

DISSERTATION

ESSAYS ON LOCAL ECONOMIC DEVELOPMENT AND SOCIAL CAPITAL

Submitted by

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ABSTRACT

ESSAYS ON LOCAL ECONOMIC DEVELOPMENT AND SOCIAL CAPITAL

Creative Sector activities and social capital are interconnected in the same spectrum of local economic development, even though is not always immediately apparent. The two are related in that social capital is a product of, and simultaneously a determinant for, the Creative Sector. The three essays in this dissertation address each component separately. The first two essays examine the Creative Sector, and the third focuses on social capital.

Motivated by the increasing role of the role of Creative Sector as growth driver and the economic base approach, in Chapter 1 titled *Role of Creative Initiatives in Economic Performance: Case Study on Colorado's Creative Districts and Main Street Communities* I examine the influence of Colorado's place-based initiative / policy on economic performance. Two dependent variables are chosen to represent performance, namely Business Establishments and Net Job Creation. In addition, sectoral employment (the Creative Sector and NAICS sector 71 (Arts, Entertainment and Recreation) and employment in sectors outside of the two) are examined as a supplement; for the placed-based policy, Creative District Certification program and the Main Street Communities program are selected, along with a set of control variables and a set of interaction terms that signify co-existence of the two policies in any particular county. The data used in estimation is a panel dataset for Colorado's 64 counties in a ten-year period (2010 – 2019).

Results indicate that both place-based initiatives affect business establishments but not their birth rates, but each influence is opposite direction; co-location of the two is also playing a role, which is positive in Urban areas but negative in Rural areas. Job creation is positively influenced by the MS Communities program in the Rural region but not by Creative District certification program. Creative Sector employment is slightly negatively influenced by the initiatives; in contrast, they do not influence employment in either

Sector 71 or Other Sectors. The results suggest that the two initiatives are beneficial, but each for different types of counties.

Chapter 2, titled *Sectoral Employment Spillover in Colorado*, focuses on spatial spillover effects of employment in two leading industrial sectors – namely the Arts, Recreation and Entertainment (NAICS 71 or Sector 71) and the Creative Sectors – on employment in Other Sectors in Colorado, based on the Economic Base Theory. The analysis is performed using county-level Quarterly Census of Employment and Wages (QCEW) data. The study aims at answering the question of whether sectoral employment in one county affects that in a neighboring county (in other words, whether spatial correlation exists). Moreover, the analysis also examines how sectoral employment (Creative Sector and Sector 71) in one county influences employment in sectors outside the two, in different counties; this is the employment spillover question.

Two variations of model specifications are tested, examined spatially and non-spatially, using lagged variables in one model and lagged log variables in another. The result suggests that overall, the two sectoral employments do influence Other Employment, but the spatial spillover is not detected. More specifically, the Creative Sector is negatively associated with the next period's employment in Other Sectors in both models. However, the significance of Sector 71 employment's relationship with employment in Other Sectors depends on how it is modeled.

Social Capital is discussed in Chapter 3, *County Level Social Capital in Colorado*. While social capital is acknowledged as being a fuzzy concept, it embeds both demand and supply side within itself. While the demand side typically addresses how social capital affects other dimensions in economics, Chapter 3 here focuses on the supply side, by inquiring how social capital at county level in Colorado is affected by various socio-economic aspects. The discussion covers various standpoints of social capital contexts and definitions that are indicative of the fuzziness of the concept itself.

Empirically, I employ a quantitative measure of social capital in the form of an index portraying civic participation (developed by Rupasingha et al. (2006)). A short panel regression was performed using a series of explanatory variables (physical infrastructure, poverty, unemployment, personal and regional incomes, education, and an economic recession). The results indicate that poverty and economic shock have the tendency to reduce social capital in Colorado in the form of civic engagement particularly in Urban regions, while larger pool of the unemployed in the society indicates a positive relationship with civic participation. Physical infrastructure, proxied by new housing permits, is negatively associated with civic participation in all three regions.

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DEDICATION

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Introduction: Link Between the Creative Industry and Social Capital

To many, the title of this dissertation may seem to cover two unrelated topics (the Creative Sector and social capital). The two lie in a multidimensional platform in which the connection between the Creative Sector (or industry) and social capital can be felt in community life. Yet, it is often misunderstood as each construct is not well defined in nature. This dissertation explores the economic notions in the Creative Sector and in the realm of social capital distinctively.

To start, I highlight that connection based on a collection of studies on the topic matter. These studies provide linkages between the Creative Sector (or creative activities / industries) and social capital and how they influence one another. Since both can have different construct and / or context, it is important to realize that any indication of relationships is based on those differences. As such, the impact channels that link them may also be very contextual; that is, it is likely impossible to culminate in an outcome that can span across all contexts. For example, social capital constructed out of trust variables may yield a different outcome from that based on community participation. Several relationship channels are mentioned here: knowledge spillover, entrepreneurship, and collective action.

Khaksar (2023) wrote a meta-analysis on how social capital is linked to the Creative Sector via the channel of knowledge management systems. The manuscript elaborates on the definition of Creative Sector, knowledge management and spillover, and the central role of social capital (based on the works by Mayasari & Chandra (2020), Cohen & Prusak (2001), Light & Dana (2013), Chuluunbaatar et al. (2014), McElroy et al. (2006), and Subramaniam & Mark (2005), among many others). In essence, the study explores how social capital influences the Creative Sector.

The said channel can be viewed from different angles. First, social capital facilitates interpersonal contacts that can lead to knowledge formation, which is a social activity. This helps build knowledge-based industries, including the Creative Sector. Second, social capital helps empower the community, leading to

better utilization of local potential, habits, and norms; this improved utilization is one of the building blocks of the Creative Sector. Third, from a more horizontal or side-by-side perspective, social capital can coexist with cultural capital; many cultures depend on social capital to thrive. Fourth, social capital facilitates cooperation and exchange of ideas that foster entrepreneurship, which in turn supports the development in the Creative Sector. In essence, social capital and the creative industry are more closely related than one might have thought. Social capital is a bridge that allows for knowledge exploration through community relationships and connections that will culminate in the production of creative products and ideas.

From a different perspective, Westlund et al. (2014) argues that both creative activities and social capital affect economic performance of a region, not only directly, but also through their influence on each other. In their study, social capital can be both a supporting and hindering factor for innovation, entrepreneurship, conducive creative environment. The following diagram depicts the spectrum that links social capital and creative industries.

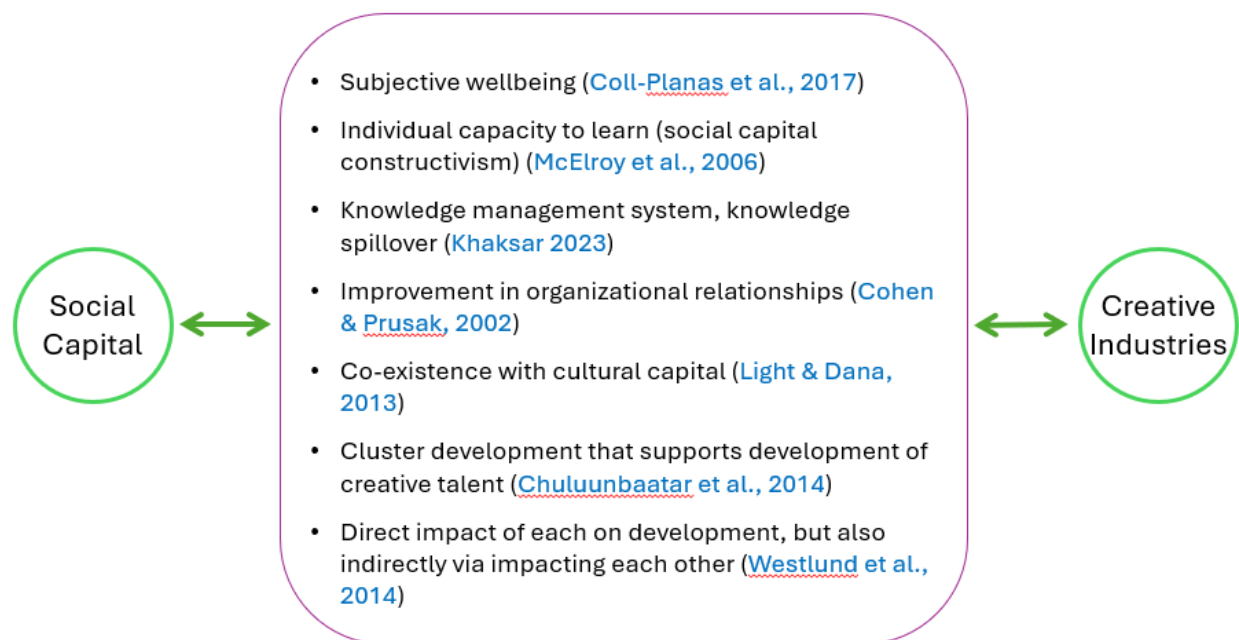


Figure 0.1. Social Capital - Creative Sector Linkage

The impact mechanisms between creative industries (or Creative Sector) and social capital materialize in various levels, starting from individual level in the form of subjective wellbeing and learning capacity, followed by a broader level such as production units. These can occur in the form of knowledge spillover and organization systems and improvement in business relationships. The broadest environment can be in the form of how social capital co-exist with cultural capital, which leads to their impact on creative activities, and development of creative clusters that houses creative talents.

It is apparent that the impact on economic development coming from social capital and the Creative Sector themselves are magnified by how the two realms influence one another. Coming from that interconnectedness, the exposition in this dissertation looks at the Creative Sector and social capital from a relatively more focused economic theory standpoint, while at the same time acknowledging the interconnectedness between them.

1 Role of Creative Initiatives in Economic Performance- Case Study on Colorado’s Creative Districts and Main Street Communities

1.1 Introduction

In recent years, the State of Colorado has witnessed increasing emphasis on development of Creative Districts through the Creative Districts Certification program, and other community-based development initiatives such as the Main Street Communities program. Such programs aim at inducing economic growth via Creative Sector and urban revitalization. This study empirically examines the impact that Creative Districts and Main Street Communities generate on economic viability in Colorado counties. The interconnectedness between community initiatives and economic development (Thornton (2012), Brooks & Kushner (2001), Richards (2020), Florida (2014), and Smit (2011)) is an underlying argument for this research.

Creative Districts (CD) in Colorado is a certification program that started in 2012, based on the State Bill in 2011. For the period of this study (2010 – 2019), there were 26 CDs incorporated. Thereafter four more CDs have been designated, and it continues to expand.¹ The program’s primary goal is “....to help communities increase jobs, incomes, and investment in creative places” (Colorado OEDIT (n.d.))². The certification provides financial awards, guidance in marketing strategies, and designated highway signs, to name a few³. To receive the designation (and grants that come with it), counties must be invited into the program and screened; accordingly, certified districts then need to reapply after 5 years.

¹ <https://www.colorado.com/articles/colorado-creative-districts>

² <https://oedit.colorado.gov/colorado-creative-districts>

³ A detailed guide to Creative District Certification can be found at <https://oedit.colorado.gov/colorado-creative-districts>.

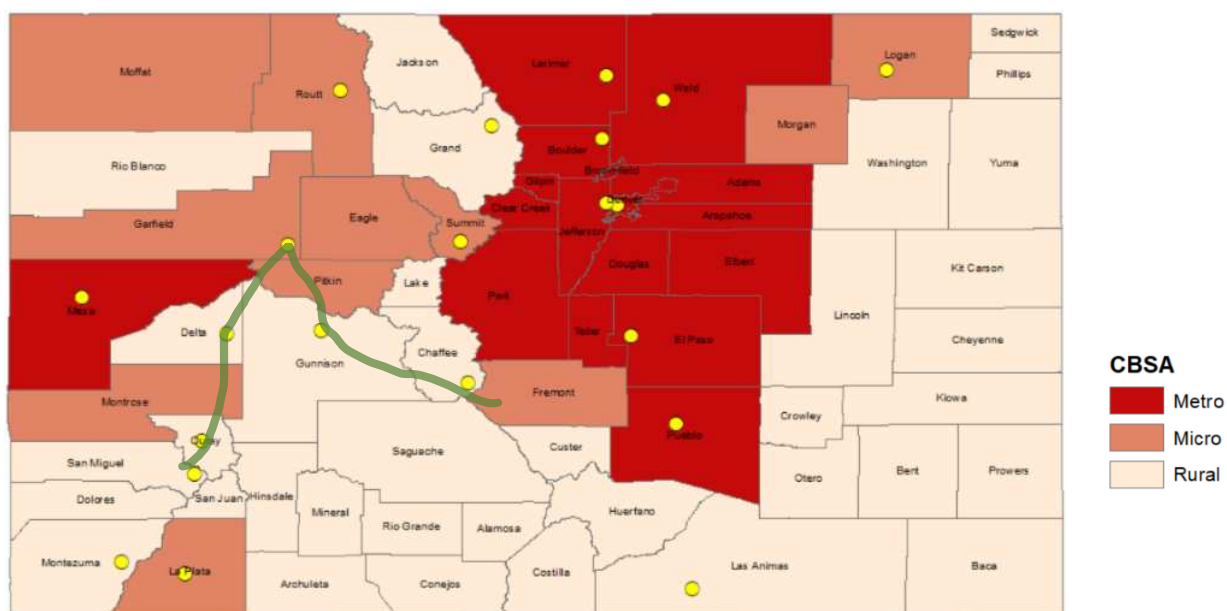


Figure 1.1. Colorado's Creative Districts

Source: Rendering of data from Colorado's OEDT. The green path depicts *Colorado Creative Corridor* exploration trail.

Figure 1.1 illustrates the distribution of Creative Districts across Colorado; these Creative Districts are scattered in both metropolitan and urban regions. The yellow dots pinpoint the geolocations of the creative districts⁴. Creative Districts have been designated to various counties, starting in 2012. Altogether there are 13 Creative Districts in the metropolitan area, 5 in micropolitans, and 8 in rural counties⁵, as described in Table 1.1. Some of the counties (Denver, El Paso and Larimer) each have more than one Creative District within their vicinity.

⁴ Some counties have more than one Creative District; however, since they are located in close proximity to one another, they are not visible in this map. For example, in Denver County there are four Creative Districts, but represented here as one single dot. Larimer county and El Paso County each has two Creative Districts.

⁵ Core-based Statistical Area (CBSA) are defined around urban clusters of 10,000 population or more. In CBSA, Metropolitan Statistical Areas (MSAs) are based on urbanized areas of 50,000 population or more, and Micropolitan Statistical Areas (MSAs) are based on urban clusters of at least 10,000 but not more than 50,000 population. Both include the surrounding county and may include other counties based on commuting patterns as determined by journey-to-work statistics (currently from Census 2000). Schaffer (2020)'s Appendix describes the development of this standard starting in 2000 when it was adopted to define metropolitan areas.

⁵ I note here that the creative class is classified as part of industries, although for empirical purposes, occupation classifications are separate from industry classification.

Table 1.1. Colorado Certified Creative Districts (2012 – 2019), Ranked by Year Established

	County	County seat	Multiple CD	Creative District	CD Zip Code	Year Certified	CBSA Region
1	Chaffee	Salida		Salida CD ****	81201	2012	Rural
2	Denver	Denver	*	Denver's art district on Santa Fe	80204	2012	Metro
3	San Miguel	Telluride		Telluride Arts District	81435	2012	Rural
4	Delta	Delta		North Folk Valley CD ****	81428	2013	Rural
5	Las Animas	Trinidad		Corazon de Trinidad Historic District	81082	2013	Rural
6	Ouray	Ouray		Ridgway CD ****	81432	2013	Rural
7	Boulder	Boulder		Downtown Longmont CD	80501	2014	Metro
8	Denver	Denver	*	Rino Arts District	80216	2014	Metro
9	El Paso	Colorado Springs	**	Downtown Colorado Springs CD	80903	2014	Metro
10	Jefferson	Golden		40 West Arts District	80214	2014	Metro
11	Pueblo	Pueblo		Pueblo Creative Corridor	81003	2014	Metro
12	Weld	Greeley		Greeley CD	80631	2014	Metro
13	Denver	Denver	*	Golden Triangle CD	80204	2016	Metro
14	Garfield	Glenwood Springs		Carbondale CD ****	81623	2016	Micro
15	Gunnison	Gunnison		Crested Butte CD ****	81224	2016	Rural
16	Larimer	Fort Collins	***	Fort Collins CD	80524	2016	Metro
17	Montezuma	Cortez		Mancos CD	81328	2016	Rural
18	Summit	Breckenridge		Breckenridge Arts District	80424	2016	Micro
19	Denver	Denver	*	Westwood CD	80219	2017	Metro
20	El Paso	Colorado Springs	**	Manitou Springs CD	80829	2017	Metro
21	Routt	Steamboat Springs		Steamboat Springs CD	80477	2017	Micro
22	Grand	Hot Sulphur Springs		Grand Lake CD	80447	2018	Rural
23	Mesa	Grand Junction		Downtown GJ CD	80501	2018	Metro
24	La Plata	Durango		Durango CD	81301	2019	Micro
25	Larimer	Fort Collins	***	Loveland CD	80537	2019	Metro
26	Logan	Sterling		Sterling CD	80751	2019	Micro

Source: Colorado Office of Development and International Trade (OEDIT).

