Storper and Scott 2009; Porter 1996), recent scholarship has paid increasing attention to the geography of creative industries as viable means to further the creative economy and to promote urban and regional growth (G. Drake 2003; Scott 2006a; Markusen 2006; Currid 2007; Knudsen et al. 2008).

There is a rich literature about the fact that creative industries cluster (Lorenzen and Frederiksen 2008; Currid and Williams 2010b; Lazzeretti, Boix, and Capone 2008; Scott 2002a; Grodach et al. 2014; Hutton 2006; Mack, Talen, and Koschinsky 2017). While there is a consensus on firm clustering as the critical spatial component of creative industries' locational decision, there is less consensus on where these clusters locate and the mechanisms by which creative clusters arise. In other words, as much as we agree that cultural and creative industries cluster, we do not have enough cohesive understanding of where these clusters locate and why.

Furthermore, among the different types of creative industries, which types tend to cluster more and co-locate with other similar businesses remains rather understudied in the literature. The benefits of these clustering patterns are also still a question when it comes to the creative industry.

Economic growth is considered to be an outcome of this concentration of cultural and creative industries (as well as creative individuals) in different geographies (Oakley 2004; Currid 2009), leading to a rise in housing prices, along with gentrification and displacement (Grodach, Foster, and Murdoch 2018; Zukin and Braslow 2011; Zukin 1989; Makagon 2010), which later brings economic and racial polarization to some areas (Zimmerman 2008). The economic efficacy of investments in creative activity has long been justified by claims that these industries help diversify the economic base of deindustrialization or highly specialized cities and regions (e.g., Pratt 1997). These are based on claims that creative workers, with high rates of self-employment and considerable human capital, earn income from directly exporting products and services and improve the productivity of noncultural industries locally (e.g., Markusen and Schrock 2006; Markusen and Gadwa 2010a), and that the presence of cultural offerings and artists attract other firms and high human capital residents (e.g., Florida 2002). Florida bolsters the impact of creative clusters on economic productivity, indicating that diverse and tolerant cities attract the creative class (and therefore the creative firms), a loose collection of individuals working in the knowledge and cultural industries who are theorized to spur innovation and economic productivity (Florida 2002). However, how much each type of creative cluster can benefit the local economic and firm productivity is yet to be determined.

Having said that, and as mentioned in the previous section, there is no consensus about the negative externalities of creative industries, with a recent empirical study conducted in the United States (Grodach, Foster, and Murdoch 2018) showing that this relationship depends heavily on the context and type of industries. Finally, while most studies investigate the role of artists and creative industries in neighborhood change, much less is known about the geographical and locational patterns of these concentrations (Grodach et al. 2014; Currid and Connolly 2008). Richard Florida (2002), for instance, identified tolerance, technology, talent, and territorial assets (2014) as crucial factors that allure the creative class to metropolitan regions. Charles Landry (2008) introduced a toolkit of seven groups of factors as the foundations of a creative city, covering a wide range from personal factors necessary for creative thoughts, to concrete factors such as availability of educational institutes, to more intangible aspects of a creative local identity or value system. In another attempt (Comunian, Chapain, and Clifton 2010), the attributes of a place that culminate in a "creative place" are considered to be infrastructure, governance (e.g., institutional frameworks), soft infrastructure (e.g., image and social networks), and the market. Similarly, Montgomery (2003b) identifies three place-characteristics of what he calls "cultural quarters" to be activity, built form, and meaning. Finally, the Americans for the Arts institute (2015) has identified five "cultural districts" based on their history (compound districts, established prior to 1930s), location (downtown area focus districts), formal or informal nature (naturally occurring or major cultural institution districts), and general type (arts and entertainment or cultural production districts).

These questions remain: Is there a difference between diverse types of creative clusters in terms of their clustering behaviors? What are the location preferences among these industries and the differences among diverse creative clusters in distinct regions? What is the relationship

between productivity and firm location inside and outside of creative clusters? Answering these questions can help planners and policymakers in decision-making processes when considering cultural and creative policies as their economic development strategies. It can also help them address some of the negative externalities related to these clusters, such as gentrification, inequality, and displacement, by offering a better understanding of the relationship between the different types of creative clusters and firm productivity.

Problem Statement

Many cities and local communities are applying creative initiatives and policies, aiming at enhancing local communities (Kong 2000; Frith 1991; Zukin 1989; García 2004; Griffiths 1995; Gibson 2012). However, some suggest that prevalent views of the exclusive creative clusters status of inner-city areas are inaccurate and potentially counterproductive to policy support and practice (Collis, Freebody, and Flew 2013). Moreover, the lack of knowledge about location preference of creative firms forces cities to adopt creative policies at a large scale, disregarding the local and specific impacts they have at the neighborhood or even street levels. Despite academic critiques about the adverse outcomes of creative clusters, local and state governments strongly believe that creative activity, broadly defined, can be harnessed as an urban economic resource. In this regard, the creative city policy field has become an emblematic form of policy transfer adopted in various ways (Grodach 2017; 2013).

Simultaneously, creative city programs appear to hide, instead of reducing, urban inequalities and reproduce similar problems across different places (Gerhard, Hoelscher, and Wilson 2016), since no cohesive guidelines are available for reducing the unexpected outcomes of the creative

clusters in neighborhoods. The discrepancy in the literature over the asserted negative externalities makes it even harder to determine what policies can work well in local communities to address these shortcomings. Carl Grodach (Grodach 2017) calls the creative policy field "fragmented and contested" (82); while the discourse has evolved, creative city policy is mostly a selective repackaging of 1980s policies with an expanded set of actors and interests, unable to address the critiques. It is worth mentioning that there is little (if any) evidence about the differences between the different creative clusters in terms of their effects on inequality or their benefits for firm productivity and economic development.

The result, therefore, has been a focus on creative policies and projects that attract highly educated and skilled professionals (aka the creative class) along with creative firms, often inducing or expediting workforce inequality, gentrification, and the displacement of small and independent manufacturing businesses (Grodach, O'Connor, and Gibson 2017). Research that can clarify what makes for creative-friendly communities and identify their boundaries would be a first step in understanding the geography of these clusters in the US. Furthermore, investigating the relationship between different creative clusters and economic productivity would elucidate to what extent these clusters contribute to the creative firms.

Aim and Significance

The aim of this research is threefold. First, I seek to identify the different characteristics of creative-friendly environments, which sets the stage for a better understanding and clarification of why creative industries cluster in specific geographies. It has several implications for planners, city authorities, and policymakers, as it would provide a robust framework for

practitioners who aim at improving economic development and enhancing the image of their communities through policy or planning initiatives. Second, I will investigate the geography of different creative clusters within the United States through an analysis of eight groups of creative categories. These groups include 1) performing arts, 2) visual arts and photography, 3) film, radio, and television, 4) design and publishing, 5) educational services, 6) software publishing and gaming, 7) crafts and jewelry, and 8) museums and collections. As mentioned before, the diversity of creative industries is one of the critical challenges for research and studies. For this study, I used all the NAICS codes that Markusen et al. (2008) identify as creative industries, but also added a new category of gaming and software publishing, based on the same article, as well as other empirical and theoretical studies that identify them as part of creative industries (National Endowment for the Arts 2017; Lazzeretti, Capone, and Boix 2012; Fahmi, Koster, and Dijk 2016).

A clarification of where these clusters locate and their locational characteristics would be a first step for investigating their effects and contributions to the economy and other externalities related to these clusters. Finally, I will study if (and to what extent) these clusters in the US are contributing to the economic development in terms of firm productivity within these clusters to investigate if clustering benefits the creative firms. Despite the efforts by planners and policymakers in attracting cultural firms and the creative class to their community, there is still a growing debate on whether the creative industries serve as catalysts or anticatalysts for the communities.

While there are many advantages to integrating creative and cultural strategies to urban development policies, there are crucial challenges as well (Grodach 2017). Cultural and creative

projects struggle with incorporating community development in urban cultural activities, engendering revitalization in low-income or disadvantaged areas, and are sometimes abused as gentrifying tools for boosting property values. Moreover, there is a dearth of evidence on the impacts of cultural policies on community development and economic growth, except in limited case studies (e.g., Grodach 2012; Garnham 2005; García 2004; Bassett 1993). The role of creative industries and cultural workers in bringing inequality and gentrification is also still under debate and would need more comprehensive investigations. Finally, how creative and cultural policies help revive shrinking cities and decayed industrial areas is yet to be explored. While economically more influential cities and communities need different approaches and policies to creative policies, more pressured cities may require separate forces and pushes when applying cultural policies.

With cities and communities competing over resources and applying several initiatives (including creative and cultural initiatives) to brand themselves, a lack of understanding of what they would need to attract and accommodate creative firms and individuals can lead to mere gentrification and displacement, without really contributing to the creative economy or developing creative-friendly environments (Grodach, Foster, and Murdoch 2018; Ley 2003; Deutsche and Ryan 1984; Zukin and Braslow 2011). Understanding the geography of the creative industries could lead to more pragmatic, evidence-based approaches towards creative economic policies. More often, an assumption on where these industries are or will be located is made based on our extant understanding of where they cluster. The findings of this dissertation can help cities and communities improve their creative-friendliness, by providing guidelines and suggestions, along with a framework for evaluating the creative-friendliness of their specific neighborhoods and minimizing the negative externalities for the local communities.

Research Questions

This dissertation seeks to answer the following questions:

1. What are the characteristics of a creative-friendly environment?
2. Where do different creative industries tend to cluster? To what extend do they follow the urban (vs. suburban) location patterns?
3. To what extent do creative clusters relate to creative-firm productivity? What are the benefits of being in creative clusters for firms?

Outline of the Dissertation

This dissertation investigates the geography and typology patterns of creative clusters and tries to map not only the different types of creative clusters but also investigate their relationship(s) with some aspects of their economic context that have been discussed and questioned in the existing literature. Therefore, the first part of the dissertation will investigate the different factors that contribute to the concentration of creative industries in specific geographies. In other words, this research is in response to the extant literature that acknowledges the clustering of creative industries.

The second part of the dissertation will be an empirical study of 20 metropolitan areas within the US that will identify the geography and typology of creative clusters in urban areas. It later discusses the relationship between these clusters and firm productivity, in terms of differences in annual sales volumes between firms that are located within and outside of creative clusters.

Chapter Two- Creative-Friendly Communities; A Literature Review

Introduction

The burgeoning research on creative clusters and investments in creative industries has become a dominant trend in recent decades. Nevertheless, the contributing factors of creative-friendly communities remain insufficiently understood. The first part of this dissertation seeks to answer the first research question of "what are the characteristics of creative-friendly communities." In other words, I will try to identify the contributors to creative-friendly communities among theories available in the creative industries field that try to explain the geography of creative industries.

This chapter seeks to examine the different factors that improve the creative friendliness of an environment. By creative-friendly settings, I mean not only the ability of a community to attract and keep creative firms and the creative class but also inspire and embrace creative thinking and creative activities among its residents. I will first investigate the various definitions of creative industries and contributing factors that influence their clustering. Second, I will discuss the differences between urban and rural creative clusters in the literature, as well as the role of creative industries in the modern economy of cities and communities. Moreover, the negative externalities of creative clusters and the creative class will be discussed, since based on the literature presented in the previous sections, creative clusters can have anticatalyst effects for local communities. The above will then set the basis for deciding what factors make a place creative-friendly. The final product of this chapter will be a proposed framework for understanding the components of creative-friendly communities. Chapter three will then provide an empirical study, locating the creative clusters and identifying their specialization in 20 MSAs in the United States. Chapter four will examine firm productivity in creative firms that locate

inside these clusters and compare them through different methods with the ones outside of creative clusters.

There are three critical phases of creative activities (Previously Landry (2008) introduces five stages), for which a creative-friendly community should accommodate: idea generation, production, and distribution (See also Scott 2002a; Comunian 2011; Wood and Dovey 2015; Escalona-Orcao et al. 2016). The first stage includes the creation of ideas and projects in the minds of talented individuals. A creative-friendly environment can set the stage for these potentials to surface. While creative individuals are the engine at this phase, it is the social and spatial characteristics of the creative-friendly environment that help create a local buzz and a creative ambiance (Storper and Venables 2004; Bathelt 2005; Currid and Williams 2010a). The built environment also provides physical proximity for social networking, if supported by the economic context, i.e., the institutions and regulations supporting creative activities and cultural industries.

The second phase includes the production of creative and cultural goods and services. At this stage, patents, brands, and cultural productions become real, ready for distribution and consumption. Dependent on the type of creative industries, the built environment, and economic context can play crucial roles at this stage by retaining a mass of creative individuals through urban amenities, affordable residential and commercial places, and urban amenities, as well as the urban buzz. The role of social, institutional, and spatial networking is also vital in the production of creative goods and services (Helbrecht 2004).

Finally, the circulation and consumption phase involves networks and media to deliver products to the consumer market. The role of the built environment here is not only providing

specific spaces (e.g., galleries, museums, or public plazas) for showcasing and performing arts and creativity but also branding the cultural products, based on specific geographies.

Data and Methodology

This chapter is based on a search of two scholarly search engines *Google Scholar* and *Web of Sciences,* as well as a *Google search* for white papers and reports between October 2018 and March 2019. The search included (but was not limited to) keywords such as creative industries, creative clusters, the creative class, geography of creative industries, and location preference of creative firms. Moreover, the search was limited to English language literature and augmented with snowball sampling when necessary to adequately address the research questions. Both empirical and theoretical studies were included, as well as quantitative and qualitative studies to ensure I include all possible evidence about where creative industries and the creative class tend to locate in both urban and rural areas. This search resulted in more than 300 journal articles, books, reports, and working papers relevant to creative industries and their geography.

I classified and labeled each resource later, in a database where the title, methodology, findings, and critical points were collected and later coded to find the main characteristics related to the location preferences of creative industries. A summary of the results of that database is presented in table 1.

Table 1- The Contributors of the Creative Clusters in empirical and theoretical research

Factors	The Built Environment				Creative Individuals	Consumer Market	Local Creative Identity				Networks and Technology			Economic Context		
Features of the Creative-Friendly Environment	Proximity and Access to Labor Pool	Urban Dimensions of Creativity	Urban Amenities and Place Quality	Climate and Natural Amenities	Talent and the Creative Class	Proximity and Access to Local, Regional, and Global Markets	Diversity and Tolerance	Socioeconomic & Neighborhood Characteristics	Cultural Capital and Aesthetics	Local Identity and Urban Buzz	Technology	Social, Institutional, and Spatial Proximity	Public Spaces and Venues	Affordability	Creative and Business-Supportive Agencies	Progressive Leadership and Policies
Empirical Research																
Lazzeretti et al. (2012)		*			*		*	*								
Currid and Williams (2010b)	*	*	*			*				*						
Grodach et al. (2014)		*	*		*		*	*			*			*		
Mack, Talen, and Koschinsky (2017)		*	*				*	*								
McGranahan, Wojan, and Lambert (2011)			*		*			*					*			
Murdoch, Grodach, and Foster (2016)		*	*				*	*	*							
Kang (2010)		*	*					*						*		
McGranahan and Wojan (2007)	*	*	*	*	*		*	*	*							
Currid and Collolly (2008)		*	*								*					
Patterson and Silver (2015)		*			*			*							*	
Drake (2003)					*				*	*		*				
Stern and Seifert (Stern and Seifert 2010)			*					*					*		*	
Escalona-Orcao et al. (2017)	*		*			*	*	*					*		*	*
Zandiatashbar and Hamidi (Zandiatashbar and Hamidi 2018)	*		*		*		*	*			*					
Rao and Dai (2017a)	*		*	*			*	*					*	*		
Comunian, Chapain, and Clifton (2010)						*		*		*	*	*	*		*	*
Fahmi, Koster, Van Dijk (2016)		*			*	*		*						*		
Lorenzen and Frederiksen (2008)	*		*		*	*				*	*	*				*
Spencer (2015)	*	*	*		*		*		*			*	*	*	*	*
Qian and Liu (2018)		*	*		*			*			*		*			
Graif (2018)		*	*		*		*	*						*	*	
Theoretical Research																
Richard Florida (2002; 2003; 2005)		*	*		*		*		*		*					
Montgomery (2003b)			*				*	*	*	*			*		*	*
Landry (2008)	*		*		*		*			*		*			*	*

The Six Factors of Creative-Friendly Community

My analysis uncovers that there are three critical phases of creative activities, which a creative-friendly community should accommodate: the idea-generation phase, the production phase, and the distribution/consumption phase (Comunian 2011; Wood and Dovey 2015; Escalona-Orcao et al. 2016). Each of the three phases should be addressed to nurture a creative-friendly community. In other words, a community that can support the entire cycle of creativity would be more successful at accommodating creative firms and activities than one that could only accommodate one or two of the phases.

The first stage of a creative activity includes the creation of ideas and projects in the minds of talented individuals. A creative-friendly community can set the stage for this potential to surface by stimulating individuals' creativity and helping to create a sense of "urban buzz" and a creative ambiance (Storper and Venables 2004; Bathelt 2005; Currid and Williams 2010a). Urban buzz is much the same as a sense of cultural cachet that comes from producing one's work in an area thick with innovators (Storper and Venables 2004). Similarly, the built environment provides physical proximity for social networking, mainly when supported by institutions and regulations that favor creative activities.

The second phase of a creative activity includes the production of cultural goods and services. At this stage, patents, brands, and cultural productions come into reality, ready for distribution and consumption. Depending on the type of creative cluster, the built environment, and the economic context can play crucial roles by attracting and retaining creative individuals through providing affordable residential and office space, urban amenities, and a competitive

identity along with a sense of urban buzz. The role of social, institutional, and spatial networking is also vital at this stage in producing creative goods and services (Helbrecht 2004).

This point brings us to the third phase, that of circulation and consumption. At this stage, networks and media enable the delivery of products to the consumer market, while the built environment provides venues, museums, or concert halls for the consumption of creative products. Importantly, at this stage, the physical environment not only provides consumption and performance spaces but also brands these cultural products. Figure 2 summarizes these relationships in more detail.

Figure 2- The Components of a Creative-friendly Environment

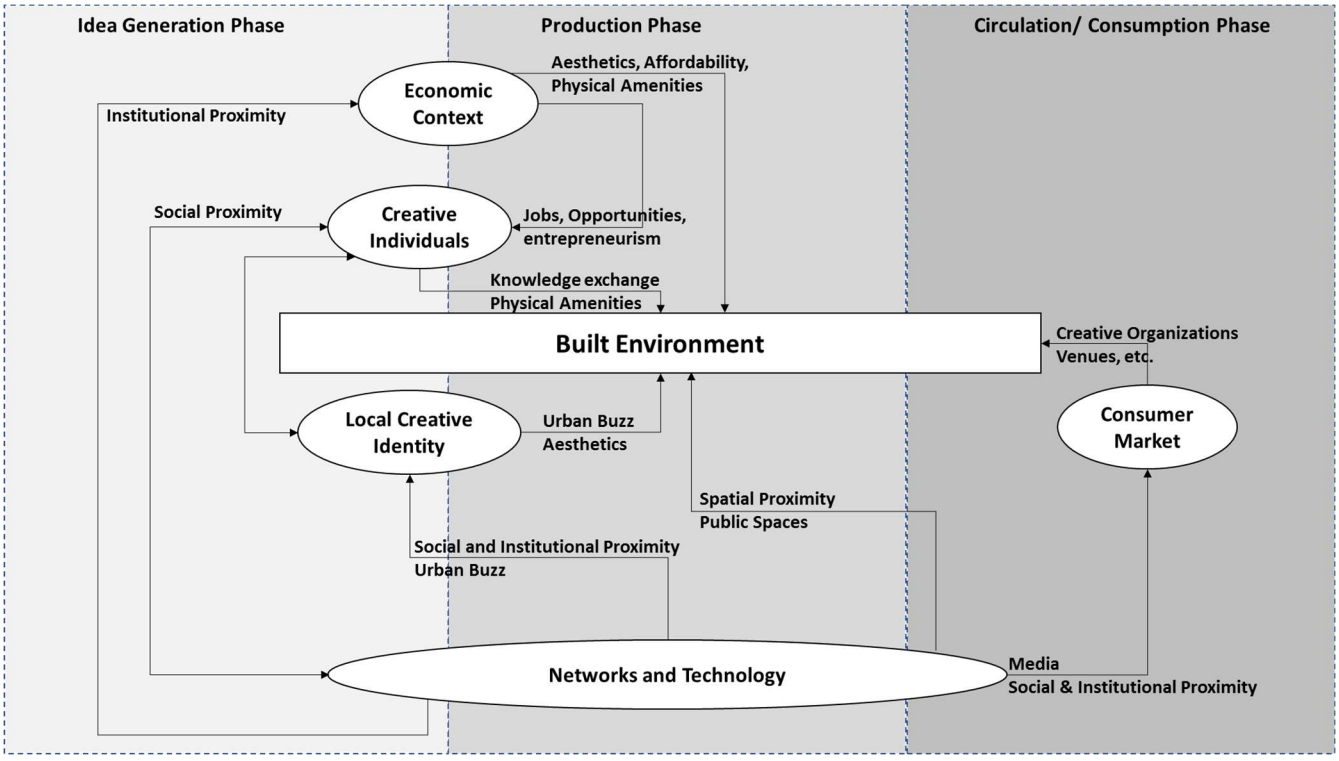


Figure 2 outlines a comprehensive framework in which different factors enable a community to support creative activity at each of the different phases of creative production—i.e., idea-

generation, production, and consumption. The built characteristics of an environment and the networking opportunities deriving from physical proximity are the two key players in this framework. Along with the other four factors, they shape a thriving creative-friendly community. The physical environment can create a supportive setting for creative activity in all three phases by enabling spatial proximity between creative producers and by providing the aesthetics, amenities, and infrastructure, as well as urban buzz, required for creativity and creative activity. Micro-interactions and network dynamics, a publicly-supported cultural sector, and small-scale cultural infrastructure—community halls, writers' centers, art spaces—are vital to building the connection between upstream resources and downstream manufacture, assembly, and consumption of creative products. They, in turn, provide creative actors and agencies with guidance and support (Comunian 2011; Gibson and Warren 2016; Brennan-Horley 2010).

Factor 1- Leadership and The Economic Context

The economic context of a community impacts how welcoming it is to creative clusters and creative activities. An "economic context" includes a community's affordability (Ley 2003; Mathews 2014), progressive leadership, policies, and regulations (Zukin and Braslow 2011; Grodach 2017).

Local politics are critical in planning, implementing, and up-keeping art spaces (Grodach 2012). A strong vision for the city and a sense of progressive leadership are the two significant factors that contribute to the development of both formal and informal arts districts. Leadership reinforces idea-generation and creative production (Chapple, Jackson, and Martin 2010) while acting as a balancing force between the will, resourcefulness, and energy of a city's leaders and that of citizens (Landry 2008).

The second way that economic context can generate a creative-friendly community is by providing affordability. Artists, a critical group among creative workers, tend to make less money than most skilled workers; therefore, they favor medium-size metros and smaller towns due to their affordability (Markusen 2014). Treating affordability of residential, business, and office space as a priority increases the odds of a community being more receptive to creative individuals and firms (Ley 2003; Andres and Round 2015). As a case in point, in their cultural master plan, the city of Austin, TX acknowledges that a dearth of affordable housing and performance space limits the development of arts opportunities in the city and discourages creative talent from living and working there (City of Austin 2009).

Factor 2- Creative Individuals

Creative clusters can transform the city's economy through attracting, accommodating, and supporting creative individuals (aka the creative class). A creative-friendly community must provide an environment that will be stimulating and comfortable for those people. The knowledge of creative individuals is person-bound and, therefore, 'sticky to place' (Helbrecht 2004, 200), which makes it vital for a creative-friendly community to provide a 'look and feel' that is suited to these individuals so that they can engage in the knowledge production process.

Following Florida's creative class theory (2002; 2014), there seems to be strong evidence suggesting that in an economy steered by creativity, cities, and regions that offer creative individuals, cultural and recreational amenities will succeed in economic development. Further evidence indicates that the location of creative and knowledge-based clusters correlates strongly with the flow of creative workers. Even though talent is mobile (Florida 2002) and creative individuals have a wide range of options when choosing their location (Atkinson and Eeasthope

2012), cities such as New York have been particularly successful in attracting larger numbers of talented and creative individuals. What makes these cities particularly attractive to a creative audience is their strengths in the other five factors discussed next.

Factor 3- Local Creative Identity

Given the role of identity and power in culture (Scott 2006a), communities have the power to attract talent by channeling their economic capital into cultural capital. The local identity of a creative-friendly community plays a critical role in branding the city to attract visitors and investment to the area (Currid 2007; Bonakdar and Audirac 2020). Moreover, the aesthetical capacities of a community, and the level of socioeconomic diversity it offers, facilitates the process of creating cultural capital and urban buzz (Breznitz and Noonan 2018; Markusen 2014; G. Drake 2003). This sense of urban buzz encourages the consumption of cultural goods and generates aesthetic as well as market value (Caves 2000). Florida (2002) argues that urban buzz sends signals about the local creative identity and social milieu of creative spaces, attracting the creative class and consumers of cultural goods. A creative-friendly community provides a setting where urban buzz can be created and experienced by visitors as well as residents.

Another feature of local creative identity is its level of diversity. Functional, morphological, and socioeconomic diversity (Wood and Dovey 2015), including equity and democracy, cultural and geographic variety, entrepreneurial behavior, the diversity of organizational forms (Grabher 2001), processes in arts and culture (Gibson et al. 2012), and a community's level of tolerance contribute to innovation and creative processes (Florida 2002). Even though it has been suggested that some accounts of the link between diversity and creative clusters have been overstated (Evans 2005; Jayne 2004), diversity has consistently been shown to

be linked with clusters of creative firms and creative individuals (Murdoch, Grodach, and Foster 2016; M. N. Rantisi, Leslie, and Christopherson 2006; Frost-Kumpf 2001).

Other features of a local creative identity include the cultural assets and aesthetics of that community. Cultural assets refer to both tangible (built material) and intangible (symbolic and traditional) forms of cultural goods, activities, and artworks. These assets can include old buildings, artifacts, creative hubs, and clusters, as well as stories, festivals, or traditions shared in a community (Roberts and Townsend 2016). In a study of New York and Los Angeles, Currid and Stolarick (2010) demonstrate that the cultural capital of a city is a function of its unique advantages and not just its artistic goods. While some commentators have suggested that artistic production can cause gentrification (Zukin and Braslow 2011; Deutsche and Ryan 1984), Ley (2003) argues that it is not the artists, but the societal valorization of the artistic abilities of the artist that attracts the rich in a way that can contribute to gentrification. Attention to a place's cultural capital and its aesthetics not only makes it more attractive to creative individuals and businesses, but it can also stimulate creative thinking and consumer spending.

Factor 4- The Built Environment

Urban environments are often considered as the locus of creativity because they are often the site of aesthetic, social, cultural, and economic experimentation (M. N. Rantisi, Leslie, and Christopherson 2006). Such experimentations generate the possibility for knowledge spillovers across firms (Knudsen et al. 2008; Comunian, Faggian, and Li 2010), where rumors, trade secrets, impressions, and gossip create what economic geographers celebrate as the Marshallian ambiance.

Specific place characteristics are associated with cultural and creative clusters (G. Drake 2003; Grodach, Foster, and Murdoch 2014). Walkable neighborhoods (Mack, Talen, and Koschinsky 2017), denser areas with the more magnificent rental and mixed-income housing (Granpayehvaghei et al. 2019; Grodach et al. 2014), and more tolerant, racially diverse communities (Graif 2018; Collins 2018; Florida 2002) are appealing to creative firms and arts-based establishments. Walkability and transit accessibility can attract creative workers and promote face-to-face interactions; thus, they must be treated as urban amenities necessary for creative-friendly communities (Zandiatashbar and Hamidi 2018; Kang 2010; Jeong, Clark, and Vansuch 2017). Natural and physical amenities also attract creative individuals (D. A. McGranahan and Wojan 2007; Rao and Dai 2017b). In many cities, this has led to amenity-driven and place-based policies intended to promote economic growth (Grodach 2012; 2017).

Factor 5- Networks and Technology

A creative-friendly community needs to provide networking dynamics for creative clusters to engender creative activity. Helbrecht (2004) categorizes networking activities based on three types of proximity: spatial proximity (e.g., accessibility to labor, firms, or infrastructures), institutional proximity (e.g., social capital, formal alliances, supporting agents and educational institutions), and social proximity (e.g., diversity, human capital, informal relationships). For example, studies have found that walkability and public transit, as indicators of spatial proximity, are linked to the location of creative firms. In one study, Kang (2010) found that improvements in the Bus Rapid Transit (BRT) public transportation system have attracted and retained creative firms in Seoul. In terms of walkability, Mack et al. (2017) revealed that large-scale arts firms are

likely to choose walkable communities, whereas small-scale arts firms do not exhibit the same tendency.

Studies on institutional proximity show that employees and arts-related firms locate close to specific institutions, which are known as "local or regional intermediaries" (Currid and Williams 2010a; Lloyd 2010). These intermediaries are substantial contributors to social capital, network development, and knowledge transfer (Vinodrai 2015). The co-location of the art firms and the intermediaries is not surprising given that knowledge is often unevenly distributed and has a propensity to concentrate in specific areas, among certain individuals, and within specialized institutions—such as universities (Scott 2006c). Finally, social proximity underscores the role of creative workers and their ability to change cultural meanings and symbols within a community (Breznitz and Noonan 2018). While spatial and institutional proximities create "atmospheres and environments conducive to new rounds of creative production and consumption" (Taylor 2015, 367), social proximity generates a social surplus above and beyond social interaction itself by creating an authentic and personal reputation, buzz, or brand (Taylor 2015). Such a reputation manifests in public spaces and venues in which people's sense of identity is constructed (Currid and Williams 2010a; Grodach 2012). The main contribution public spaces can make is in encouraging face-to-face contact that facilitates socialization, learning processes, and psychological motivation (Storper and Venables 2004).