Notes:

* / ** / *** Counties that have more than 1 CD.

**** CDs that are part of Colorado's Creative Corridor, aimed at developing rural destinations via a 331-mile exploration trail.

Colorado's *Main Street Communities* is a local initiative that serves as a bottom-up development mechanism relying on self-reliance, resilient business practices and local empowerment⁶. The main tools employed in this program is community-led downtown revitalization. The program is aimed at revitalization of smaller towns in Colorado, including historic buildings, pedestrian-oriented streets, street furniture, sidewalks, signs, landscaping, with a longer-term goal to promote a positive image of the town's commercial district as a business as well as living communities, and enhance business competitiveness to support economic vitality. The official Main Street Communities have access to technical assistance, consulting services, training, mini grants, and scholarships. Out of the 23 Communities, most are located in rural counties (12), followed by metropolitans (7) and micropolitans (4). Figure 1.2 and Table 1.2 below detail the distribution of the MS Communities⁷.

Different from the CD Certification program that is administered in a top-down fashion (i.e., counties must be invited into the program), Main Street Communities involvement is acquired through applying to the program after fulfilling a series of requirements. Alternatively, towns can also apply to be a MS Affiliate, which does not have any requirements.

⁶ MS Communities program is managed by the Department of Local Affairs, while Creative Districts Certification is managed under Colorado Creative Industries. Both offices are branches of Colorado's Office of Economic Development and International Trade (OEDIT).

⁷Detailed information on what the Main Street Communities program offers can be found at <https://dlg.colorado.gov/main-street>.

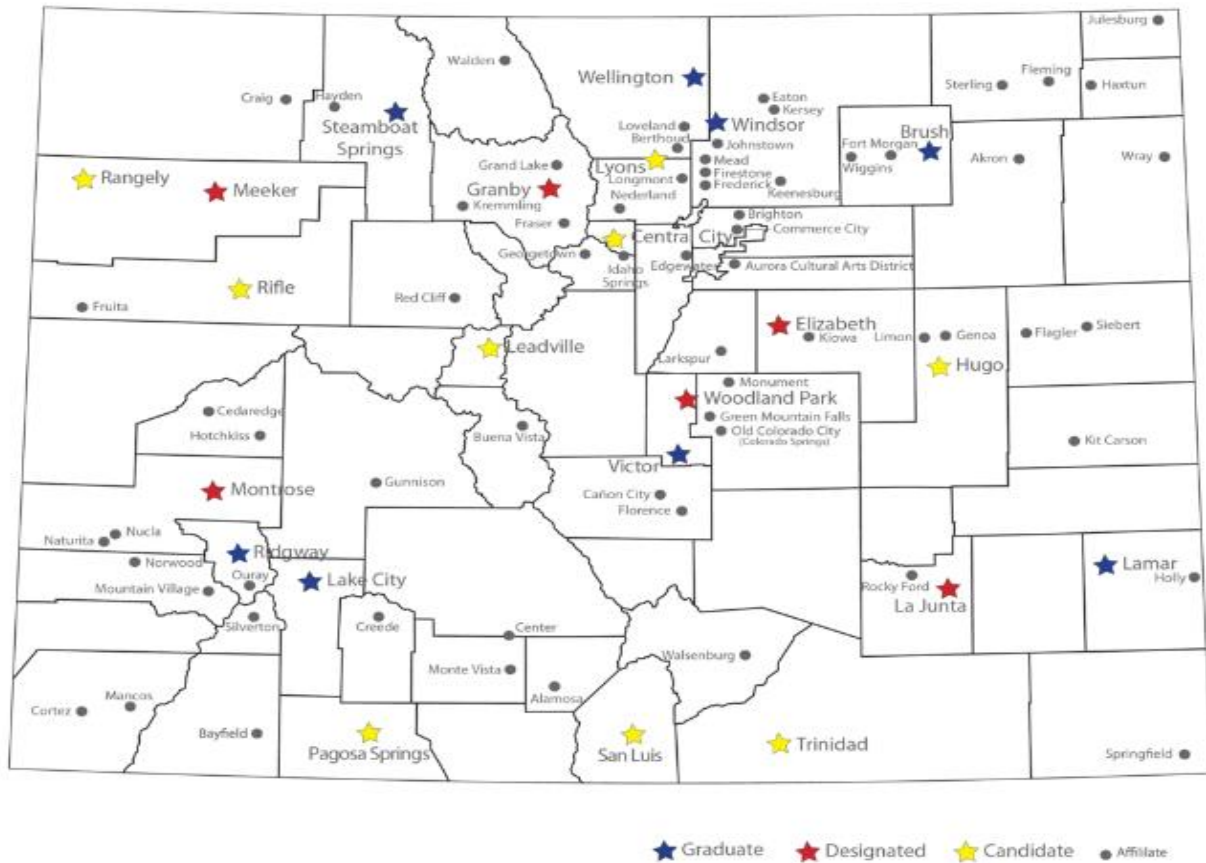


Figure 1.2. Locations of Main Street Communities

Source: <https://cdola.colorado.gov/main-street-communities> Colorado Department of Local Affairs (2024).

Note: DOLA has changed the designations of MS Communities, which are now ‘Exceptional’, ‘Excelling’, and ‘Achieving; see Table 1.2.

As Table 1.2 shows, many of the counties that are developing their Main Street Communities are also designated as Creative Districts. It is therefore in our interest to examine the nature of their conjunction or complementarity in impacting business viability in the county.

Table 1.2. Main Street Communities in Colorado, Ranked by Year Established

	MS Community	County	CBSA	Classification	MS Year Established	Creative District in County	CD Year Established
1	Brush	Morgan	Urban Core		2001		
2	Lake City	Hinsdale	Rural	★ ★	2005		
3	Steamboat Springs	Routt	Urban Core	★	2006	Steamboat Springs CD	2017
4	Granby	Grand	Rural	★	2008	Grand Lake CD	2018
5	Rifle	Garfield	Urban Core	★	2009		
6	Lamar	Prowers	Rural	★	2009		
7	Lyons	Boulder	Urban Core		2010	Longmont CD	2014
8	Montrose	Montrose	Urban Core	★	2012		
9	Ridgway	Ouray	Rural	★	2012	Ridgway FUSE (recently renamed)	2013
10	Victor	Teller	Urban Core	★	2012		
11	Trinidad	Las Animas	Rural	★	2013	Corazon de Trinidad Historic District	2013
12	Woodland Park	Teller	Urban Core	★	2014		
13	Central City	Clear Creek	Urban Core		2015	Georgetown Heritage Center & Cultural Arts	2020
14	Elizabeth	Elbert	Urban Core	★	2015		
15	Leadville	Lake	Rural	★	2015		
16	Wellington	Larimer	Urban Core	★ ★	2015	Fort Collins CD, Loveland CD	2016 2019
17	Windsor	Larimer & Weld (Home Rule)	Urban Core	★ ★	2016	Fort Collins CD, Loveland CD, Greeley CD	2016 2019 2014
18	Meeker	Rio Blanco	Rural	★	2016		
19	La Junta	Otero	Rural		2018	La Junta	2021
20	Hugo	Lincoln	Rural		2020		
21	Rangely	Rio Blanco	Rural	★	2020		
22	San Luis	Costilla	Rural	★	2021		
23	Pagosa Springs	Archuleta	Rural	★	2023		

Rural = 12
 Urban Core = 11
 ★ = Exceptional
 ★ = Excelling
 ★ = Achieving

The research questions of this study are the following. (1) Do Colorado's Creative Districts play a role in the economic performance of its counties? (2) In a similar fashion, do Main Street Communities play an economic role? (3) Are there any meaningful differences in economic impacts when both initiatives

co-locate in a county? and (4) Do per capita income and agglomeration effect support the economic role of the two place-based initiatives?

County economic development / economic growth in this study is seen in context of economic / business vitality. As such, I measure it through job creation and establishment birth rates. Establishment birth rate looks at the emergence of local business establishments (not businesses per se – in our context I acknowledge the fact that a business can have more than one establishment to operate, and economic vitality can occur in expansion / addition of those establishments, while the business units themselves may or may not increase in number). Our two primary explanatory variables (Creative Districts and Main Street Communities) are conjectured to generate significantly positive impacts on job creation and business establishments rate, as aimed in their respective objectives. Empirically, I employ a panel dataset with Colorado counties as the unit of analysis for 2010 to 2019. With that approach I hope to contribute a systematic empirical analysis of community initiatives in Colorado that highlights the conjunction of two community development programs. The estimation outcome can serve as basis for formulating further necessary steps to develop the two programs.

The contributions to economic literature are (a) the construction of an empirical study at county level. To my knowledge, this study has not been conducted before. (b) the framework of combining two different place-based policies (or initiatives, depending on one's viewpoint) into coherent estimation. As previously mentioned, Creative Districts Certification program is more top-down in essence, while the Main Street Communities program is the opposite.

This essay continues as follows. In section 2 I explore the relevant literature, focusing on cultural districts as a tool for development (and redevelopment) and cultural / creative economy in general. Conceptual framework and empirical approach will be presented in sections 3 and 4, respectively. Section 5 discusses the results and Section 6 concludes.

1.2 Literature Review

In this section I explore various definitions of the Creative Sector leading to the particular one used in this study, the formal definition of Sector 71, and the studies linking them to economic development.

1.2.1 Definitions of the Creative Sector

The definition aspect can differ widely, depending on whom or which institution / organization is setting up that classification. In general, Creativity refers to “...*the capacity to find innovative solutions to problems, to create new products or processes*” (Bowen et al. (2008)), which is quite broad in context. Focusing on the neighborhood-level analysis, Jackson et al. (2003) is more specific in stating that “Definition of art, culture and creativity depend on the cultural values, preferences, and realities of residents and other stakeholders in a given community”, despite not specifying industry categories that constructs their understanding of the Creative Sector. For the purpose of quantitative studies, the context and definition of the Creative Sector also differs between studies; Seman & Carroll (2017) adopted US Bureau of Labor Statistics’ classification of the sector (based on NAICS categories), while in Harris et al. (2013), it is stated that “...*In some US states, the term Creative Economy is determined and analyzed at state-wide level; in some states, it is analyzed at the local level (city, county, or regional); in many other states, the creative economy is not defined*”.

Markusen et al. (2008) suggested that a nested definition of creative industries is necessary to approach the context. In her analysis for the New England region, three studies are adopted in terms of conceptualizing the cultural sector: the New England Creative Economy Project (NEFA), Americans for the Arts (AFTA), and University of Minnesota’s Project on Regional and Industrial Economies (PRIE). AFTA began its Creative Industries project in 2004 to demonstrate the significance of cultural business in the US as it is considered the umbrella group for arts funding and policy advocates at all levels in the US government system (state, local, and federal). It quantified and mapped arts-centric businesses and employment at the local, state, and national levels, providing data to arts and community leaders.

I also note here that in her study, the creative and cultural sectors are used somewhat differently from our purpose; in this paper, the term *cultural sector* is more closely linked to Sector 71 (Arts, Entertainment and Recreation), while in Markusen's paper, the cultural sector is framed as Cultural industries are those "... employing many workers whose work does not involve creative tasks"; it also includes for-profit, non-profit, and public establishments that produce cultural goods and services. In this study, I follow Seman & Carroll's (2017) (i.e., BLS) classification of the Creative Sector.

1.2.2 Definition / scope of the Arts, Entertainment and Recreation Sector

The scope and definition of this sector is much more streamlined compared to that of the Creative Sector. NAICS definition for Sector 71⁸ is

"The Arts, Entertainment, and Recreation sector includes a wide range of establishments that operate facilities or provide services to meet varied cultural, entertainment, and recreational interests of their patrons. This sector comprises (1) establishments that are involved in producing, promoting, or participating in live performances, events, or exhibits intended for public viewing; (2) establishments that preserve and exhibit objects and sites of historical, cultural, or educational interest; and (3) establishments that operate facilities or provide services that enable patrons to participate in recreational activities or pursue amusement, hobby, and leisure time interests. Some establishments that provide cultural, entertainment, or recreational facilities and services are classified in other sectors. Excluded from this sector are: (1) establishments that provide both accommodations and recreational facilities, such as hunting and fishing camps and resort and casino hotels are classified in Subsector 721, Accommodation; (2) restaurants and night clubs that provide live entertainment in addition to the sale of food and beverages are classified in Subsector 722, Food Services and Drinking Places; (3) motion picture theaters, libraries and archives, and publishers of newspapers, magazines, books, periodicals, and computer software are classified in Sector 51, Information; and (4) establishments using transportation equipment to provide recreational and entertainment services, such as those operating sightseeing

⁸ <http://www.vtlmi.info/naicsdef.cfm?naics=71>

buses, dinner cruises, or helicopter rides are classified in Subsector 487, Scenic and Sightseeing Transportation.”

The US Bureau of Labor Statistics also uses NAICS classification⁹:

“The arts, entertainment, and recreation sector is part of the leisure and hospitality super-sector. The Arts, Entertainment, and Recreation sector includes a wide range of establishments that operate facilities or provide services to meet varied cultural, entertainment, and recreational interests of their patrons.”

As mentioned previously, in many cases there appears to be close similarity between Sector 71 and the “cultural” sector, such as in Beyers (2008). In terms of how it compares to the Creative Sector, Markusen et al. (2008) asserted that “... *creative economy is broader than cultural economy, since the former includes also science, engineering, computing, and education sectors, while the latter does not (at least in this paper's context)*”.

Our context of Colorado’s Creative Districts is the notion of cultural economy, in which Creative Districts can be regarded as a subset of. Katz & Wagner (2014) referred to these regions as “innovation districts” serving as leader in developing new businesses and employment opportunities. In terms of area development, creative districts are often seen as tools for urban development and redevelopment. For example, the case study of Omaha, Nebraska highlights the role of music venues in supporting the downtown’s redevelopment project (Seman, 2010). The music industry is considered a pull-factor for local employment as it utilizes local independent music artists, which in turn acted as catalyst for redevelopment in the area. In addition, the cultural sector, or the music industry, also generates positive externalities from the interaction of skilled workforce and the clustering of cultural activities (Seman, 2015). A similar study from China also examined how the cultural sector affects economic outcome via tourism, particularly intention to revisit the area (Lai et al., 2021). A stimulus-response framework underlies a survey conducted to solicit behavioral attitudes, and the estimation result from structural equation modelling indicates that

⁹ <https://www.bls.gov/iag/tgs/iag71.htm>

cultural contact positively influences tourists' intention to revisit. This signifies the importance of cultural or creative activities in sustaining future consumption spending in the area.

In a different context, Seman & Carroll (2017) conducted a comparative analysis of creative economies in Texas metropolitan areas in how they are affected by the economic recession of 2008. The essence is that there can be a two-way impact mechanism in which the creative / cultural sector affects the broader economy, and vice versa. Focusing closer on the creative clusters in urban areas, Smit (2011) argues that redevelopment in terms of visual quality of neighborhoods supports creative entrepreneurship and can be an important tool in urban planning. Her study is based on interviews with entrepreneurs in the Netherlands. While being qualitative research, this suggests a different impact channel of the Creative Sector in impacting economic outcome.

Creative placemaking is another important concept that bridges neighborhood characteristics such as physical structure and social treats with area performance such as livelihood and economic growth. Markusen & Gadwa (2010) argues that revitalization of neighborhoods will bring impacts that are routed via job and income creation which will dynamically foster innovation of new products and attract more workers. Their extensive study involves 14 case studies involving 2 million creative workers.

Creative districts or clusters can also play an economic role in their capacity as cultural amenities. McGranahan & Wojan (2007) argues that the creative class theory (Florida, 2002) holds by testing artistic employment at the county level and supplement it with using its residuals to show different economic dynamism (involving opportunities for marginalized workers to step up the career ladder). Their study involves testing a hypothesis that the same unobservable factors affecting influxes of Bohemians also influence local economic dynamism¹⁰. Florida's "3-T" argument (Technology, Talent and Tolerance) asserts that creative environment / amenities will be the primary factor that attracts high-skilled workers ("Talent") and eventually the presence of high-skilled workers will attract more of the kind (Florida, 2014). In

¹⁰ Bohemians here refer to artistic workers in the visual, performing arts and authors). Economic dynamism refers to the opportunities for creative workers to improve upon their careers.

McGranahan & Wojan (2007)'s study, their simultaneous equation model suggested that creative class occupations strongly influenced employment growth. More specifically, higher concentration of artistic amenities correlates with higher concentration of artist locations, supporting Florida's creative class theory. In addition, wider ethnic diversity is also associated with greater diversity in arts production. Recognized for its usefulness, Florida's "3T" approach was later measured for and ranked among 139 nations worldwide into the Global Creativity Index (GCI) (Florida et al., 2015), indicating the importance of creative class and creative amenities in shaping economic growth.

Artistic dividend is an important notion related to the contribution of artists or the Creative Sector to the local economy. While many growth models based on artistry or creative economy employ the export concept or multiplier effect, the fact is that many aspects of the creative economy are not accounted for because of measurement difficulties. For example, when artistic or creative goods are sold in the local market, they do not count as export-generating. The resident artist thus is not counted as being part of the economic base (Markusen & Schrock, 2006). The economic contribution of the creative industry is often underestimated, and the multiplier effect calculated is lower than it is. This understatement of economic impact needs to be considered in evaluating the impact of the Creative Sector.

1.3 Conceptual Framework

This study examines the contribution of the Creative Sector in the form of Creative Districts to employment creation. The underlying framework for this research comes from a few standpoints.

First, a blend of creative class and amenities based on Richard Florida's creative class theory (Florida (2002, 2014)). This theory states two important aspects, namely that the creative class is the backbone of innovative industries, and that local amenities play an important role in attracting creative and skilled workers into the area. In my study, creative districts (and the local initiatives such as Main Street Communities) can serve as local amenities. The clustering of creative workers in the area will induce agglomeration of businesses which will further be a pull factor for more in-migration of skilled and/or

creative workers. In addition, the arts and culture dimensions in creative economy also present some symbolic and experiential aspects serving as amenities attractive to workers; for example, the presence of a renowned art museum symbolizes or represents creative amenity in a city (Currid (2009), Seman & Carroll (2017)).

Second, the role of the Creative Sector as a growth driver. In this context, there are a couple of arguments that are worth consideration. According to Lloyd & Clark (2001), arts and culture can help the Creative Sector to secure its role as an “entertainment machine” that fosters economic growth. Other impact mechanisms that would also trigger employment include formation of physical capital, such as building cultural / artistic infrastructure (Seman & Carroll, 2017), establishment of cultural institutions that symbolizes commercial activities, such as a performance hall or the label of “Music City USA” in Memphis, Tennessee (Strom, 2002), and production of creative goods and services (Pratt & Hutton, 2013). The latter also involves a notion of a general equilibrium feedback effect: the Creative Sector induces the larger economy, which further provides support for other industries including the creative industry, and so on). From a different standpoint, local consumption of the creative goods will also be exported to other markets via the tourism sector (Scott (2000), Markusen & Schrock (2009)). These articles are important for this research in that they pinpoint various impact channels for the Creative Sector’s impacting economic outcomes.

Third, the approaches of Economic Base and Tourism-Led Growth Hypothesis (TLGH). The Economic Base approach (Krikelas, 1992), states that a “base” sector can induce production (and employment) in the non-base sector, and together they will contribute to economic growth through a multiplier effect. This model, albeit older, is still considered relevant for modern times as an export-led growth approach (Schaffer, 2020). Implementation in international trade models such as by Balassa (1978) confirms the relevance of exports in triggering efficiency of local factors of production and contributing to economic output. The TLGH approach is more stylized than the Economic Base model and is considered a derivative of the export-led growth framework; although it is also essentially a Keynesian concept, it is an

empirical time-series model that tests the relationship between tourism sector and economic growth, and further supplemented with a causality test (Watson & Deller, 2022). Developed for Spain by Balaguer & Cantavella-Jorda (2002), the model examined whether tourism industry could be a long run growth driver. While some studies have indicated that tourism can be both welfare-improving and welfare-reducing under different circumstances (Hazari & Kaur (1995), Hazari & Ng (1993)), under the time-series specification and cointegration methodology, their study found a positive long-run correlation between tourism and economic growth. Granger causality test confirmed that tourism affects Spain's economic growth unidirectionally. Employment impacts are used as proxy for economic growth while creative districts represent the Creative Sector. A meta-study by Brida et al. (2016) comprises 95 papers from tourism and international economics journals and identified main impact mechanisms, which include income multiplier, tax revenues, leakages, and inter-sectoral spillover effects. The theoretical foundation of TLGH is the Keynesian demand-side function and neoclassical supply-side production function of standard labor and capital, adding tourism as the export component. In addition, endowment of natural resources increases the likelihood of tourism's contribution to growth. All 95 studies employed time-series estimation, ranging from vector error correction models, autoregressive distributed lag model, Granger causality, and cointegration. Most of them show evidence of unidirectional impact of tourism on economic growth in both short and long run, and a portion suggests the opposite direction; only a small fraction indicates no causality or no support for TLGH, or bidirectional causality. The robustness of the TLGH framework makes it substantial in motivating my research method, in which I examine the employment impact of creative districts. The way creative districts operate can be regarded as similar to that of tourism.

1.4 Empirical Approach

This study examines the economic role of the two community initiatives, the Creative Districts and Main Street Communities. These two are seen as a representation of creative activities which are believed to have impacts on the surrounding economy similar to other creative activities such as music and art, which

are documented widely. For example, Beyers et al. (2004) estimated economic impacts (multipliers) of the music sector on Seattle's economy using input-output analysis. As such, a comprehensive input-output approach is a common framework used in measuring economic impacts. The study also made a comparison of similar approaches conducted in other different cities such as Chicago and Nashville.

A different framework was employed by Lorenzini (2011) that identified factors affecting the local production of extra-urban cultural districts in Italy. The notion of "extra-urban" in the study refers to rural regions that rely on place-based policies related to cultural clusters. The study highlights several important aspects such as (1) competitive cultural activities can satisfy local demand as well as serve as inputs for productive processes in other areas; (2) private entrepreneurs in the sector (such as artists) rely on local demand to generate sufficient returns; and (3) the success of the cultural sector as growth engine also depends on inter-industry linkages (both vertical and horizontal). Therefore, any sectoral evaluation needs to consider the dimensions of agglomeration and industrial linkages (general equilibrium) as well. This study is relevant to my research as it brings up the notion of cultural districts as models for development outside of city boundaries (in Colorado there are several creative districts as well as Main Street initiatives outside of the metropolitan region). A similar study was done for the case of Germany's planning region, in which Wedemeier (2010) evaluated the linkage between creative professions and economic growth in urban clusters. Using cross-sectional analysis for labor growth, he found that technological employment and bohemians contribute positively to the planning regions, which goes in conjunction with Richard Florida's argument on the role of creative class.

An empirical growth model incorporating cultural variables was developed by Granato et al. (1996). The study used a regression model of 25 countries supported by a set of nonparametric methods to test the positive effect of cultural attitudes (achievement and thrift) on economic growth. They used World Values Survey data (1960-1989) to construct an index of achievement motivation that was then used as proxy for cultural value. The result suggests that the positive link is present, while it is also possible that economic growth also affects cultural value (reverse causality). A difference-in-difference model was

developed by Portillo & Wagner (2021) to examine how cultural districts influence urban revitalization in Louisiana. Taking sales of residential properties as proxy, their study demonstrated that cultural districts serve as important amenities that positively affect home prices within those districts' boundaries.

The Creative Districts Certification program in Colorado can also be seen as a form of regional place-based policy (or industrial policy, as it applies to a particular sector) focusing on specific local production system that creates job and support economic growth. From this regional policy perspective, Castillo et al. (2017) examined the long-term causal relationship between regional industrial policies, in the form of a Tourism Development Plan, and tourism sector employment growth in Salta province, Argentina. The counterfactual approach used in their study is based on Synthetic Control Method in which they estimated a counterfactual situation for Salta in the absence of the tourism policy. The result suggests that the tourism policy has a positive causal effect on sectoral employment. In addition, they also found a strong inter-sectoral employment spillover effect in which for one extra tourism job created, a corresponding one job in other sectors in the province was created. In relation to that, Hansen et al. (2005) proposed a regional policy analysis framework based on creativity as growth driver. In this framework, the regional policy should be diversified or disaggregated and situated for different regions' needs.

This study considers some of the aspects mentioned above, in an alternate take: First, it examines the relationship between creative districts, community initiative (Main Street Communities, hereafter MS Communities), which is a partial equilibrium analysis, a stark alternative to a general equilibrium framework such as input-output analysis. Second, it extends the clustering of creative activities to reach areas outside the urban regions. Third, the empirical analysis incorporating the creative variables is not examining causality. Fourth, the estimation considers co-existence (or co-location) between Creative District and MS Communities for some counties.

1.4.1 Model

In this study economic outcome is represented by different proxies, namely business establishments, job creation, and sectoral employment. From production perspective, Creative Districts and MS Communities are accompanied at the right-hand side of the equation by a set of control variables: per capita income representing consumption capabilities, real GDP and median home values representing wealth, age structures in the population, and population density that is a proxy for agglomeration indicator.

In addition, I include some interaction variables as well: (a) Interaction between the Creative District and MS Community, to address co-location between the two in certain counties; (b) Interaction between the Creative District and per capita income as well as interaction between MS Communities and per capita income, to address how income in a county affects the role of the creative initiatives; and (c) Interaction between the Creative District / MS Communities and population density, to consider whether it is more meaningful for the Districts / Communities to be located in urban or rural areas. Panel data is used for this research, in a model specified as the follows:

$$\begin{aligned} Y_{it} = & \alpha_i + \beta_1 CD_{it} + \beta_2 MS_{it} + \beta_3 rGDP_{it} + \beta_4 Ypercap_{it} + \beta_5 Age018_{it} + \beta_6 Age1925_{it} + \\ & \beta_7 Age2545_{it} + \beta_8 Age4664_{it} + \beta_9 Age6590_{it} + \beta_{10} medhmval_{it} + \beta_{11} popden_{it} + \\ & \beta_{12} (CD * MS)_{it} + \beta_{13} (CD * popden)_{it} + \beta_{14} (CD * Ypercap) + \beta_{15} (MS * Ypercap) + \\ & \beta_{16} (MS * popden)_{it} + \varepsilon_{it} \end{aligned} \quad (1.1)$$

Where the explanatory variables are described as follows in Table 1.3:

Table 1.3. Explanatory Variables

CD	Creative District Dummy
MS	Main Street Communities Dummy
rGDP	Real GDP (2012=100)
Ypercap	Per Capita Income (US\$, 2012 = 100)
Age018	Population share (Age 0-18)
Age1925	Population share (Age 19-25)
Age2645	Population share (Age 26-45)
Age4664	Population share (Age 46-64)
Age6590	Population share (Age 65-90)
Medhmval	Median Home Value (US\$)
Popden	Population Density
CD*MS, CD*popden, CD*Ypercap, MS*Ypercap, MS*popden	Interaction terms

I employ five different model specifications, of which the dependent variables (Y_{it}) are listed in Table 1.4. All estimations are fixed effect panel data across 64 counties ranging from 2010 – 2019 (10 years) based on the Hausman Test. The main variables of interest are Number of Establishments, Net Job Creation and Creative Sector employment. The two additional sectoral employments are included to enrich the scope of the analysis considering that programs and/or policies may have more direct influence on economic sectors.

For each model I break down the panel units based on CBSA classification into All Counties, Rural Counties, and Urban Core (Metropolitan & Micropolitan counties combined). The reason behind this is the placement of creative districts that are currently more distributed in Urban Core areas, while MS Communities are more dispersed into the rural counties; one of our aims in this study is to examine how different the impacts are across different CBSA regions.

Table 1.4. Model Specifications

Model	Dependent Variable	Data Source
Establishments	Number of Establishments	BDSD
	Establishment Birth Rate	
Net Job Creation	Net Job Creation	BDSD
	Net Job Creation Rate	
CS Employment	Share of CS Employment (lagged)	QCEW
S71 Employment	Share of S71 Employment (lagged)	QCEW
Other Employment	Share of Other Employment (lagged)	QCEW

Net Job Creation refers to the difference between Job Creation and Job Destruction (or jobs lost). It is widely known that adoption of technology or innovative processes can create new jobs and cause some workers to lose theirs; place-based policies (such as Creative Districts and MS Communities) are no different. This is the rationale for choosing Net Job Creation as one of economic outcomes indicators in this study. *Other Employment* refers to NAICS sectors outside the Creative Sector and Sector 71. The aim is to see how the two place-based policies are related to employment in sectors not directly related to them, with the underlying argument is that of a spillover in which the Creative Districts and MS Communities can potentially be linked to employment in Other Sectors.

The Creative Sector employed here are defined based on Bureau of Labor Statistics (Seman & Carroll, 2017) while Sector 71 (Arts, Entertainment and Recreation) follows NAICS category directly. Both are presented in Tables 1.5 and 1.6, below. Employment numbers are both taken at the 6-digit NAICS level.

Table 1.5. BLS Definition of the Creative Sector

Museums and Education	Film, Radio, and TV
712110* Museums	512110 Motion Picture and Video Production
611610 Fine Arts Schools	512120 Motion Picture and Video Distribution
	512131 Motion Picture Theaters (except Drive-Ins)
Performing and Visual Arts	512132 Drive-In Motion Picture Theaters
711510* Independent artists, writers, and performers	512191 Teleproduction and Other Postproduction Services
453920 Art Dealers	512199 Other Motion Picture and Video Industries
711110* Theater Companies and Dinner Theaters	515111 Radio Networks
711120* Dance Companies	515112 Radio Stations
711130* Musical Groups and Artists	515120 Television Broadcasting
711190* Other Performing Arts Companies	515210 Cable and Other Subscription Programming
711310* Promoters of Performing Arts, Sports, and Similar Events with Facilities	532230 Video Tape and Disc Rental
711320* Promoters of Performing Arts, Sports, and Similar Events without Facilities	
512210 Record Production	Design and Publishing
512220 Integrated Record Production/Distribution	541310 Architectural Services
512230 Music Publishers	541410 Interior Design Services
512240 Sound Recording Studios	541420 Industrial Design Services
512290 Other Sound Recording Industries	541430 Graphic Design Services
339992 Musical Instrument Manufacturing	541490 Other Specialized Design Services
451140 Musical Instrument and Supplies Stores	339950 Sign Manufacturing
541921 Photography Studios, Portrait	511110 Newspaper Publishers
541922 Commercial Photography	511120 Periodical Publishers
332323 Ornamental and Architectural Metal Products Manufacturing	511130 Book Publishers
337212 Custom Architectural Woodwork and Millwork Manufacturing	4512 Book, Periodical, and Music Stores
	519130 Internet Publishing and Broadcasting and Web Search Portals
	541810 Advertising Agencies
	541820 Public Relations Agencies
	541830 Media Buying Agencies
	541840 Media Representatives
	541850 Outdoor Advertising
	541860 Direct Mail Advertising
	541870 Advertising Material Distribution Services
	541890 Other Services Related to Advertising

Source: Seman & Carroll (2017)

(note: the symbol * denotes 6-digit categories in the Creative Sector that are also part of Sector 71)

It is important to note that there are some overlaps between the two sectoral categories, which in the two tables are identified with the (*) symbol. These overlaps can pose a double counting issue, which in my estimation, is accounted for; to avoid double counting, the sum of the two sectors' employment has been recomputed to ensure that the categories in question only appear once. Next, Table 1.6 describes the scope of the Arts, Entertainment and Recreation sector (NAICS 71).

Table 1.6. NAICS Sector 71 (Arts, Entertainment and Recreation)

Codes	Titles
71	Arts, Entertainment, and Recreation
7111	Performing Arts Companies
711110 *	Theater Companies and Dinner Theaters
711120 *	Dance Companies
711130 *	Musical Groups and Artists
711190 *	Other Performing Arts Companies
7112	Spectator Sports
711211	Sports Teams and Clubs
711212	Racetracks
711219	Other Spectator Sports
7113	Promoters of Performing Arts, Sports, and Similar Events
711310 *	Promoters of Performing Arts, Sports, and Similar Events with Facilities
711320 *	Promoters of Performing Arts, Sports, and Similar Events without Facilities
7114	Agents and Managers for Artists, Athletes, Entertainers, and Other Public Figures
711410	Agents and Managers for Artists, Athletes, Entertainers, and Other Public Figures
7115	Independent Artists, Writers, and Performers
711510 *	Independent Artists, Writers, and Performers
7121	Museums, Historical Sites, and Similar Institutions
712110 *	Museums
712120	Historical Sites
712130	Zoos and Botanical Gardens
712190	Nature Parks and Other Similar Institutions
7131	Amusement Parks and Arcades
713110	Amusement and Theme Parks
713120	Amusement Arcades
7132	Gambling Industries
713210	Casinos (except Casino Hotels)
713290	Other Gambling Industries
7139	Other Amusement and Recreation Industries
713910	Golf Courses and Country Clubs
713920	Skiing Facilities
713930	Marinas
713940	Fitness and Recreational Sports Centers
713950	Bowling Centers
713990	All Other Amusement and Recreation Industries

(note: the symbol * denotes 6-digit categories in Sector 71 that are also part of the Creative Sector).

To ensure consistent measurement, the estimation uses employment share instead of the number of employed persons; that is, the sum of sectoral employment divided by the total population in the county. I employ a panel data consisting of 64 counties in the State of Colorado. For Colorado counties, I use the

QCEW (Quarterly Census of Employment and Wages) data from the Bureau of Labor Statistics (BLS), 2010-2019. The summary statistics of the variables of the model are presented in Table 1.7.