The presence of creative-supportive agencies is an essential facet of this category. For business start-ups to thrive, they must have access to resources such as venture capitalists, knowledge-intensive firms, and a skilled workforce (Flew 2010; Zandiatashbar and Hamidi 2018). This type of organizational and supervisory stimulation of creativity emerges from a

combination of available resources and an ability to strike the type of balance between supportive and external pressures, as well as limitations that are conducive to creative work (Amabile 1998; Hotho and Champion 2011). Therefore, creative and business-supportive organizations can help sustain a creative district, particularly in informal artistic developments, where informal networks of power can affect decision-making processes (Chapple, Jackson, and Martin 2010). For instance, Comunian (2011) found that artists relied on grants and support from the Arts Council in the North East region of England to support their creative activities. Some of the benefits provided by creative-supportive agencies are institutional support for economic valorization (Ley 2003; Grodach 2013) and the advertising and marketing of creative products (Markusen 2014; Mould, Tim Vorley, and Liu 2014). In general, this is accomplished by grant-making and funding (Grodach 2013), along with the facilitation of creative organizational cultures that promote empowerment, innovation, and lifelong learning (Landry 2008).

Finally, the creative class theory suggests that technology has a considerable impact on where creativity happens and how it is distributed (Markusen 2014; Storper and Scott 2009). For instance, San José's 01SJ Biennial event brings art and technology together to encourage the development of new products, attract people to downtown, and showcase the city's diversity (Markusen and Gadwa 2010b). Potts et al. (2008) categorize technology into three groups: cultural technology (e.g., history), physical technology (e.g., science), and social technology (e.g., practical ethics). They note that since social networks heavily influence creative clusters, they will not only benefit from new technologies but also affect the broader society's adoption and retention of new technological advancements. While a creative-friendly community can take advantage of new technologies, educational institutions, cultural gatekeepers, and the media, its

ability to harness these resources depends on the other factors as discussed previously in the framework.

Factor 6- The Consumer Market

Access to and availability of a pool of people who consume cultural goods is an essential factor in the clustering patterns of creative firms (O'Connor 2009). Currid and Williams (2010a) demonstrate that the social consumption of art and culture in New York and Los Angeles is not spatially random but concentrated in specific nodes in limited geographies in those two cities. In another study (2010b), they conclude that while cultural firms exhibit a consistent pattern of co-location in New York City and Los Angeles, they require an immediate consumer base, which means that the presence of consumers of cultural products could impact the firms' choice of location.

Even though cultural and creative products are, to some extent, distributed via the internet, significant clusters of production are still the dominant distribution places of creative products to the public. Scott (1999) suggests that one reason this is the case is that centers of cultural activity are places with a considerable amount of creative energy, which facilitates the exchange of products –in addition to the transactional benefits of physically being in the company of others. However, the consumption of cultural products is increasingly replaced with electronic forms of use because of the media's ability to deliver products to farther, less localized places (Bathelt 2005; Murdoch, Grodach, and Foster 2016; Scott 1999). Therefore, creative clusters need to have access to the media, cultural gatekeepers, and the internet.

A fundamental limitation of this chapter is the diversity of creative industries. As discussed in the introduction, arts and cultural industries include a variety of types with different location behaviors. Therefore, the framework may need specific revisions for each kind of creative cluster, if used for particular industries within existing communities. In the following chapters, I have attempted to identify some of the differences between various categories of the creative economy. It is worth mentioning that the proposed framework is based on the existing consensus about the general location preferences of creative industries and is not specific to any place or creative firm.

Conclusion

This section's central question is: what factors contribute to a community being welcoming to a creative cluster? In response to this question, this paper provides a framework that outlines the factors conducive to the creative-friendliness of a community across the three phases of creative activity, namely idea-production, artistic creation, and distribution. Identifying the creative-friendly features of a community is essential to the understanding of where and why creative firms and individuals tend to cluster. It can also help policymakers know what factors to prioritize when making policy decisions, as well as how to address the challenges of equity and gentrification proactively.

I argue that the built environment and the dynamics of networks and technology have a strong presence at all three phases of creativity, whereas the consumer market, for example, has its most potent effect in the circulation and consumption phases. At the idea-generation stage, the

economic context and the built environment work through networks, empowered by the community's local identity, to inspire, support, and facilitate activities among creative individuals. The economic context also supports the affordability of the built environment and its attractiveness for the creative class by producing an atmosphere that is supportive of innovation and creativity. A community that embraces creative activities from the phase of idea-generation to the consumption phase encourages creativity among individuals and organizations.

Future research may focus on more in-depth examinations of each of the six factors discussed to investigate their relationship with creative clusters and with each other. Empirical evidence on how some of the six factors affect the creative-friendliness of a community remains limited. Future research can operationalize each element to provide quantified evidence on the magnitude of creative clustering, to build upon the framework introduced in this paper. Future research could also address the causal relationships between soft and hard factors of creative clusters; empirical studies investigating these clusters often limit their scope to cross-sectional correlations due to data limitation. Longitudinal studies focusing on tracking creative clusters' dynamics over time would help clarify these relationships. Finally, the negative externalities of creative clusters, such as unaffordability, displacement, gentrification, and social inequity, call for empirically grounded case studies.

Creative clusters as economic magnets are just beginning to be fully explored. Instead of anticatalysts epitomizing inequality and gentrification, a thorough understanding of how creative-friendly communities work could enable policymakers to utilize the benefits of these clusters as active catalysts for urban revitalization.

Chapter Three- The Geography and Typology of Creative Clusters

Introduction

Creative industries are finding their positions as potent catalysts for economic development, and neighborhood revitalization in communities, even though our knowledge of the location preference of the creative clusters needs further expansion. To demonstrate the formidable presence of arts and culture in the country, suffice it to say that nationally, 673,656 businesses with 3.48 million employees are involved in the creation or distribution of the arts, representing %4.01 %2.04 of all U.S. businesses and employees, respectively (Americans for the Arts 2017a).

In the introduction of this proposal, I mentioned that the existing literature about the creative economy demonstrates that creative industries tend to cluster. However, the contributors to the geography of these clusters are still in question. While there are scholars in Europe, as well as East Asia that have attempted to map the creative clusters (Boix et al. 2016; Department for Digital, Culture 2001; Rao and Dai 2017b), there are very few studies within the United States that try to identify the location patterns of these clusters. Moreover, the extant empirical research mostly focuses on case studies and specific industries, such as fashion, cinema, or music (Scott 2002a; Currid and Williams 2010b; Gibson et al. 2010). The inadequacy of empirical studies emanates, for the most part, from the fact that creative and cultural industries include an eclectic range of industries with diverse characteristics, and therefore, require specific attention.

The following chapter seeks to address these gaps by investigating the geography of creative clusters of different specializations as well as the relationship between them. I will attempt to answer the second research question of "Where do the different creative industries tend to cluster? Is there any difference or similarity between these location patterns?" Here, I will explore the geography of different specializations among creative clusters, drawing upon hotspot

analysis and a typology of creative clusters based on a comprehensive list of the North American Industry Classification System codes (Markusen et al. 2008). This research is one of the first national studies that use disaggregated address-level employment size and sales volume for all firms within the United States to quantify the geography of creative clusters.

Clusters, in general, have been discussed to affect competitiveness within geographies (Porter 1998). Thus, they have become new agendas for all business executives since they have become "the conventional wisdom about how companies should be configured, how institutions such as universities can contribute to competitive success, and how governments can promote economic development and prosperity" (Porter 1998, 78). They are expected to both affect and get affected by the local economy at the same time.

Much of the planning literature has focused on the direct economic impact of cultural districts on their region, vis-à-vis the impacts of specific sectors within these industries (e.g., Noonan 2013). Typically, these studies focus on the number of jobs created by major cultural institutions, the amount of tax revenue they generate, and their multiplier effect on restaurants, retail, parking, and associated hotel and visitor services to measure and evaluate their impact on economic development. For example, an article (Lazzeretti, Boix, and Capone 2008) demonstrates that in 2001, creative industries include 879,000 jobs in Italy (5.6 percent of total employment) and 673,000 jobs in Spain (4.12 percent of total employment). That study divides creative industries into two categories of traditional (printing and publishing, architecture and engineering, film, video, and performing arts) and non-traditional industries (advertising, software and computer services, and research and development) (see table 2 below for further information on job size for each category in Italy and Spain).

Similarly, in 2017, more than 4 percent of all businesses and 2 percent of all employees in the United States were represented by creative industries (Americans for the Arts 2017b). This report (see table 3) divides creative industries into six categories of museums and collections, performing arts, visual arts, and photography, film, radio and television, design and publishing, and art schools and services, together which include 673,656 businesses and 3,484,486 employees.

Table 2- Number and share of employment in creative industries in 2001, Italy and Spain

	Jobs		% on total employment		% on creative industries	
	Italy	Spain	Italy	Spain	Italy	Spain
Traditional	579,855	457,864	3.7	2.8	66.0	68.0
Printing and publishing	173,391	196,951	1.1	1.2	19.7	29.2
Architecture and engineering	295,289	142,459	1.9	0.9	33.6	21.2
Film, video and performing arts	111,175	118,454	0.7	0.7	12.6	17.6
Non-traditional	299,107	215,499	1.9	1.3	34.0	32.0
Advertising	52,240	61,949	0.3	0.4	5.9	9.2
Software and computer services	223,771	144,785	1.4	0.9	25.5	21.5
Research and development	23,096	8,765	0.2	0.1	2.6	1.3
Total creative industries	878,962	673,363	5.6	4.1	100.0	100.0

Source: (Lazzeretti, Boix, and Capone 2008)

Table 3- The businesses and employees of the sub-categories of the creative industries in 2017 in the US

CATEGORY	BUSINESSES	EMPLOYEES
I. Museums and Collections	**17,858**	**173,898**
Museums	13,850	127,174
Zoos and Botanical	1,430	28,735
Historical Society	2,521	17,391
Planetarium	57	598
II. Performing Arts	**117,140**	**523,687**
Music	49,728	228,571
Theater	2,938	24,656
Dance	218	3,612
Opera	204	4,802
Services and Facilities	23,520	143,640
Performers (not elsewhere classified)	40,532	118,406
III. Visual Arts and Photography	**198,897**	**780,463**
Crafts	17,197	104,534
Visual Arts	23,199	192,978
Photography	137,194	338,426
Services	21,307	144,525
IV. Film, Radio and Television	**85,619**	**844,616**
Motion Pictures	73,253	473,996
Television	6,676	337,810
Radio	5,690	32,810
V. Design and Publishing	**234,750**	**1,041,507**
Architecture	38,955	274,754
Design	158,050	357,826
Publishing	2,823	40,555
Advertising	34,922	368,372
VI. Arts Schools and Services	**19,392**	**120,315**
Arts Councils	1,219	7,078
Arts Schools and Instruction	16,960	100,447
Agents	1,213	12,790
ALL CREATIVE INDUSTRIES	**673,656**	**3,484,486**

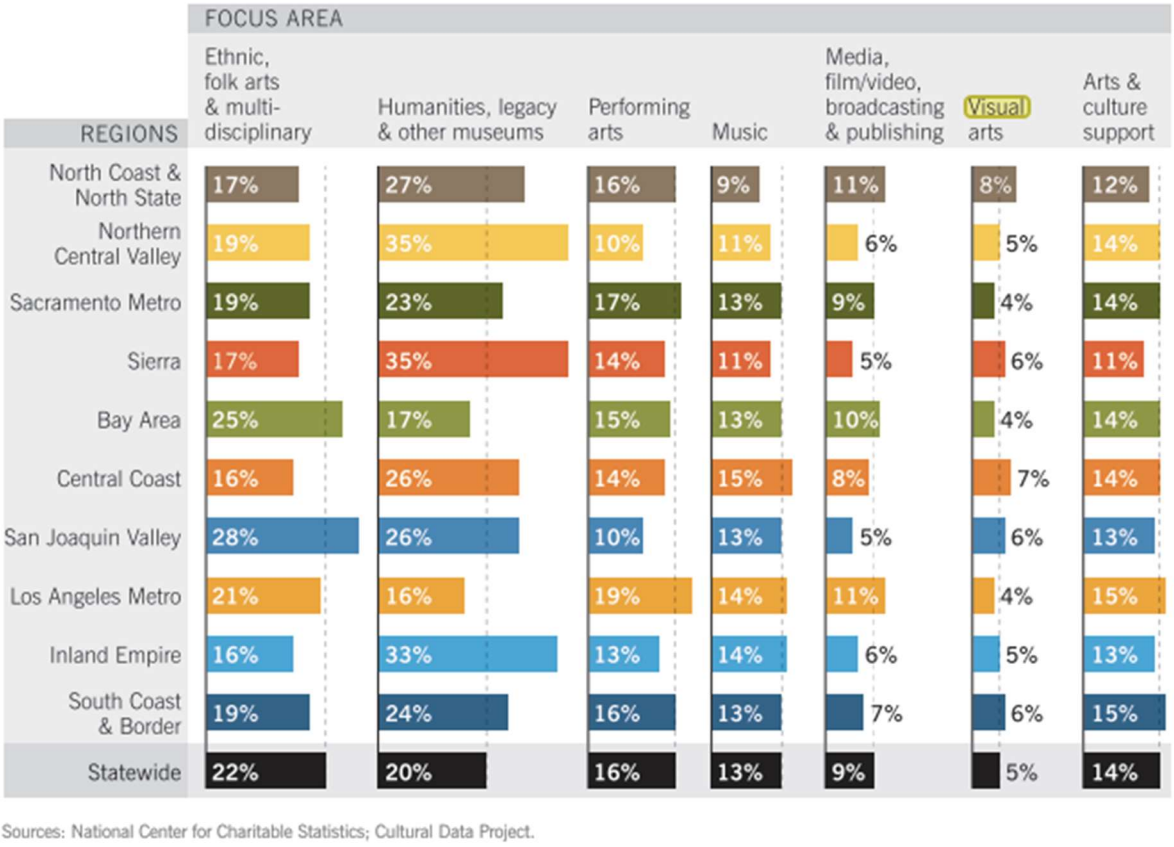
Source: (Americans for the Arts 2017b)

The two examples above demonstrate the trends and statistics in which scholars and policymakers explain the effects and relationships between the creative industries (and the specific industries ranging from art schools to motion pictures and museums) and economic development in both cities and neighborhoods.

It has been discussed previously that the creative industries are proliferating; they tend to be environmentally friendly, and they employ high-skilled, high-waged, creative workers in most cases. Simultaneously, cultural- and creative- products industries generate positive externalities insofar as they contribute to the quality of life in the places where they cluster and enhance the image and prestige of the local area (Scott 2004). At the same time, the rise of the creative clusters is constitutive elements of much of the contemporary urbanization process. An example is the recent transformation of several decaying garment manufacturing factory buildings in Los Angeles to a "fashion district" that is now a center for upscale production and showroom activities. A surrounding street scene complements this new fashion center with its commercial functions with a diverse and unique atmosphere that attracts crowds of tourists (Scott 2004). A similar case of the built environment, economy, and culture at a larger scale, where there is a convergence of monumental architectural set pieces, intimate forms of street life, and traditional artisanal and fashion-oriented industries is central Paris (Scott 2000a). Local authorities all around the world are focusing on revalorizing the inner-city areas based on experiments like these, often parallel to the local real estate interests. The increase in property price (or gentrification) emanating from this process, however, often cause strong political opposition from those who are displaced or in other ways, disadvantaged by this process (Indergaard 2001; Lloyd 2002).

In this dissertation, I have divided the creative industries into seven categories of performing arts, visual arts (including cinema and photography), media, design and publishing, crafts, software and gaming, and education. My hypothesis why these industries may cluster in different patterns and why their effects on the local economy are not precisely similar emanates from the fact that some of the sectors within creative industries are more reliant on the individuals' interaction and the 'local buzz' than the others. Even though the digital media is changing the way the creative products are distributed, some of these sectors, and especially some of the creative individuals, still need specific place-related criteria for a variety of reasons, from inspiration to branding and to representing the creative products' consumers. One example is the difference between theater and computer gaming sectors; where computer gaming products can easily be distributed and consumed over the internet, the performing arts industries are still dependent on the built environment, competing over where to be presented and to which audience. The importance and clustering of the performing arts clusters, for instance, in the cities of New York and Los Angeles (Broadway and Hollywood), is an excellent example of this difference (Markusen et al. 2011) (see table 4 below). In the following, I explain further why each sector tends to cluster and why they may be different.

Table 4- Focus areas of arts and cultural nonprofits by region



Sources: National Center for Charitable Statistics; Cultural Data Project.

Visual arts

In general, individual metropolitan areas, are considered to be endowed with a variety of classes of cultural-products districts. Allen Scott (Scott 2004) studies Los Angeles with its numerous clusters based on industries such as clothing, furniture, jewelry, motion pictures, television-program production, music recording, publishing, and advertising, as well as its array of theme parks, convention centers, and sports facilities and its upscale shopping and entertainment districts. The Los Angeles metropolitan area also contains a cluster of highly reputed architectural firms and is the site of what is probably the world's largest collection of automobile design studios. In a way, this metro area is an anomaly and an example of how

different sectors among creative industries cluster not only together but co-locate with other sectors for a more significant benefit from the urbanization economy.

In 1996, total employment in the cultural-products industries of Los Angeles stood at 412,392 workers, representing 11.9% of the total labor force, which makes this the largest group of sectors in the local economy, far ahead even of the formerly dominant aerospace industry (Scott 2000c). Scott (Scott 2004) also discusses that the steady opening up of global trade in cultural products is now making it possible for various audio-visual production centers around the world to establish durable competitive advantages and to attack new markets. In other words, the pattern among symbolic elements comprises a semiotic code that is called a style in the visual arts or genre (Jones, Lorenzen, and Sapsed 2015).

Performing arts

One of the economic impacts for this category of creative industries has been discussed to be supported towards public subsidies for urban megaprojects built around performing arts or cultural centers (Stern and Seifert 2010). There is also other research regarding the effects of performing-arts-related industries cluster (including but not limited to music, dance, and theater) and their impact on local economies (Connell and Gibson 2001; 2004; Breznitz and Noonan 2018; Gibson et al. 2010). These studies, however, have often ignored the substitution-effect problem, which can lead to inflated estimates of a new development's probable impact (Markusen and Gadwa 2010a).

Media, Software and Gaming

A study in Ireland (Murphy, Fox-Rogers, and Redmond 2015) shows the location decision trends of the media and computer gaming in the city of Dublin. It is worth acknowledging that the government intervention has been highly influential in the emergence of Dublin's Digital Hub, whereas the television and film cluster in the south of the city was found to be more organic and gradual in its evolution. Others study the clustering patterns of these two industries and their contributions to the local economy (Bathelt 2005; Cunningham 2002a; Currid and Williams 2010a; O'Connor 2009; Ley 2003; Indergaard 2001).

Crafts, Design, and Publishing

Using geographical information systems (GIS), Williams and Currid-Halkett (2011) study fashion as part of the design industries in Los Angeles. Within the industry's sub-sectors, they observe spatial patterns and similar geographical clustering patterns. Moreover, they find that fashion, like high technology and Hollywood, tends to produce regional network agglomerations, influential headquarter cities and co-location of particular sectors.

Another study in Toronto and Copenhagen reveals the pervasive influence of institutions that shape and constrain the ability of the labor market to secure the position of designers in the creative economy (Vinodrai 2015). The author explains that in Toronto, "the pre-existing landscape of design-related professional associations has been discipline-specific and oriented to the local and provincial level, in part due to existing institutions and rules governing labor markets." In contrast, in the Copenhagen case, where the professional associations have a long

history embedded in craft traditions, “the orientation of the professional associations has been open, national, and multidisciplinary” (p. 429).

Education

While education is an essential part of the cultural capital (Bourdieu 1986), recent research at the zip-code level in the US has found that both districts and arts programs (especially at schools that specialize in arts education) have a positive relationship with the share of jobs in the arts and digital media (Breznitz and Noonan 2018), with stronger relationships in urban areas. Their findings are especially interesting for my research since they show that proximity to cultural districts is associated “only with stronger growth of arts and cultural jobs, with basically no effect on the growth of the share of high-tech jobs and weaker effects on the growth of digital media jobs” (p. 1059). Another report about cultural vitality in communities (Jackson, Kabwasa-Green, and Herranz 2006) discusses the importance of art schools in the cultural and creative vitalities of arts districts in the United States (See also Markusen et al. 2011; Oakley 2004; Gilligan 2014).

As noted previously, the mutually beneficial effects of proximity, frequently encourage groups of establishments in cultural-products industries to converge together around their mutual center of gravity, thus forming specialized industrial districts. The number and variety of such districts in the contemporary world are increasing apace, as suggested by the following specific empirical types that have received attention in the literature:

- clothing (Pietrobelli and Barrera 2002; N. M. Rantisi 2002; Scott 2002b);

- film and television program production (Turok 2003; Krätke 2002)
- music (Gibson et al. 2010; Currid and Williams 2010b; Scott 1999; Connell and Gibson 2001);
- publishing of books, magazines, newspapers, comic books, and such (Norcliffe and Rendace 2003);
- design services (Molotch 1996; Hutton 2006; N. M. Rantisi 2002); and
- Advertising (Grabher 2001; Jones, Lorenzen, and Sapsed 2015).

One can extend this list via reference to urban entertainment districts (Lloyd and Clark 2001; Frost-Kumpf 2001) as well as cultural districts comprising museums, art galleries, and performing arts complexes (Santagata 2002).

The findings of this chapter will have several policy implications for local communities throughout the country. Identifying where the creative clusters are located within cities and metropolitan areas, planners and policymakers can look more carefully at the causes and effects of such clustering. Instead of anticatalysts epitomizing inequality and gentrification, a thorough understanding of where creative clusters (tend to) locate and how they interact with one another and the built environment enables policymakers to utilize the benefits of these clusters as active catalysts for urban and rural revitalization.

Case Study, Data and Methodology

To study the geography of the creative clusters in the United States, I investigate twenty of the largest and most culturally active metropolitan areas (MSA) within the country. Some of these MSAs have been well studied (e.g., Los Angeles, New York, Austin, or San Francisco) and the others are the top MSAs that had the most significant number of workers employed in cultural and creative jobs or the number of creative jobs per capita in 2017 (Sauter 2018). These MSAs include:

1. New York-Newark-Jersey City, NY-NJ-PA MSA
2. Los Angeles-Long Beach-Anaheim, CA MSA
3. Chicago-Naperville-Elgin, IL-IN-WI MSA
4. Dallas-Fort Worth-Arlington, TX MSA
5. Washington-Arlington-Alexandria, DC-VA-MD-WV MSA
6. Miami-Fort Lauderdale-Pompano Beach, FL MSA
7. Boston-Cambridge-Newton, MA-NH MSA
8. Phoenix-Mesa-Chandler, AZ MSA
9. San Francisco-Oakland-Berkeley, CA MSA
10. Detroit-Warren-Dearborn, MI MSA
11. Seattle-Tacoma-Bellevue, WA MSA
12. Minneapolis-St. Paul-Bloomington, MN-WI MSA
13. St. Louis, MO-IL MSA
14. Austin-Round Rock-Georgetown, TX MSA
15. Baltimore-Columbia-Towson, MD MSA

16. Orlando-Kissimmee-Sanford, FL MSA
17. San Antonio-New Braunfels, TX MSA
18. Portland-Vancouver-Hillsboro, OR-WA MSA
19. Denver-Aurora-Lakewood, CO MSA
20. Nashville-Davidson–Murfreesboro–Franklin, TN MSA

In order to map the geography of the different types of creative clusters, this chapter will employ a 2-step research design. I will use the address-level firm dataset from the Esri Business Analyst Database (EBAD), which includes the 6-digit NAICS for identifying the creative clusters across different categories. I will draw upon hotspot analysis and a typology of creative clusters based on a comprehensive list of the North American Industry Classification System codes (see Markusen et al. 2008). I then divided the creative industries into seven groups of 1) performing arts, 2) visual arts and photography, 3) film, radio, and television, 4) design and publishing, 5) educational services, 6) software publishing and gaming, and 7) museums and collections. Derived from the 2016 ESRI Business Data Source, I will leverage advanced statistical methods to create a mesh of identical hexagons, which will help ensure that the sampling results within similar geographies represent all regions within the case study. Besides, this study will use cluster analysis to find specialization among creative clusters, demonstrating wherein different cities and regions the different creative clusters locate. I explain the two steps in more detail below.

Step one- Identifying the Geography of Creative Clusters

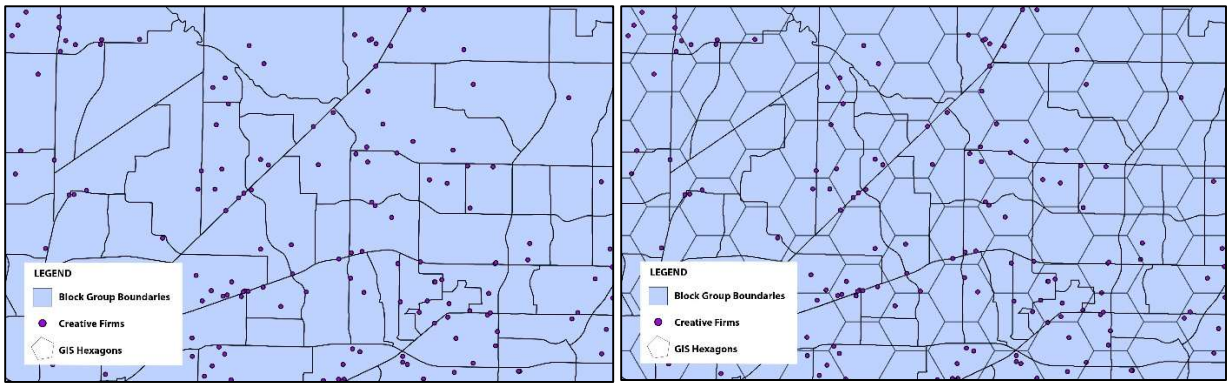
This step includes tessellation sampling– i.e., using hexagon cells in place of irregularly shaped polygons of census boundaries to reduce sampling bias-, and hotspot analysis region by region to identify the location of creative clusters. I applied these spatial modeling techniques for identifying the location of creative clusters in the MSAs. I also used spatial modeling to detect poly-centricity of spatial structures in regional studies, changes in the location of CBDs, or the location of employment sub-centers (Hajrasouliha and Hamidi 2017; Hamidi 2015). This research is an attempt at identifying the location of creative clusters in the US.

The two major spatial statistics available are Local Moran's I and Getis-Ord Gi*. The Local Moran's I identify cases of positive, i.e., high-high or low-low (HH, LL) and negative, i.e., high-low or low-high (HL, LH) spatial autocorrelation. On the other hand, the Getis-Ord Gi* identifies cases with positive autocorrelation with a more straightforward definition and readily interpretable output (Getis and Ord 1992). The standardized Gi* is essentially a Z-value associated with statistical significance (Manepalli, Bham, and Srinadh Kandada 2011). Since I am interested in all clusters of positive values, I used local Getis-Ord Gi* statistics for identifying the clusters of creative industries.

Furthermore, existing studies use Census-defined boundaries as their unit of analysis. However, the census units suffer from size inconsistency that is a limitation for a contiguity-based spatial analysis. Since I am using a firm-level dataset, I incorporated tessellation to address this inconsistency issue, creating similar units to analyze throughout the nation. Using the tessellation-sampling method in ArcGIS, I divided the urbanized portion of each region into

hexagon cells (see Figure 3). Each cell with an area of 0.3 square miles, equal to the average land area of the U.S. urbanized census block groups.

Figure 3- The differences between the unit sizes of census block groups and the suggested hexagons



The most common method to capture creative clusters at the neighborhood and MSA levels is Location Quotient (LQ) (Escalona-Orcao et al. 2016; Propris et al. 2009; Markusen and Schrock 2006; Zandiatashbar and Hamidi 2018). However, LQ does not represent the total number of employments as well as the firms in these cells. Therefore, I used Principal Component Analysis (PCA) to calculate the input variable for the Getis-Ord Gi* analysis based on the number of firms and employment in the hexagon cells. PCA is a method of data reduction that turns several correlated variables into a smaller number of distinct factors (Abdi and Williams 2010).

PCA is helpful for this study since there are several highly correlated variables, each representing one aspect of concentrated creative industries in the hexagons. In order to decide what input variable would be best at this point, I needed a pilot study to ask some experts about the validity of the findings. I other words, I used the DFW as a pilot to investigate which variable(s) would represent the clusters of creative firms and employment in an MSA.

Demonstrated in Table 5, I used several input variables as the determinant for the hotspot analysis before finalizing the methodology. Using different NAICS codes for all of the creative industries within the US (see Appendix 1), as well as the codes only for arts firms, I created 14 different input variables and conducted the Getis-Ord Gi* in the DFW area. These variables included a range from just the number of firms or employment size in hexagon cells to PCA models of four variables.

I ran the model with all 14 variables (see Table 5) and received very diverse responses (i.e., possible boundaries for creative clusters in the DFW area). To decide which input variable would provide the most accurate result in hotspot analysis, as mentioned before, I printed the maps and consulted with planners in the city of Dallas. The interviewees were Luis F. Tamayo, the chief planner at the City of Dallas and Lynn Rushton, public art collection and conservation manager at the City of Dallas. Based on their suggestions and feedback, I decided that the 2nd variable provides the most accurate representation of where the creative firms cluster in the metroplex.

Table 5- Input variables for hotspot analysis of the creative clusters

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
LQ for CIs	*				*									*
MSA-LQ for CIs									*		*BC		*	
LQ for Arts			*			*								
Ratio of CIs	*						*							
Ratio of Arts			*					*						
Number of CIs	*	*								*BC	*BC		*	*
Employment in CIs	*	*								*BC	*BC		*	*
Number of Arts Firms			*	*										
Employment in Arts			*	*										
CI Emp by Firms / Area												*BC		
Percent of the variance	49. 8	71.9	49.5	80.1	100	100	100	100	100	78.4	54.5	100	47.9	49.0

*BC- represents models where instead of hexagon cells, the block groups as unit of analysis

This input variable includes a Principal Component Analysis (PCA) of the number of creative firms and employment in each hexagon. It includes almost 72% of the variance in the

DFW, while also represents all the creative firms, as opposed to only arts firms. The variance across different MSAs varies between 52.748 in Miami to 94.376 in Chicago (See Table 6 below). The two variables of the number of creative firms and employment have a Pearson correlation of 0.620.