Table 1.7. Summary Statistics

Variable	Obs	Measurement	Mean	Std. dev.	Min	Max
Number of Establishments	640	Number / quantity	2189.711	4351.676	30	23271
Net Job Creation	640	Number of jobs created - number of jobs lost	724.402	2688.622	-7965	24747
Creative District Dummy	640	Dummy variable	0.163	0.369	0	1
Main Street Community Dummy	640	Dummy variable	0.205	0.404	0	1
Real GDP (2012=100)	640	2012 dollar	4,741,768.00	10,800,000.00	33,755.00	72,900,000.00
Per Capita Income (US\$)	640	2012 dollar per person	77,566.57	155,528.80	568.04	1,252,483.00
Population share (Age 0-18)	640	Number of people in group per population	0.954	1.867	0	13.893
Population share (Age 19-25)	640		0.285	0.469	0	2.046
Population share (Age 26-45)	640		0.963	2.267	0	17.311
Population share (Age 46-64)	640		1.253	4.186	0	30.315
Population share (Age 65-90)	640		3.550	14.080	0	83.160
Median Home Value (US\$)	640	2012 dollar	229,490.60	122,605.70	62,200.00	670,200.00
Population Density	640	Population per sq.mi.	130.857	559.018	0.680	4756.410

1.5 Estimation Results and Discussion

I focus on lagged effects, as contemporaneous effects are unlikely to bring about meaningful economic interpretation; after all, it takes time for the effects, if any, to materialize in the form of changes in business establishments. In addition, I also test the relationship with establishment birth rates, i.e., the changes in new establishments that occur in the following year¹¹. Marginal Effects and the corresponding three result tables are listed below.

¹¹ The official BDS (Business Dynamics Statistics Data of the U.S. Census) definition of establishment is “a fixed physical location where economic activity occurs”, whereas establishment birth rate is “a measure of the rate of establishment births from the prior year (t-1) to the selected year (t), calculated as

$$100 * \left(\frac{\text{Number of establishments born between } t-1 \text{ and } t}{\text{Average number of establishments across years } t \text{ and } t-1} \right).$$

As it is customary in regression procedures, the beta coefficients describe the relationships between variables, particularly between one predictor and the dependent variable, holding other predictors unchanged. Moreover, the inclusion of interaction terms implies that complementarity between predictors is expected. Empirically this makes the model effectively non-linear. The extent of the relationships between the predictors and the dependent variables are then captured by the marginal effects. The intuitive interpretation of the relationships is thus more explained by the marginal effects instead of by the beta coefficients.

A brief description of each of the tables are as follows; for brevity, only the main variables are displayed here. Table 1.8 summarizes the economic roles of Creative Districts and MS Communities through the three dependent variables categories (business establishments, job creation, and sectoral employment) in the form of marginal effects. Table 1.9 presents the estimation for business establishments, and Table 1.10 for job creation. The complete output tables are in Appendix A, including that for Sectoral Employments. Each Table breaks down the associative relationship into three geographical categories: All Counties, which captures the role on average for the entire State, Rural counties, and Urban Core counties. The aim of this breakdown is to explore differences, in any, in different regions of the State¹².

Marginal effects describe the unit change associated with the first difference in each variable; in other words, the slope of the dependent variable (the regression surface) with respect to changes of any of the variables. This is substantial as it allows for expressing the beta coefficients into the contribution of the explanatory variable to the outcome (Buis (2010), Perraiillon (2019), Leeper (2024)). The marginal effect used here is the average marginal effect, which were computed considering the explanatory variables in this paper are measured at the mean. In addition, since the model involves some interaction variables, the marginal effect of any variable that is also interacted with another also depends on the value of the other covariates as well. For example, if the regression is in the following form,

$$\hat{Y} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_1 X_2 + \beta_5 X_1 X_3 + \beta_6 X_1 X_2 X_3 \quad (1.2)$$

¹² Figure 1 depicts how Creative Districts are more concentrated in the urban areas relative to that in rural.

then the marginal effect with respect to variable X_1 is computed as

$$\frac{\partial Y}{\partial X_1} = \beta_1 + \beta_4 X_2 + \beta_5 X_3 + \beta_6 X_2 X_3 \quad (1.3)$$

The marginal effects for this model are summarized in Table 1.8., portraying the average tendencies of how the Creative Districts and MS Communities contribute to the dependent variables in Panels A and B, respectively. Business establishments are significantly responsive to both CDs and MS Communities, although the magnitudes and directions differ in each region; in Rural counties, the response to CD is positive - there are 32 more establishments on average that are associated with the presence of a Creative District - while it is negative in the Urban Core areas. The associated birth rates of new establishments appear to be occurring at a diminishing rate, although for the given data they are statistically insignificant. This diminishing rate suggests that over time the impact will be obsolete, at which point it may be necessary to supplement it with a different initiative or policy.

On the other hand, the response of business establishments to the MS Communities is the opposite (negative in Rural and positive in Urban). This may imply that businesses in Urban areas are more capable to capitalize on existing markets and infrastructure, contributing to a marginal effect of over 700 more establishments. The rate of birth is similar to the case of Rurals', which is diminishing but insignificant, at least for the time being.

Altogether this suggests that the contribution of Creative Districts towards business establishments is still small, while the slowing birth rates may suggest that this is a temporary, short-term pattern. This can potentially be explained by the fact that each county focuses on different aspects in their Creative District, not to mention that not all counties are awarded Creative District Certification. While some Creative Districts are attracting new businesses (such as in Mancos in Montezuma County or Ridgway in Ouray County), other Creative Districts may already have an established art community and their emphasis is not on establishment creation but more on artistic expression (such as in Loveland in Larimer County).

Moreover, the fact that economic motivation is not the primary focus of all Creative Districts in Colorado may also be the underlying factor for many other objectives, such as job creation and sectoral employment¹³.

The average contribution of MS Communities (Panel B) is different from that of Creative Districts. A smaller number of business establishments (-27) is associated with the presence of MS Communities in the Rural areas. Since we are focusing on associative relationships, this reflects the issue of selection, in which Counties self-select themselves into participating in the MS Communities program, seeing it as a potential tool to improve economic struggles. A different situation is seen in the Urban counties, where they experience a much higher number of establishments compared to the Rural areas, as well as in comparison to their response to Creative District Certifications.

Net Job Creation is positively associated with MS Communities, seen here as 62 more jobs in the Rural counties while on the other hand the number of establishments is negatively associated. This may indicate that MS Community, with its emphasis on downtown revitalization programs (in smaller towns), triggers more momentum for urban areas in their Creative Sector. For the Rural areas the momentum happens in Sector 71 (Arts, Recreation and Entertainment), suggesting that on average, the probable effect on the economy is channeled through tourism-related activities; visitors are attracted to downtowns that are revitalized. In terms of sectoral employment, MS Communities are seen to have slightly negative association with the Rurals but not the Urban Core counties. This confirms the conjecture that Rural areas think of the MS Communities program as a redevelopment tool when their economies are struggling.

It is important to note that marginal effects here record the effects at a non-additive scale since they also take into account the interaction terms included in the model, presented in Tables 1.9 and 1.10.

¹³ Many counties' Creative Districts focus more on vibrancy of artistic and creative life over contribution to economic growth.

Table 1.8. Marginal Effects

Panel A: Marginal Effects of Creative Districts

Area	Number of Establishments	Establishment Birth Rates	Net Job Creation	Net Job Creation Rate	Creative Sector Employment	Sector 71 Employment	Other Sectors' Employment
All Counties							
dy/dx	-223.2951	-1.3162	-2.0548	-0.5587	-0.0016	-0.0009	0.0036
std. err.	(108.5282)	(0.3699)	(425.9772)	(1.2217)	(0.0014)	(0.0024)	(0.0031)
Rural							
dy/dx	32.0224	-0.8627	38.1486	1.2555	-0.0025	-0.0025	0.0065
std. err.	(14.6458)	(0.9290)	(65.7637)	(1.4661)	(0.0021)	(0.0019)	(0.0024)
Urban Core							
dy/dx	-757.0304	-1.1040	-156.8721	-0.5237	0.0015	0.0029	-0.0020
std. err.	(188.8120)	(0.9110)	(980.9415)	(0.6498)	(0.0015)	(0.0040)	(0.0038)

Panel B: Marginal Effects of Main Street Communities

Area	Number of Establishments	Establishment Birth Rate	Net Job Creation	Net Job Creation Rate	Creative Sector Employment	Sector 71 Employment	Other Sectors' Employment
All Counties							
dy/dx	240.1705	0.1780	553.9025	-0.1096	-0.0005	-0.0021	0.0028
std. err.	(123.5608)	(0.5986)	(1016.7470)	(0.6591)	(0.0014)	(0.0049)	(0.0048)
Rural							
dy/dx	-27.0012	-0.1416	62.4509	-0.4721	-0.0023	0.0016	-0.0003
std. err.	(6.1156)	(0.4826)	(24.5784)	(0.6561)	(0.0012)	(0.0015)	(0.0019)
Urban Core							
dy/dx	758.5769	-1.9234	142.6037	0.5358	0.0050	-0.0248	0.0211
std. err.	(316.6065)	(1.0769)	(1847.0230)	(0.4270)	(0.0044)	(0.0179)	(0.0152)

For example, the relationship between Creative Districts and Business Establishment is positive for all regions, contrary to the marginal effects which are positive for Rurals only; however, this result considers the exclusion of interaction terms that involves the role of income and population density. Similar results are given by Table 1.10 regarding Job Creation that renders the relationship between MS Communities and Job Creation as insignificant or inconclusive, whereas the marginal effects concluded a negative association for Rural counties. This result implies that the two programs are complementary to one another (or supplementary, to say the least) when located in an Urban county. Business establishments are utilizing the already available economic infrastructure of urban areas (size of market, easier access to resources, etcetera) that is not or less available in Rural counties.

One distinctive aspect of the output tables is thus the association of co-location with the dependent variables, which is not explicitly shown in the marginal effects table (as it is embedded in the marginal effects coefficient themselves). Table 1.9 indicates a positive relationship for Urban counties and negative for the Rurals'; this implies that with the co-location, the existence of MS Community in an Urban county that already has a Creative District amplifies the nature of its effects on business establishments and diminishes it in Rural settings. On the other hand, the relationship between Creative Districts and Job Creation in Urban areas is positive which seems to drive that for the entire State. However, this coefficient occurs within the assumption of linearity of the Creative District variable; due to the nonlinearity, this coefficient is not capturing it, and hence the marginal effect is more appropriate. The regression coefficients also show how per capita income and population density influence the magnitude of relationship between the creative initiatives and business establishments. Per capita income slightly diminishes the effectiveness of the Creative District program in both Rural and Urban areas. Meanwhile, for MS Communities the per capita income does not seem to be influential.

Table 1.9. Estimation Results: Business Establishments

VARIABLES (1-year lag)	Number of Establishments			Establishment Birth	
	All Counties	Rural	U.Core	All Counties	Rural
Creative Districts	585.7** (270.7000)	132.8** (49.9200)	769.8*** (166.1000)	0.804 (0.6120)	5.486 (4.3620)
MS Community	-148.8** (57.9500)	-26.15*** (5.8120)	-353.1*** (112.8000)	0.622 (0.5150)	-2.288** (0.9400)
Percapita Income	-0.001 (0.0007)	0.000 (0.0001)	-0.002 (0.0019)	2.99E-05 (0.0000)	2.72E-05 (0.0001)
Population Density	2.252** (0.8610)	29.55*** (6.2330)	2.253*** (0.6850)	-0.000188 (0.0023)	0.558 (0.5660)
Creative District * MS Community	61.260 (72.3300)	-45.14** (22.1100)	233.4* (136.8000)	0.0184 (0.3440)	-0.66 (0.9750)
Creative District * Percapita Income	-0.0107** (0.0047)	-0.00106** (0.0004)	-0.0169*** (0.0034)	-2.84e-05** (0.0000)	-8.41E-05 (0.0001)
Creative District * Population Density	0.051 (0.0463)	-4.132** (1.6360)	0.122* (0.0608)	0.000559*** (0.0002)	-0.144 (0.1070)
MS Community * Percapita Income	-0.000182** (0.0001)	0.000 (0.0000)	0.000 (0.0002)	-2.75e-06** (0.0000)	6.85E-06 (0.0000)
MS Community * Population Density	3.037*** (1.0850)	0.377 (0.6040)	3.722** (1.3980)	-0.0018 (0.0056)	0.269** (0.1050)
Constant	1,109*** (170.9000)	45.580 (45.9700)	2,951*** (646.9000)	-5.669 (5.5910)	-21.87*** (7.0580)
Observations	576	324	252	576	324
R-squared	0.877	0.577	0.92	0.126	0.164
Number of cntynum	64	36	28	64	36

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

In terms of job creation (Table 1.10), the regression coefficients contrast with marginal effects. The marginal effects suggest that the model does not capture any influence on net job creation, while the regression coefficients indicate a positive relationship between Creative Districts and job creation. Similarly, while the marginal effects suggest a positive relationship between MS Communities and Job Creation, the regression coefficients describe otherwise. The co-location aspect also appears to be related to job creation in the Rural counties, but not in the Urban areas, suggesting that the presence of MS Community diminishes the effect of Creative District on job creation, and vice versa. In addition, per capita income negatively influences Creative District in the Rurals, and MS Communities in the Urban areas. This

is particularly interesting since when they are deemed to be a successful policy, when the communities become wealthier, their role weakens.

Table 1.10. Estimation Results: Job Creation

VARIABLES (1-year lag)	Net Job Creation			Net Job Creation	
	All Counties	Rural	U.Core	All Counties	Rural
Creative Districts	1,662* (870.3000)	531.900 (361.2000)	2,593*** (624.5000)	1.061 (1.0500)	12.11** (3.5750)
MS Community	-162.500 (248.8000)	29.470 (39.6900)	-95.510 (551.9000)	0.494 (0.9530)	-4.019** (1.2320)
Percapita Income	0.003 (0.0028)	0.000 (0.0009)	0.011 (0.0157)	0.000 (0.0000)	-5.69e-05 (0.0000)
Population Density	6.681 (5.4270)	54.88* (31.1200)	9.945 (6.6990)	-0.001 (0.0006)	-0.085 (0.0794)
Creative District * MS Community	-437.200 (305.0000)	-246.7** (104.5000)	-86.500 (704.2000)	0.658 (1.5980)	-0.473 (1.9670)
Creative District * Percapita Income	-0.023 (0.0149)	-0.005 (0.0050)	-0.0325** (0.0141)	0.000 (0.0000)	-0.00013 (0.0001)
Creative District * Population Density	1.693*** (0.2030)	-23.68** (9.2210)	1.347*** (0.3800)	0.000 (0.0005)	-0.363** (0.0984)
MS Community * Percapita Income	0.000879* (0.0005)	-0.000461*** (0.0001)	0.002 (0.0014)	0.000 (0.0000)	0.000 (0.0000)
MS Community * Population Density	5.481 (8.8520)	13.76*** (1.9350)	0.233 (6.8690)	-0.00415* (0.0024)	0.644** (0.1710)
Constant	2,231** (875.4000)	-166.000 (170.2000)	6929.000 (4146.0000)	-1.264 (0.8580)	1.410 (2.0690)
Observations	576	324	252	576	324
R-squared	0.13	0.147	0.176	0.051	0.090
Number of cntynum	64	36	28	64	36

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

1.6 Limitation of the Study

This research was bounded by a short period (10 years). As of the time of writing, there are still more Creative Districts being established¹⁴ and there was not enough data that captured their economic roles. A longer period may result in more accurate depiction of the economic roles of the two programs, for example by facilitating a more comprehensive causal inference such as a difference-in-difference analysis. The short period did not allow for such treatment.

Another aspect that could potentially enrich the analysis is by using occupational data (this study uses industrial (NAICS) data). Occupational data would allow for more specific treatment of variables and can offer a more detailed breakdown within, say, the Creative Sector (for example, a certain *industry* can consist of different dimensions of *occupations*). Unfortunately access to occupational data was not possible for this research.

Some Colorado counties are positioned relatively close to one another, but this study did not investigate the probable spillover effect from one county to another. For example, a creative district or an MS Communities in one county may have a role in employment or business establishment in a neighboring county. Inclusion of a spatial spillover analysis may offer different magnitudes of impacts.

Utilizing different impact variables such as area sales and backward / forward linkages may present a different picture of economic role of the two community initiatives as well. In addition, exploring the non-traditionally economic side can also complete a holistic view of CD and MS Communities, such as changes in participation in the community post-establishment of the initiatives.

Expanding the unit of analysis to a broader country-level can serve as a robustness check to test the hypothesis on economic role of place-based policies, on a note that at the same time it also needs to be specific enough to capture unique characteristics that are embodied in different U.S. States, and it may require a much longer period as well.

¹⁴ See <https://www.colorado.com/certified-creative-districts>, also <https://edcconline.org/four-new-creative-districts/>

1.7 Conclusion

This study examines the economic role of place-based policies, namely Creative District Certification program and the Main Street Communities initiative in Colorado counties. Counties are categorized as either Rural or Urban Core, with the latter being a combination of metropolitan and micropolitan counties. Relationships were estimated for five different economic performance indicators: business establishments and their birth rates, job creation and its rate, and sectoral employment (Creative Sector, Sector 71, and Other Sectors employment).

Both the Creative Districts and MS Communities play a role in business establishments (but not in their birth rates); but each in a different direction: Creative Districts are positively associated with establishments in Rural areas, while for MS Communities it is the opposite. MS Communities, on the other hand, is associated negatively in Rural areas, while positively in the Urban Core.

In counties where they co-exist, establishments in urban areas are increasing, but in Rural counties they are declining, suggesting that urban areas are capitalizing more on both initiatives when they co-locate. When per capita income and / or agglomeration effects are included as part of the model, per capita income matters in supporting the role of Creative Districts but not of the MS Communities', while agglomeration effect (population density) positively supports both roles in urban areas.