Table 6- Details of the PCA estimation for the input variable based on the MSAs

MSA	Factor Loadings		Eigenvalue	% of Variance
	Firms	Employment		
New York	0.967	0.967	1.87	93.586
Los Angeles	0.868	0.868	1.51	75.370
Chicago	0.971	0.971	1.89	94.376
Washington	0.881	0.881	1.55	77.592
Miami	0.726	0.726	1.06	52.748
Boston	0.891	0.891	1.59	79.338
Phoenix	0.906	0.906	1.64	82.010
San Francisco	0.944	0.944	1.78	89.182
Detroit	0.844	0.844	1.43	71.291
Seattle	0.775	0.775	1.20	60.074
Minneapolis	0.887	0.887	1.58	78.738
St. Luis	0.916	0.916	1.68	83.820
Austin	0.942	0.942	1.77	88.651
Baltimore	0.914	0.914	1.67	83.621
Orlando	0.891	0.891	1.59	79.357
San Antonio	0.827	0.827	1.37	68.415
Portland	0.966	0.966	1.87	93.235
Denver	0.922	0.922	1.70	85.062
Nashville	0.946	0.946	1.79	89.544

Using the PCA estimation calculated for each hexagon, the local Getis-Ord Gi* with queen neighboring for each of the 20 MSAs separately. In queen neighboring, units are considered neighbors if they have common borders or corners. This analysis compares the Creative Score value of a hexagon's neighbors (local sum) to the overall sum Creative Score value of an MSA using the Getis-Ord Gi* equation, as shown in Table 7 below. When the local sum is higher than the total sum, and that difference is too significant to be the result of random chance, there would

be a statistically high chance that this group of cells is a hotspot (Manepalli, Bham, and Srinadh Kandada 2011). Ultimately, I will identify clusters of cells with high Creative Score values (hotspots) as the creative cluster candidates.

Table 7- The equation for the Getis-Ord Gi* analysis

The Getis-Ord local statistic is given as:

$$G_i^* = \frac{\sum_{j=1}^{n} w_{i,j}x_j - \bar{X}\sum_{j=1}^{n} w_{i,j}}{S\sqrt{\frac{\left[n\sum_{j=1}^{n} w_{i,j}^2 - \left(\sum_{j=1}^{n} w_{i,j}\right)^2\right]}{n-1}}} \quad (1)$$

where x_j is the attribute value for feature j, $w_{i,j}$ is the spatial weight between feature i and j, n is equal to the total number of features and:

$$\bar{X} = \frac{\sum_{j=1}^{n} x_j}{n} \quad (2)$$

$$S = \sqrt{\frac{\sum_{j=1}^{n} x_j^2}{n} - \left(\bar{X}\right)^2} \quad (3)$$

The G_i^* statistic is a z-score so no further calculations are required.

Moreover, I applied False Discovery Rate (FDR) adjustment in calculating the hotspots, in which the critical p-values determining confidence levels are reduced to account for multiple testing and spatial dependence. The hotspot analysis identifies the concentration of hexagons encompassing the clusters of creative economic activities, or creative clusters. The hexagons which have a z-value between 1.96 and 2.58 at the 95% level of confidence are considered as creative clusters.

Step two- Identifying the Typology of Creative Clusters

Once the clusters are identified, in the second step, I will use the Herfindahl-Hirschman Index (HHI) and Location Quotient (LQ) to identify the specialization of the identified creative clusters. The HHI index is widely used in the literature as the measure of market concentration or competition. It is calculated by squaring the market share of each firm competing in a market and then summing the resulting numbers. It can range from close to zero to 10'000 (100^2). A market with an HHI of less than 1,500 is a competitive marketplace indicating even distribution (e.g. of employment among firms), an HHI of 1,500 to 2,500 to be a moderately concentrated marketplace, and an HHI of 2,500 or higher to be a highly concentrated marketplace (Kopczewska 2018). In other words, the closer a market is to a monopoly (i.e., HHI = 10'000), the higher the market's concentration (and the lower its competition).

I computed three HHI indices for each cluster, using the below equation for accounting for the share of each creative industry in the number of firms, employment size, and sales volume because different types of creative clusters demand different employment sizes for their operations. Similarly, the number of firms is widely cited as an indicator of urbanization externalities, occurring as a result of the agglomeration effect, as mentioned in the introduction.

Herfindahl-Hirschman Index (HHI)

$$HHI = \sum_{i=1\ldots6}^{I} (A_{ic}/A_c * 100)^2$$

A_{ic} = employees, firms, or sales volume in creative category *i*

Ac = total number of creative employees, firms, or sales volume

A hierarchical clustering algorithm with the average distance measure to classify types of clusters based on the three continuous HHI indices will be used at this step. I used STATA 15

software to calculate the HHI and identify the type of creative clusters in terms of their competitiveness in the creative economy, as demonstrated in Table 8. Further, using location quotient (LQ) and specialty thresholds, I used the highest LQ value to indicate each cluster's specialization.

Table 8- The HHI for three categories for all the 221 identified creative clusters

Herfindahl-Hirschman Index (HHI)	Categories	Number of Clusters	Percent
HHI for the share of firms	Competitive	210	95.0
	Moderate competition	4	1.8
	Monopoly	7	3.2
HHI for the share of employees	Competitive	150	67.9
	Moderate competition	25	11.3
	Monopoly	46	20.8
HHI for the share of sales volume	Competitive	148	67.0
	Moderate competition	23	10.4
	Monopoly	50	22.6
Total		221	100.0

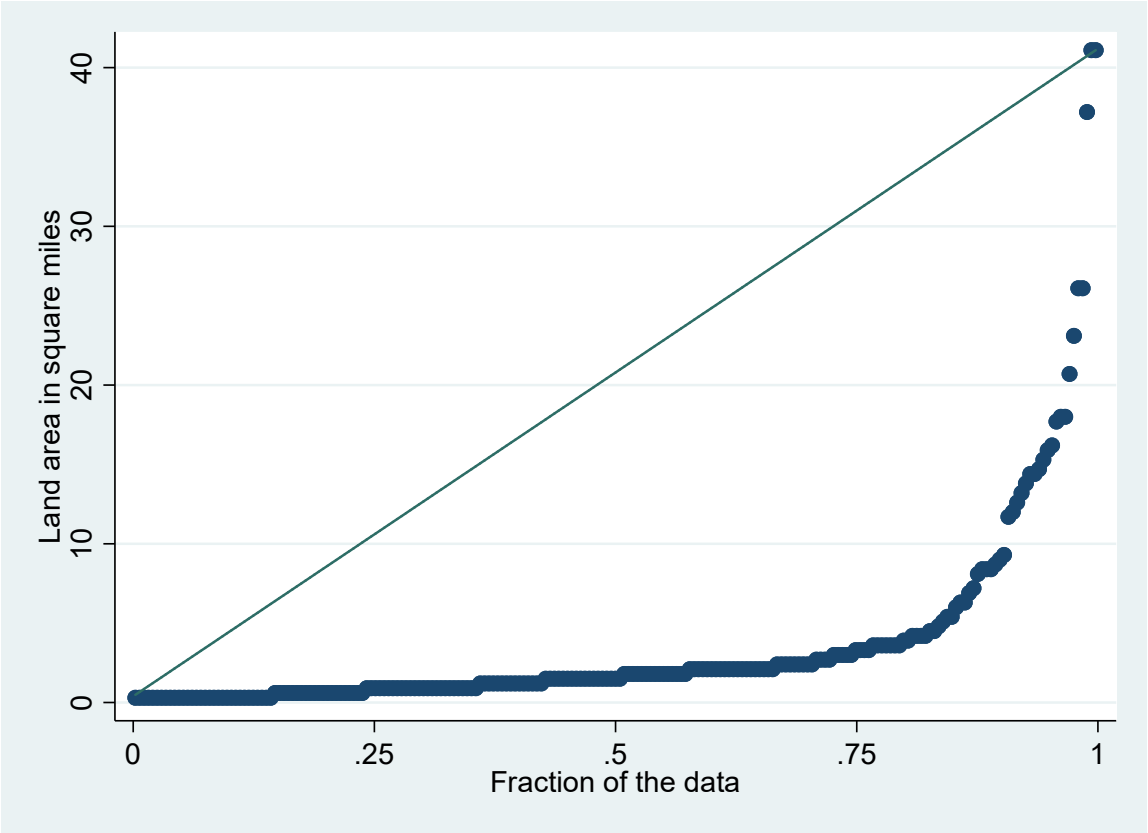
As demonstrated in Table 8 above, if one considers the share of firms, most (95%) of the identified clusters are competitive. This share drops to 67.9% and 67% when the share of employment/ sales volume is used as input variables in the HHI calculation. In this dissertation, I used the Herfindal-Hirschman Index based on the share of employment for each of the 221 identified creative clusters. Forty-six clusters (20.8%) are in the form of monopoly, meaning there is only one (or sometimes two) of the industries that include the most substantial part of creative production in the cluster. Moreover, 25 clusters (11.3%) have moderate competition, and the rest of the clusters (150 or 67.9%) show a degree of competitiveness within them. This finding is consistent with the limited theoretical and empirical observations, demonstrating an overarching typology of how particular sectors within the industry co-locate (e.g., Williams and Currid-Halkett 2011; Grodach et al. 2014; Boix, Hervás-Oliver, and Miguel-Molina 2015). In

terms of the clusters' land area, as delineated in Table 9 and Figure 4 below, most of the clusters are small, with a mean of 3.7 square miles.

Table 9- Descriptive statistics for the area of the creative clusters in the dataset

Variable	Obs	Mean	Std. Dev.	Min	Max
CArea	221	3.692308	6.286514	.3	41.1

Figure 4- The distribution of the land area of the identified creative clusters (in square miles)



Finally, the specialization of each of the creative clusters is identified using location quotient (LQ), representing the local concentration of employment in each cluster (see the equation below). Following the accepted economic theory, an LQ greater than 1.0 indicates that the cluster has proportionately more specialized workers than the larger comparison area (MSA in

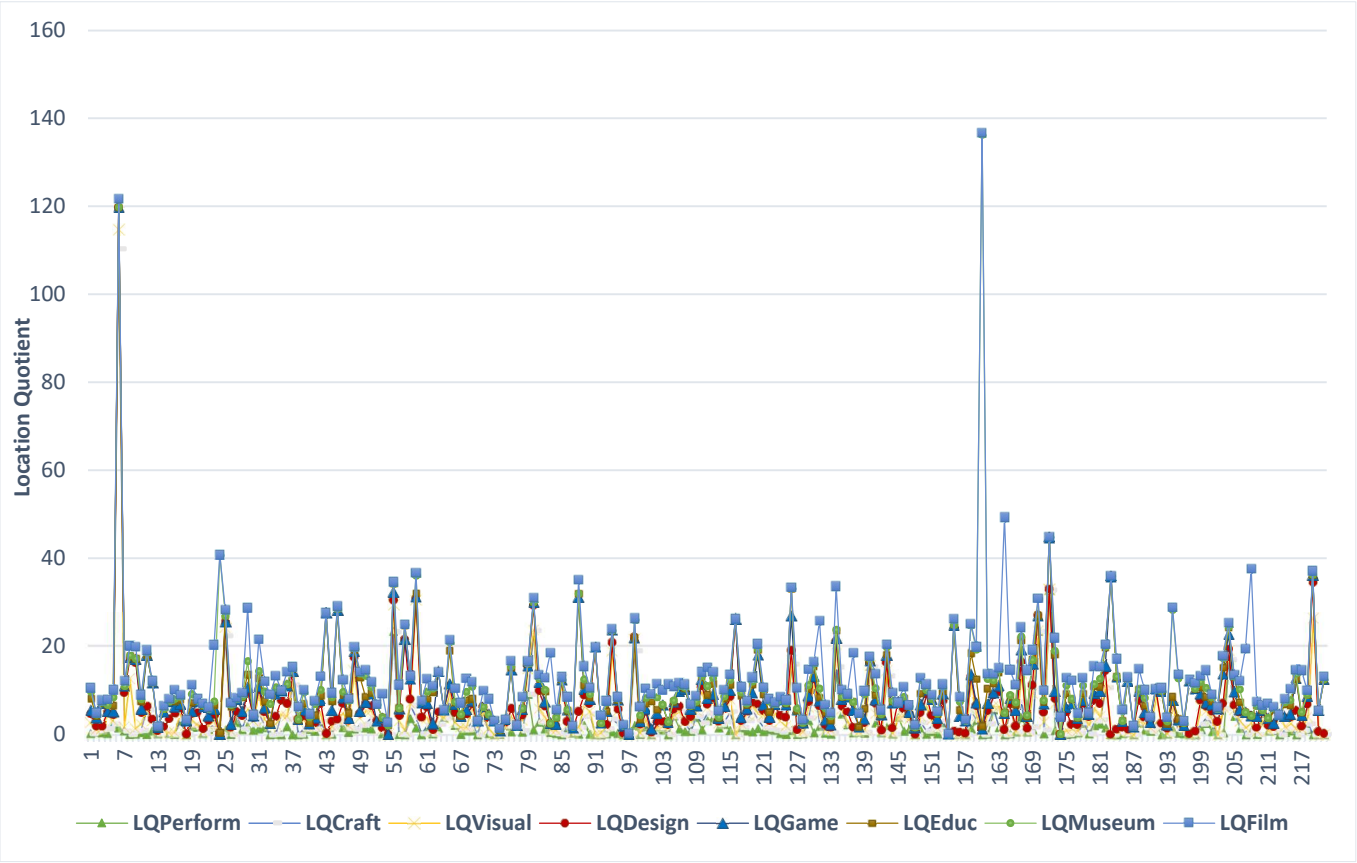
this research) employed in each specific industry sector, implying that the cluster produces more of a product or service than is consumed by the clusters' residents. The excess can be available for export outside the creative cluster. An LQ of at least 1.25 is required to consider classifying clusters as an exporter in that industry (Kopczewska 2018). Still, an LQ higher than 1.25 does not necessarily mean that a cluster is exporting; there may simply be excessive local demand. Identifying area export industries (LQ > 1.25) is useful, as it provides a measure of the degree of industry specialization within a cluster. The equation for computing LQ is:

$$LQ_i = {(e_i/e_t)}\Big/{E_i/E_t}$$

Where:
LQ_i = location quotient of creative category i
e_i = number of employees in creative category i in the cluster
e_t = total employment in the cluster
E_i = number of employees in creative category i in the MSA
E_t = total employment in the MSA

The LQ in the 46 monopoly clusters and 25 moderate competitive clusters (see Figure 5) suggests that there are one or two specialized categories in these clusters, as opposed to the more competitive clusters where more than two industries have the LQ of 1.25 and higher. The distribution of LQ in the 221 creative clusters in Figure 5 shows that the mean for all the categories is one and above, indicating that the clusters, on average, have proportionately more workers than their MSA employed in all industry sectors. Except for educational industries, all the LQs have means above 1.25, the threshold for specialization in these clusters. Looking at the minimum and maximum range in the LQs (figure 5), film, media, and tv, as well as gaming and software, have the highest LQs among all.

Figure 5- The distribution of the LQ of eight categories of creative industries



Variable	Observations	Mean	Standard Deviation	Min	Max
LQ Performing Arts	221	1.6	3.6	0	32.78
LQ Crafts		1.8	7.8	0	108.83
LQ Visual Arts		1.7	3.2	0	26.46
LQ Design		1.7	2.87	0	26.03
LQ Film and Media		2.1	4.4	0	44.48
LQ Gaming and Software		2.6	4.6	0	35.86
LQ Educational		1.0	1.5	0	8.39
LQ Museums		1.6	9.5	0	134.51

Table 10 below demonstrates the number of industries in each cluster with LQs higher than 1.25, i.e., the specialization threshold. It represents the fact that while 10 of the clusters have no LQ of 1.25 (this means that even though there are clusters at those areas, they produce creative products that are mostly consumed inside the clusters, themselves), 51.11% of the clusters (113

clusters) have three or more industries that have the exporting LQ threshold (see Table 10). This delineates the fact that creative clusters, as we find them, include co-location of more than one industry and produce creative products that are consumed regionally or even internationally.

Table 10- The distribution of clusters in terms of the industry LQs above 1.25

NumHighLQ	Freq.	Percent	Cum.
0	10	4.52	4.52
1	41	18.55	23.08
2	57	25.79	48.87
3	46	20.81	69.68
4	34	15.38	85.07
5	21	9.50	94.57
6	10	4.52	99.10
7	2	0.90	100.00
Total	221	100.00	

Finally, looking at the industry with the highest LQ in the 71 monopoly clusters in Table 11, it appears that the gaming and software industries are the most prevalent (44.25%) “monopoly” clusters among the creative clusters of the US. This finding is in tandem with the literature that specifies the clusters of film, television, and cinema tend to locate close to clusters of performing arts. The co-location of these industries may need further research about the trends and reasons for these clustering patterns. In four of the clusters, the monopoly that has been identified in the cluster is not supported by the LQ, meaning that the industry is not a regional producer, but more probably a strong local monopoly.

Table 11- The highest LQ in the monopoly clusters

Monopoly Clusters	Frequency	Percent
Crafts and Jewelry	3	4.23
Design and Publishing	6	8.45
Education	5	7.04
Film, Radio, TV	6	8.45
Gaming and Software Publishing	30	42.25
Museums and Collections	3	4.23
Performing Arts	8	11.27
Visual Arts	6	8.45
None	4	5.63
Total	71	100

In the following Figures (6,7 and 8), the specialization of the clusters with HHI indicating monopoly is demonstrated in three MSAs of the Dallas-Fort Worth, the Washington-Arlington-Alexandria, and the Orlando area. The clusters with the monopoly are mostly the smaller ones farther from the downtown areas of the principal cities in the MSAs.

Figure 6- The specialization of creative clusters in the Dallas- Fort Worth MSA

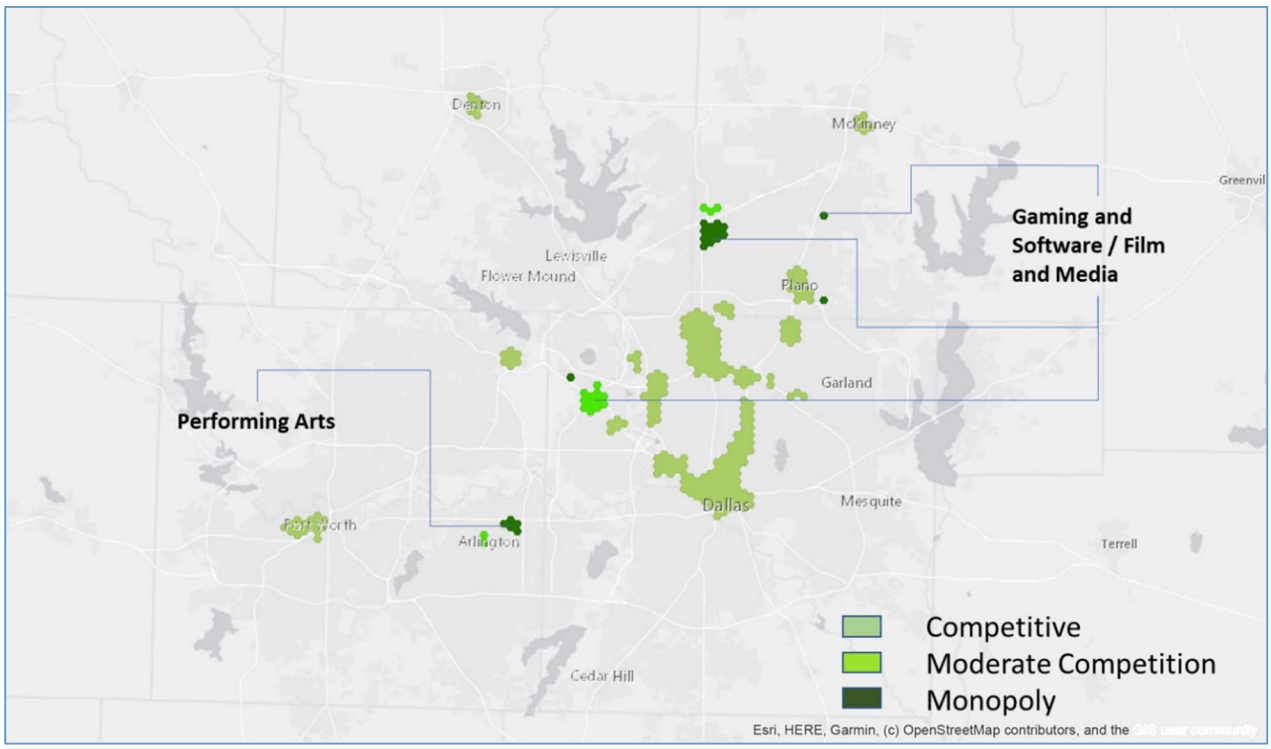


Figure 7- The specialization of creative clusters in the Washington-Arlington-Alexandria MSA

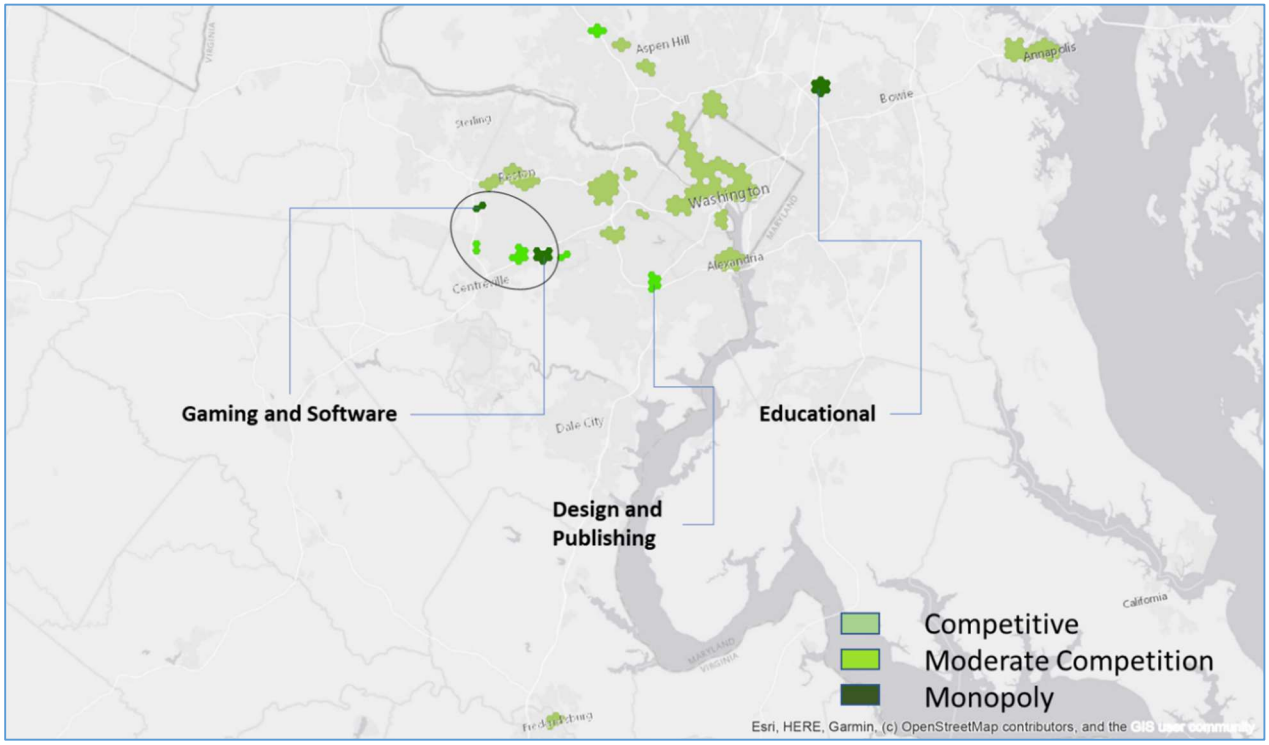
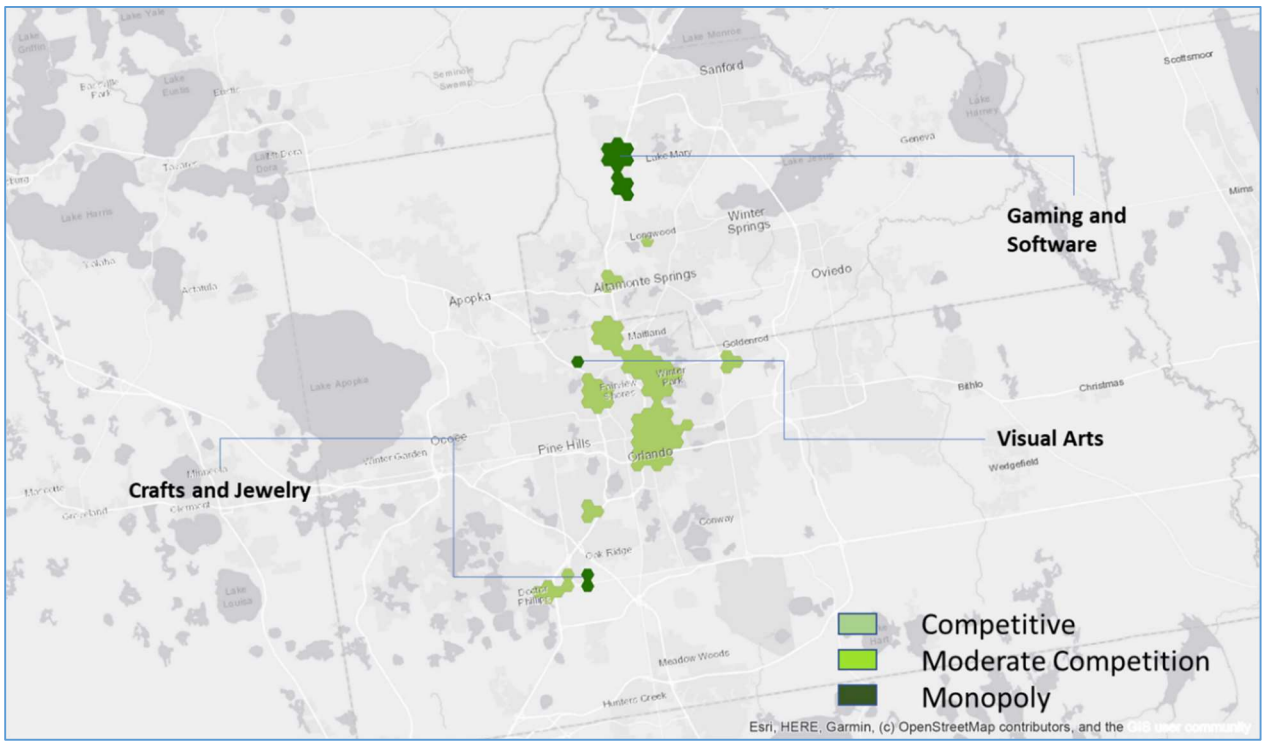


Figure 8- The specialization of creative clusters in the Orlando MSA



To estimate if the clusters farther than the CBDs are more monopolistic in nature, I ran a T-test in Stata 15.0. Using GIS-Pro 1.3 (see Table 12), I computed the distance from the closest CBD to each cluster, estimating the two groups of competitive (0 in the table) vs. monopoly (1 in the table) in terms of their mean in their distance from the CBD. The results below show that the average distance from the CBD between firms in competitive and monopoly clusters is statistically and significantly different from each other at the 99% level, and the clusters that are monopolistic are significantly farther than the CBDs.

Table 12- The t-test for the nature of creative clusters and their distance from the CBD

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	150	1116.67	171.6801	2102.644	777.4278	1455.912
1	71	2268.196	287.7469	2424.598	1694.303	2842.089
combined	221	1486.617	152.7314	2270.516	1185.613	1787.621
diff		-1151.526	318.4509		-1779.146	-523.905

diff = mean(0) - mean(1) t = -3.6160
Ho: diff = 0 degrees of freedom = 219

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.0002 Pr(|T| > |t|) = 0.0004 Pr(T > t) = 0.9998

The most significant clusters (in terms of the land area of the cluster are located in the Los Angeles, Boston, St Luis, DFW, and Minneapolis metro areas, respectively. Table 13 shows the top 20 most significant creative clusters. While all the most significant creative clusters have competitive HHIndex (meaning there is a competitive behavior in terms of the share of employment among creative firms in these clusters), the highest LQ in most of these giant clusters belongs to the sector of film, radio, and TV. The second highest LQ in these clusters shows a more diverse nature, with design and publishing and museum and collections as the most frequently observed sectors.

Table 13- The 20 most significant creative clusters in the US

Location in the MSA	Shape Area (square miles)	Specialization Status	Highest LQ	Second Highest LQ	#Sectors with LQ>1.25
Los Angeles	106448511	Competitive	Film, Radio, TV	Performing Arts	6
Boston	106448510		Film, Radio, TV	Museum and Collections	4
St Luis	96347558		Film, Radio, TV	Museum and Collections	5
DFW	67598690		Film, Radio, TV	Museum and Collections	3
Minneapolis	67598689		Film, Radio, TV	Performing Arts	4
Washington DC	59828725		Film, Radio, TV	Educational Services	5
Austin	53612754		Film, Radio, TV	Educational Services	4
New York	46619786		Film, Radio, TV	Design and Publishing	7
Seattle	46619786		Film, Radio, TV	Design and Publishing	6
Chicago	45842790		Film, Radio, TV	Visual Arts	6
Denver	41957807		Performing Arts	Design and Publishing	6
DFW	41180811		Crafts and Jewelry	Film, Radio, TV	4
Phoenix	39626818		Film, Radio, TV	Design and Publishing	4
Orlando	38072825		Film, Radio, TV	Design and Publishing	5
Detroit	37295828		Film, Radio, TV	Design and Publishing	4
Baltimore	37295828		Museum and Collections	Design and Publishing	5
San Antonio	35741836		Gaming and Software	Crafts and Jewelry	4
Los Angeles	34187843		Performing Arts	Film, Radio, TV	5
Nashville	32633850		Performing Arts	Museum and Collections	5
Portland	31079857		Film, Radio, TV	Design and Publishing	5

When it comes to monopoly or moderately competitive creative clusters, however, the results are different. Table 14 below delineates the top largest monopoly clusters in terms of land area. Phoenix, Los Angeles, St. Luis, and the DFW metropolitan areas have the largest monopoly clusters (in terms of land area) among all studied MSAs. The majority of these clusters are in the monopoly of two sectors: gaming and software, and film, radio, and TV, which may be partly because these two sectors are more employment-heavy and larger scale, as compared to performing and visual arts.