Job creation is positively influenced by the MS Communities program in the Rural region but not by Creative District certification program. In this context, job creation in urban areas is affected by both per capita income and population density via Creative Districts. In contrast, these two variables play their role in Rural counties through supporting the MS Communities program.

Per capita income does have a slight role in facilitating the place-based policies – Creative Sector employment relationship; however, considering the miniscule magnitude, it can be regarded as significantly zero as well. In other words, employment in Colorado's Creative Sector does not depend on per capita income and population density.

Creative Sector employment in urban areas is slightly influenced by the two place-based policies, however the magnitude itself is very small (near zero). For the Rural counties there is no significant role of the two initiatives captured by the model. Similar patterns are observed for Sector 71 employment and Other Sectors' employment. The MS Communities initiative is slightly supported by per capita income, but also small and close to zero. Moreover, like the situation for the Creative Sector, for Sector 71 employment per capita income also does not appear to have any influence either in facilitating the role of both Creative Districts and MS Communities.

The marginal effects describe the average contribution of the two programs, considering the coexistence of both initiatives in one county (wherever applies) as well as the probable influences of per capita income and population density. The estimates suggest that the dynamics coming from the two place-based policies are more meaningful in the Rural areas: Creative Districts play a role in the increase in the number of business establishments and net job creation, with the latter picking up the momentum and increasing faster over time.

Since marginal effects incorporate changes in other variables in the model as well, implications for future policies can draw insights from them. Linkages between MS Communities and Sector 71 employment should be one of the aims of future policies, particularly in support of the TLGH in urban regions. In addition, more attention should be dedicated to bridge activities in creative districts in Rural areas to generate employment in the two sectors (Creative Sector and Sector 71).

To address the limitations of this study, several options are proposed, including expanding the period and variables, exercising causal analysis, and broader unit of analysis.

2 Sectoral Employment Spillover in Colorado

2.1 Introduction and Motivation

Economic growth is determined by various factors, one being sectoral growth. The creative industry as well as the Arts, Entertainment and Recreation industry (Sector 71) could potentially contribute to economic growth of a region (Potts & Cunningham, 2008). This is initiated through the intersectoral spillover mechanism and agglomeration effects (Potts & Cunningham (2008), Schaffer (2020), Garidzzirai et al. (2018)). Here, intersectoral spillover refers to how economic activity in one sector leads or generates activity in another sector. The spillover mechanism looks at how changes in one sector influence the change in a different sector. This is the aim of this research, with the addition of spatial spillover that focuses on the influence of a different sector in a different locality (county). Agglomeration effect is looking at how concentrated population plays a role in that intersectoral relationship; in this study I use population density as a proxy for agglomeration, on the consideration that higher population density provides a spending base that can induce sectoral activities.

This study examines the linkage between the Arts, Entertainment and Recreation Sector (NAICS Sector 71), the Creative Sector and employment in Other Sectors in the State of Colorado. It is describing how sectoral employment (in the two sectors) is associated with employment in Other Sectors outside the two (“Other Employment”). In addition, when the Arts, Entertainment and Recreation sector is viewed as one of Colorado’s competitive advantages, it can also trigger economic development, based on Porter’s (1990) framework. This framework argues that economic development is driven by improvements in value chain; in the context of Colorado, Sector 71 focuses on highlighting Colorado’s abundant natural amenities, thereby generating differentiation that leads to competitive advantage.

This sector, along with the Creative Sector, can also impact regional development in a virtuous cycle, especially when it stimulates knowledge-driven economy; industrial structure such as this is a part of a complex regional hierarchy of urban- and non- urban areas (DeGroot et al, 2008). Knowledge

economics in this form of industrial and occupational human capital gave a new perspective to the “conventional” factors of production such as labor, capital and land (Florida, 2014). One central argument in Florida’s line of thought is that every single individual is a creative, making creativity the underlying construct for the so-called *creative class* consisting of knowledge workers, information societies, and high-tech economies, captured by *the Creative Index* (Florida, 2002, 2014)¹⁵.

The analysis is performed at county level, using the Quarterly Census of Employment and Wages (QCEW) data from 2010-2019; in this study I employ industrial (NAICS) data. Emphasis on Arts, Entertainment and Recreation as well as on the Creative Sector implies that these two sectoral categories are expected to be one of the drivers of Colorado’s economic growth. Yet, many of the studies regarding the Creative Sector and economic performance that are specific for Colorado are not based on structured empirical studies other than case studies and / or survey interviews (Seman (2010, 2015) and Bakhshi et al. (2013), among the few). Moreover, these studies are focusing on occupational data, rather than industrial/sectoral. In this research, I explicitly explore the empirical relationship between the two sectors and economic performance using industrial data. Indicators used for each of the two sectors as well as economic growth are sectoral employment and employment in Other Sectors.

Between 2010 and 2019, Colorado’s economy has grown 3.5 percent on average, which is a significant improvement after the state of Colorado has also suffered from the 2008-2010 financial crisis. In fact, Colorado was one of the most prominent recovery states in the nation, along with Texas, North Dakota and Utah. In terms of leading industries in the State of Colorado, according to Colorado Office for Economic Development and International Trade¹⁶, main industries in the state include high-tech industries, advanced manufacturing, and creative class occupations¹⁷. The creative industry is listed as number 10 of

¹⁵ This index considers the creative class share of the labor force, high-tech industries, patents per capita, and diversity (including racial and gender). Florida places this index as the cornerstone in economic growth and as the barometer for economic potential.

¹⁶ <https://choosecolorado.com/key-industries/>

¹⁷ Note here that the creative class is classified as part of industries, although for empirical purposes, normally occupations are separate from industry classification.

thirteen main industries in Colorado, by the Front Range Community College (Charles (2019)). Looking at the growth fluctuations in Figure 2.1 below, it is essentially the behavior of these average employment growth rates that motivate my research question on the relationship between the two sectors and employment in the sectors outside the two, on the foundation of Economic Base theory.

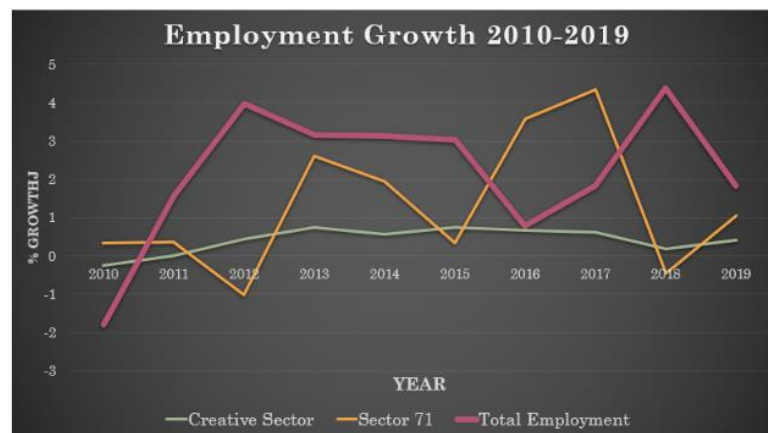


Figure 2.1. Employment Growth over Time

Source: Bureau of Labor Statistics, various years

The growth fluctuations suggest that visually, total employment growth is more aligned with the Sector 71 growth, but not much to the employment growth in the Creative Sector. Each of Colorado's 64 counties has different characteristics; some are in or near the Urban Core, some are very distant. Hence, Creative Sector employment and that in Sector 71, that are more concentrated in the Urban Core, may pose different magnitudes of impact on different counties. By design, non-spatial analysis does not account for spatial heterogeneity. Spatial analysis allows these complexities to be considered to gain better understanding about the spatial patterns that affect economic outcomes. The increasing role of spatial analysis is also acknowledged in social science literature (see Anselin (1999) and Goodchild et al. (2000)).

The State of Colorado has 64 counties, some of which are metropolitan in nature, and many are strongly rural. Rich with natural amenities, Colorado has prominent outdoor activities infrastructure, making entertainment and recreation sectors some of the dominant categories in the State's economy.

However, intensity of sectoral employment is uneven, with higher concentration in urban areas; Figure 2.2 depicts the distribution of Sector 71 employment across Colorado counties, where there is a tendency for higher concentration of Sector 71 employment to reside in the mountain areas and the Front Range (directly east side of the mountains). Coincidentally, Creative Districts certifications are awarded to counties that are mostly located along similar regions.

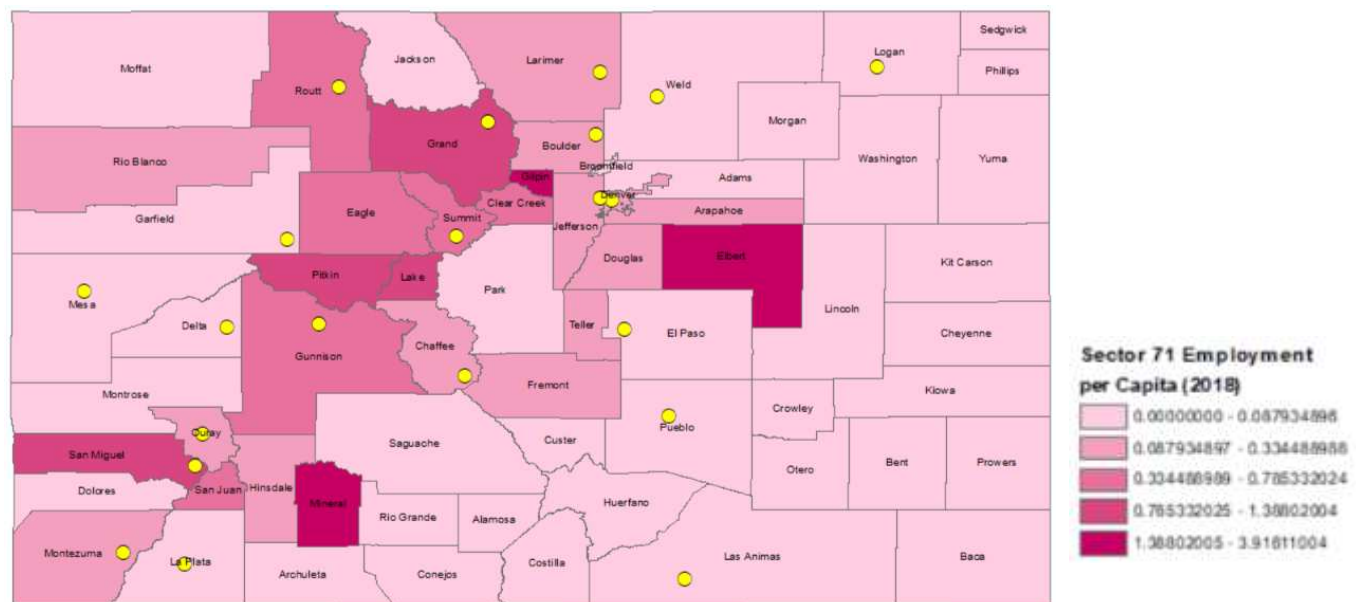


Figure 2.2. Sector 71 Employment across Colorado

Source: Rendering of data from Colorado's OEDIT and QCEW. The yellow dots depict the location of Creative Districts in Colorado, as of 2019.

The indication of the increasing role of the Creative Sector in supporting economic development is the driving motivation for this study. This research proposal aims at examining the relationship between Sector 71, the Creative Sector, and economic development in Colorado. More specifically, I investigate how employment in the Creative Sector and that in Sector 71 generates employment spillover onto Other Sectors (i.e., NAICS sectors outside the Creative Sector and Sector 71) in Colorado's economy. My interest lies in whether there are spatial relationships in sectoral employment across counties. The research questions in this study are

1. To what extent does the Arts, Entertainment and Recreation sector (Sector 71) affect, or are related to, employment in Other Sectors in Colorado?
2. To what extent does the Creative Sector affect, or are related to, employment in Other Sectors in Colorado? These first two questions are explored using an empirical analysis that is based on the Economic Base Theory.
3. Are the counties in Colorado spatially dependent on one another? That is, does Other Employment in a particular county depend on that in another? This aspect is crucial to begin with, as interdependence will justify spatial analysis; this question addresses whether there is any spatial autocorrelation.
4. To what extent does the presence of a Creative District influence employment relationships? Colorado's Creative District Certification program aims at inducing more economic activities, and I am interested in examining whether this goal is achieved. Furthermore, I also look at how Creative District and Sector 71 Employment are jointly influencing Other Employment. This interaction term is included to account for the importance of Sector 71's activities that are supposedly supported by Creative District certification. As depicted in Figure 1, a large portion of Creative Districts are established in counties that have relatively high concentration of Sector 71 workers.

The above research questions will be explored in a non-linear specification fashion, followed by a discussion on interpretations and implications. The underlying arguments are as follows. *First*, employment in both the Creative Sector and Sector 71 in Colorado is conjectured to trigger employment in Other Sectors in the respective county; this is based on the spillover / multiplier mechanism according to the Economic Base approach, as well as viewed from the cluster (or agglomeration) framework, in which proximity with the two sectors can generate new economic activities as well. In my case, the two sectors are viewed as the economic base, which is conjectured to lead to employment in Other Sectors in the Colorado economy.

Secondly, in many existing literatures, the Creative Sector is often developing because the creative class is attracted by amenities offered in a locality. For Colorado, natural amenities are assumed to be a

fixed factor in each county; my study therefore looks at the Creative Sector as representing local service amenities, which is not present in every county. A vibrant Creative Sector is expected to attract workers into the area, generate knowledge spillovers at the same time, and support Colorado's Arts, Entertainment and Recreation sector. Counties with richer Creative Sector are thus conjectured to employ more workers and experience; on the flipside, a Creative Sector is also influenced on the region's state of economic development / growth.¹⁸

Thirdly, these employment relationships are also affected by characteristics of local population / area, such as level of education, population density, and household size. In my empirical estimations, these characteristics are included as control variables.

Inquiries 1 and 2 will be addressed in the baseline model specification before proceeding to the spatial model to discuss questions 3 and 4. To test the spatial relationship and effects I use the Spatial Durbin Model (SDM) which allows for considering spatial lags. The SDM is expected to improve the results of the non-spatial specification in that the outcome should provide better estimates for Colorado's situation¹⁹.

This study aims to fill the gap between the need of a more coherent empirical research on how both the Creative Sector as well as the Arts, Entertainment & Recreation sector are affecting employment in Other Sectors and the fact that such types of research are not easily found, particularly at county level. By addressing those research questions, I expect this study's contribution to come from the implementation of the economic base theory in local context of sectoral employment. In particular, the contribution of this research is (a) Structured empirical study on employment impacts of the Creative Sector and Arts, Entertainment & Recreation sector on local (county level) economic performance, using industrial classification (NAICS), and (b) Spatial and non-spatial examination how Colorado's Art, Entertainment

¹⁸ This notion of endogenous amenities is the focus in studies such as Walsh (2007), Bernini et al. (2020), and Brueckner et al. (1999).

¹⁹ The SDM is one of the most important specifications in modelling spatial relationships. See, for example, Mur and Angulo (2005), Tientao et al. (2016), Jeguirim (2021), and Feng & Chen (2018).

and Recreation sector as well as its Creative Sector contribute to employment growth in sectors outside the two.

The remainder of this paper is structured as follows: In Section 2 I will revisit the relevant literature in the topic, focusing on various impact mechanisms on economic growth and development. In Section 3 I focus on the conceptual framework of this study, followed by empirical methodology in Section 4. Section 5 discusses the empirical result, for both the non-spatial and spatial specifications. Section 6 concludes.

2.2 Literature Review

In this section I explore several aspects: the context and measurement of the Creative Sector and Sector 71, and how they are linked to economic development.

2.2.1 The Creative Sector and Sector 71

In this section I briefly review existing literature on sectoral employment. A more detailed exposition can be found in Chapter 1 (Tables 1.5 and 1.6, pp. 20-22). As described, the focus is on how they are constructed and the impact mechanisms on economic performance.

The definitions of creativity and Creative Sector take various forms, from broad to specific, as described by Bowen et al. (2008) and Jackson et al. (2003). Studies on the Creative Sector including how it plays a role in an economy are often performed at local levels and in qualitative fashion, such as those conducted by Seman & Carroll (2017), Harris et al. (2013), and various studies by Seman (2010, 2015, 2020). To approach the context, often a nested definition is needed as suggested by Markusen et al. (2008). In this paper, I adopt NAICS definition of the Arts, Entertainment and Recreation (Sector 71)²⁰ to represent the cultural sector (Beyers (2008)) and Bureau of Labor Statistics (BLS) definition of the Creative Sector (based on Seman & Carroll (2017))²¹.

²⁰ <https://www.bls.gov/iag/tgs/iag71.htm>

²¹ In my exploration we found several different definitions (in terms of included sectors) for the Creative Sector. For my purpose we adopt the Bureau of Labor Statistics' definition for the sake of data consistency.