Moreover, looking at the column with the number of sectors with LQs higher than 1.25 in Table 14, which represent sectors that are regionally capable of exporting their creative products, there are some lessons for urban planners and policymakers. 1) The smaller the clusters, there are fewer numbers of regionally competitive sectors. This relationship was expected since smaller clusters can typically include a lower number of firms and employment. 2) The sector of film, radio, and TV is, in general, one of the most frequent highest LQ in both competitive and monopoly clusters. It can represent the fact that this sector tends to cluster more than other sectors among the eight different specializations in this study.

The gaming and software firms are more found in the monopoly clusters, demonstrating the fact that these firms may not tend to co-locate with other creative sectors of this study. This is not a discrete separation of these firms from the other categories, but their tendencies of being located as separate clusters (in most cases), points out to the fact that researchers may not need to include them as part of creative industries. It is worth mentioning that for the sake of this research, I only included the software and gaming firms, that is slightly separate from the knowledge-based and innovative industries. Yet, their clustering patterns demonstrate that

together, they are a propulsive force that can change the face of neighborhoods and cities. Clusters of cultural and creative production, Hutton (2017) explains, perform a propulsive role in many advanced urban-regional economies. These clusters include "established industries such as architecture, advertising, graphic design, and the film and music industries—increasingly reshaped by digital technologies and the Internet, as well as by increasing outsourcing, exemplified by video games production and other interactive media" (Hutton 2017, 17). However, this relationship is not evident and is not supported by the findings of this study (see Table 14).

Table 14- The 20 most significant monopoly creative clusters in the US

Location in the MSA	Shape Area (square miles)	Specialization Status	Highest LQ	Second Highest LQ	#Sectors with LQ>1.25
Phoenix	6.3	Monopoly	Gaming and Software	Crafts and Jewelry	4
Los Angeles	4.5		Film, Radio, TV	Visual Arts	6
St. Luis	3.6		Film, Radio, TV	Visual Arts	6
DFW	3.6		Gaming and Software	Film, Radio, TV	3
DFW	3.6		Gaming and Software	Film, Radio, TV	2
Orlando	3.3		Gaming and Software	Design and Publishing	4
Nashville	3		Gaming and Software	-	1
Baltimore	2.7		Film, Radio, TV	Gaming and Software	4
Baltimore	2.4		Gaming and Software	Educational Services	2
Boston	2.4		Gaming and Software	Crafts and Jewelry	2
Minneapolis	2.1		Performing Arts	Visual Arts	2
Seattle	2.1		Gaming and Software	-	1
San Francisco	2.1		Gaming and Software	Performing Arts	2
Washington DC	2.1		Educational Services	-	1
Detroit	2.1		Film, Radio, TV	Gaming and Software	2
Miami	2.1		Design and Publishing	-	1
Boston	2.1		Gaming and Software	-	1
Boston	2.1		Gaming and Software	Film, Radio, TV	2
Minneapolis	2.1		Design and Publishing	-	1
Detroit	2.1		Museum and Collections	-	1

Metropolitan Comparisons

To compare the metro areas in terms of the number of creative clusters, Figures 9 and 10 offer a comprehensive view. The results offer a rather unexpected trend about the number of creative clusters when compared to population and employment numbers. The most populated metropolitan areas in the US do not seem to have the most numbers of creative clusters, nor do they have larger geographies for their creative clusters. New York, Newark, Jersey City metro area is the largest metropolitan area in the US, with a population of almost 20 million people. Yet, it has only two clusters of 13 and 0.3 square miles in size. While the sizeable creative cluster in this MSA is the 9th largest cluster among all the metro areas, representing the Manhattan area in general, it may not wholly represent the effect and degree of effect on the creative products in the US. In other words, creative employment and the annual sales volume of creative firms are the highest in the NY metro area among all other 19 MSAs. However, they mostly cluster in one geography and close to each other. Table 10 delineates that New York's creative cluster is also a competitive one, meaning that in seven categories of creative firms (except educational services), this cluster offers regionally exporting activities.

Similar to New York MSA, the Los Angeles, Long Beach, Anaheim metro area, the second-highest number of employees and sales volume in creative industries, ranks seventh among the 20 MSAs for the number of creative clusters with 15 clusters, only three of which are monopoly (two film, radio, tv, and one gaming and software dominated). When one looks at the sales volume and the number of employees in this metro area, however, the effect of these clusters and the degree to which their creative products circulate nationally and internationally may narrate a different story.

The Dallas-Fort Worth metroplex has the highest number of creative clusters (22) and the highest land area (similar to the Los Angeles area) covered by these clusters among all. The sales volume and the number of creative employments, however, for the DFW area are not among the top three. Most of the monopoly creative clusters in the DFW area belong to gaming and software firms (5 out of 8) and are located in more suburban areas (as opposed to the CBDs) (see also Figure 6). Washington DC, Boston, Minneapolis, and Detroit metro areas are the other MSAs with the highest numbers of creative clusters, while not necessarily following the order in the number of creative employees or sales volume. Chicago, Denver, and New York metropolitan areas are the three MSAs with no monopoly creative clusters, whereas DFW, Washington DC, and Phoenix metro areas have eight monopoly clusters along with competitive ones.

The specialization of the creative clusters is demonstrated in Figure 12 below. Minneapolis, St. Luis, Detroit, and Phoenix have the most diverse specialized clusters, whereas Miami, Seattle, San Francisco, and Los Angeles have the most percentage of multifunctional clusters. The competitive nature of the creative clusters, as discussed before, represents the previous discussions about the co-location of creative firms of different types, for access to the labor pool, face-to-face contact, identity and local buzz, and the general diversity as a basis for creative activity.

Figure 9- The comparison of the number of creative clusters, their land area, and employment in the 20 MSAs

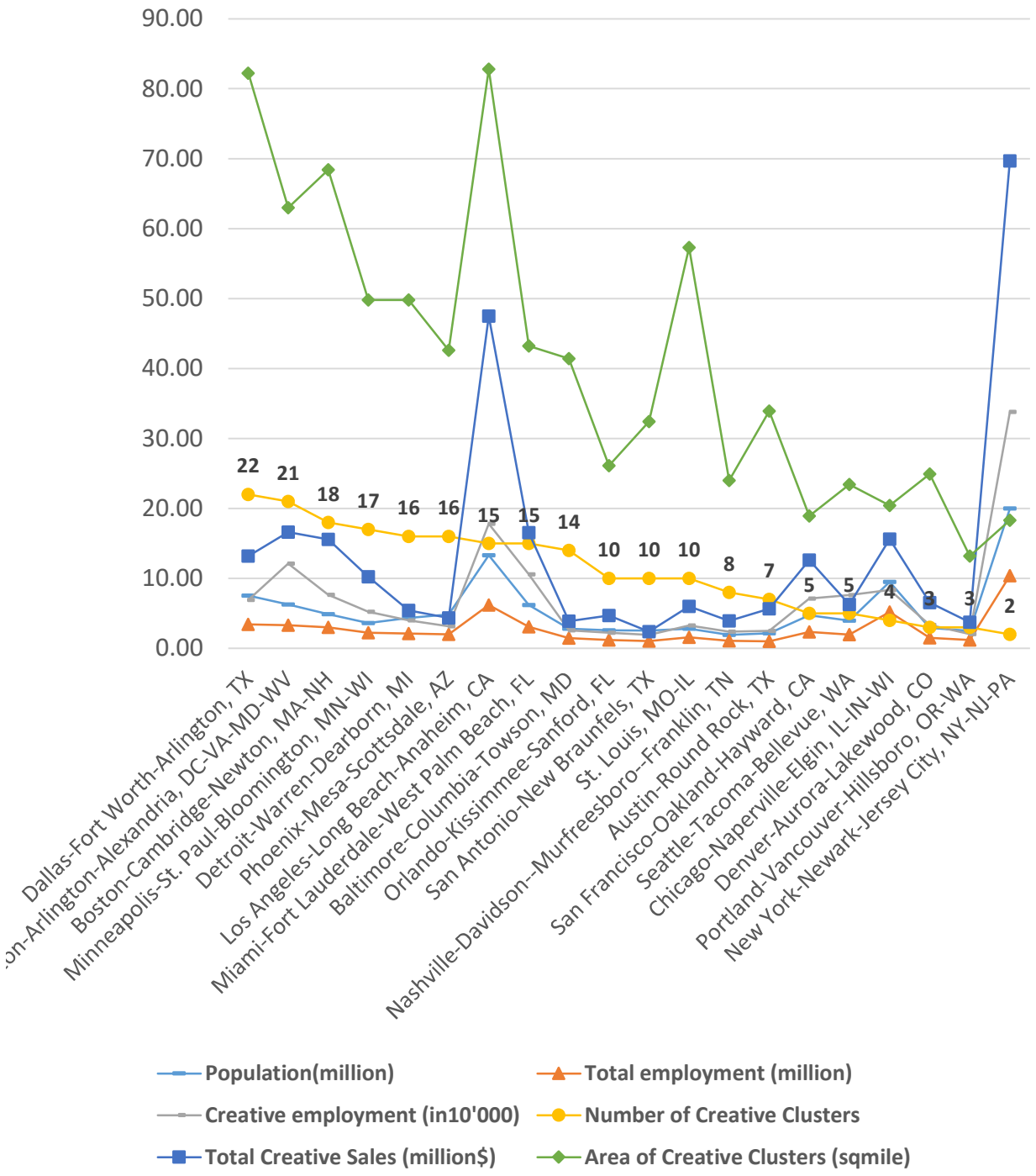


Figure 10- The comparison of the number of specialized creative clusters in the MSAs

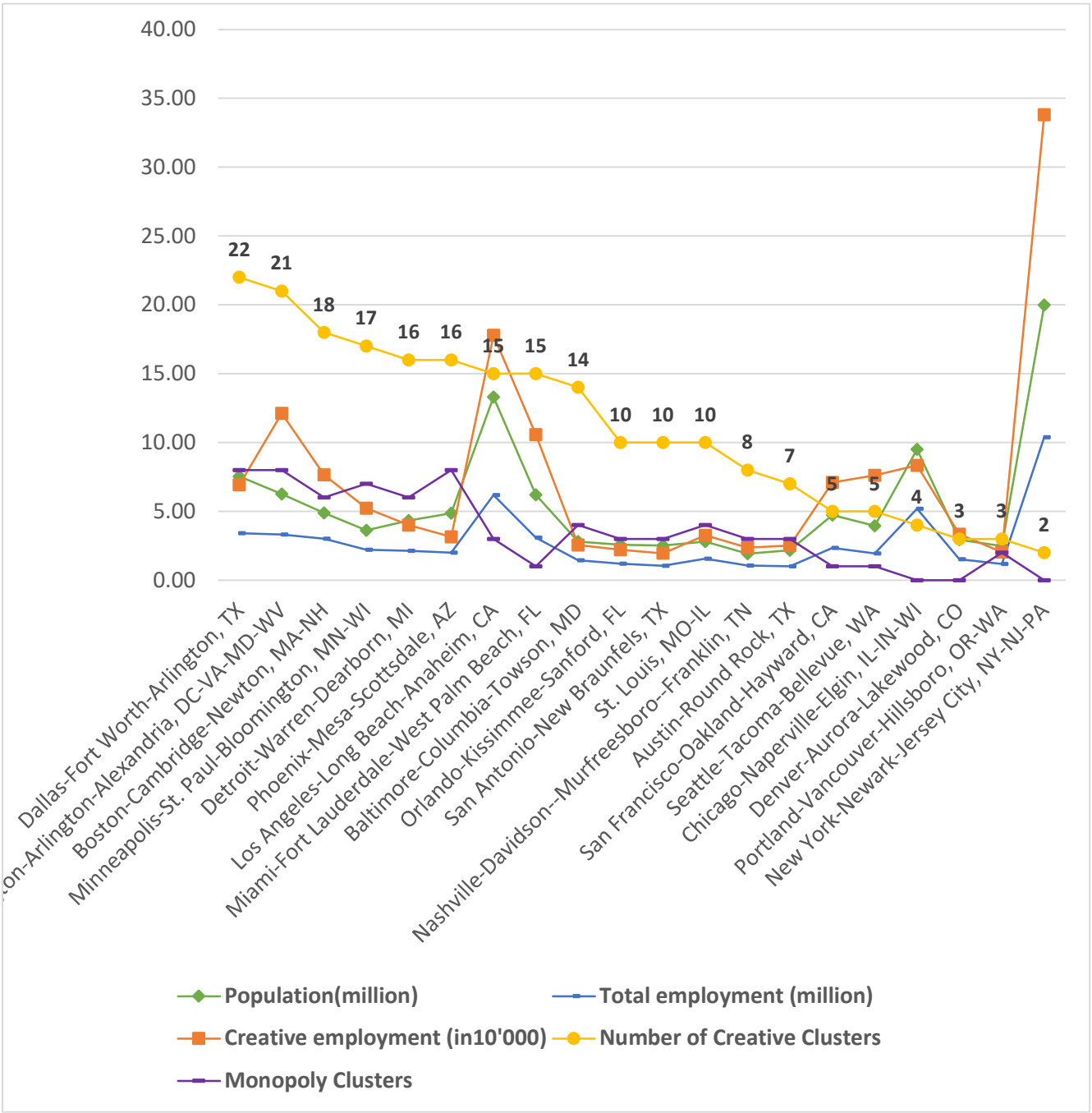


Figure 11- The specialization of monopoly clusters in the 20 MSAs (in percent)

Figure 12- The comparison of monopoly and competitive clusters in the MSAs (in percent)

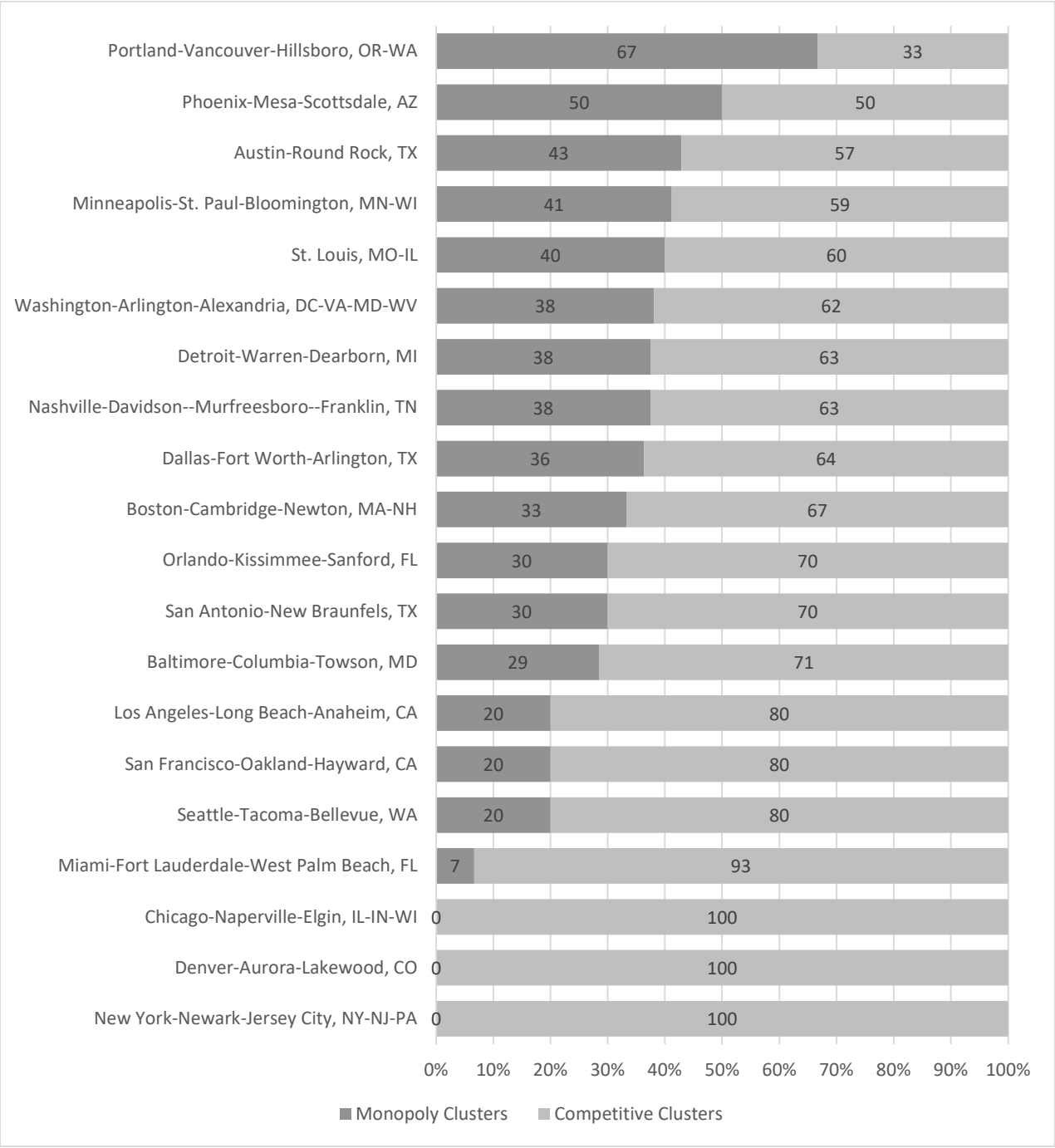


Table 15- The number of creative firms inside and outside of clusters in each MSA

Location in the MSA	Outside Clusters		In Clusters		Total Creative Firms
	Frequency	Percent	Frequency	Percent	
Los Angeles	27428	69.8	11868	30.2	39296
Boston	10262	74.4	3531	25.6	13795
St Luis	4153	70.0	1779	30.0	5932
DFW	9949	72.2	3823	27.8	13772
Minneapolis	6859	76.2	2137	23.8	8996
Washington DC	10582	73.6	3787	26.4	14369
Austin	3280	67.9	1551	32.1	4831
New York	37660	69.1	16876	30.9	54536
Seattle	8724	75.5	2837	24.5	11561
Chicago	18435	80.9	4360	19.1	22795
Denver	5557	74.7	1878	25.3	7435
Miami	12882	78.7	3485	21.3	16367
Phoenix	6583	78.2	1832	21.8	8415
Orlando	3909	79.7	997	20.3	4906
Detroit	6503	80.5	1578	19.5	8081
Baltimore	4190	73.2	1534	26.8	5724
San Antonio	2712	72.8	1014	27.2	3726
San Francisco	10975	70.6	4560	29.4	15535
Nashville	3509	70.6	1461	29.4	4970
Portland	4724	75.8	1505	24.2	6229

Table 16- The number of creative firms inside and outside of clusters based on categories

Categories of Creative Firms	Outside Clusters		In Clusters		Total Firms
	Frequency	Percent	Frequency	Percent	
Crafts and Jewelry	4656	62.42	2803	37.58	7459
Design and Publishing	65450	73.47	23636	26.53	89086
Education	14131	82.94	2906	17.06	17037
Film, Radio, TV	34549	71.82	13559	28.18	48108
Gaming and Software Publishing	28614	72.93	10623	27.07	39237
Museums and Collections	9481	80.52	2294	19.48	11775
Performing Arts	22546	115.92	8728	44.88	19449
Visual Arts	19449	71.26	7844	28.74	27293
Total	198876	73.31	72393	26.69	271269

Conclusion

This chapter is a step forward in our knowledge of the geography and typology of creative clusters. As stated before, there are only a few studies that try to map the creative clusters in the US, in limited case studies and at much larger scales (Graif 2018; Currid and Williams 2010a). This dissertation identifies the creative clusters and their type, using a disaggregated dataset in 20 of the U.S. large MSAs.

The findings demonstrate that, in most cases, creative clusters tend to locate in the inner part of the larger (most populated) cities in these metropolitan areas. These clusters also follow the general location pattern of other businesses in these metro areas. The Herfindal-Hirschman Index analysis exhibits that most of the creative clusters embrace clusters of more than one category, while about 30% of the clusters show levels of monopoly in them. For example, clusters of film, television, and cinema tend to locate close to clusters of performing arts, while gaming and software programming clusters have a slightly different pattern. This approach creates a systematic methodology that enables a comparative analysis across the country by ranking the creative clusters in terms of their size and regional competency. Another further research can include some more in-depth analysis of these clusters in terms of their history and the impacts of local regulations on their creation and changes.

Investigating the location quotient of the clusters also provides some insight into these clusters and the specialized sectors in the different clusters. While the LQ for film, radio, and tv tend to appear as regionally competitive in most of the clusters, regardless of its competition status, gaming and software- oriented firms tend to be located within monopoly clusters, further from the other sectors in the metro areas. These demonstrate the fact that creative firms are not

necessarily in contact with each other and are not economically linked to each other. While most downtown-located clusters are competitive and include more than three or four sectors of LQ > 2.5 (or regionally advantaged), the monopoly clusters tend to have gaming and software firms as the primary or the only industry that clusters and offers growth opportunities. The proponents of creative firm clustering suggest that the clustering of these firms generates dynamic efficiency, which is the flexibility to mix and match different skills, along with the incentives and autonomy to develop innovative ideas and techniques and to maximize sales (Leadbeater and Oakley 1999; Turok 2003).

Several policy implications for local communities could be derived from this study. Planners and policymakers can benefit from the findings of this study as it will offer a quantified measurement of where the creative clusters located in the country. In my visits to the City of Dallas, the chief planner of the city, Luis Tamayo, expressed their immense interest in having the results of my research. From what I learned, when discussing the concept of creative clusters, the city is also asking this question and does not have the tools to find them. These clusters offer the potential magnets of development while also identify the location of the growing creative economy within cities and regions around the nation. Instead of anticatalysts epitomizing inequality and gentrification, a thorough understanding of where the creative clusters locate, and how they interact with other clusters and the built environment, enables policymakers to utilize the benefits of these clusters as effective catalysts for urban and rural revitalization.

Research on immigrant, ethnic, and racial arts organizations, venues, programming, artists, and participation, whether urban or rural, is hampered by a lack of appropriate and representative data. The available surveys and datasets have various limitations that affect the data in terms of

what they represent. For example, the Cultural Data Project (CDP) (SMU DataArts n.d.) surveys nonprofit arts organizations. Still, it poorly covers smaller organizations, particularly those specializing in ethnic, folk, and multi-disciplinary arts and culture. Large, mainstream arts organizations are more likely to respond to such surveys because funders require it to grant applicants; therefore, these datasets are not random samples. The use of these data can spread misconceptions that belittle small and diverse organizations (Markusen 2014). To address such issues, researchers can benchmark these datasets against the National Center for Charitable Statistics (IRS) data, for instance, to correct for this distortion (Markusen et al. 2011).

Another challenge regarding the data is the occupation and the "job" of the artists. There are no datasets for this aspect of the creative industries since many artists and individuals in this industry do not occupy particular jobs to account. This shortcoming is one of the most critical aspects of data-driven research about the creative industries. While cross-sectional analysis is studied to bring inconsistent results (Grodach and Seman 2013), due to a lack of locational attributes in the census data, longitudinal analysis at large scales is very difficult, if not impossible. I chose to investigate businesses, which can be considered to be a more stable representative of the industries in research.

Having said all that, I must acknowledge the fact that the dataset that I am using for my dissertation (Esri Business Analyst) does not include proprietorship, occupation, wages, and longitudinal information for artists, bringing in a considerable limitation to this study. However, I can discuss that it is one of the best address-level datasets for firms available in the United States and accounts for the location of businesses with relatively high accuracy. Therefore, the

language in my dissertation focuses more on the clusters of creative "industries" and not artists or the creative class.

There are some other limitations to this part of my studies. First, the role of proprietorship cannot be adequately reflected in this research, and hence including data on proprietorship could yield more precise results concerning creative clusters and their economic activities in communities. To my knowledge, a dataset at the national level on proprietorship is not available. Second, as discussed in the literature review, creative industries also located in rural areas in distinct patterns, different from what happens in the urban and suburban areas. Separate research can be conducted to study the location pattern of creative clusters in rural and extra-metropolitan areas. Finally, being the only available source of business-level information at the national level, the Esri Business Analyst Dataset does not capture wages and earning, nor does it consider some of the artistic or creative activities (such as self-employment or home-based employment) at the community level. It is a frequent but considerable data limitation when using establishment-level datasets, especially at the national level.

Chapter Four- The Role of Specialized Creative Clusters in Firm Productivity

Introduction

With all the competitive advantages of the inner city for industry clustering (Porter 1998), Hutton (2006) argues that this advantage is especially present for "New Economy" industries dependent on "the salient features of the innovative milieu of the 21st-century inner city" (p. 1822). While these industries tend to cluster together, the patterns can be different. For instance, investigating some new media industries, Hesmondhalgh and Pratt (2005) note the importance of the aesthetic qualities of these industries' products, as well as "the unclear and malleable nature of the skills required, and the project-based nature of the work" (p. 9). These industries, in general, tend to be more centralized than average (Currid 2007). Kneebone, who revisited Glaeser and Kahn's work on job sprawl, showed higher rates of centralization for creative industries (Kneebone 2010). She found that information; professional, scientific, and technical services; and health care and social assistance jobs locate in central cities, and educational services are distributed equally throughout the metropolitan area, although other industries are more likely to locate in the suburbs. Regarding the creative clusters, this pattern can be the result of the need for proximity for some sectors to facilitate better information flows necessary to these industries.

The literature discusses that there can be vast differences between where creative workers live and work. For instance, according to Markusen et al. (2006), visual artists and writers are more apt to live outside of major metro areas and more likely to live in the suburbs than musicians and performing artists. Moreover, musicians are more ubiquitously distributed than any other group of artists, in part due to high employment rates (33%) in religious organizations (Markusen et al. 2006). For this, GIS mapping techniques can help to enable visual displays of

complex data sets like these that enhance the presentation of research findings (Markusen 2014), which is part of the objectives for this dissertation.

Revisiting the contemporary literature as offered in the previous chapters, there are 'hard' factors for the location decision of firms in general. These hard factors include the availability of a skilled labor force, an accommodative institutional context, attractive economic contexts such as tax regimes, good transportation, and communications infrastructure that enables market accessibility, as well as affordable housing, office, and retail space (see chapter two for more details). In tandem with these factors, Musterd and Murie (2010, 20) point to more concrete factors such as 'nearness to global financial centers, the presence of an international airport, telecommunication services and other service suppliers and clients, as well as the availability of an international labor pool.'

Finally, Scott (Scott 2004) uses the Los Angeles example to explain that positive spillover effects frequently diffuse across the entire urban area from their more narrowly confined district of origin. Hence, design projects or fashion innovations that cluster in specific spaces are often imitated in others. A particular district or area in the city may embrace specific kinds of worker-skills that are then found to have critical applications in other parts of that same city. Similarly, the "reputation effects that relate to a particular industry (e.g., motion pictures) in a specific place are sometimes appropriate-able by other industries (such as fashion clothing) in adjacent locations" (p. 472).

It is worth noting at this point that in most of the case studies mentioned above, the subject of research has been limited to: either the creative cluster as a whole; one or few industries in particular; or the number/clusters of artists or creative workers, and not the relationships within

the different creative clusters of various types. In other words, in none of these studies, the clustering patterns of particular industries and how they relate to other clusters have not been addressed, especially in the United States. While some of the criticism about the creative industries revolve around the fact that artists and the different creative sectors differ from each other in many ways (e.g., Markusen 2006; Makagon 2010; Bain and McLean 2013), not much evidence exists to demonstrate the different clustering patterns for diverse creative sectors and the firm productivity within each of these clusters. My research, therefore, will address this gap by offering a detailed analysis of the clustering patterns of specific industries and their relationships with firm productivity within the urbanized areas of the selected cities.

Creativity has long been considered as the driver of economic development. Schumpeter's (1942) 'creative destruction' and Jacobs's (1961; 1969) investigations about New York's urban life introduce creativity as the fundamental explanation for a prosperous economy. Garcia (2004) recognizes three sets of norms and goals in the literature when creative industries are considered: economic growth, neighborhood and regional regeneration, and cultural impacts. The proponents of the strong economic impact of creative industries on local communities claim that cultural and creative allure of cities and neighborhoods will bring economic development, regenerate communities and bring strong cultural identity into urban and rural areas. Florida (2002), drawing upon Glaeser's (1998) human capital mobility, suggested cities must attract and retain the creative class to boost their economic growth. Lloyd (2002) and Lloyd and Clark (2001), similarly ascertain that cultural investments, as well as bohemians and artists, bring neighborhood revitalization to communities. Utilizing creative industries as catalysts in communities requires substantial investments to produce remarkable cultural events and

infrastructures. However, the desired change has happened at a far slower and less consistent pace than it is expected (García 2004; Mathews 2014). In other words, the balance between long-term cultural initiatives and social and spatial benefits has not been achieved.

On the other hand, critics question this causal relationship (Markusen 2006; Glaeser 2005). Scott (2010), for example, argues that creativity 'can not be simply imported into cities' (p. 202), while Pratt (2011) calls the creative class theory 'hard branding with a soft edge' (p. 125). Others claim that the appeal of creative clusters encourages cities to develop consumption spaces, rather than civilize economic development by 'bringing in culture' (Peck 2005, 763). In fact, this relationship is dialectical (Kong 2000) because while creative industries contribute to economic activities in a specific area, economic activity is also part of the culture-generating and creative processes. Other critics relate artists and creative industries to gentrification and displacement since them moving to neighborhoods and upgrading of decayed and aging industrial or residential buildings changes the look and feel of the area. That often attracts higher income groups and displaces existing residents, businesses, and the artists themselves (Zukin and Braslow 2011; Pratt 2010; Ley 2003; Lloyd 2010; Deutsche and Ryan 1984).

One of the related economic aspects of a creative-friendly environment is its matter of affordability. Artists, as a critical group among creative workers, are discussed to make less money than most skilled workers, and therefore, affordable communities matter to them most (Markusen and Schrock 2006). The availability of affordable housing, as well as business and office spaces, can attract creative individuals and firms to an environment (Ley 2003; Ponzini and Rossi 2010; G. Drake 2003; Andres and Round 2015) and therefore, creative neighborhoods recognize affordability as a priority. For instance, in their cultural master plan, the city of Austin

acknowledges that a dearth of affordable housing and performing spaces limits the development of arts opportunities and discourages creative talent from living and working in the city (City of Austin 2009). Markusen (2014) suggests that artists favor medium-size metros and smaller towns due to affordability and the availability of cheaper and more expansive workspaces. This part of the dissertation examines whether creative clusters contribute to economic development (in the form of firm productivity) of their local communities to test the theories mentioned above.

This final chapter will investigate whether and to what extent specialized creative clusters contribute to the firm productivity in their local community. The relationship and effects of creative clusters on firm productivity and local and regional economic development is a relatively understudied and assumed part of the creative economy, which has consequently caused debates, as discussed in the literature review section of this proposal. This part of the dissertation will be an attempt at addressing these debates about the role of different types of creative clusters on firm productivity and gentrification.

Data and Methodology

Different creative and cultural clusters tend to have different behaviors in terms of where they locate and how they may affect their adjacent environment through agglomeration economy and knowledge spillover. As explained in chapter three, each category within the creative economy has a specific relationship with the built environment, local economy, and the labor force. However, to the author of this dissertation's knowledge, there is not much research that investigates these relationships, especially with regards to specific types of clusters. Despite the efforts by planners and policymakers in attracting the cultural firms and creative class to their community, there is still a growing debate on whether the creative industries serve as catalysts or anticatalysts for the communities. My research will be the first comprehensive study at the national level to investigate the different creative firms and clusters and their relationship with firm productivity. By using address-level firm data, this chapter provides a much clearer understanding of these clusters for planners and creative policymakers.

Productivity can be explained to be "efficiency in production: how much output is obtained from a given set of inputs. As such, it is typically expressed as an output-input ratio." (Syverson 2011, 329) Labor productivity is the most common measure of this type, although sometimes capital or materials productivity measures are also used. In this research, I use firms' annual sales volumes (and sales volume per employee in one linear regression test) as the proxy for firm productivity.

I investigate the relationship between the different creative clusters and firm productivity, using three statistical methods: propensity score matching (PSM), logistic regression (logit), and linear regression. While logit and linear regression are the most common tools for estimating the

relationship between variables, PSM is widely used to create paired matches of firms located within specific areas to overcome issues resulting from the nonrandom assignment of individuals to treatment groups (i.e., being situated in the cluster in this study) in the evaluation of social programs (Oakes and Johnson 2006).

Linear Regression

To do the linear regression, I used firms' annual sales volumes as a proxy for firm productivity, from the Esri Business Data Analyst data for individual firms. Looking at 20 metropolitan areas within the US, the dataset includes 271'269 firms. Of these firms, 26.69% or 72'393 of them are located within the 221 identified creative clusters, as seen in Table 17.

Table 17- The frequency of the number of firms within and outside of creative clusters

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InCluster	Freq.	Percent	Cum.
0	198,876	73.31	73.31
1	72,393	26.69	100.00
Total	271,269	100.00	

Table 18 provides more details about the number and percentage of creative firms within and outside of the identified clusters. Among all the MSAs, Austin, New York, and Los Angeles metropolitan areas have the highest percentage of their creative firms located within these

clusters with 32.11, 30.94, and 30.20 percent, respectively. Chicago and Detroit metro areas, on the other hand, have the least percentage of their creative firms inside these clusters with 19.13 and 19.53 percent. These small percentages of firms inside clusters demonstrate a more disperse pattern of creative firms, which may be due to a lack of creative friendliness in the neighborhoods of these two MSAs, even though the number of creative firms in the Chicago and Detroit metro areas is not the smallest among the 20 case studies of this dissertation.

Table 18- The frequency of the number of firms within and outside of creative clusters in the MSAs

MSA	Cluster Status	Frequency	Percentage
Austin-Round Rock-Georgetown	outside cluster	3280	67.89
	Inside cluster	1551	32.11
Baltimore-Columbia-Towson	outside cluster	4190	73.20
	Inside cluster	1534	26.80
Boston-Cambridge-Newton	outside cluster	10262	74.40
	Inside cluster	3531	25.60
Chicago-Naperville-Elgin	outside cluster	18435	80.87
	Inside cluster	4360	19.13
Dallas-Fort Worth-Arlington	outside cluster	9949	72.24
	Inside cluster	3823	27.76
Denver-Aurora-Lakewood	outside cluster	5557	74.74
	Inside cluster	1878	25.26
Detroit-Warren-Dearborn	outside cluster	6503	80.47
	Inside cluster	1578	19.53
Los Angeles-Long Beach-Anaheim	outside cluster	27428	69.80
	Inside cluster	11868	30.20
Miami-Fort Lauderdale-Pompano Beach	outside cluster	12882	78.71
	Inside cluster	3485	21.29
Minneapolis-St. Paul-Bloomington	outside cluster	6859	76.24
	Inside cluster	2137	23.76
Nashville-Davidson–Murfreesboro–Franklin	outside cluster	3509	70.60
	Inside cluster	1461	29.40
New York-Newark-Jersey City	outside cluster	37660	69.06
	Inside cluster	16876	30.94
Orlando-Kissimmee-Sanford	outside cluster	3909	79.68
	Inside cluster	997	20.32
Phoenix-Mesa-Chandler	outside cluster	6583	78.23
	Inside cluster	1832	21.77
Portland-Vancouver-Hillsboro	outside cluster	4724	75.84
	Inside cluster	1505	24.16
San Antonio-New Braunfels	outside cluster	2712	72.79
	Inside cluster	1014	27.21
San Francisco-Oakland-Berkeley	outside cluster	10975	70.65
	Inside cluster	4560	29.35
Seattle-Tacoma-Bellevue	outside cluster	8724	75.46
	Inside cluster	2837	24.54
St. Louis	outside cluster	4153	70.01
	Inside cluster	1779	29.99
Washington-Arlington-Alexandria	outside cluster	10582	73.64
	Inside cluster	3787	26.36

Using STATA 15.0 software package for all the analysis section in this chapter, the variables that control for the annual sales volume of firms include the ones in table 19 below. First, is the firm's sectoral category, which represents which part of the creative economy each firm belongs. Table 25 demonstrates how different these categories are in terms of average sales volumes. In addition to the firms' sectoral types, I included four variables related to firms' characteristics as independent variables—firms' number of employees, square footage of buildings, job accessibility via transit, and proximity to a city's downtown area. These variables are supported by the literature to have a strong correlation with firms' sales volumes. The production function theory explains that labor and capital are the two factors of production with the most significant impact on the quantity of output (i.e., the sales volume here) (Aigner and Chu 1968). The notion of capital structure illuminates what kind of funding a company uses to finance its overall activities and growth measured by employment size and assets (building's square footage and employment size) (Fischer, Heinkel, and Zechner 1989). And lastly, economies of scale—indicating the parameters through which the scale of production increases in the long run through its accessibility to shared labor pools, customer markets, specialized suppliers, and knowledge as a result of intra-industry firm proximities (Marshall 1890) explains the other two variables, i.e., access to transit and proximity to city centers. Table 19 below includes information for the indicators mentioned above.

In general, firms are expected to be more productive when they locate in denser areas in large cities (Combes et al. 2012). Two critical explanations for the higher firm productivity in larger urban areas are 1) self-selection (tougher competition in larger cities, where only the most productive firms survive), and 2) agglomeration economies (promoting social and economic

interactions that culminate in productivity), both of which reinforced by local natural advantages. I am investigating 20 large MSAs within the US, and the differences in the urban and local experiences can affect firm productivity. However, in a study of firms' productivity in France, Combes and his colleagues (2012), they find that self-selection does not explain any of the productivity differences. Another study (Holl 2016) in Spain shows that because highways attract economic activity, which can lead to local density increases, it can, in turn, affect productivity through agglomeration benefits. She also shows that highways increase firm-level productivity directly and beyond the effect of density, similar to the other research in France. Therefore, one of the missing variables in my model here can be the distance to highways.

In different fields, contributors to firm productivity differ. For example, in industrial organization, productivity is linked to several features of technology, demand, and market structure, such as the effect of competition, the size of sunk costs, and the interaction of product market rivalry and technology spillovers (Syverson 2011). Labor economists, however, relate workers' human capital to productivity differences, the productivity effects of incentive pay, managerial talent and practices, organizational form, and social connections among coworkers (Syverson 2011). I must acknowledge here that as the R-squared in my regressions delineate, I may miss valuable variables that impact firm productivity that need to be included for more accurate results.

The critical variables for all the three models are the sales volume (SALESVOL) and the dummy variable indicating whether a firm is located in a cluster (InCluster). I control for some other variables that are discussed above, to affect firm productivity (or sales volume) in this report. They include a firm's number of employees (EMPNUM), a firm building's square

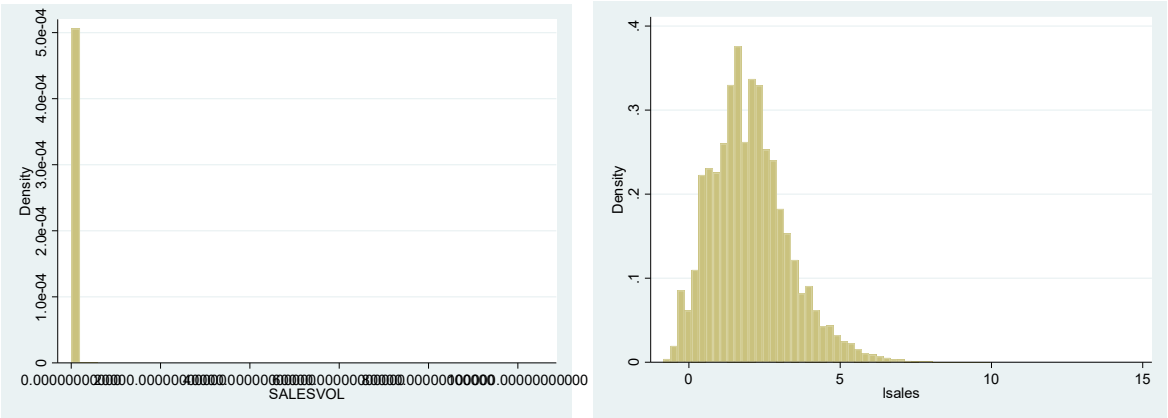
footage, the status of a firm, its sectoral category, as well as job accessibility through both car and transit. According to Chatman and Noland (2014), transit services may cause agglomeration, and agglomeration may increase the productivity of firms and workers.

Table 19- Dependent, independent, and control variables used for the analysis

Variable	Variable Description	Data Source
Dependent Variable		
Firm Sales Volume	estimated sales or assets in a hundred thousand dollars	ESRI Business Analyst (2016)
Independent Variables		
Employment Number	number of employees at each firm (This variable is used in Logit and PSM only)	ESRI Business Analyst (2016)
Firm building's Square Footage	categorical square footage estimation of firms' buildings 1=0-1,499; 2=1,500-2,499; 3=2,500-4,999; 4=5,000-9,999; 0=N/A or 0 (This variable is used in Logit and PSM only)	ESRI Business Analyst (2016)
Sectoral Categories	firm sectoral category based on the 6-digit NAICS codes divided into eight categories as seen in Table 22- 8 dummy variables	ESRI Business Analyst (2016)
Job Accessibility by Transit	a measure of access to jobs within 45-minute transit commute, distance decay weighted	Smart Location Database (2010)
Car Accessibility to Similar Firms	a measure of access to jobs within 45-minute car access, distance decay weighted	Smart Location Database (2010)
Distance to the nearest CBD	calculated using GIS Pro (National Atlas of the United States 2014)	National Atlas of the United States (2014)
Regional Codes	7 dummies for regional locations in the US- see Table 20	
Location within or outside the cluster	calculated in this research- Dummy	

Controlling for all other variables, the three methods below examine the relationship between the sales volume and the location of creative firms inside and outside of creative clusters. Examining the multicollinearity and normality as two of the preconditions for linear regression before running the test, I decided to log-transform the dependent variable (see Figure 13).

Figure 13- The histogram of the sales volume variable and its log-transformation in the case study



I also log-transformed all other variables except the InCluster, since it is a dummy (0 or 1) variable. This log-transformation makes the coefficients into elasticities. I ran the model to test the relationship between firm productivity (sales volume) and the location of firms in the creative clusters, controlling for firms' access to jobs by 45 minutes transit, distance to CBDs, their regional codes, and the category of creative firms (see Table 21). The dummy variables for the two latter variables are explained in Table 20 below.

Table 20- Descriptive statistics for the dummy variables in the linear regression model

Regional Codes		Frequency	Percent
1	North West	17'790	6.56
2	West	54'831	20.21
3	South West	38'179	14.07
4	Mid-West	45'804	16.89
5	Mid Atlantic	74'629	27.51
6	South East	26'243	9.67
7	North East	13'793	5.08
Total		271'269	100.00

The analysis suggests that, after controlling for all other variables in the model, creative firms within the clusters are associated with 0.33 percent change higher annual sales volumes than the

reference group (non-cluster creative firms). The model in Table 21 has an adjusted R-squared of 0.235, which means that it accounts for 23.5 percent of the variation in the dataset. The multicollinearity in the model has also been checked, with below 4 for all the variables in the model. All the variables are significant at the 0.001 level. Finally, in the model demonstrated in table 21, for each %10 increase in the number of jobs available within 45 minutes of transit, a firm's sales volume increases by almost 0.7 percent. Interestingly, the distance to the city centers has a negative relationship in this model, demonstrating that firms closer to the downtown areas have 0.01% higher sales volumes.

I have also controlled for regional location, as well as firms' creative sectors. The model uses the performing arts sector as the base (or referent), and the other seven sectors are being compared to these firms in the model. Interestingly, except for educational services, museums and collections, and visual arts, other firms have higher sales volumes than the performing arts firms. When compared to the NorthWest region (Portland and Seattle as the referents), firms in all the regions have higher sales volumes, since their coefficients in this model are positive and significant.

Table 21- Linear regression results for firms' annual sales volume

```
. reg lsales InCluster lNear lJob45 i.Region_Cod NCraft NVisual NDesign NFilm NGaming NE
> duc NMuseum
```

Source	SS	df	MS		
Model	60698.5436	16	3793.65898	Number of obs	= 153,962
Residual	197162.455	153,945	1.28073308	F(16, 153945)	= 2962.10
Total	257860.998	153,961	1.67484622	Prob > F	= 0.0000
				R-squared	= 0.2354
				Adj R-squared	= 0.2353
				Root MSE	= 1.1317

lsales	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
InCluster	.325955	.0074574	43.71	0.000	.3113387	.3405713
lNear	-.0106507	.0031748	-3.35	0.001	-.0168733	-.0044282
lJob45	.0657175	.0024778	26.52	0.000	.0608611	.0705739
Region_Cod						
West	.2164374	.0119569	18.10	0.000	.1930021	.2398727
South West	.2922318	.0143924	20.30	0.000	.2640229	.3204407
Mid-West	.3007949	.012923	23.28	0.000	.2754661	.3261237
Mid-Atlantic	.381835	.0119461	31.96	0.000	.3584208	.4052492
South East	.2107946	.0155239	13.58	0.000	.1803682	.2412211
North East	.3370197	.0171188	19.69	0.000	.3034672	.3705721
NCraft	1.318862	.0172777	76.33	0.000	1.284998	1.352726
NVisual	-.5446951	.0115107	-47.32	0.000	-.5672559	-.5221342
NDesign	.4871386	.0091426	53.28	0.000	.4692193	.5050578
NFilm	1.132884	.0107247	105.63	0.000	1.111864	1.153904
NGaming	.977666	.0107474	90.97	0.000	.9566015	.9987306
NEduc	-.6631805	.021004	-31.57	0.000	-.7043479	-.6220131
NMuseum	-.7143104	.0643639	-11.10	0.000	-.8404624	-.5881584
_cons	.6746068	.0321868	20.96	0.000	.6115214	.7376922

However, looking at the plot of residuals, I identified a pattern, demonstrating the fact that there must be some important variables missing in the model. Therefore, I re-ran the test with four dummy variables of the square-footage of firms' buildings, as shown in Table 22. Table 22 has an r-squared of %52, only by adding one variables of the number of employees per average square footage for each category. While there are no multicollinearity issues here, the plot of residuals still suggests that very important variables are missing in the model. Nonetheless, after controlling for all other variables in the model, creative firms within the clusters are associated with 0.34 percentage change higher annual sales volumes than the firms outside these clusters.

All the variables here are significant at the 0.001-level. The new variable added in this model demonstrates that for each 10 percent increase in the number of employees per square footage, the annual sales volume increases by almost 10 percent.

Table 22- Improved linear regression results for firms' annual sales volume

```
. reg lsales InCluster lNear lJob45 lEmpSqft i.Region_Cod NCraft NVisual NDesign
>  NFilm NGaming NEduc NMuseum
```

Source	SS	df	MS	Number of obs	=	153,717
				F(17, 153699)	=	9813.30
Model	134087.834	17	7887.51964	Prob > F	=	0.0000
Residual	123536.864	153,699	.803758412	R-squared	=	0.5205
				Adj R-squared	=	0.5204
Total	257624.698	153,716	1.67597841	Root MSE	=	.89653

lsales	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
InCluster	.3363396	.0059118	56.89	0.000	.3247527	.3479266
lNear	-.0079502	.0025172	-3.16	0.002	-.0128838	-.0030166
lJob45	.0905855	.0019665	46.06	0.000	.0867312	.0944398
lEmpSqft	.9582636	.003169	302.38	0.000	.9520524	.9644749
Region_Cod						
West	.1537134	.0094823	16.21	0.000	.1351282	.1722986
South West	.3780842	.0114171	33.12	0.000	.355707	.4004614
Mid-West	.1954301	.0102536	19.06	0.000	.1753333	.2155269
Mid-Atlantic	.4835952	.0094786	51.02	0.000	.4650173	.5021731
South East	.3077823	.0123119	25.00	0.000	.2836512	.3319134
North East	.4371975	.0135746	32.21	0.000	.4105915	.4638035
NCraft	1.724819	.0137655	125.30	0.000	1.697838	1.751799
NVisual	-.2118869	.0091929	-23.05	0.000	-.2299048	-.1938691
NDesign	.4767761	.0072471	65.79	0.000	.4625721	.4909802
NFilm	1.077672	.0085039	126.73	0.000	1.061005	1.094339
NGaming	1.012385	.0085212	118.81	0.000	.9956839	1.029087
NEduc	-.5251737	.016649	-31.54	0.000	-.5578054	-.492542
NMuseum	-.8601779	.0511523	-16.82	0.000	-.9604355	-.7599204
_cons	6.219136	.0314285	197.88	0.000	6.157537	6.280735

As another proxy for firm productivity, I also created a dependent variable of firm annual sales volume per employee and log-transformed it similar to the model above to achieve normality in the variable. Running the same model with the new dependent variable provided a slightly higher r-squared (29.89 percent) (see Table 23). There are no VIF scores more than 4 in

this model, meaning there is no multicollinearity issue. Here, the firms inside clusters have 0.06 percentage change higher sales volume per employee as compared to those outside of the clusters.

Table 23- Linear regression results for firms' annual sales volume per employee

```
. reg lSaleEmp InCluster lNear lJob45 i.Region_Cod NCraft NVisual NDesign NFilm NGami
> ng NEduc NMuseum, robust

Linear regression                               Number of obs     =    153,962
                                                F(16, 153945)     =    8012.97
                                                Prob > F          =     0.0000
                                                R-squared         =     0.2989
                                                Root MSE          =     .53268
```

lSaleEmp	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
InCluster	.0622236	.0034722	17.92	0.000	.0554181	.0690291
lNear	.0001178	.0014859	0.08	0.937	-.0027945	.0030301
lJob45	.029964	.0011633	25.76	0.000	.0276839	.0322441
Region_Cod						
West	.1509013	.0055606	27.14	0.000	.1400027	.1618
South West	.1014297	.0066005	15.37	0.000	.0884928	.1143665
Mid-West	.0480284	.0058657	8.19	0.000	.0365317	.0595252
Mid-Atlantic	.1433258	.0054667	26.22	0.000	.1326112	.1540404
South East	.0569076	.0074736	7.61	0.000	.0422595	.0715557
North East	.1291882	.0075167	17.19	0.000	.1144557	.1439208
NCraft	1.398086	.0205631	67.99	0.000	1.357783	1.438389
NVisual	-.125598	.0057199	-21.96	0.000	-.136809	-.1143871
NDesign	.2104676	.003366	62.53	0.000	.2038703	.2170649
NFilm	.4739015	.0047598	99.56	0.000	.4645723	.4832306
NGaming	.3056613	.0031383	97.40	0.000	.2995102	.3118123
NEduc	-.8415564	.0046122	-182.46	0.000	-.8505963	-.8325165
NMuseum	-.9626124	.011756	-81.88	0.000	-.9856539	-.939571
_cons	.0707229	.015102	4.68	0.000	.0411233	.1003225

Logistic Regression

Logistic regression or logit can be used when the dependent variable is a dichotomy akin to the dummy (0 or 1) variable. In the logit regression model, I used a dummy variable (InCluster) that represents the location of each of the 271'269 creative firms in the 20 metropolitan areas,

representing their location inside and outside of the clusters. Here, I control for the firms' distance to the nearest CBD, job availability by car and by transit, the size of the firm (in terms of sq of buildings), and the eight categories of creative industries. I used four dummy variables for the five interval data of square footage (with N/A or 0 as the referent). I also used seven dummy variables for the eight creative industries with Crafts and Jewelry as the referent. The Pseudo R-square for the model is %25.98, and all the variables are statistically significant at the 0.001 level. Table 22 shows some explanation of the two variables that were controlled for in the logit model. The square-footage codes (sqcodes) include five categories as are available in the Esri Business Analyst database, categorizing the size of firms' buildings. Table 24 shows that more than 65 percent of the firms are within the two first categories (i.e., below 2499 sqft). The category codes (categcodes) also represent the specialization of firms in the database for the eight critical types of creative industries. Appendix 2 of this dissertation includes the NAICS code for these firms.

Table 24- Descriptive statistics for the dummy variables in the Logit model

Building's SqFt Codes		Frequency	Percent
1	1 – 1,499 sqft	95'165	35.08
2	1,500 – 2,499 sqft	82'821	30.53
3	2,500 – 4,999 sqft	45'017	16.59
4	5,000 – 9,999 sqft	35'617	13.13
5	N/A or 0	12'649	4.66
Total		271'269	100.00
Category Codes		Frequency	Percent
1	Crafts and Jewelry	7'459	2.75
2	Design and Publishing	89'086	32.84
3	Educational	17'037	6.28
4	Film, Radio, and TV	48'108	17.73
5	Gaming and Software	39'237	14.46
6	Museum and Collections	11'775	4.34
7	Performing Arts	31'274	11.53
8	Visual Arts	27'293	10.06
Total		271'269	100.00

Controlling for all other variables in the logit model, the firms that are located in the clusters show a positive and statistically significant, as shown in both Table 25 and Table 26. In terms of firm categories, the model chose the firms in crafts and jewelry as the base (referent), and as can be seen in the model, the firms in the educational category and museums and collections have less probability of being in the clusters when compared to crafts and jewelry businesses.

The firm's sales volumes in clusters are significantly (Sig. <0.001) higher than the firms outside of the cluster. This positive relationship implies that the more productive a firm is, the odds of it being located inside a creative cluster is higher:

$$\text{Exp (B) for income} = 0.0001$$

$$= e^{b} - 1$$

$$= (1.0001) - 1 = 0.0001 \times 100 = 0.01\ \%$$

This means that for firms with a hundred thousand dollars higher sales volumes, we can expect to see about a 0.01% increase in the odds of being located within the creative clusters. In other words, the odds ratio of a firm with a hundred thousand dollars higher sales volume to be located in a cluster is 1.00001 times more. Alternatively, calculating the probability, the positive relationship implies that the more productive a firm is, the more likely it is to be located inside a creative cluster:

$$P = e^{\ln(odds)} / (1 + e^{\ln(odds)})$$

$$p = e(0.0001) / (1 + e(0.0001))$$

$$p = 0.50$$

This means that firms with a hundred thousand dollars higher sales volumes have 0.5 more probability of being located within the creative clusters.

An increase of square footage of the firm's building to the first interval (1-4,999sqft) increase odds of locating inside by 79 percentage. As the building sizes increase, the odds of firms being located in the clusters increases. Similarly, a firm in design and publishing, film, gaming, museums, performing, and visual arts industries, when compared to craft and jewelry, will increase its odds of locating in the cluster increases respectively by 14.6, 45.4, 18.4, 31.6, and 39.3 percent. The odds of a firm from educational services or museums and collections being located in clusters, as compared to crafts and jewelry, decrease by 61.8 and 75.1 percent.

Table 25- Logistic regression results for firms' sales volumes differences in clusters

```
. logistic InCluster SALESVOL NEAR_DIST Job45Trans Job45Car i.SQCode i.CategCode

Logistic regression                             Number of obs     =    271,269
                                                LR chi2(15)       =   81777.55
                                                Prob > chi2       =     0.0000
Log likelihood = -116479.44                     Pseudo R2         =     0.2598
```

InCluster	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf.	Interval]
SALESVOL	1.000111	.0000292	3.80	0.000	1.000054	1.000168
NEAR_DIST	.9999134	2.01e-06	-43.04	0.000	.9999095	.9999173
Job45Trans	1.000014	1.73e-07	79.37	0.000	1.000013	1.000014
Job45Car	1.000002	3.50e-08	47.15	0.000	1.000002	1.000002
SQCode						
1 – 1,499 sqft	1.789095	.064261	16.20	0.000	1.667477	1.919583
1,500 – 2,499 sqft	2.685338	.0951203	27.89	0.000	2.50523	2.878395
2,500 – 4,999 sqft	3.655159	.1317234	35.97	0.000	3.405892	3.922668
5,000 – 9,999 sqft	4.539826	.1662297	41.32	0.000	4.225438	4.877606
CategCode						
Design and Publishing	1.146225	.0395708	3.95	0.000	1.071234	1.226467
Educational Services	.6177902	.0253277	-11.75	0.000	.5700909	.6694805
Film, Radio, and TV	1.454698	.0521513	10.45	0.000	1.355992	1.56059
Gaming and Software	1.18459	.0425529	4.72	0.000	1.104056	1.270999
Museum and Collections	.751756	.0322956	-6.64	0.000	.6910494	.8177956
Performing Arts	1.316209	.0483617	7.48	0.000	1.224755	1.414493
Visual Arts	1.393006	.0518442	8.91	0.000	1.295011	1.498416
_cons	.0562609	.0027462	-58.96	0.000	.0511279	.0619092

Note: _cons estimates baseline odds.

When it comes to the employment number, similar to sales volume, as demonstrated in Table 26, an increase of one employee in a firm will increase the odds of being inside the cluster by %0.06. In other words, an increase of 100 in the employees increases the odds of being in the cluster by %6. The pseudo-R-squared in this model is 0.26, and all the variables show a significant relationship at the 0.001-level.

Table 26- Logistic regression results for firms' employment number differences in clusters

```
. logistic InCluster EMPNUM NEAR_DIST Job45Trans Job45Car i.SQCode i.CategCode

Logistic regression                             Number of obs     =    271,269
                                                LR chi2(15)       =   81832.79
                                                Prob > chi2       =     0.0000
Log likelihood = -116451.82                     Pseudo R2         =     0.2600
```

InCluster	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf.	Interval]
EMPNUM	1.000567	.000079	7.19	0.000	1.000413	1.000722
NEAR_DIST	.9999134	2.01e-06	-43.04	0.000	.9999094	.9999173
Job45Trans	1.000014	1.73e-07	79.40	0.000	1.000013	1.000014
Job45Car	1.000002	3.50e-08	47.12	0.000	1.000002	1.000002
SQCode						
1 – 1,499 sqft	1.789085	.0642604	16.20	0.000	1.667468	1.919573
1,500 – 2,499 sqft	2.683806	.0950629	27.87	0.000	2.503807	2.876746
2,500 – 4,999 sqft	3.64852	.1314725	35.92	0.000	3.399728	3.915519
5,000 – 9,999 sqft	4.445669	.1633457	40.60	0.000	4.136774	4.777631
CategCode						
Design and Publishing	1.139235	.0392881	3.78	0.000	1.064777	1.2189
Educational Services	.6141939	.0251227	-11.92	0.000	.5668764	.6654611
Film, Radio, and TV	1.446603	.0518154	10.31	0.000	1.34853	1.551809
Gaming and Software	1.176324	.0422078	4.53	0.000	1.09644	1.262028
Museum and Collections	.742902	.0318553	-6.93	0.000	.6830184	.8080359
Performing Arts	1.305986	.0479354	7.27	0.000	1.215334	1.4034
Visual Arts	1.385771	.0515254	8.77	0.000	1.288375	1.49053
_cons	.0565899	.0027611	-58.86	0.000	.0514289	.0622688

```
Note: _cons estimates baseline odds.
Note: 0 failures and 2 successes completely determined.
```

Propensity Score Matching

Studying the various firms within different creative clusters requires the introduction of other variables into the study, using a non-random assignment of firms. In other words, the most similar firms are compared to one another regarding their geographic location towards creative clusters. Therefore, systematic differences between individual firms in the treatment group (creative clusters of different types) versus those in the control group (non-clusters) that must be

controlled for to assess the actual impact of the treatment are needed to be used at this level (Zandiatashbar et al. 2019). Firms in suburban regions might be smaller (or larger) than those in downtown areas, depending on their specialization, introducing a diverse range of relationships with the environment as well as their profitability.

PSM addresses these issues by generating a treatment group of firms located in the different types of creative clusters as well as a control group, which includes similarly matched firms located in non-cluster areas as well as clusters of various kinds. One can define the propensity score as the conditional probability of assignment to a particular treatment given a vector of observed covariates. PSM has been discussed to estimate causal effects on the matched data (Arpino 2018). It also reduces dependence on statistical analysis or modeling (C. Drake 1993) and increases objective causal inference (Rubin 2006). Very few methodological and applied works exist regarding clustered data since, in such datasets, bias can arise from omitted individual and cluster-level confounders.