2.2.2 Link between the Creative Sector and Economic Development

The influence of the Creative Sector on urban growth can be traced through various channels or mechanisms or approaches. Creative activities can contribute to enhancing human capital, physical capital, networking and social capital, as well as serve as an amenity that supports other economic activities. On top of that, it is often argued that skilled workers are attracted to migrate to areas rich in creative amenities. Florida (2002) asserted that the link between creative occupations and urban growth is established through the “3T” framework (the existence of Technology, Talent, and Tolerance). Technology is represented by the presence of supporting industries, particularly knowledge-based industries. Talent refers to the creative class itself that is educated and employs a significant degree of entrepreneurship; Tolerance captures the support system in the area, such as the vibrancy of the urban atmosphere, or the “quality of life in a place” such as community lifestyle. These three aspects are the necessary preconditions for creative workers to be willing to relocate in a particular city that will lead to urban growth^{22 23}.

The fact that Colorado’s main industries include information-intensive sectors support Florida’s notion of Technology. Acknowledgment of creative talent through the establishment of Creative District Certifications supports the notion of Talent. In terms of Tolerance or the quality of place, I am referring to the social amenities of the local areas that also includes racial / ethnic tolerance and / or gender equality. Florida also captures all these in great detail in the form of the *tolerance index* which itself is a part of the global creativity index. In another study, he acknowledges the argument that 3T is often insufficient as a pull-factor for labor; natural amenities such as climate and urban form are also significant (Florida, 2014). Florida stated that growth in quality of life constitutes for about 40 percent of employment growth effect of

²² It is important to note that Florida (2002) emphasized the impact mechanism for urban regions and excluded rural areas whereas this paper incorporates both.

²³ Other studies interpret the 3T concept more loosely. Technology is translated as cost of living, talent as education level, and tolerance is often understood as vibrancy of the area, comprising a broader understanding, which can include amenities, social services, and “sense of place” in general.

college graduates, in which amenities play a substantial role. In this study, similar educational attainment is included as one of the control variables.

Essential elements of the creative class, namely knowledge and ideas, are also believed to be the backbone of modern regional development (McGranahan & Wojan, 2007). This was the finding of examining rural counties in the US, using natural amenities as indicators for quality of life. Their study extends that of Florida's (2002) that focused on metropolitan areas, and the recast definition (or scope) of Florida's creative class. Natural amenities are believed to expand the size of the creative class in the region, which will then lead to a change in the composition of jobs. It is from this changed composition of jobs that new economic activities are generated, and further triggering economic growth. McGranahan and Wojan highlighted specific characteristics of the creative class that make this mechanism possible, namely their engaging in tasks that "...create meaningful new forms" (McGranahan & Wojan (2007: 200)). The data used in their study is occupational categories, not industrial, following that used in Florida (2002). Empirically their study focused on growth-on-growth analysis; their results suggested that there is not much link between *county* employment growth and the growth of the creative class, but the connection at the *area* level is strong. For my study, McGranahan & Wojan's framework of amenity – migration link is relevant to the extent that it presents the importance of amenities to support the creative industry. In Colorado it is safe to assume that natural amenities can be treated as fixed factor for all counties; in this study the Creative Sector itself has a role of providing a type of service amenity rather than natural one to support the Arts, Entertainment & Recreation sector (Sector 71).

In their follow-up paper, McGranahan et al. (2011) found that creative talent is attracted to rural areas based on what those areas have to offer, particularly outdoor amenities. They argued that the clustering of talented or creative individuals will improve the combination of knowledge and ideas, thereby contributing to rural growth. In this context, natural amenities are perceived as engines for growth. The motivation was the fact that 20 percent counties in the US gained stronger employment growth in the rural regions, compared to that in the metropolitan areas and that natural amenities and entrepreneurship are more

commonly found in the rural regions. These high-amenity rural areas are thought to be attracting creative / skilled workers more than their metro counterparts. This framework is essentially saying that for the Creative Sector to induce economic growth, it needs to be supported by a strong presence of natural amenities; impact on growth is created by the synergy between creative employment and their entrepreneurship. A natural amenities index (McGranahan, 2009) was used to represent a composite between landscape, climate and recreation. Related to this, Glaeser et al. (2001) have previously suggested that areas with higher / stronger amenity factor grow faster than those with lower / less amenities. In my study we refrain from including the natural amenities index since the data is not available for all counties; instead, as mentioned above, the presence of Creative Sector is treated as a service amenity.

Specific to Colorado, Seman (2020)'s report on Denver's Creative Sector indicates that the creative occupations contribute significantly to Denver's economy; between 2010 and 2019 the creative industry employment has grown 29 percent and contributed to 4 percent of all sales of goods and services in Denver area. From a conceptual perspective, the Economic Cluster Theory (Porter, 2000) asserts that creative economies can be viewed as economic clusters, which capitalizes on locational advantages which in turn triggers economic growth for the region (Seman, 2015). Creativity and talent are also seen as a factor that contributes to regional growth through the competition channel (Hansen et al., 2005). In this framework, innovation is considered crucial in competition, and creativity builds innovation²⁴. This is in line with Florida (2002) who suggested that talented people can lead to agglomeration or clustering in cities, which will further generate innovative ideas and production, and competition as well.

On a broader scale, findings that there is a close relationship between creative employment (or the creative class) and economic growth are not only revealed for the US, but in other countries as well. Boschma et al. (2009) examines the case of the European continent and found that in more than 500 regions in 7 countries, vibrant creative class is dependent on the presence of openness, tolerance, and employment

²⁴ Moreover, since innovation also an element that shapes social capital, we can link creativity to that dimension as well.

growth. The authors explored the extent of the spatial distribution of the creative class and found that it is indeed unbalanced across regions and countries. The creative class in their study is the dependent variable, and they extend it to investigate how it affects economic growth through the mechanisms of innovation and entrepreneurship. Following Florida (2002), their analysis is also based on occupational, rather than industrial, classification. Piergiovanni et al. (2012) suggests another impact channel. They linked creative industries and business formations in looking at impact mechanisms on growth, using Italian provinces as case study.

Employment spillovers have been subjected in many studies, such as in tourism sector (Kadiyali & Kosova, 2013). The authors investigated how growth in the tourism sector affected employment in non-hotel industries using a dynamic panel model. Castillo et al. (2017) published a study on industrial policy in Argentina and how it impacts employment. Using the synthetic control method, they found a significant 11 percent annual impact over 10 years in hospitality sector employment brought about by a Tourism Development Policy in one of Argentina's provinces. This growth further translates into over 1300 formal jobs in the tourism sector. In a different light Rodriguez-Gamez & Dallerba (2012) did an exploratory spatial data analysis for a medium-sized city in Mexico and found significant spatial dependence and heterogeneity for Central Business Districts and its surrounding area. The study concluded that employment centers (CBDs) remain the densest employment areas. The concentration of workers also contributes to facilitate faster and more intense economic activities, and hence, growth (see Ramirez & Loboguerrero (2002), Basile (2008), Seif et al. (2017), Bai et al. (2012), and Wheeler (2001) for expositions on the role of spatial concentrations in fostering economic growth).

A different side related to area resilience is worth exploring as well. The Creative Sector, like the tourism sector, is highly dependent on consumption spending; consumers are in turn prone to shocks in the economy. At the end, creative / tourism sectors are also strongly influenced by shocks. A study done by Watson & Deller (2022) examined economic resilience in the US, factoring in dependence on the tourism industry; the shock impacting the industry was COVID-19 pandemic. In their study, resilience is a term

defining how the growth path deviates in response to a shock. Their model is mainly spatial, incorporating different spatial models to capture county-level spillover effects of the tourism industry. Their result states that a post-shock period will release pent-up demand for tourism, creating a positive impact on the economy by increasing resilience score.

2.2.3 Spatial Relationships and Dependence

The second part of the study discusses spatial relationship of sectoral employment. Spatial economics have been developed since the 18th century with Von Thünen's ideas and has increasingly been used in economic analysis, such as in tourism, public health, economic growth, and regional science (see, for example, Goldstein & Klüsener (2014), Hall (2012), Fingleton & Lopez-Bazo (2006), Bai et al. (2012), and Cosci & Mirra (2018)). The developing role of spatial analysis in social sciences in general is also manifested in various social interactions and neighborhood dynamics, as emphasized by Goodchild et al. (2000) and Anselin (1999).

In the employment literature, Soot & Sen (1991) developed a large-scale model for linking employment and economic development that is based on labor shed data. Cubukcu (2011) surveyed the development of spatial economic base multiplier and discovered that the economic base theory has steadily lost popularity due to the limited amount of research pertaining to its spatial dimension, as pointed out by Richardson (1978). In a newer study, Richardson's (1985) survey on economic base literature acknowledges the notion of the more common "spaceless" economic base multiplier. In general, the spatial notion pertaining to analysis of employment are more geared toward identifying the patterns spatial distribution and characteristics of employment or population densities, particularly in urban areas or employment centers, such as in studies by Baumont et al. (1999), Chhetri et al. (2014), and Rodriguez-Gamez & Dallerba (2012). In terms of spatial spillovers, the term "spillovers" refers more to externalities and social processes (Anselin, 2003). Biles (2003) is one of the rare studies on spatial multipliers, which is also the most relevant to my research. He investigated the economic base model for Yucatan, Mexico with spatial effects, and developed a spatial economic base model estimating spatial multipliers. Empirical evidence on employment

generation was found locally as well as across localities in the Yucatan region. An important implication in the study is that the result implies economic potential as a function of economic size and distance.

For the strategy-related economic activity or policies, spatial distribution of employment can bring about important implications. For example, local or state-level government may consider policies to alter the geographical composition of employment, such as reducing density in urban areas using taxation as policy instrument (Bollinger & Ihlanfeldt, 2002). In a detailed study McLafferty & Preston (1996) brought spatial analysis to a deeper level in which they analyzed spatial racial mismatch and gender gap in New York's employment; it appears that different spatial barriers exist for workers of different races, at least for New York. Phenomena like these may call for further government involvement in mitigating the situation. Cerqua & Pellegrini (2017) analyzed the lack of capital subsidy policies when in fact capital generates spatial spillovers (the term "spillover" here refers to externalities, but I find it relevant to my Colorado case particularly to the Creative District certification program, which is seen as a subsidized recreational amenity analogous to the capital subsidy case in their study). The authors proposed an integrated framework that attempts to find a balance or compromise between positive agglomeration effect from the clustering of capital, and the negative impacts from cross-sectional substitution and crowding-out effect when capital grows in a particular location. A corresponding study related to amenities and agglomeration effect is presented by Dalmazzo & Blazio (2011), who argue that urban areas create positive amenities impact for residents; in other words, urban agglomeration of economic activities generate higher welfare effects by creating a richer set of amenities. This implies the inflow mechanism for workers into urban and metropolitan areas or population centers. In the context of Colorado, Creative Districts as a local amenity is conjectured to influence the sectoral employment relationships.

Spatial analysis methodology is captured by the Manski model (Elhorst (2010), Anselin (1993, 1996)) which captures the essence of spatial dependence that arise from both spatially lagged dependent variables, spatial autocorrelation from the spatially distributed explanatory variables, and from latent variables that are often captured as a disturbance. Among the variants of spatial models, the Spatial Durbin

Model (SDM) is becoming increasingly popular in econometric analysis. Beer & Riedl (2012) showed the appropriateness of the SDM in analyses of panel datasets, which is further complemented by Belotti et al. (2017)'s work in developing statistical packages dedicated to the procedure.

2.3 Conceptual Framework

The underlying framework for this study is the Economic (or Export) Base Theory and spatial dependence. Crone et al. (1999) provides the underlying definition of economic base as “... *those activities that provide the core employment and income in which the rest of the local economy depends. Concerns about what constitutes the economic and its size are part of trying to understand how various activities might affect opportunities for the people living in the area and those whose well-being depends on the level of economic activity in the area.*” The following conceptual description of the Export Base Model follows Schaffer (2020), Krikelas (1992), McCann (2001), and Biles (2003) that formalized the link between the basic (B) and the non-basic (NB) sectors. In total, economic activity in a regional or local economy takes the form of

$$T = B + NB(B) \quad (2.1)$$

where the index T, B and NB denote the total, basic and non-basic economic activities, respectively. The latter term states that the NB sector is dependent on the B sector. The B sector itself is the export sector, i.e., economic activities dedicated to serving the interests and needs of the consumers outside the region, making it essentially a production economy. Therefore, it is determined by aspects outside the region, similar to how export spending normally is. On the other hand, the NB sector is to serve the needs of the region and is thus governed by local factors. The connection of NB to the B sector is established due to demand (or spending) linkages; higher demand for the B sector leads to a higher purchasing power of the locality, which will then give way to higher demand for the NB sector as well. McCann (2001) also stressed an interpretation that NB is directly linked on the total economic activity also, i.e.,

$$NB = NB(T) = \alpha T \quad (2.2)$$

where $\alpha \in [0,1]$.

The coefficient α here denotes the share of NB in the overall (T) economic activity in the region. When the total activity of the region changes, the NB sector changes as well, analogous to the responsiveness of consumption spending to overall GDP. This implies that when the B sector improves triggered by export demand, it affects the NB sector through T^{25} . The clear distinction between these two sectors is always fuzzy, in the sense that is often not possible to pinpoint which economic activity serves a particular region exclusively. For example, the music industry located in county A in a particular region serves both the local needs as well as that in other areas.

From equations (1) and (2) we can then define the region's base multiplier as

$$M = \frac{T}{B} = \frac{1}{1 - \alpha} \quad (2.3)$$

M also describes the responsiveness of total economic activity in the region when the B sector fluctuates:

$$\Delta T = M \cdot \Delta B, \quad (2.4)$$

indicating that larger changes in the B sector will generate more / additional economic activity in the region, supported by the dependence of NB on the B sector. Thus, B can be argued as the driver of economic growth in the local economy. In empirical setting, the relationship between B and NB can be written as

$$NB = f(B) = \beta_0 + \beta_1 B \quad (2.5)$$

Which describes the total activity in the region as

$$T = \beta_0 + (1 + \beta_1)B \quad (2.6)$$

and the multiplier as

$$M = \frac{dT}{dB} = (1 + \beta_1) \quad (2.7)$$

This format has been in use since the 1950-1960s era in which the economic base model was widely adopted in regional growth research. For example, Weiss and Gooding (1968) provided a simple regression equation to estimate,

$$S = Q + b_1 X_1 + b_2 X_2 + b_3 X_3 \quad (2.8)$$

²⁵ Since $T = B + NB$ and $NB = \alpha T$, we have $T = B + \alpha T$, and $T(1 - \alpha) = B$.

where the multiplier is thus $1 + b_i$.

For Colorado, in this framework I place the Creative Sector and Sector 71 as the base economy²⁶. Colorado's Office of Economic Development and International Trade reports that the Creative Sector generated 191,248 creative jobs created in 2019, and houses three of the nation's top 40 vibrant arts communities²⁷. Creative activities serve as a "mix" of both physical and human capital in a local economy (Seman, 2015), which can be regarded as the root of the spillover/multiplier effect into the larger economy. Both the Creative Sector and Sector 71 are claimed to be part of Colorado's primary economic sector (and competitive advantages); the recreation sub-sector raised \$48.7 million in 2013 alone, with over 7000 business establishments and annual employment of over 177,000.²⁸

From the Export Base Model, I view the Creative Sector and Sector 71 as serving the market outside of the respective county they reside in, which place them as the base (B) sector. Since I focus my analysis on sectoral employment, using the total employment as the dependent variable can involve biased results as the in terms of employment; that is because the $T = B + NB$ specification is more of an identity rather than a functional form. Because of this, I am placing my emphasis on the *spillover* effect of a particular sectoral employment (i.e. the Creative and NAICS 71 sectors) on employment in Other Sectors. In other words, I am examining

$$NB = f(B) \quad (2.9)$$

This conceptual framework is the basis for my empirical identification.

In spatial context, spillover effect is an impact brought about by an economic activity onto a different activity, such as commonly known in externality literature. Spatial dependence is the framework

²⁶ This is also supported by the increasing support of Creative District Certification, aimed at enhancing the two sectors.

²⁷ <https://choosecolorado.com/key-industries/creative-industries/>

²⁸ <https://choosecolorado.com/wp-content/uploads/2016/06/CO-Tourism-and-Outdoor-Rec-Profile.pdf>

integrated with the Economic Base Model elaborated previously (Schaffer (2020), Krikelas (1992), McCann (2001), and Biles (2003)).

Endogenous spatial effect is reflected in the relationship between the dependent (or Y) variable with itself but originating from a different geographical unit (the spatial lag). Similarly, the Y variable in a particular locality may also be affected by the explanatory variable of another place (exogenous spatial relationship or spatial correlation). The spatial version of the model will incorporate the spatial autocorrelation involving the weight matrix W for the total economy, with the index i and j representing own location and neighboring ones:

$$T_i = B_i + NB_i + W_{ij}T_j \quad (2.10)$$

For my model, I am looking at the two sectors seen as the base economy (Sector 71 and the Creative Sector), and I am examining how it affects the non-basic economy (Other Employment), making the total economic activity as follows:

$$T_i = \text{Sector 71} + \text{Creative Sector} + \text{Other Employment} \quad (2.11)$$

from which I measure the employment spillover as

$$\text{Other Employment} = f(\text{Sector 71}, \text{Creative Sector}) \quad (2.12)$$

For the spatial counterpart the underlying model is

$$\text{Other Employment}_i = f(\text{Sector 71}_i, \text{Creative Sector}_i, \text{Sector 71}_j, \text{Creative Sector}_j) \quad (2.13)$$

which will be explored in more detail in the next Section.