I use a binary logit model to estimate propensity scores utilizing the sample of creative firms located in the different creative clusters (treatment) and non-cluster (control) areas. The PSM is calculated using STATA 15.0 software and the 'teffect' built-in package. The creative industries, similar to the previous chapter, are the list of North American Industry Classification System (NAICS) codes, categorized into eight specializations for the purpose of this study, as explained in chapter three. In addition to the firms' sectoral categories, I have used several firm characteristics for score matching - sales volume of creative and non-creative firms, building sqft of the firm, job accessibility via transit, accessibility to jobs within a 45-minute drive - as

confounding factors in sales volume (productivity) outcomes. The number of employees for each firm was also included at first but was dropped due to multicollinearity.

The results, as observed in Table 27 below, demonstrate the difference close to the one in linear regression. Controlling for all other variables and comparing the most similar firms in the database, the results show that the firms that are located in creative clusters have $449'078.2 more sales volume than the creative firms outside of these clusters. However, one may notice that this result is not significant.

Table 27- Propensity score matching results for creative firms' sales volume

```
. teffects psmatch (SALESVOL) (InCluster Job45Car Job45Trans NEAR_DIST CategCode SQCo
> de)

Treatment-effects estimation                   Number of obs      =    271,269
Estimator      : propensity-score matching     Matches: requested =          1
Outcome model  : matching                                     min =          1
Treatment model: logit                                        max =         86
```

SALESVOL	Coef.	AI Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
ATE						
InCluster (1 vs 0)	4.490782	3.286871	1.37	0.172	-1.951367	10.93293

As demonstrated in this section, the PSM did not provide a significant result, while the linear regression and logistic regression provided more detailed information about these clusters and their relationship with firm productivity.

Results and Conclusions

Creative clusters have long been discussed to contribute to the economic development of local and regional areas and benefits firms and local businesses. However, the diversity of creative industries has made it difficult for researchers to investigate the extent to which these contributions take place. This study is the first comprehensive study at the national level to investigate the different creative clusters and their relationship with firm productivity. By using address-level firm data, this dissertation provides a much clearer understanding of these clusters for planners and creative policymakers.

The analysis in this chapter demonstrates a positive and statistically significant relationship between the creative clusters and firm productivity for creative firms, as supported by the literature. The sales volume for creative firms within the clusters is significantly higher as compared to non-cluster areas. While locating in creative clusters may be less unaffordable for creative firms, they may prefer these locations in the metropolitan areas due to the image of the identity of the community. The results of this research also show that it is not only the image or softer factors; the creative firms that are located in these clusters also have higher sales volumes. These clustering patterns provide some empirical evidence at the national level about the determinants of where creative and cultural firms tend to locate. Some of these determinants, as discussed in chapters one and two before, are access to the labor pool, the structure of consumption and technology, the need to face to face contact, urban buzz, and branding (Markusen and Gadwa 2010a; Currid and Williams 2010a; Vanolo 2008; Han and Hawken 2017; Scott 2006a; Evans 2009b).

Looking at the results of the logistic regression, it also appears that education, museum, and crafts are the less clustering categories among creative firms. In other words, in tandem with the literature to some extent, the data shows that these three specializations of the creative economy are more dispersed, which is due to the nature of museums and collections, education (accessibility and the location of schools) and crafts businesses. What I expected was for the performing arts businesses to have a lower probability of being located within the clusters than most other categories, because performing arts employees, including singers and dancers, are expected to be located close to the churches in communities. Nonetheless, the data shows that performing arts has the third-highest probability of being located in the clusters, only after film and media industry and visual arts firms.

One limitation of this part of the dissertation is that I studied the relationship between the creative clusters and firm productivity in a cross-sectional manner, which does not indicate a causal relationship. For this to be causal, a panel data that could take the age of the firm, the number of years each firm stays within a cluster, and the changes in affordability, as well as growth in sales volume into account, could provide a much stronger case to discuss the benefits of creative clusters for firm productivity. Moreover, the lifespan of creative firms, I could discuss could affect the economic context of the local communities. There are also some other factors such as the public or private nature of creative firms and historical information about the history and identity of communities where these clusters locate, which can potentially affect this relationship and need to be investigated. Similar to the previous chapter, the Esri Business Analyst Dataset does not include the information on proprietorship, nor does it capture wages

and earning or some of the artistic or creative activities (such as self-employment or home-based employment) (e.g., Markusen and Johnson 2006).

The change in affordability in and around creative clusters across the nation would be still a subject for future research since this would need longitudinal data, for which some indicators such as the change in housing value, availability of affordable housing, income, and other variables of both socio-economic and built-environment would be needed. There is little information on the relationship between the lifespan of creative businesses and their effects on economic development, knowledge spillovers, and displacement (Zukin and Braslow 2011; Schuetz 2014; Caves 2000). For example, Wojan and Pulver (1995) find that those industries that are at their end of product life-cycle tend to locate in more remote rural regions. In describing the life cycle of creative neighborhoods in New York, Zukin and Braslow (Zukin and Braslow 2011) reveal a dynamic that sees artistic production gradually replaced by creative consumption services (such as luxury shops, art galleries, and trendy cafes) in some gentrification process. Similarly, Pratt (2009) finds the same evolution in Hoxton in London, whereas a similar dynamic is observed in some Asian cities such as Beijing with slight differences (Currier 2008).

Finally, in the study of firm productivity, some very important variables have not been investigated and included in the three models. Some built environmental characteristics of firms' settings, managerial and structural differences, firms' assets, and ambitions, as well as firms' political structures, are some of these missing variables that need to be taken into account when we study firm productivity.

Chapter Five- Conclusions and Policy Implications

Conclusions

This dissertation is a step forward in our knowledge of the geography and typology of creative clusters and their association with creative firm productivity in the United States. Few studies attempt to map creative clusters in the US, usually using limited case studies and larger units of analysis (Graif 2018; Currid and Williams 2010a). This dissertation identifies both the location of creative clusters and their typology with further analysis of how they relate to firms' sales volumes, using a disaggregated dataset in 20 large US metropolitan areas.

The results in chapter three demonstrate that creative firms, in general, tend to cluster in the inner parts (the CBD) of larger cities, within MSAs. Looking at the spatial patterns of these clusters, I demonstrated that they follow the general location pattern of other businesses in these metro areas. Creative clusters show an "urban nature" in most cases, meaning that there is a higher propensity for clusters of creative firms to be found in inner urban areas. However, these patterns have differences among MSAs.

The number and geographic size of creative clusters do not reflect the general pattern of creative employment and creative sales volume in MSAs. While between 20 to 30 percent of each MSA's creative firms are located within clusters, they differ widely in the number of creative clusters and the land area that they cover. For example, the New York and Los Angeles MSAs have the highest number of employment and sales volume for creative workers and productivity. Nevertheless, they are the 20th and 7th in terms of the number of creative clusters, respectively. This can be partly explained by the literature that relates artists and creative firm's location choices to affordability. Affordable loft space existing in historical buildings or calm natural environments farther from the CBD are only some of the discussed attractive places for

artists (Markusen and Schrock 2006; Gibson 2014). Although not addressed in this dissertation, affordability can be one of the reasons why DFW, Minneapolis, and Detroit are among the top ten MSAs with the highest number of creative clusters.

Follow-up research at this point would be a close investigation of the year each firm was founded and its locational attribute. There is very little research looking at the lifespan of creative firms and how they relate to creative clusters (e.g., Caves 2000). Based on the literature and the observations in this research, it would be expected that newer companies locate farther away from CBDs, mostly due to affordability issues. Such relationships, however, depend heavily on the category of creative activity, since galleries, for example, are expected to have much shorter lifespans, in comparison to educational services (Caves 2000; Schuetz 2014), while clusters maintained through a continuous turnover of establishments in similar locations.

The Herfindahl-Hirschman Index (HHI) analysis in chapter three exhibits that in most clusters, there is a meaningful and significant co-location of firms from more than one category, while about 30% of the clusters show levels of monopoly in them. Further location quotient (LQ) analysis in these clusters delineates that these co-locations have specific patterns. For example, clusters of film, television, and cinema tend to locate close to clusters of performing arts, while gaming and software programming clusters have a slightly different pattern. They locate farther from city centers and tend to create a monopoly for themselves.

It is worth mentioning here that the analysis demonstrates that firms of performing arts (44.88%), crafts and jewelry (37.58%), Visual arts (28.74), and film, radio, and tv (28.18%) have the highest share of firms being located within creative clusters, while firms of education (17.06%) and museums and collections (19.48%) tend to be more dispersed in the MSAs.

Looking at this finding, it partially supports the linear regression and logit results in chapter four: the educational firms, as well as museums and collections, showed to have lower sales volumes when compared to all other categories of creative industries.

The suggested approach in this dissertation creates a systematic methodology that enables a comparative analysis across the country. It ranks creative clusters in terms of their size and regional competency while also identifying their specializations. In the study area, %30 of all creative firms are located within creative clusters. Among these clusters, one-third are monopolistic, meaning only one or two industries have the most (if not all) shares of employment and sales volume in those clusters.

Investigating the location quotient of the clusters also provides some insight into these clusters and the specialized sectors in different clusters. While the LQ for film, radio, and tv tend to appear as regionally competitive in most of the clusters, regardless of its competition status, gaming and software firms tend to be located within monopoly clusters, further from the other sectors in the metro areas. It highlights the fact that creative firms are not necessarily in need of co-locating. In contrast, the proponents of creative firm clustering suggest that the clustering of these firms generates dynamic efficiency, which is the flexibility to mix and match different skills, along with the incentive and autonomy to develop innovative ideas and techniques to maximize sales (Leadbeater and Oakley 1999; Turok 2003). Moreover, while most downtown-located clusters are competitive and include more than three or four sectors of LQ > 1.25 (or regionally advantaged), most of the monopoly clusters tend to have gaming and software or film, radio, tv firms as the primary or the only industry that offers growth/import opportunities.

The analysis in chapter four demonstrates a positive and statistically significant relationship between the creative clusters and firm productivity for creative businesses, as is supported by the literature. The sales volume for creative firms within the clusters is significantly higher when compared to the non-cluster areas. While locating in creative clusters may be less affordable for creative firms, they may prefer these locations in the metropolitan areas due to different factors. The results of this research also show that it is not only some softer factors such as the creative image or local buzz (as discussed in chapter two) that may incentivize creative firms to cluster. The study shows that higher sales volumes are also related to creative firms in these clusters, highlighting the multi-dimensional benefits (one may be careful about the causal language here) of firm clustering for creative businesses. These clustering patterns confirm the theories that indicate access to the labor pool, the structure of consumption and technology, the need of face to face contact, urban buzz, and branding (Markusen and Gadwa 2010a; Currid and Williams 2010a; Vanolo 2008; Han and Hawken 2017; Scott 2006a; Evans 2009b) are some of the determinants of where creative and cultural firms tend to locate.

Looking at the results of the logistic regression, it also appears that education, museum, and crafts are less clustering categories among creative firms. In other words, in tandem with the literature to some extent, the data shows that these three specializations of the creative economy are more dispersed, which is due to the nature of museums and collections, education (accessibility and the location of schools) and crafts businesses. I expected the performing arts businesses to have a lower probability of being located within the clusters than most other categories, since performing arts employees, including singers and dancers, are expected to be located near the churches in communities. Nevertheless, the data shows that performing arts has

the third-highest probability of being located in clusters, only after the film and media industry and visual arts firms. In fact, 44.88 percent of performing arts firms are located within clusters, which is the highest share among all other creative categories.

Policy Recommendations

In this section, policy recommendations are offered based on the findings of this research. Planners and policymakers can benefit from the results of this study, as it provides a quantified measurement of where creative clusters locate in different MSAs across the country. During my visit to the City of Dallas, the chief planner, Luis Tamayo, expressed immense interest in the results of this research for the city. When discussing the concept of creative clusters, cities also ask these questions but do not often have the tools to investigate and provide valid answers for them.

These clusters offer potential magnets for neighborhood economic development while also identify the location of the current creative agglomeration within cities around the nation. Instead of being categorized as anticatalysts epitomizing inequality and gentrification, a thorough understanding of where the creative clusters locate and how they interact with other clusters and the built environment enables policymakers to utilize the benefits of these clusters as active catalysts for urban and rural revitalization.

Policy Implication 1- Implications of the methodology for city officials

First, I suggest that the methods used in this research for identifying creative clusters, which combines information on some dimensions of creative firms in a geographic database, will allow

planners to integrate information on cultural activity with the types of data more commonly used in community and economic development analysis. It is crucial and critical for urban planners to know where they can find the clusters of creative firms (and not necessarily artists) to be able to strategize and plan for their success in their cities and MSAs.

Planners must begin with existing and emerging creative clusters because these areas tend to have the basics (including the infrastructure, the economic context, and the labor force) already in place. In other words, one can expect that the infrastructure for creative activity is already at an acceptable level in identified boundaries. While one may assume that the identified clusters enjoy a diverse residential population, further research is needed to investigate if this is the case for all these clusters. After all, the presence of creative workers and artists, nonprofit, and creative organizations, as well as creative commercial firms of all or most creative categories, set a strong basis upon which to build a robust creative community. Many low-income city neighborhoods may have these factors, but they lack a consumer base to help them take off (Stern and Seifert 2010).

A related issue in the cultural and creative economy is the ability of a place to serve minorities, immigrants, and other diverse constituencies. The shift from manufacturing to creative and service economy has pushed cities to use arts and culture as a fundamental basis for their economic competitiveness (Collins 2018). According to Zukin (1996), since ethnic diversity and multiculturalism are two accepted and valued realities of the contemporary city, notions of "exotic" and "authentic" cultural urban experiences are marketable assets for communities. In the context of the cultural and creative economy, many scholars have explored the different ways planners and policymakers can leverage arts and culture for social and

economic gain. Arts and culture are used to help community organizing (Wherry 2011), increase place identity (Grodach and Loukaitou-sideris 2012; Main and Sandoval 2015), and facilitate economic empowerment by allowing the local community to find economic benefits in niche "ethnic production" (Hoffman 2003).

However, a report (Sidford 2011) finds that only 10 percent of grants, with a primary or secondary purpose of supporting the arts, explicitly benefit underserved communities, including lower-income populations, communities of color, and other disadvantaged groups. It represents the fact that many arts and culture-related projects do not contribute to underserved populations or neighborhoods. Moreover, creative entrepreneurs face numerous challenges when trying to develop a market in low-income neighborhoods with high crime rates (Stern and Seifert 2010). Issues of safety and security, low street traffic, the inability to attract potential participants and customers from the other parts of the city, and a lack of experience or technical expertise on how to grow their businesses —all prevent these entrepreneurs from transforming their sweat equity into stable enterprises. All of these elements need to be addressed by a metropolitan or regional authority to find solutions to the negative externalities of creative clusters.

Policy Implication 2- Investment in downtown competitive vs. suburban monopoly clusters

One of the findings of this research is the fact that in almost all the MSAs, more massive creative clusters are located within the downtown/historic part of the larger cities. Simultaneously, the monopoly clusters trace mostly in the more suburban areas of the MSAs or the downtown areas of smaller cities in these regions. Arts and culture increasingly employ many people in major MSAs. Since 1940, creative firms have consistently been the third or fourth-

largest employers for the New York MSA, employing almost as many people as the financial industry (Currid 2007). The existence of creative firms and creative clusters in the urban areas has been previously discussed (Lorenzen and Frederiksen 2008; Currid and Williams 2010b; Lazzeretti, Boix, and Capone 2008; Scott 2002a; Grodach et al. 2014; Hutton 2006; Mack, Talen, and Koschinsky 2017), as mentioned in this dissertation. We know that firms benefit from positive externalities of clustering through knowledge spillovers across companies, proximity, and access to labor, as well as entrepreneurial and serendipitous networking opportunities that act as catalysts for potential growth (Duranton and Puga 2004; Storper and Venables 2004; Puga 2010). Increasing returns to scale in production (aka external economies of agglomeration), cross-industry or supplier relationships, and proximity to a labor pool are other reasons for firm clustering in more compact areas (Chatman and Noland 2011).

While cultural and creative products are distributed and consumed globally, it is mostly modern capitalism's heartlands (global cities such as London, Los Angeles, Paris, New York, or Tokyo) that generate these cultural products (Scott 1997; Lorenzen and Frederiksen 2008). In my dataset, it appears that all MSAs have clusters of creative firms located in/ or close to the downtown areas of the largest cities. Some of the MSAs, however, include more suburban clusters, whereas most of the MSAs have them close to the CBD areas.

The question here is, which one(s) should the cities focus on more and why. As suggested in policy implication 1, I believe that cities may benefit if they start with the existing clusters and investigate what has attracted the creative firms in those areas in the first place. Chapter two of this dissertation offers some insight into the different attractive factors of creative-friendly communities. However, still, the degree to which each of these clusters enjoys these six elements

is unknown. Understanding what supports the creative firms within the existing clusters can help local communities not only to support creative firms and creative activity within these boundaries but also to prepare strategies for further expanding or planning for new clusters in their local communities.

Policy Implication 3- The urgent need of strategies for addressing the issues of social equity and other externalities

Social equity and other externalities related to creative clusters connect the dynamics of such agglomerations of creative firms to the concerns of planners and policymakers. In fact, it is the urban authorities who deal with the negative externalities of creative clusters. It is a right for residents of all communities to have access to creative and cultural opportunities and facilities. However, artists and the creative employees in the US's labor force are disproportionately white and male and less apt to be immigrants as a whole (Markusen and Johnson 2006). This pattern is evident not only in the production phase of the cultural and creative economy but also in the consumption phase (O'Brien and Oakley 2015). For example, almost three times as many white people attended classical music concerts as African Americans. Similarly, whites' attendance at both musical and non-musical plays was more than twice that of Hispanics (Sidford 2011). It is also evident in the literature that in the gentrification processes related to arts and culture, younger, white, and college-educated individuals and families replace the existing residents in neighborhoods (Makagon 2010).

Another empirical research study (D. McGranahan and Wojan 2007) shows that between 1990 and 2000, Blacks and Hispanics had relatively lower shares of employment in creative

class occupations. In a few articles, however, it is found that among diversity variables in US metropolitan areas, the Hispanic population shows a highly significant positive association with cultural entrepreneurship, whereas the Asian population exhibits a significant negative impact (Qian and Liu 2018).

By looking at the location of the identified creative clusters initially, one may recognize that they are located in more affluent or middle-income areas of MSAs, making it evident that lower-income areas may lack the infrastructure, consumer market, and the potential labor pool, necessary for a creative-friendly community. The role of planners and policymakers at this point can be to provide policies supportive of the creative economy if they have the will to reduce unequal opportunities when it comes to arts and creative activities in neighborhoods. In many parts of different MSAs, this requires long-term planning and active participation of authorities and philanthropists to create and sustain a creative-friendly community. Local communities can also consider providing exclusive programming for people of color and affinity groups, working along an integrationist path (O'Brien and Oakley 2015). There is no panacea when it comes to how a community should provide opportunities.

The negative externalities and their impacts on market activities are also relevant to urban planners and their approach to creative clusters. Economic inequality and gentrification, as discussed before, have been associated with the agglomeration of creative firms in an area. In the process where arts and creative firms generate a local buzz, provide a boost for social networks, and spawn neighborhood revitalization, the creative firms or the artists do not receive most of those benefits. One may discuss the economic benefits of a creative cluster for a community, but the artists and enterprises that stimulated the revival to glean only the most indirect benefit (Stern

and Seifert 2010). According to the creative class theory, further expansion of economic inequality and its consequences, such as social problems, displacement, or gentrification, is not avoidable when it comes to clusters of creative workers or an informal arts sector (Florida 2017; Schuetz 2014).

In this research, I have not addressed or investigated the inequality or gentrification side of creative clusters. However, I have collected some information about how planners can address these issues here to maximize the benefits of revitalization generated by creative clusters. First, social investments and supporting grassroots initiatives can minimize the social inequality that happens alongside these clusters. Small loans for predevelopment and bridge financing and investment strategies that are not profit-maximizing but are profit-seeking are some of these initiatives that can be supported by cities (Stern and Seifert 2010). Second, proactive place-making activities, including providing safety and security, community facilities, support and encouragement of festivals and local fairs, as well as convenient public transit and enforcement of zoning regulations, could provide neighborhoods with the basis for creative activity without a need for beautification or gentrification of these spaces. The third factor relates to the education and training of community residents. As was found in the study, educational services related to creative activities are one of the least clustering industries of all. However, not all communities enjoy the training of creativity in their schools and within their curricula. Even though workforce-development policies are not decided upon locally, creative clusters within neighborhoods could serve as the anchors for artists' centers (Markusen and Johnson 2006) or technical training programs.

Finally, cities and local communities need to track and document creative activities and creative clusters more closely. Along with knowledge of how to do so, many towns and cities lack information about how creative firms and cultural clusters create change and benefit or hurt neighborhoods. If local communities collected detailed information, both quantitively and qualitatively, they would provide a rich platform for research and investment in these clusters.

Policy Implication 4- Maximizing the creative clusters' benefits

An outcome of cultural and creative concentration firm productivity as well as economic growth (Oakley 2004; Currid 2009), is a rise in housing prices, along with gentrification and displacement, which later brings economic and racial polarization to some areas (Zimmerman 2008). I did not investigate the economic growth or neighborhood revitalization in this research. Instead, I examined the association between creative clusters and firm productivity. Testing for this relationship through three different methods shows that creative firms have positively and significantly higher sales volumes when they are located within clusters. Does this mean that clusters benefit firms and impact their productivity, as the agglomeration economies suggest? Or does it indicate that creative firms that are more productive and have higher sales volume can afford being located within these clusters? I have also shown that creative firms that are located within clusters have higher numbers of employees, meaning that they are, on average, more extensive and developed than those outsides of these clusters. Answering these questions requires further studies and falls outside the scope of this dissertation.

One can expect that the impact of creative clusters on firm productivity in the local economy could be either positive and negative. It is positive when being located within clusters increases

the productivity of employees and firms due to the positive externalities of the place, but detrimental when the clusters make a community or neighborhood such a desirable place to live in that employees would be willing to accept lower wages/ sales volumes in return for living in an area that provides such amenities, images, or identities (Bakhshi, Lee, and Mateos-Garcia 2014). This research demonstrates that in the 20 MSAs that I studied, clusters are associated with higher firm productivity, meaning that no matter where in cities or metropolitan areas, firms benefit from being located within clusters of creative firms. It is an exciting finding for both urban planners and creative firms and entrepreneurs when compared to the study above in the UK, showing that cities can invest in creative and cultural clusters and highlighting the fact that clusters also relate to higher firm productivity for these firms.

The results of the logit regressions also show that creative firms that are located inside clusters have a higher probability of being closer to the downtown area. It emphasizes how (creative) placemaking activities in the downtown areas can help boost the creative economy, not only in the city but also in the metro area, as well as the region. Such city-instigated strategies to provide zoning, regulations, and support can assist creative firms, individuals, and entrepreneurs to not only improve their business and productivity but to flourish in the community and enjoy the benefits of the new economy and creative activity in the long run.

Some of the creative categories, such as educational services and museums and collections, have lower tendencies to cluster and even to affect regional development (Florida, Mellander, and Stolarick 2008). Nevertheless, they provide strong support and training for educating creative workers. Supported by the findings in this research, this emphasizes the fact that educational services require the provision from the cities and the federal government to be(come)

available in all parts of the metro areas to provide equal access to the residents and to reduce the social inequalities in terms of access to and availability of creative education and activities.

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Appendix One- Map of the specialization of creative clusters in the 20 metropolitan areas in the US

Figure 14- The specialization of creative clusters in the Dallas- Fort Worth MSA

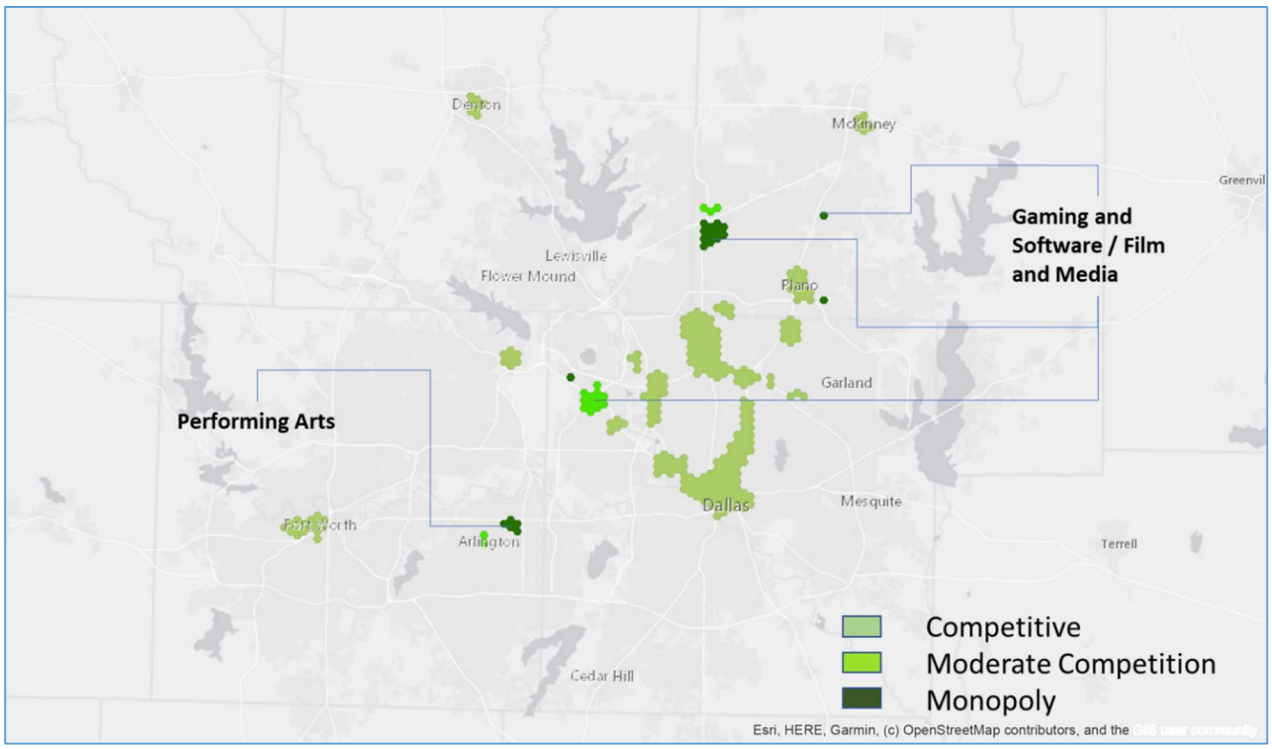


Figure 15- The specialization of creative clusters in the Washington-Arlington-Alexandria MSA