2.4 Empirical Methodology

The estimation procedure in this paper relies on the two sectoral employments, namely employment in the Creative Sector and Sector 71. In this context, it is important to realize that there are some overlaps of some subsectors between the two, as described in Chapter 1. Like the treatment in that Chapter, here I also made necessary adjustments to ensure that double counting issue is avoided.

The data consists of 64 panels made of 64 counties in the State of Colorado. It comes from QCEW (Quarterly Census of Employment and Wages) data from the Bureau of Labor Statistics (BLS) and from the Colorado's State Demography Office of the Department of Local Affairs (DOLA), 2010-2019²⁹. The QCEW raw data displays the employment numbers at the establishment level for each county, for each month in a quarter. To aggregate, I take these monthly numbers and take the annual average, which is then used as annual data. As the data is also decomposed into the 6-digit NAICS categories, I can measure the annual employment for the Creative Sector (as defined by BLS) as well as for Sector 71, for each county and year. This is the dataset that is then used for estimation.

2.4.1 Variable Construction

My model specifies that the dependent variable is total employment in sectors outside the Creative Sector and Sector 71 combined at county level, and the explanatory variables are primarily the Sector 71 and Creative Sector employments. BLS' definition of the Creative Sector also includes some NAICS 71 sub-sectors; since I am using the Creative Sector in the estimation alongside Sector 71, this also poses an issue of double counting. Therefore, I take out the Creative Sector components out of Sector 71, leaving a "S71netCS" employment variable, which is then denoted as Sector 71 employment adjusted for the double counting. To normalize the treatment on these variables, all three are denoted as *employment rate*, which is defined contextually here as the number of employments divided by total county population.

In this study I include the following demographic and socioeconomic control variables, which are (a) Educational attainment variables, measured by the share of population aged 25 and older that have completed bachelor's degree as well as associate's degree. This distinction is made to see whether the economic impact of the two sectors could benefit from having workers from different educational backgrounds. (b) Median Age in the county; the median age of the county's population is included to see

²⁹ The 2010-2019 time window was selected despite employment data was available from 2001, because there are some control variables that were not consistently available for the entire 2001-2019 period.

whether the economic impact of Sector 71 and the Creative Sector are influenced by the age structure, i.e., whether older age contributes positively to that economic impact of the two sectors in question; (c) Individual income, (d) Average household size, which represents the size of average families in a county. It is conjectured that larger average family size may support Sector 71 and the Creative Sector better, through the spending channel. (e) Median home value as a proxy for wealth, and (f) Population density, which can indicate how an area attracts workers (i.e., the agglomeration effect). In addition, the presence of a Creative District in the county is added as a dummy variable. . The summary statistics of the involved variables are presented below in Table 2.1.

Table 2.1. Summary Statistics

Variable	Obs	Mean	Std. dev.	Min	Max
Other Employment Rate	640	0.4553	0.1675	0.0098	0.8691
Creative Sector Employment Rate	640	0.0688	0.0832	0.00	0.5303
Sector 71 Employment Rate	640	0.1697	0.2020	-0.0022	0.9448
Bachelor's Degree Holders Rate	640	0.2989	0.1324	0.07	0.631
Associate's Degree Holders Rate	640	0.0835	0.0239	0.009	0.156
Median Age	640	42.0792	5.6399	32.50	55.90
Per Capita Personal Income (\$)	640	44385.60	15981.47	16191.00	175694.00
Household Size	640	2.3685	0.1941	2.00	2.98
Median Home Value	640	229490.60	122605.70	62200.00	670200.00
Population Density	640	130.8566	559.0182	0.68	4756.41
Creative District (dummy)	640	0.1625	0.3692	0	1

2.4.2 Model

The baseline model for this study is non-spatial panel regression with fixed effects. For a situation where spatial relationships / dependence is obvious, such as in the case of Colorado, panel fixed effect regression is generally producing biased and inconsistent results (Eilers (2019)) since it does not account

for that dependence, albeit able to control for some forms of heterogeneity across individual units (counties in the case of Colorado). This baseline is then compared and contrasted to the spatial version of the model.

Spatial regression models capture dependence, which can be in various forms. The Spatial Durbin model (SDM) is one of the most used for non-linear specification³⁰. Briefly comparing across models, Spatial Autoregressive (SAR) and Spatial Error Model (SEM) specifications are found to embed severe drawbacks in terms of biases, while SDM, SDEM (Spatial Durbin Error Model) and SLX (Spatially Lagged Independent Variables) can yield more accurate estimates of direct impacts (i.e., of an explanatory variable on the dependent variable within the same spatial unit) (Ruttnauer (2022)).

The SDM distinguishes between the direct effect that expresses the change of dependent variable in unit i caused by the change of the explanatory variable x for that unit (in this study's context, a specific county), and the indirect effect counterpart, representing how the dependent variable in unit i is affected by a change in the explanatory variable x of all *other* units (all units except unit i) (Belotti et al. (2017)). As economic activity across space spills over from one geographical unit to another (e.g., across counties), it is more likely that that spillover does not happen instantaneously, which is the rationale for the lag(1) model specification in which the dependent variable at time t is seen in association with a series of explanatory variables occurring in the preceding period ($t-1$). The lagged log model explores the elasticity between two different years (t and $t-1$).

To obtain *OtherEmp*, the dependent variable, I subtract the Creative Sector and Sector 71 employment from the Total employment for each county in each year between 2010 – 2019. It is thus defined as

$$OtherEmp_{it} = Total\ Employment_{it} - (CS\ \&\ S71\ Employment)_{it} \quad (2.14)$$

The log version places *OtherEmp* as the dependent variable since *OtherEmp* is a share variable (total Other Employment with respect to total population). This model is thus a log form with respect to only several of the explanatory variables (that are in levels). For all estimations, the Hausman test was

³⁰ Since there is a dummy variable and an interaction term, my model can be considered as non-linear.

conducted, and resulted in the fixed effect models to be the appropriate specification. The baseline empirical model is described as

$$OtherEmp_{it} = \beta_0 + \beta_1 CS_{it} + \beta_2 S71netCS_{it} + Z'_{it} \cdot \delta + \varepsilon_{it} \quad (2.15)$$

in which the two sectors are the base economic sectors. Z is the vector of control variables, i denotes county index ($i \in [1,64]$) and t represents years ($t \in [2010,2019]$), respectively. The term $S71netCS$ is the employment in the Sector 71 net of subsector employment that are also part of the Creative Sector³¹.

In the second part of the study, my approach for analyzing spatial relationships is the Spatial Durbin Model (SDM), by far the most used in spatial econometric analysis. SDM is derived from the Manski (1993) model and is broader than the Spatial Error Model (SEM) in that it also considers exogenous spatial relationships between the dependent variable and the spatially lagged explanatory variables. For Colorado, I am dealing with sectoral employment that varies from county to county. I believe that Other Employment in a particular county can be influenced by that in other counties, linked by commuting patterns, economic distances, and industrial linkages; the similar line of thought can be applied to how Other Employment is affected by sectoral employment in different counties, which can also be attributed to spending linkages across counties. For this reason, I adopt the SDM approach for my estimation.

The SDM approach is described as the relationship between the dependent variable and the explanatory variables, considering the different values for other localities, which is captured by the weight matrix W ³²:

$$Y_{it} = \rho WY_{-i,t} + X_{it}\beta + WX_{it}\varphi + \alpha_i + \mu_i + \varepsilon_{it} \quad (2.16)$$

Y_{it} is an $(nx1)$ vector of the dependent variable, with the indices i and t representing the geolocation and time variable, respectively. The parameter ρ describes the spatial autoregressive coefficient that associates the dependent variable and its spatially lagged version ($WY_{-i,t}$), also known as the endogenous

³¹ See Tables 1.5 and 1.6 in Chapter 1 of this dissertation.

³² This is derived from the General Nesting Spatial Model, or the Manski Model, which takes the form

$$Y = \rho WY + \alpha_n + X\beta + WX\varphi + \mu, \text{ with } \mu = \lambda W\mu + \varepsilon.$$

interaction effect. X_{it} is a $(n \times k)$ matrix of the explanatory variables; the term $WX_{it}\varphi$ denotes the exogenous interaction effect. β is the $(k \times 1)$ vector of association parameters, φ is also a $(k \times 1)$ vector of association parameters linking Y_{it} to explanatory variables in different localities, and ε_{it} is the error term. α_i represents the vector of constants. A non-spatial specification ignores the $\rho WY_{-i,t} + WX_{it}\varphi + \mu_i$ part of the equation. The following estimation equation is a representation of equation (16) in the context of Colorado's case:

$$\begin{aligned} OtherEmp_{it} = & \rho WOtherEmp_{-i,t} + \beta_1 S71_{it} + \beta_2 CSnet_{it} + W(S71_{it}\varphi_1 + CSnet_{it}\varphi_2) \\ & + Z'_{it} \cdot \delta + \varepsilon_{it} \end{aligned} \quad (2.17)$$

This specification describes the exploration of Other Employment as possibly being affected by itself in different counties, by the sectoral employment both in the same as well as in other counties, a series of control variables, and an error term.

The weight matrix used in this study is one based on population centroid, as a more realistic alternative to area centroid. In general, a centroid of an area refers to the balancing point of that area's shape, or gravitational center, normally measured as the average coordinates of that area. The population centroid is often considered to be a more realistic representation of an area's balancing point, as it is determined by where the concentration of population is within that area. Mathematically, it is the specific point within that area at which the population has the smallest possible sum of squared distances³³. The population center weight matrix used here is also in terms of inverse distance; that is, the farther away a county is from a population center, the less the employment spillover effect is from the two sectoral employments. The rationale for this is that closer distance to a population center, the faster consumer spending in a particular sector (such as Sector 71 or the Creative Sector) will reach economic activities in Other Sectors, which in turn contributes faster to Other Employment. From the supply side perspective, production and distribution costs are potentially lower when closer in distance to population centers. In other words, backward and forward linkages may play a significant role in why population-center weight

³³ An internal or interior point is analogous to a centroid which is the point of the area's central mass, but in spatial terms, an internal point is guaranteed to be in a polygon, while a centroid may not always be.

matrix is more meaningful for Colorado's case. Formally, the population-centered weight matrix is defined as

$$w_{ij} = \begin{cases} 0 & \text{if } i = j \\ M_{ij} & \text{if } i \neq j \end{cases} \quad (2.18)$$

where M_{ij} represents the standardized decreasing function geolocation point of the population center of a county, i.e. $M_{ij} = \frac{1}{d_{ij}^2}$ (incorporates a weighting power $p = 2$).³⁴ The strength and magnitude of spatial relationship is influenced by how it is numerically measured, represented by a weight matrix that is exogenous to the system being estimated (Zhang (2012)). The weight matrix thus captures the different degrees of importance of each locational unit.

2.5 Estimation Results and Discussion

The Moran's I spatial diagnostic test (Anselin (1993, 1996)) is used to detect spatial dependence before proceeding with estimation. It illustrates the relationship between a (univariate) variable and the weighted average value of its neighboring localities for that same variable. The null hypothesis for Moran's I statistic is that the variable or attribute is randomly distributed (in other words, the spatial process or occurrence is a random chance). The statistically significant Moran's I statistic suggests that the spatial occurrences are not random, which implies that a spatial dependence is present for the respective variable. In my context, it measures the how Other Employment of a county and that of the neighboring counties (the spatial lag) are interconnected, weighted by the distribution of population centers in the State of Colorado. I experimented with the Moran's I for my three main variables to gain a general idea of whether there are spatial relationships of each variable in a particular location with that in other counties nearby. I computed the Moran's I statistic using two different weight matrices: inverse distance and inverse population. For the former, the statistic was not significant, seemingly suggesting that there is no

³⁴ A power of 1 smooths out the impact surface from the centroid or internal point in a region. A power of 2 increases the impact factor, making the impacts more pronounced. A visual elaboration (GISGeography (2022)) is available at <https://gisgeography.com/inverse-distance-weighting-idw-interpolation/>.

meaningful spatial dependency in the region for Other Employment. When computed based on the latter, however, a significance emerged. This indicates that spatial dependence is present.

Table 2.2 below presents the global Moran's I, which describes the overall spatial pattern of the dataset. I computed the Moran's I for the beginning and the end year of the period (2010 and 2019). This stems from the consideration that within 2010 and 2019, the State of Colorado has witnessed tremendous development in both Sector 71 and the Creative Sector, including the designation of the (currently) 26 Creative Districts.

Table 2.2. Moran's I (2010 and 2019)

Variable	Moran's I value (2010) and p-value	Moran's I value (2019) and p-value
Other Employment	0.0351 (0.0047) ***	0.0424 (0.0012) ***
Sector 71 Employment	0.0616 (0.0000) ***	0.0669 (0.0000) ***
Creative Sector Employment	0.0627 (0.0000) ***	0.0529 (0.0000) ***

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Note: Computation based on inverse distance weight matrix of population mean. The weight matrix is constructed from the 2010 Census data. Respective scatterplots are in Appendix B.

Moran's I test indicates that spatial correlation is detected for all three main variables in this study; that is, the hypothesis of spatial randomness is rejected, and spatial clustering is present at the beginning and at the end of the estimation period. For Sector 71 and Other Employment, the dependence is strengthening in the 10-year period, while for Creative Sector employment, it is weaker in 2019 compared to 2010. Overall, this test supports the idea of proceeding with spatial estimation.

Initially, four iterations were run for both versions: lag(1), log, lag(1) of the log, and growth. Only two are reported here, the lag(1) and lag(1) of the log. The contemporaneous log version and the growth are no longer considered due to (1) the unrealistic view of contemporaneous influence and response, and (2) essentially the notion of growth can be represented by percentage change, which is the log specification. Tables 2.3 and 2.4 illustrate the comparisons between the baseline (panel) model and their respective spatial

counterparts. For all models, the dependent variable is Other Employment Share (with respect to total population in the county). In the Spatial Durbin Model, I only focused on the fixed-effect specification, considering that county-specific effects (i.e., the individual heterogeneity) are not believed to be random.

Both tables consist of three output columns: the first column (Baseline) is non-spatial. The spatial output consists of SDM-FE (Local Effect) column referring to the direct effect and the SDM-FE (Wx) is the indirect effect (spillover). In both models there is a loss of one observation due to the 1-year lag; the dataset used for estimation is therefore truncated to include only 2011-2019.

In Model 1 (lag(1)) the baseline panel model indicates that Creative Sector employment is strongly and negatively associated with Other Employment, particularly in Rural counties; the coefficient of -0.49 indicates that employment in Other Sectors declines as much as 49 percent when there is an increase of 1 percent in Creative Sector employment. Similarly, Sector 71 Employment is also negatively associated with Other Employment in the following period. In Urban Core areas, significant relationships are not detected. The negative magnitude implies that when there is an upswing in the two sectoral activities, there is an influx of workers originating from outside sectors. This does not necessarily mean that those upswings trigger the influxes- it is also possible that the mechanism works in reverse. The association coefficients as estimated capture the association but not necessarily the causality.

Considering spatial dependence, the SDM's direct effects indicate that both the CS and Sector 71 employment of a county are directly associated with Other Employment in the same county, but in the opposite direction. The spatial correlation is indicated by the rho, which is negative, suggesting that counties' Other Employment characteristics are diverse from one another (in other words, there is no indication of clustering, but dispersion instead; that is, units (counties) with small values are neighboring with those with high values (Griffith & Arbia (2010)).

Table 2.3. Model 1: Lagged Regression

VARIABLES (t-1)	Dependent Variable: Other Employment (t)		
	Panel lag	SDM-FE lag	
	All Counties	Local Effect	Spillover
Creative Sector Employment Rate	-0.488*** (0.1790)	-0.528*** (0.1880)	-2.935 (2.2280)
Sector 71 Employment Rate	-0.236* (0.1200)	-0.254** (0.1060)	-0.386 (0.6610)
Bachelor's Degree Holders Rate	0.0614 (0.0794)	0.0326 (0.0822)	0.195 (0.6880)
Associate's Degree Holders Rate	-0.128 (0.1560)	-0.179 (0.1550)	1.409 (0.9090)
Median Age	-0.00236 (0.0028)	-0.00128 (0.0030)	-0.000459 (0.0304)
Per Capita Personal Income	1.29e-06* (0.0000)	1.59e-06** (0.0000)	-3.48E-06 (0.0000)
Household Size	1.22E-01 (0.1080)	9.85E-02 (0.1170)	-4.49E-01 (0.9960)
Median Home Value	9.49E-08 (0.0000)	8.44E-08 (0.0000)	-3.65E-07 (0.0000)
Population Density	1.30E-04 (0.0001)	9.22E-05 (0.0001)	2.13E-04 (0.0006)
Creative District (dummy)	-4.32E-03 (0.0064)	-4.05E-03 (0.0070)	0.0272 (0.0735)
CS Employment * Per Capita Income	-1.33E-07 (0.0000)	-3.19E-07 (0.0000)	2.74E-05 (0.0000)
Sector 71 Employment * Per Capita Income	-3.71e-06** (0.0000)	-3.37e-06** (0.0000)	-1.17E-05 (0.0000)
CS Employment * Population Density	-2.01E-04 (0.0002)	-3.63E-05 (0.0002)	5.52E-06 (0.0016)
Sector 71 Employment * Population Density	0.000282 (0.0003)	0.000135 (0.0002)	0.0023 (0.0018)
Creative District * Sector 71 Employment	0.00957 (0.0296)	0.0173 (0.0295)	0.267 (0.3200)
rho		-0.0546 (0.2340)	
sigma2_e		0.000486*** (0.0001)	
Constant	0.26 (0.2910)		
Observations	576	576	576
R-squared	0.341	0.272	0.272
Number of cntynum	64	64	64

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Other predictors that are significant are per capita personal income and its conjunction with Sector 71 employment. The relationship between personal income and Other Employment is positive but very small, suggesting that when personal income per person increases by \$1, it almost does not trigger any meaningful increase in that employment. Given the magnitude for all counties, for Other Employment to be positively triggered by 1 percent, personal income per person needs to increase as much as over a million dollars. This is very challenging for any economy. When compiled along Sector 71 employment, the result also indicates that the contribution of income to Sector 71's association with Other Employment is very small. The spatial side of Model 1 states that there are some direct effects within the local Rural county from the fluctuations in both the Creative Sector and Sector 71, but cross-county employment spillovers are not detected. Per capita personal income within a county appears to matter very slightly in terms of its relationship with Other Employment, but it does not show any spillover effect onto that in other counties'. It does, however, matter in supporting the relationship between Sector 71 employment and Other Employment, but not in supporting that of the Creative Sectors'. This unusual outcome motivated the move to Model 2, in which the non-share variables are subject to logarithmic transformations.