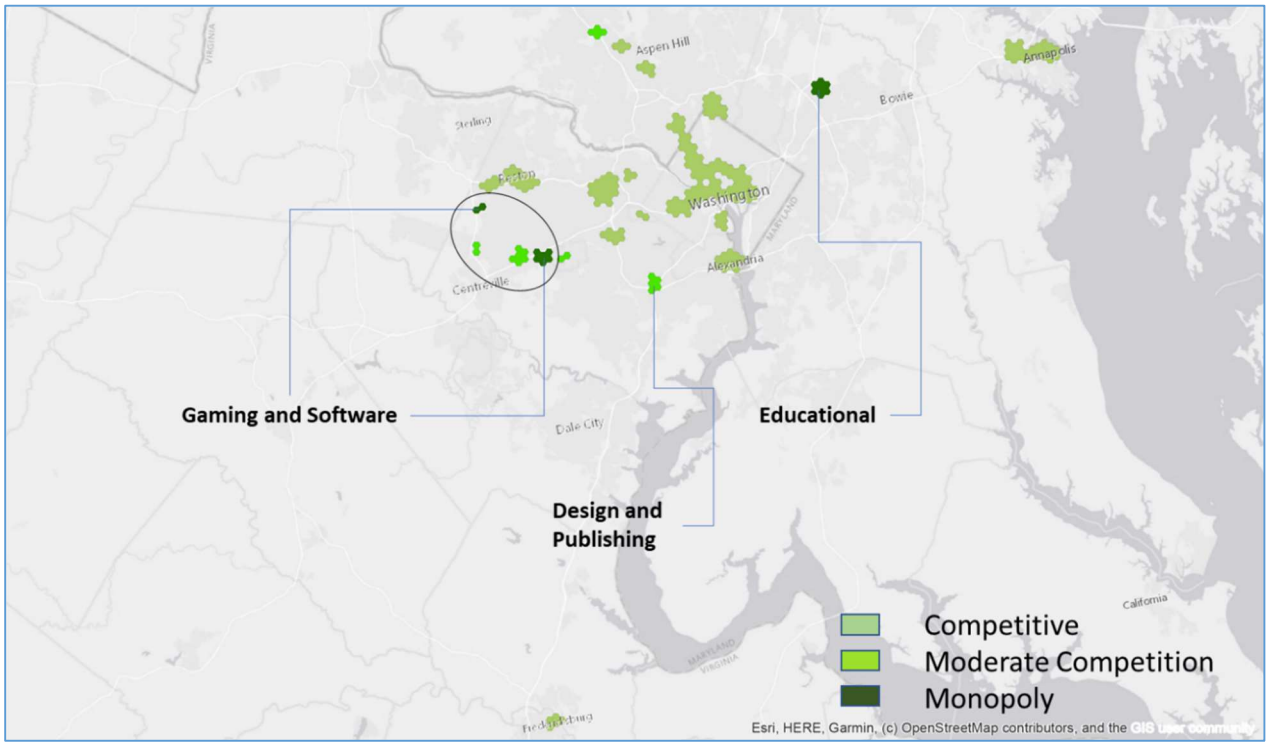


Figure 16- The specialization of creative clusters in the Orlando MSA

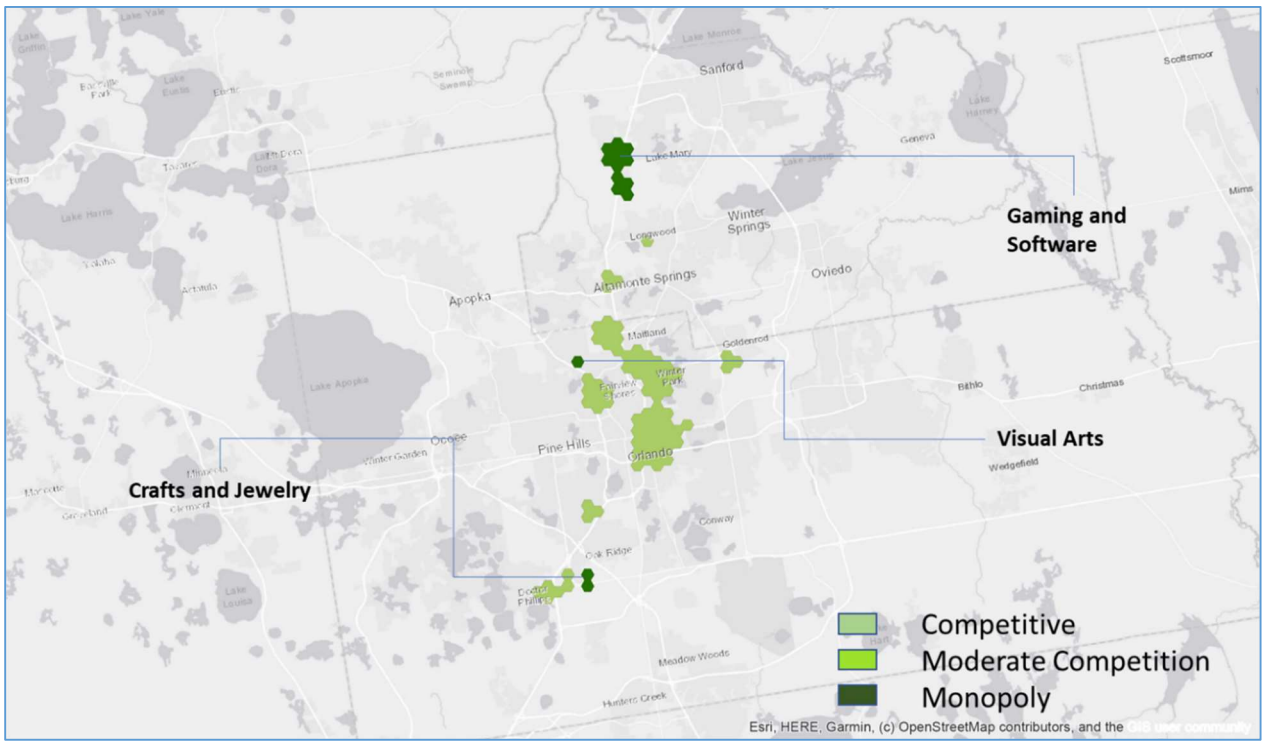


Figure 17- The specialization of creative clusters in the Boston MSA

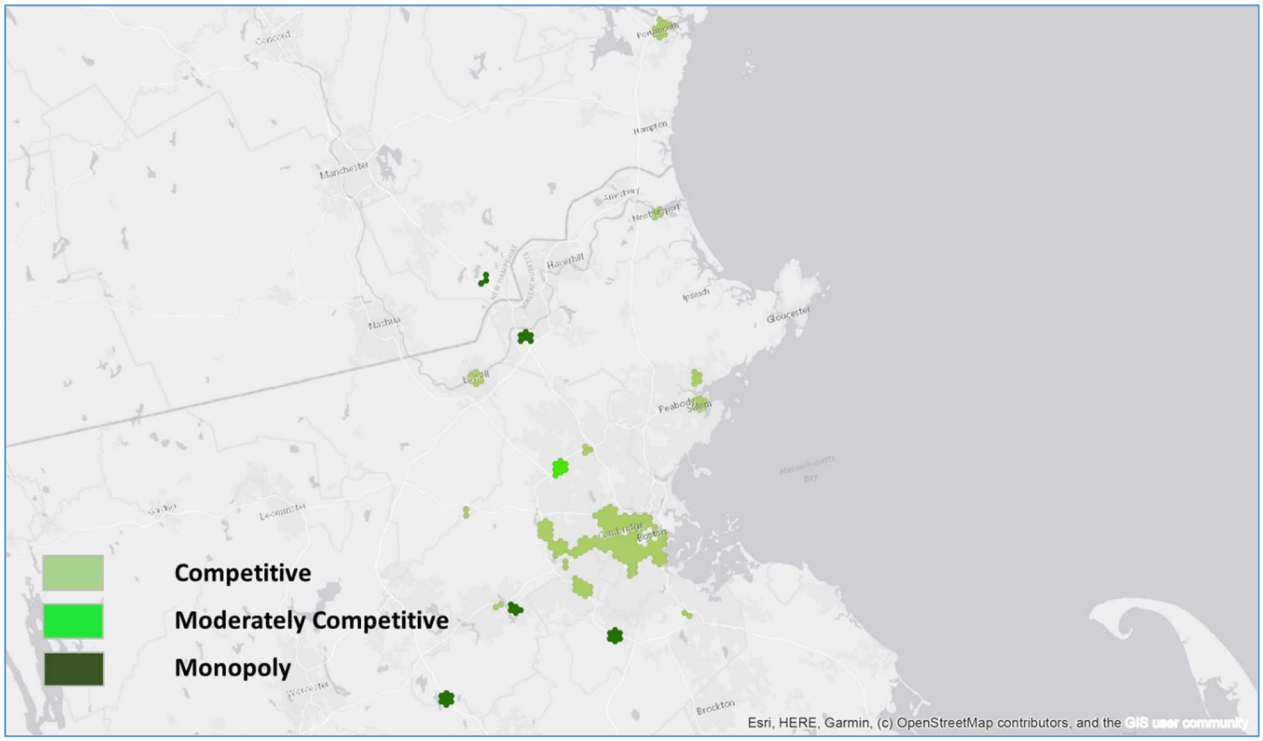


Figure 18- The specialization of creative clusters in the St. Luis MSA

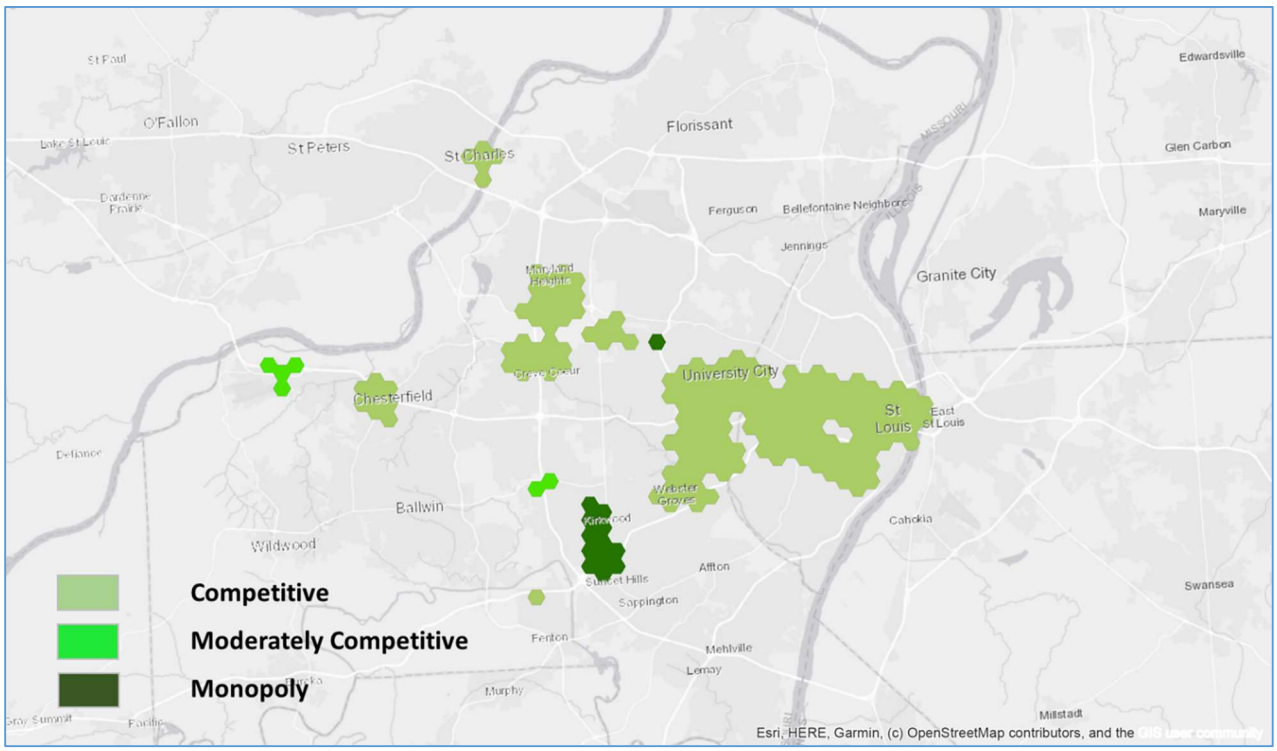


Figure 19- The specialization of creative clusters in the San Francisco MSA

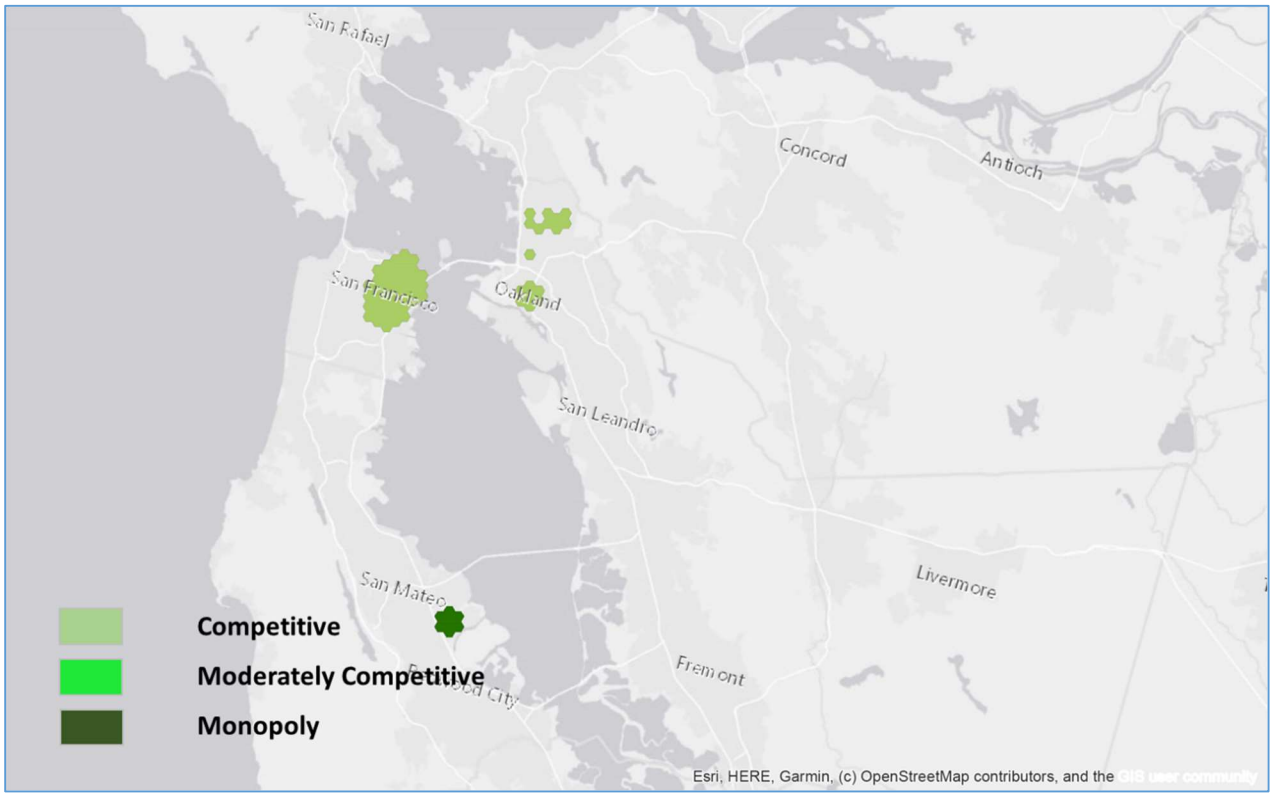


Figure 20- The specialization of creative clusters in the Seattle MSA

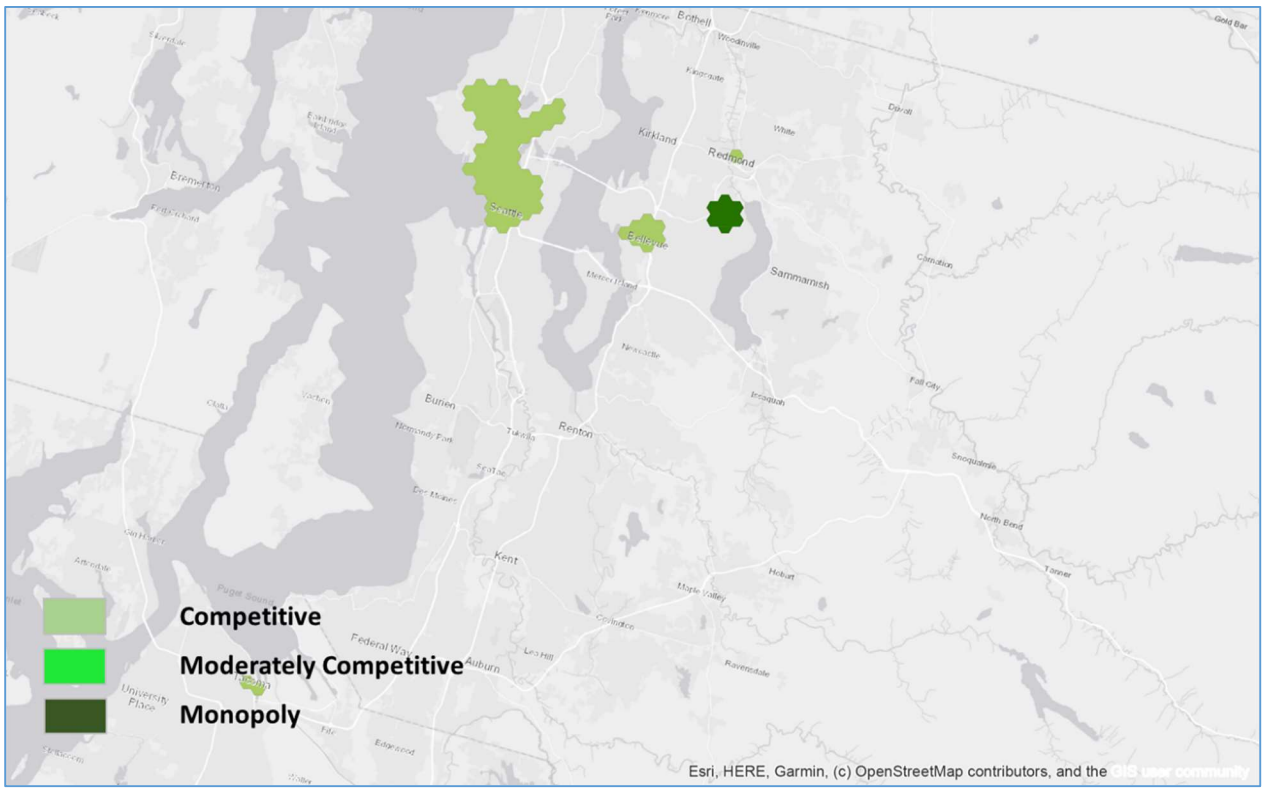


Figure 21- The specialization of creative clusters in the San Antonio MSA

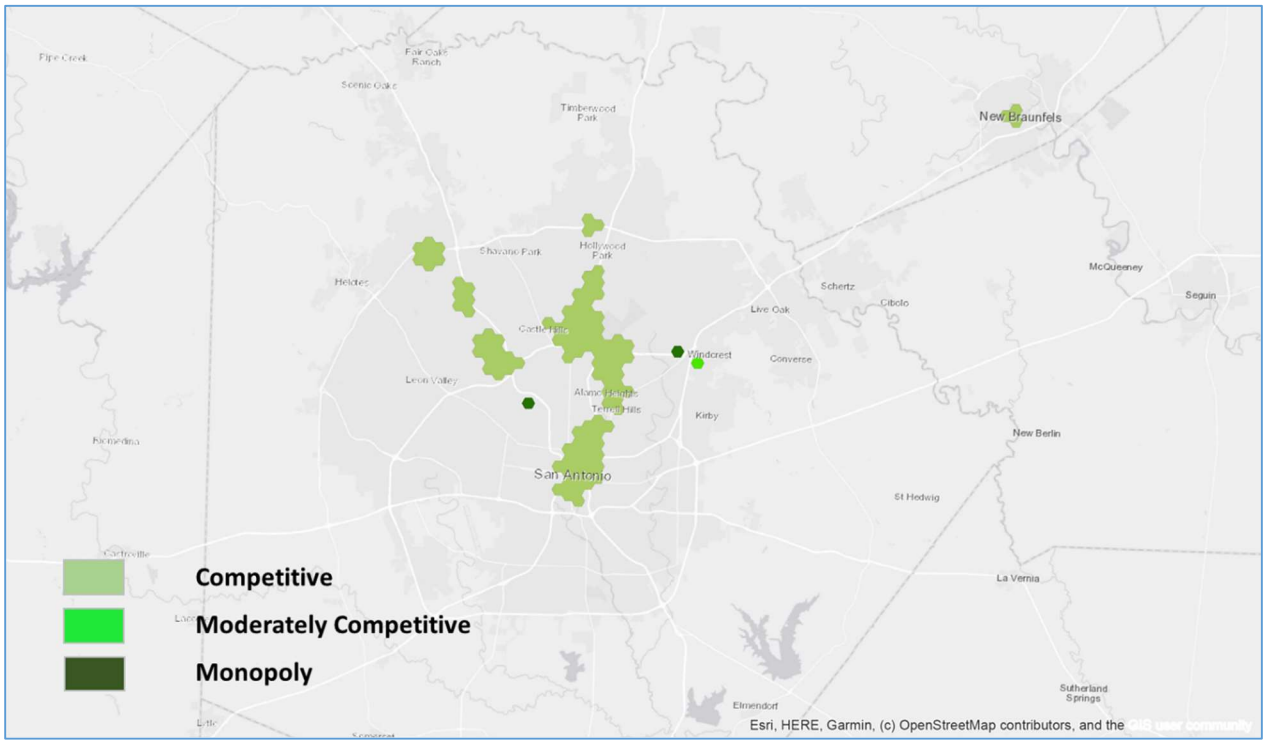


Figure 22- The specialization of creative clusters in the Portland MSA

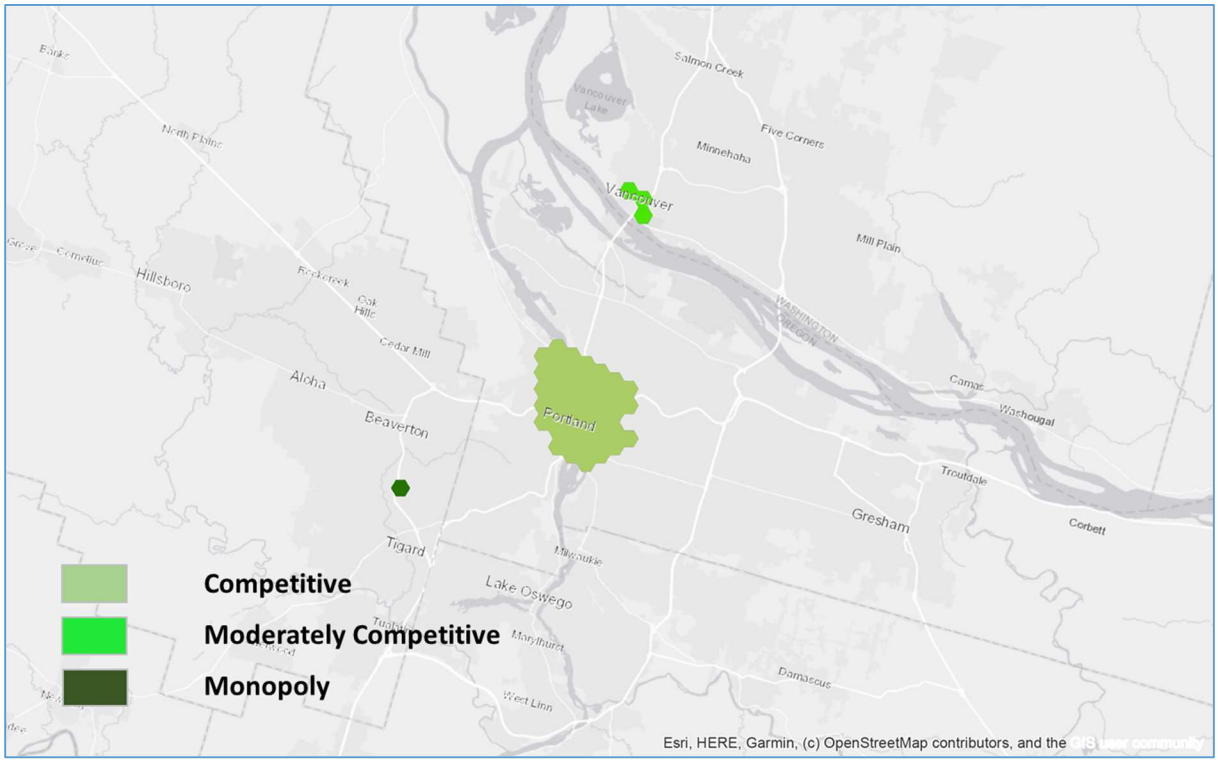


Figure 23- The specialization of creative clusters in the Phoenix MSA

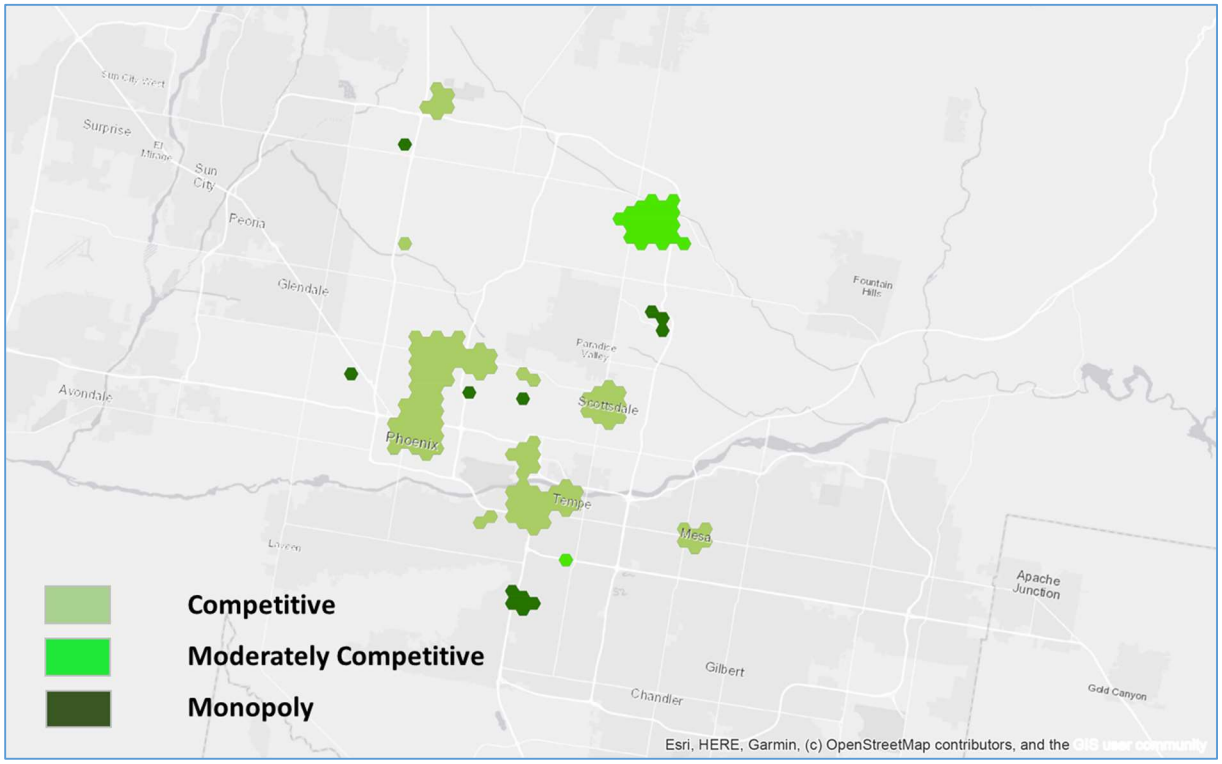


Figure 24- The specialization of creative clusters in the Baltimore MSA

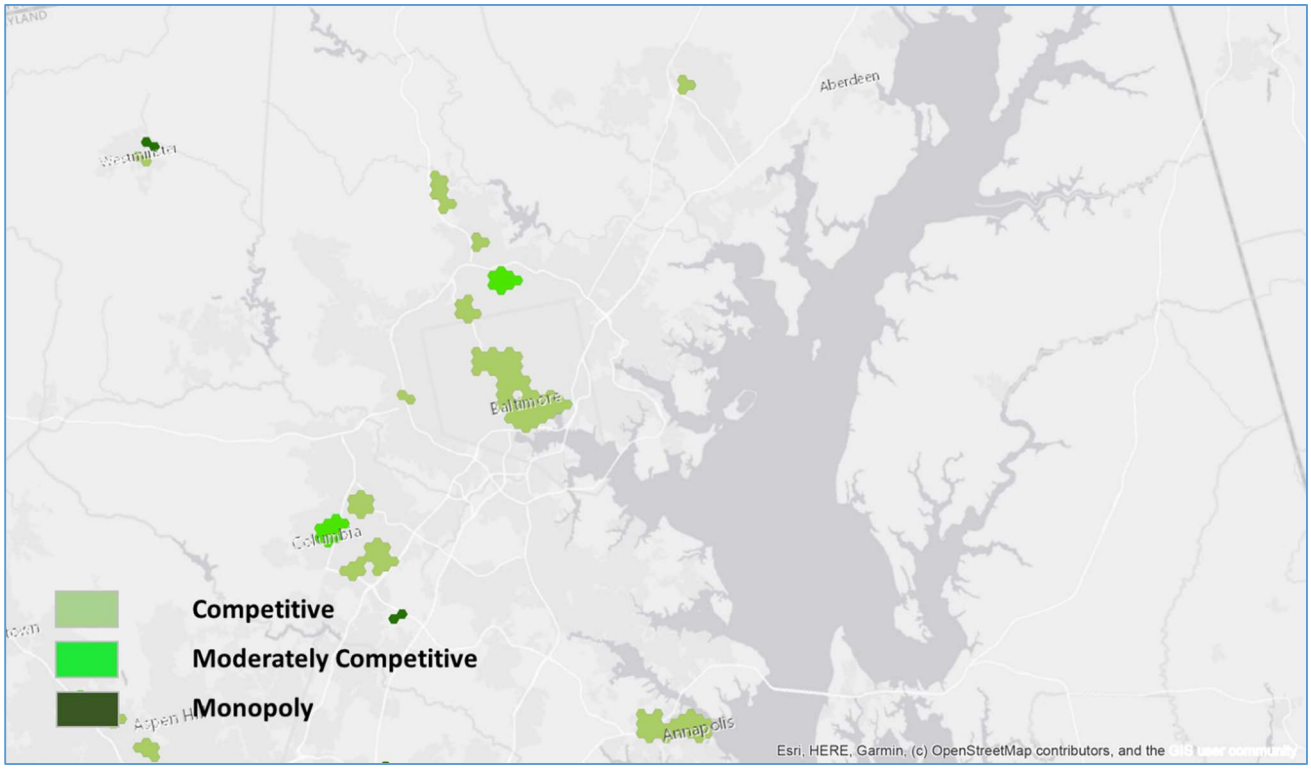


Figure 25- The specialization of creative clusters in the New York MSA

Figure 26- The specialization of creative clusters in the Nashville MSA

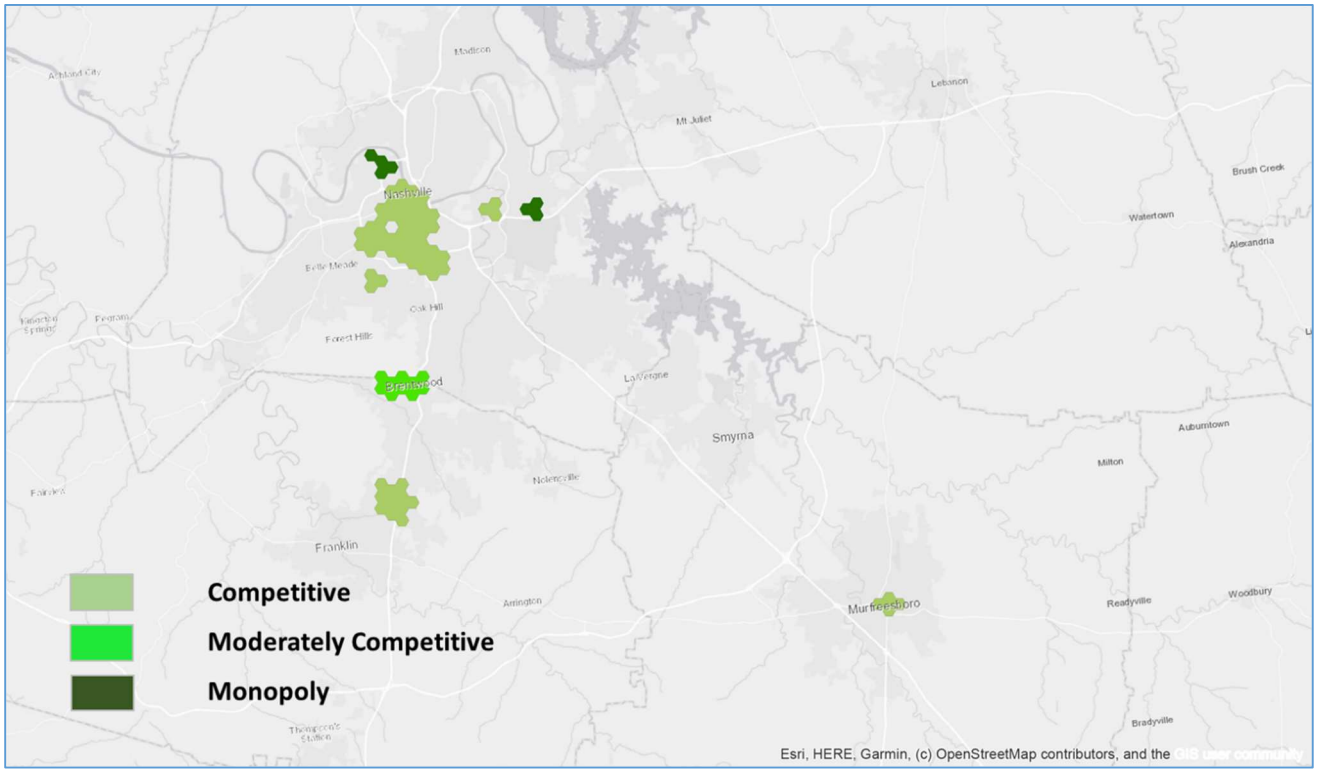


Figure 27- The specialization of creative clusters in the Minneapolis MSA

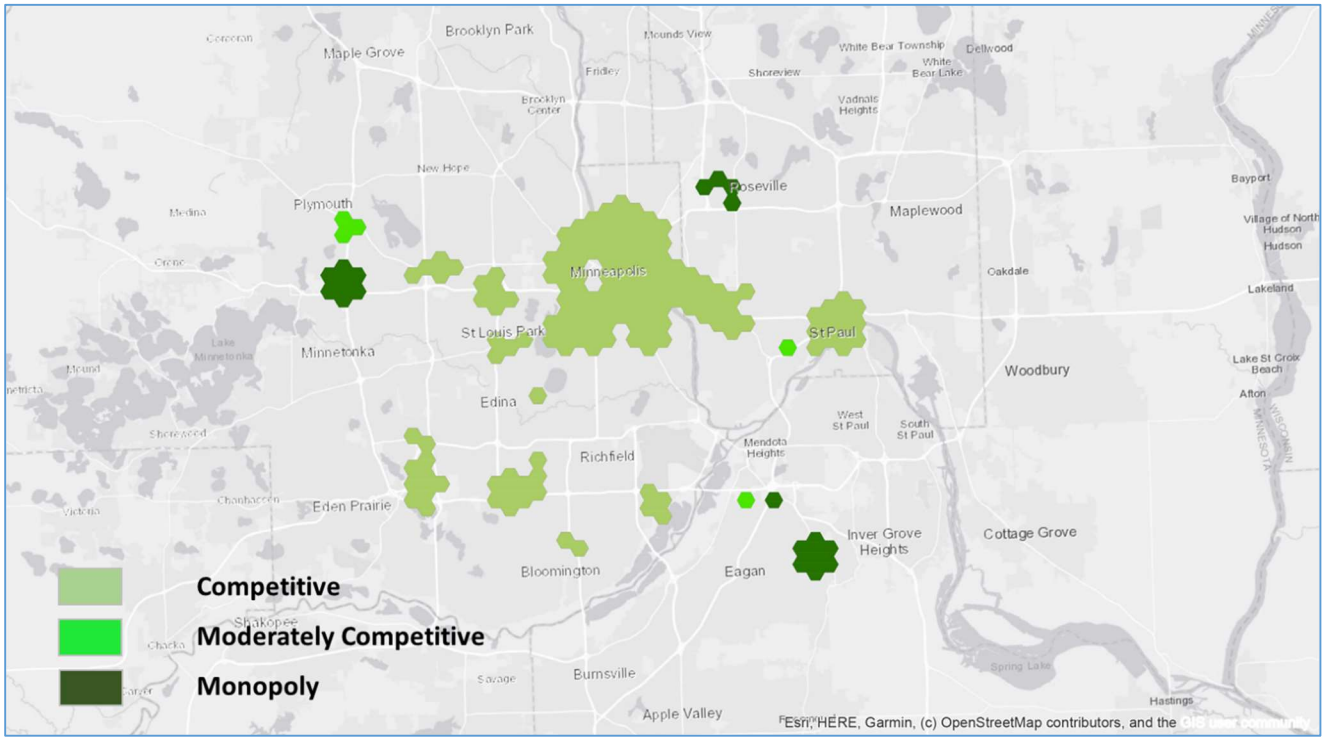


Figure 28- The specialization of creative clusters in the Miami MSA

Figure 29- The specialization of creative clusters in the Los Angeles MSA

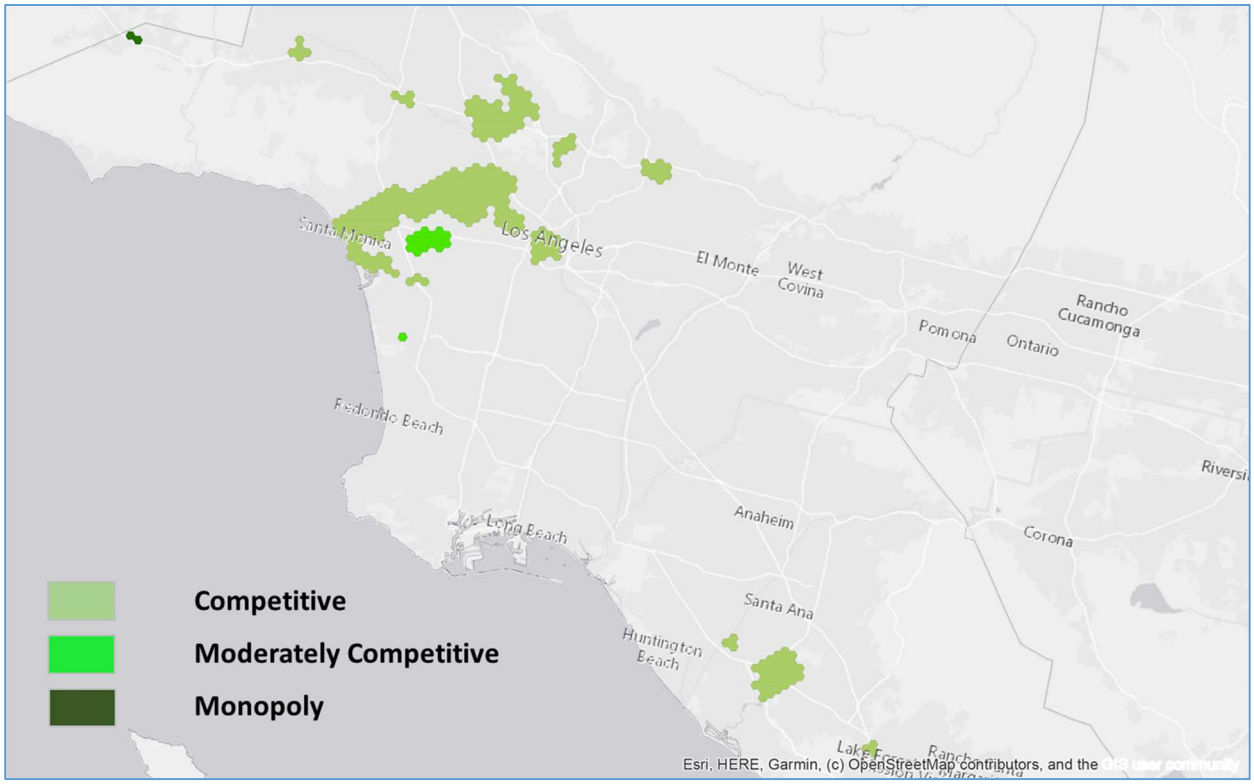


Figure 30- The specialization of creative clusters in the Detroit MSA

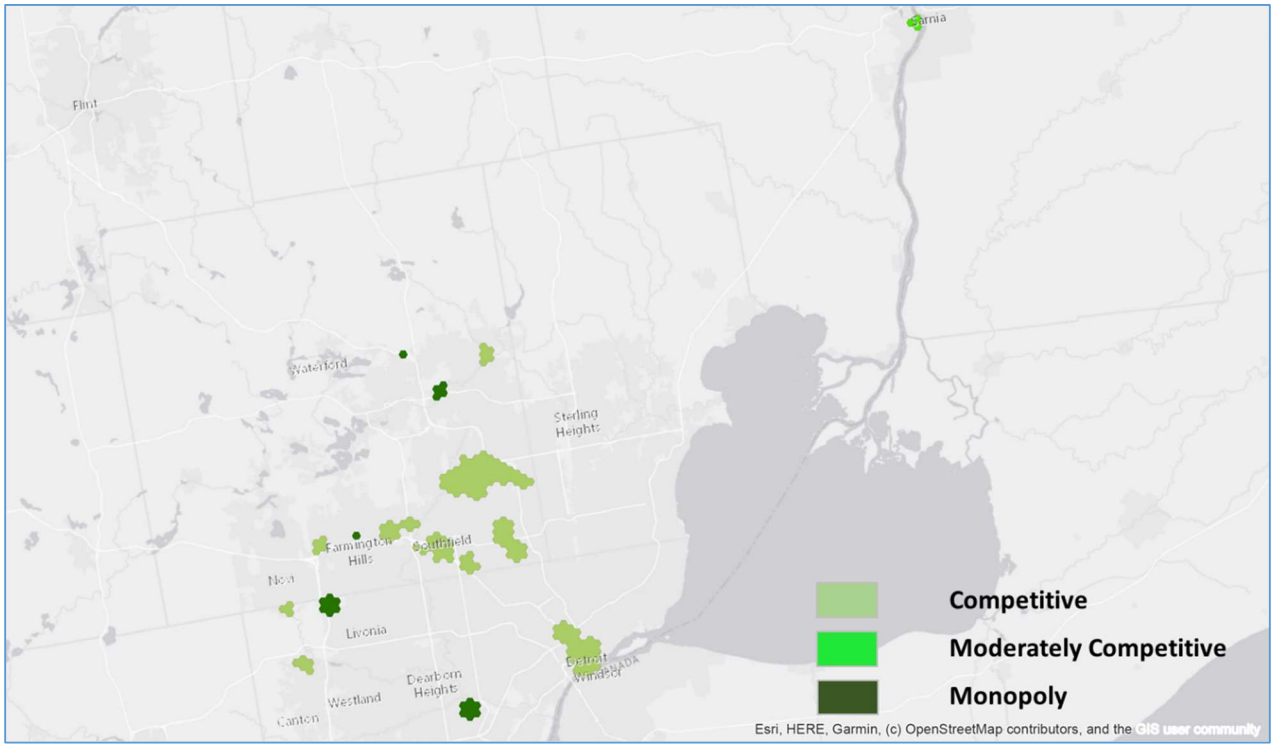


Figure 31- The specialization of creative clusters in the Denver MSA

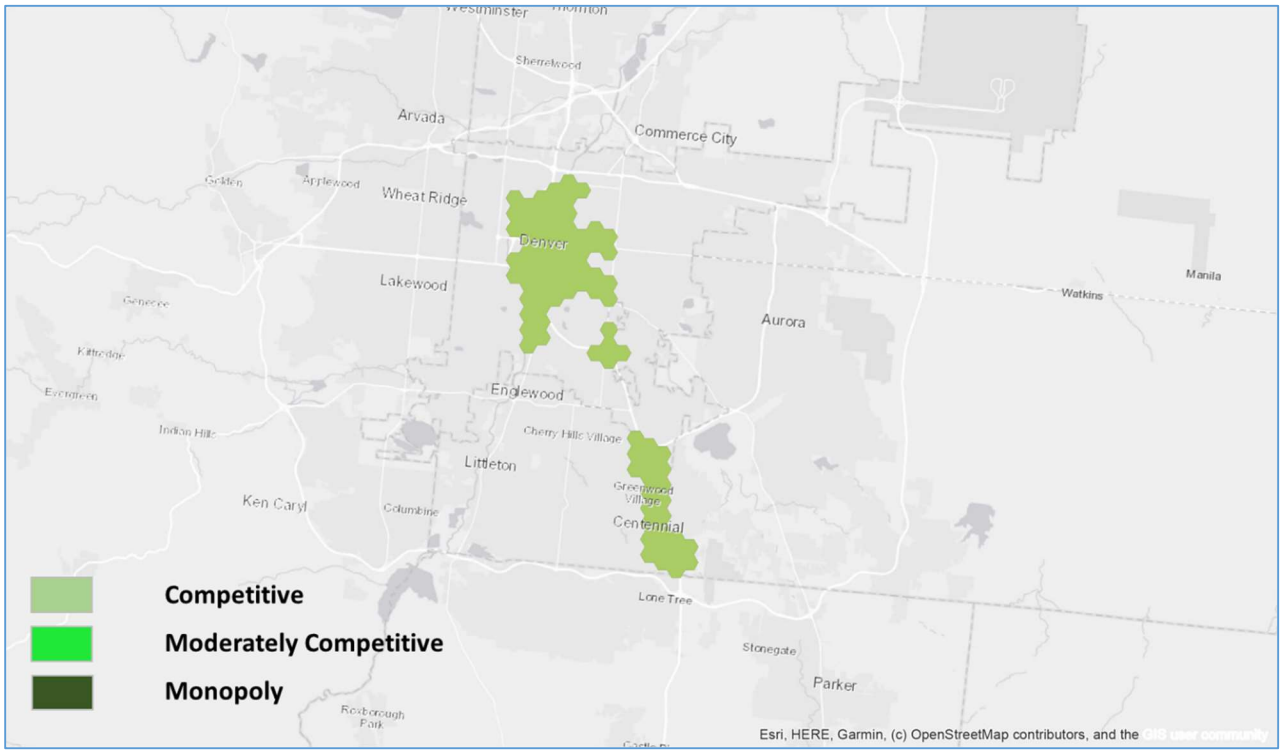
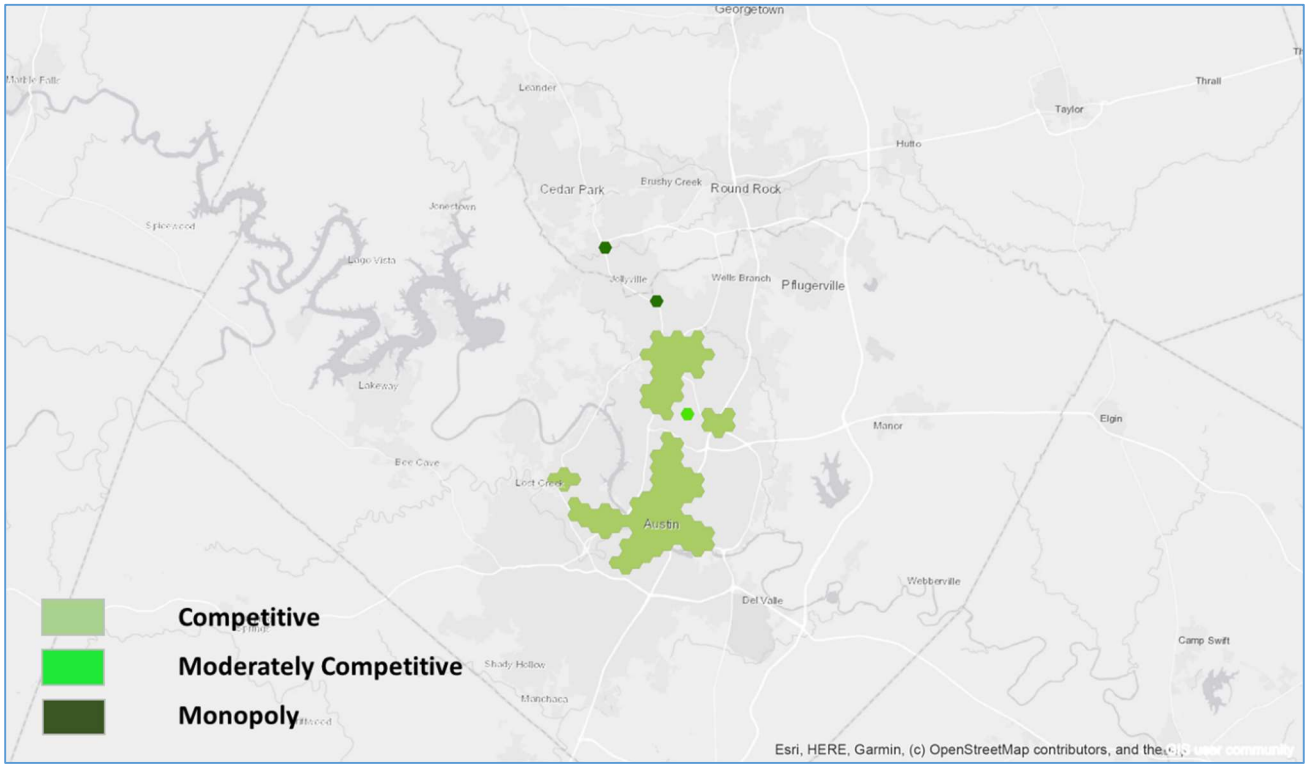


Figure 32- The specialization of creative clusters in the Chicago MSA

Figure 33- The specialization of creative clusters in the Austin MSA



Appendix Two- List of NAICS Codes for the eight categories of creative firms

Table 28- The NAICS codes for the performing arts category

NAICS Code	Information
711110	Theater companies and dinner theaters
711120	Dance companies
711130	Musical groups and artists
711190	Other performing arts companies
711510	Independent artists, writers, and performers
451140	Musical instrument and supplies stores
512210	Record production
512220	Integrated record production/distribution
512230	Music publishers
512240	Sound recording studios
512290	Other sound recording industries

Table 29- The NAICS codes for the visual arts category

NAICS Code	Information
541921	Photography studios, portrait
541922	Commercial photography
453920	Art dealers
812921	Photofinishing Laboratories (except one-hour)
812922	One-hour photofinishing
423410	Photographic equipment and supplies merchant wholesalers
443130	Camera and photographic supplies stores
325992	Photographic film, paper, plate, and chemical manufacturing

Table 30- The NAICS codes for the design and publishing category

NAICS Code	Information
541310	Architectural services
541320	Landscape architectural services
541340	Drafting services
541410	Interior design services
541420	Industrial design services
541430	Graphic design services
541490	Other specialized design services Advertising
511110	Newspaper publishers
511120	Periodical publishers
511130	Book publishers
511191	Greeting card publishers All
511199	All other publishers

323110	Commercial lithographic printing
323111	Commercial gravure printing
323112	Commercial flexographic printing
323113	Commercial screen printing
323115	Digital printing
323117	Book printing
323119	Other commercial printing
323121	Tradebinding and related work
323122	Prepress services
332323	Ornamental and architectural metalwork manufacturing
333293	Printing machinery and equipment manufacturing
451211	Book stores
424110	Printing and writing paper merchant wholesalers
424920	Book, periodical, and newspaper merchant wholesalers

Table 31- The NAICS codes for the educational services category

NAICS Code	Information
611610	Fine arts schools
519120	Libraries and Archives

Table 32- The NAICS codes for the museums and collections category

NAICS Code	Information
712110	Museums
712120	Historical sites
712130	Zoos and botanical gardens
712190	Nature parks and other similar institutions

Table 33- The NAICS codes for the crafts and jewelry category

NAICS Code	Information
443810	Jewelry stores
451130	Sewing, needlework, and piece goods stores
339992	Musical instrument manufacturing
423940	Jewelry, watch, precious stone, and precious metal merchant wholesalers
337212	Custom architectural woodwork and millwork manufacturing
339911	Jewelry (except costume) manufacturing
339912	Silverware and hollowware manufacturing
339913	Jewelers' material and lapidary work manufacturing
339914	Costume jewelry and novelty manufacturing
339942	Lead pencil and art good manufacturing

327112	Vitreous china, fine earthenware, and other pottery product manufacturing
327212	Other pressed and blown glass and glassware manufacturing

Table 34- The NAICS codes for the film, radio, and tv category

NAICS Code	Information
541810	Advertising agencies
541830	Media buying agencies
541840	Media representatives
541850	Outdoor advertising
515111	Radio networks
515112	Radio stations
515120	Television broadcasting
515210	Cable and other subscription programming
516110	Internet publishing and broadcasting
517510	Cable and other program distribution
519110	News syndicates
532230	Videotape and disc rental
443112	Radio, television, and other electronics stores
451220	Prerecorded tape, compact disc, and record stores
512110	Motion picture and video production
512120	Motion picture and video distribution
512131	Motion picture theaters (except drive-ins)
512132	Drive-in motion picture theaters
512191	Teleproduction and other postproduction services
512199	Other motion picture and video industries

Table 35- The NAICS codes for the software and gaming category

NAICS Code	Information
334614	Software and Other Prerecorded Compact Disc, Tape, and Record Reproducing
511210	Software Publishers
518210	Data Processing, Hosting, and Related Services
541511	Custom Computer Programming Services
541512	Computer Systems Design Services
541519	Other Computer Related Services

Appendix Three- Analysis of Variance (ANOVA) and Some Descriptive Statistics about the Database

In this appendix, I provide some analyses for a better understanding of the differences between firms' specializations in terms of their annual sales volume and employment. I used the analysis of variance (ANOVA) test and a post-hoc test in order to analyze the differences between creative firms' means in terms of their sales volume and employment size. This appendix also helps to see if there are any significant differences between the different types of creative firms in terms of size and economic activity.

Table 34 below demonstrates the average, minimum, and maximum sales volume and employment number for the creative firms within the eight categories. The average sales volume for the firms in crafts and jewelry shops are the highest among all creative firms, followed by the film, radio, and tv and gaming and software firms that have an average sale of half of those in the crafts and jewelry. The lowest average sales volume belongs to museums and educational services. Interestingly enough, the average employment number among all these firms do not show much difference, with crafts and jewelry having the lowest and museums having the highest average number of employees. To see if these differences are statistically different, however, I run the ANOVA test, the results of which are demonstrated in the following.

Table 36- The descriptive statistics of the creative firms in the dataset

Firm's Specialization		Sales			Employment		
		Mean	Min	Max	Mean	Min	Max
1	Crafts and Jewelry	6066.848	0	739783	6	0	500
2	Design and Publishing	2517.926	0	1.07e+7	11	0	75000
3	Educational	124.206	0	74140	11	0	3000
4	Film, Radio, and TV	3208.821	0	1688000	14	0	6000
5	Gaming and Software	3119.341	0	1533750	18	0	40000
6	Museum and Collections	35.334	0	1533750	20	1	11000
7	Performing Arts	1195.836	0	1292190	8	0	8000
8	Visual Arts	1183.147	0	577951	4	0	2000
	Total	2280.211			12		

Table 37- The ANOVA for the differences in sales volume among creative firms

```
. oneway SALESVOL CategCode, tabulate
```

CategCode	Summary of SALESVOL Mean	Std. Dev.	Freq.
1	6067	20930	7,459
2	2518	39873	89,086
3	124	724	17,037
4	3209	20942	48,108
5	3119	17505	39,237
6	35	856	11,775
7	1196	9734	31,274
8	1183	9978	27,293
Total	2280	26052	271,269

Analysis of Variance

Source	SS	df	MS	F	Prob > F
Between groups	3.8926e+11	7	5.5608e+10	82.11	0.0000
Within groups	1.8372e+14	271261	677273795		
Total	1.8411e+14	271268	678691265		

```
Bartlett's test for equal variances:  chi2(7) =  3.0e+05  Prob>chi2 = 0.000
```

The ANOVA test for the differences in the average sales volume for the different categories of creative firms delineates a statistically significant model, where most of the firm categories show a difference of low or high productivity. When compared to all other categories, crafts and jewelry firms have the highest sales volume, which is also significant at the 0.001 level of confidence.

Table 38- The ANOVA coefficients in sales volume among creative firms

```
. pwmean SALESVOL, over(CategCode) mcompare(bonferroni) effects

Pairwise comparisons of means with equal variances

over         : CategCode
```

	Number of Comparisons
CategCode	28

SALESVOL	Contrast	Std. Err.	Bonferroni t	Bonferroni P>|t|	Bonferroni [95% Conf.	Interval]
CategCode						
2 vs 1	-3548.922	313.691	-11.31	0.000	-4528.819	-2569.025
3 vs 1	-5942.643	361.3207	-16.45	0.000	-7071.324	-4813.961
4 vs 1	-2858.028	323.8483	-8.83	0.000	-3869.654	-1846.401
5 vs 1	-2947.507	328.7258	-8.97	0.000	-3974.369	-1920.645
6 vs 1	-6031.515	385.1201	-15.66	0.000	-7234.54	-4828.49
7 vs 1	-4871.013	335.3441	-14.53	0.000	-5918.549	-3823.476
8 vs 1	-4883.702	340.0213	-14.36	0.000	-5945.848	-3821.555
3 vs 2	-2393.72	217.6134	-11.00	0.000	-3073.493	-1713.947
4 vs 2	690.8948	147.2436	4.69	0.000	230.9404	1150.849
5 vs 2	601.4153	157.6819	3.81	0.004	108.8541	1093.977
6 vs 2	-2482.592	255.187	-9.73	0.000	-3279.737	-1685.448
7 vs 2	-1322.09	171.0515	-7.73	0.000	-1856.415	-787.7656
8 vs 2	-1334.779	180.0483	-7.41	0.000	-1897.208	-772.3506
4 vs 3	3084.615	232.0158	13.29	0.000	2359.852	3809.378
5 vs 3	2995.135	238.7765	12.54	0.000	2249.254	3741.017
6 vs 3	-88.87226	311.8831	-0.28	1.000	-1063.122	885.3774
7 vs 3	1071.63	247.8089	4.32	0.000	297.533	1845.727
8 vs 3	1058.941	254.1024	4.17	0.001	265.1844	1852.697
5 vs 4	-89.47949	177.0291	-0.51	1.000	-642.4768	463.5179
6 vs 4	-3173.487	267.5745	-11.86	0.000	-4009.327	-2337.647
7 vs 4	-2012.985	189.0352	-10.65	0.000	-2603.487	-1422.483
8 vs 4	-2025.674	197.2134	-10.27	0.000	-2641.723	-1409.626
6 vs 5	-3084.008	273.4576	-11.28	0.000	-3938.225	-2229.79
7 vs 5	-1923.506	197.2745	-9.75	0.000	-2539.745	-1307.266
8 vs 5	-1936.195	205.1244	-9.44	0.000	-2576.955	-1295.434
7 vs 6	1160.502	281.3789	4.12	0.001	281.5405	2039.464
8 vs 6	1147.813	286.9371	4.00	0.002	251.489	2044.137
8 vs 7	-12.68907	215.5715	-0.06	1.000	-686.0838	660.7057

When comparing the number of employees among the different categories of creative firms, the model is again statistically significant, which shows that these differences are meaningful to some extent. With the ad hoc Bonferroni test, the more specified differences are shown in Table

37 below. In the case of the average number of employments, there are more fluctuations, and fewer comparisons are statistically significant. The number of employees in museums and collections is the highest among all these creative categories, significant at the 0.001 level.

Table 39- The ANOVA coefficients in average employee numbers among creative firms

```
. oneway EMPNUM CategCode, tabulate
```

CategCode	Summary of EMPNUM Mean	Std. Dev.	Freq.
1	6	17	7,459
2	11	260	89,086
3	11	53	17,037
4	14	87	48,108
5	18	236	39,237
6	20	154	11,775
7	8	66	31,274
8	4	23	27,293
Total	12	183	271,269

Analysis of Variance

Source	SS	df	MS	F	Prob > F
Between groups	4915712.83	7	702244.691	21.09	0.0000
Within groups	9.0330e+09	271261	33299.9123		
Total	9.0379e+09	271268	33317.1742		

```
Bartlett's test for equal variances:  chi2(7) =  2.5e+05  Prob>chi2 = 0.000
```

Table 40- The ANOVA coefficients in the average employee numbers among creative firms

```
. pwmean EMPNUM , over(CategCode) mcompare(bonferroni) effects

Pairwise comparisons of means with equal variances

over         : CategCode
```

	Number of Comparisons
CategCode	28

EMPNUM	Contrast	Std. Err.	Bonferroni t	Bonferroni P>|t|	Bonferroni [95% Conf.	Interval]
CategCode						
2 vs 1	5.172023	2.199588	2.35	0.524	-1.698975	12.04302
3 vs 1	4.409927	2.533566	1.74	1.000	-3.50434	12.32419
4 vs 1	7.557815	2.270811	3.33	0.024	.4643321	14.6513
5 vs 1	11.66858	2.305012	5.06	0.000	4.468268	18.8689
6 vs 1	13.7193	2.700447	5.08	0.000	5.283735	22.15486
7 vs 1	1.978258	2.351419	0.84	1.000	-5.367025	9.323541
8 vs 1	-2.578928	2.384215	-1.08	1.000	-10.02666	4.868803
3 vs 2	-.7620962	1.525896	-0.50	1.000	-5.528639	4.004446
4 vs 2	2.385791	1.032466	2.31	0.584	-.8393902	5.610973
5 vs 2	6.496562	1.105659	5.88	0.000	3.042742	9.950381
6 vs 2	8.547274	1.789361	4.78	0.000	2.957729	14.13682
7 vs 2	-3.193765	1.199406	-2.66	0.217	-6.940428	.5528976
8 vs 2	-7.750951	1.262492	-6.14	0.000	-11.69468	-3.807223
4 vs 3	3.147888	1.626885	1.93	1.000	-1.93412	8.229895
5 vs 3	7.258658	1.674291	4.34	0.000	2.028565	12.48875
6 vs 3	9.30937	2.186912	4.26	0.001	2.477971	16.14077
7 vs 3	-2.431669	1.737626	-1.40	1.000	-7.859605	2.996267
8 vs 3	-6.988855	1.781756	-3.92	0.002	-12.55464	-1.423067
5 vs 4	4.11077	1.241321	3.31	0.026	.2331751	7.988365
6 vs 4	6.161482	1.876222	3.28	0.029	.3006049	12.02236
7 vs 4	-5.579557	1.325508	-4.21	0.001	-9.720132	-1.438982
8 vs 4	-10.13674	1.382852	-7.33	0.000	-14.45645	-5.817036
6 vs 5	2.050712	1.917473	1.07	1.000	-3.939026	8.04045
7 vs 5	-9.690327	1.383281	-7.01	0.000	-14.01137	-5.369282
8 vs 5	-14.24751	1.438324	-9.91	0.000	-18.7405	-9.754525
7 vs 6	-11.74104	1.973017	-5.95	0.000	-17.90428	-5.577795
8 vs 6	-16.29822	2.011991	-8.10	0.000	-22.58321	-10.01324
8 vs 7	-4.557186	1.511578	-3.01	0.072	-9.279002	.1646311