Model 2 examines the logarithmic specification using lagged explanatory variables to capture realistic delayed responses. The log regression is that with respect to per capita income, median age, household size, median home value, and population density. With respect to the other variables, the regression is log-linear considering how those variables are constructed; for example, sectoral employment is in *share* format, which is the number of employments in the sector divided by total population. This log model aims to capture response relationships (i.e., elasticities). The interpretation of elasticity in the lagged version is similar, except that it considers a 1-year delay. The dataset is also truncated to include only the years 2011-2019. Intuitively, the lag(1) version of the log specification (i.e., elasticity) is more realistic than the contemporaneous version, for the reason of a lagged response in Other Employment. In this study I limit the time lag to only one year to avoid losing more observations.

Table 2.4. Model 2: Lag – Log Regression

VARIABLES (t-1)	Dependent Variable: Other Employment (t)		
	Panel lag-log	SDM-FE lag-log	
	All Counties	Local Effect	Spillover
Creative Sector Employment Rate	-0.500*** (0.1680)	-0.575*** (0.2110)	-3.059 (2.0860)
Sector 71 Employment Rate	1.108 (0.8200)	0.714 (0.8340)	9.424 (7.1140)
Bachelor's Degree Holders Rate	0.0516 (0.0867)	0.0472 (0.0870)	0.247 (0.6130)
Associate's Degree Holders Rate	-0.0988 (0.1540)	-0.0958 (0.1580)	1.903* (1.0830)
(log) Median Age	-0.0410 (0.1280)	0.0612 (0.1240)	0.9170 (0.9280)
(log) Per Capita Personal Income	0.0619** (0.0294)	0.0745** (0.0313)	0.0067 (0.1450)
(log) Household Size	0.2490 (0.2690)	0.128 (0.2600)	-1.423 (2.6500)
(log) Median Home Value	0.0455** (0.0204)	0.0284 (0.0198)	0.0364 (0.1450)
(log) Population Density	0.0124 (0.0682)	0.0250 (0.0791)	-0.423 (0.4490)
Creative District (dummy)	-0.0004 (0.0065)	-0.0020 (0.0073)	-0.0189 (0.0698)
(log) CS Employment * (log) Per Capita Income	0.0000 (0.0000)	0.0000 (0.0000)	0.0000 (0.0000)
(log) Sector 71 Employment * (log) Per Capita Income	-0.159** (0.0759)	-0.1190 (0.0783)	-1.0170 (0.6330)
(log) CS Employment * (log) Population Density	0.0152 (0.0804)	0.0794 (0.0814)	1.520*** (0.5480)
(log) Sector 71 Employment * (log) Population Density	0.0787* (0.0420)	0.0671 (0.0490)	0.4270 (0.3880)
Creative District * (log) Sector 71 Employment	-0.0049 (0.0300)	0.0051 (0.0310)	0.3750 (0.3080)
rho		-0.0923 (0.1590)	
sigma2_e		0.000483*** (0.0001)	
Constant	-0.766 (0.5260)		
Observations	576	576	576
R-squared	0.336	0.262	0.262
Number of cntynum	64	64	64

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

The outcome of Model 2 (Table 2.4) is similar in the direction of the Creative Sector compared to Model 1, but Sector 71 no longer has a significant association with Other Employment. The relationship between Creative Sector employment and Other Sectors' is similar to the non-log version in Table 2.3., in that it works in the opposite direction with similar magnitude. A spillover effect from CS onto Other Employment in other counties is not detected as well; this suggests that Other Employment in a particular county is likely not affected by changes in sectoral employment (CS and Sector 71) in other counties, at least for the data range of 2011-2019. In other words, a county's Other Employment is likely to be independent from sectoral activities in other neighboring counties. Since the spillover across counties are more likely to occur over an extended period, a longer period may be able to capture this dependence better.

An interesting spillover effect is coming from the Associate's Degree Holders variable: the spillover outcome suggests that with an increase in that education category in any county, there is an increase (around 2) in Other Employment share in neighboring counties. For example, if a community college in Boulder County produces 10 percent more associate's degree holders in, say, 2017, Weld or Larimer counties could see around 19 percent more employment in Other Sectors, relative to their own population. Overall, the spatial interdependency indicated by the spatial rho in this lag(1) specification is negative, suggesting that the average influence on a county from variables in other counties works in the opposite direction; that is, variables in county or counties $-i$ will put pressure on Other Employment in county i . On the other hand, insignificance is also detected, which is presumably related to the relatively short panel data employed in estimation.

For per capita personal income, the logarithmic transformation provides a more intuitive interpretation of the relationship; here, a one percent increase in per capita personal income is related to a 0.06 percent increase in Other Employment overall in the State, and slightly higher at 0.07 percent in Rural areas. Moreover, the interaction term between income and Sector 71 was able to make Sector 71 employment play a more meaningful role in Other Employment: with the help of personal income, the relationship with Other Employment registers at -0.16, indicating the likelihood of the consumers spending

that extra income in Sector 71 instead of in Other Sectors. This implies that personal income is an essential component in the viability of Sector 71.

Population density (as a proxy for agglomeration) has a small role according to the baseline panel estimation despite showing insignificance on its own, but this appears to be at the State-wide average level. When analyzed using spatial estimation, the effect of agglomeration is no longer visible, both for intra (within) county and across county. For Creative Sector employment in particular, the positive role of density is visible only in the Urban areas, while that role in relation to Sector 71 occurs in the overall State; this suggests that they counties can capitalize better on existing urban infrastructure and consumer base relative to the Rural counterparts. It also indicates that when the Creative Sector in a particular county grows it will draw workers the previously did not work in the CS nor Sector 71. This is possible through its building new businesses and innovative activities, as well as stimulating the population's spending in the local economy. Based on the data, Rural counties do not appear to be benefiting from agglomeration that occurs in various physical development such as housing supply and expansions of market and infrastructure.

The overall (or average) economic base multiplier in the baseline specification for the CS can be approximated at $M = (1 + \beta) \approx 1.5$, while for Sector 71 it is $M \approx 0.76$ since the coefficient is negative. The spatial multiplier is slightly smaller than the baseline's multiplier, indicating the increased complexity that spatial dependence is bringing into sectoral employment relationships.

In context of economic base approach that underlies this research, a comparison between the two models is presented in terms of multiplier. Table 2.5 summarizes the multipliers of each main variable in the two models, including Creative District certifications and the interaction term (co-presence) of Creative District and Sector 71 employment.

Table 2.5. Summary of Economic Base Multipliers

Sector	Lag Model			Lag-Log Model		
	Baseline	Local	Spillover	Baseline	Direct	Indirect
Creative Sector	0.512***	0.472***	n.s.	0.5***	0.425***	n.s.
Sector 71	0.764***	0.746***	n.s.	n.s.	n.s.	n.s.

Note: n.s.: *not significant*

Across the two models, the significant economic base multipliers of the Creative Sector are consistent. However, Sector 71 does not deliver meaningful multipliers, and neither does the Creative District certification program, even when interacted with Sector 71 employment in a county it was awarded to. The conjecture so far is that it may be linked to the short panel size that poses limited statistical power.

Several aspects can potentially improve the outcome of the research, spanning across model specification and data coverage. One, this analysis did not include an attempt to trace the optimal time lag as suggested by Dormann & Griffin (2015), which argue that optimal time lags are usually short. As mentioned in the previous section, the selection of lag(1) is purely based on practical reasons: to keep the panel dataset as large as possible, while at the same time to factor in certain notion of time differences in a static regression analysis. When data allows for a longer period, it may lead to different outcomes.

Two, as author I believe that the specification of the model can be improved upon by incorporating different variables and different empirical approaches, such as using a dynamic spatial model or causal inference, or other spatial methodologies. Since this study focuses on spatial lags, a reasonable extension is employing a spatial error specification, such as the Spatial Durbin Error Model, which accounts for the dependence of error terms. Contrary to the SDM which is a more global estimation in that it also incorporates the spatially lagged dependent variable, the SDEM does not include the spatially lagged dependent variable, making it a local estimation instead. In this study the case of Colorado counties is treated as a global one in the sense that interactions between all counties are being considered. One may

restrict spatial spillovers to only occur between closely neighboring counties only, in which situation a SDEM model may be deemed more appropriate.

Three, a larger panel dataset involving more geographical units and longer timeframe may increase the explanatory power of this model. At the national level, these may be able to capture a more holistic spillover effects at county level and provide a framework for relevant policies that can apply across the board.

Four, another potentially interesting avenue for similar study is to use occupational, rather than industrial or sectoral data. While sectoral data overviews business activities, occupational data is more individualized, looking at types of jobs. For Creative Sector- and Sector 71- related investigations, occupational data may allow for more specific relationships.

Five, this study used Other Employment as a proxy for economic performance. Alternatively, using different proxies such as sales and net job creation can potentially deliver different insights on how sectoral employment and place-based policy (e.g., Creative District Certification) can have any influence.

Six, the weight matrix itself may have some limitations that influence the outcome. Corrado & Fingleton (2012) brought up one important caveat that restricts the accuracy of a spatial model: given the simple construction of W , it obviously contains certain simplifying assumptions that may not accurately reflect real-life conditions. This limitation of a weight matrix remains something to be aware of.

2.6 Conclusion

This study examines the influence of employment in certain sectors on employment *outside* those sectors in different counties in Colorado (i.e., Other Employment). This is performed by making a comparison between a baseline fixed effect panel model and the spatial counterpart, using the Spatial Durbin Model, based on the conceptual foundation of Economic Base Theory.

Baseline estimation results indicate that based on the selected period, both sectoral employments are significantly and negatively associated with Other Employment in the next period. The direct spatial effect confirms this, which means that they influence Other Employment within their own county; however,

spatially the sectoral employment spillover is not captured. In terms of percentage responses (log version), the results are similar for the Creative Sector, but there is a reversal in Sector 71 in that it no longer registers a significant relationship in the baseline as well as in the spatial versions.

On a separate note, the presence of Creative Districts does not appear to have meaningful association with Other Employment, both seen in the baseline as well as the spatial models, even after coupled with Sector 71 employment. The conjecture regarding this “ineffectiveness” is that it originates from two possible sources: limited (short) panel and model specification: in 2019 there are still Creative District Certifications being awarded; their employment impacts, if any, are not yet captured by available data.

The results also indicate that there are significant multiplier effects running from sectoral employment to Other Employment that implies inter-sectoral linkages, however these were only detected within county; the indirect, or spillover, effect, was not captured by the model’s multipliers.

Several implications arise from this study and its limitations. The need for a longer panel dataset, experimenting with different variables, using different economic performance indicators (such as using occupational (rather than industrial) data, employing different proxies for economic performance and different modeling approaches, are among the few.

3 County Level Social Capital in Colorado

3.1 Introduction

Social capital is commonly understood as a set of shared values in a society or community, aiming at enhancing the way individuals collaborate towards a common purpose. As such, definitions of social capital range within a wide array of trust, cooperation, social participation, non-profit activities, collective actions, and many other forms. There is no single definition that describes social capital to its fullest.

In literature, social capital has documented contribution to economic development and growth at the local level as well as at a more aggregate level (Bjornskov (2008), Whiteley (2000), Fengqiao & Dan (2015), Odgen et al. (2014), among the many). Moreover, studies have demonstrated that these economic impacts can range from positive to negative (Pillai et al. (2017)), and are dispersed into various dimensions of life, such as happiness (Bjorskov (2008)), and education and employment (Fengqiao & Dan (2015)). Some other studies such as Yoo & Lee (2009) claimed that there is no evidence that social capital is linked to economic performance. All these variations in research outcome indicate that. This study examines social capital in Colorado; I take a production or supply side approach to evaluate factors that affect social capital at county level.

For the measurement of social capital, different authors have proposed different ways to quantitatively measure social capital; however, due to the broad nature – and deep at the same time – measures of social capital tend to be very contextual. For example, a trust measure of social capital such as *Trustindex* is to address credibility of businesses from consumers' standpoint, while trust in governments is often measured differently through surveys. I use *social capital index* data constructed by the Department of Agricultural Economics, Sociology, and Education of The Pennsylvania State University³⁵ (Rupasingha et al., 2006). In their framework, social capital was measured at county level for various years (1990, 1997,

³⁵ <https://aese.psu.edu/nercrd/community/social-capital-resources>

2005, 2009, and 2014). For this study I use the 2005, 2009 and 2014 data considering that for other variables used in my estimation, the 1990 and 1997 data are incomplete. The index itself ranges from -1.9 to 6.8; the publisher of the index stated that the negative value simply means that a particular county has a low level of social capital. In other words, the higher the number, the more social capital is accumulated in a county. For Colorado overall, an indication of the social capital is presented in Table 3.1. At the State level, social capital has increased between 2005 and 2009, but declined afterwards. Unfortunately, there is no further measurement beyond 2014.

Table 3.1. Colorado's Social Capital Index, 2005-2014

Year	Mean	Median
2005	0.5663	0.2570
2009	0.9719	0.4405
2014	0.7378	0.2455

Source: Calculated from Rupasingha et al. (2006).

In comparison to other US States outside the District of Columbia, Colorado's mean of social capital index ranks in position #9, as displayed as a snapshot in time in Table 3.2.^{36 37} Colorado's relatively high index ranking is the motivation behind this study. I am intrigued to discover the extent to which Colorado's social capital is linked to socio-economic variables and how it is affected by an external shock. Social capital is a complex notion which is often seen as explaining economic outcomes as well as one that is impacted by economic outcomes; in this study I only focus on one-sided relationships which is the production side of social capital. This supply-side approach is important for understanding how the magnitudes are often not as expected. For example, why the social capital index of Utah is the lowest among all, and Wyoming's is the highest. When measured using different proxies, the ranking can be different. My

³⁶ The means are calculated from the counties within each State. The District of Columbia is excluded because the District includes only one county.

³⁷ In Section 4 I describe the construction of the index which can provide further sense of this ranking.

study is not an attempt to compare the differences across States, but merely investigate how, for the case of Colorado, economic variables affect social capital.

Table 3.2. Ranking of Social Capital Index of U.S. States

State	Social Capital Index (2014)	Rank	State	Social Capital Index (2014)	Rank
Wyoming	2.01762	1	Michigan	-0.30305	26
North Dakota	1.62118	2	Arizona	-0.32933	27
Minnesota	1.55631	3	Arkansas	-0.32933	28
Montana	1.48689	4	New Mexico	-0.34472	29
Nebraska	1.33815	5	North Carolina	-0.35703	30
South Dakota	1.02281	6	Connecticut	-0.36682	31
Iowa	1.01401	7	California	-0.38700	32
Oregon	0.79920	8	Indiana	-0.40971	33
Colorado	0.73302	9	Kansas	-0.40971	34
Wisconsin	0.62959	10	Texas	-0.41518	35
New Hampshire	0.42700	11	Delaware	-0.44210	36
Vermont	0.37410	12	Georgia	-0.48208	37
Washington	0.30252	13	Alaska	-0.48359	38
Illinois	0.21218	14	New York	-0.51066	39
South Carolina	0.19661	15	Florida	-0.53786	40
Virginia	0.16869	16	Alabama	-0.58387	41
Massachusetts	0.16595	17	New Jersey	-0.62269	42
Maine	0.09862	18	Louisiana	-0.63333	43
Maryland	-0.01069	19	Mississippi	-0.65760	44
Pennsylvania	-0.02202	20	Nevada	-0.66717	45
Ohio	-0.11103	21	West Virginia	-0.81524	46
Missouri	-0.12050	22	Hawaii	-0.88538	47
Idaho	-0.22817	23	Tennessee	-1.09318	48
Oklahoma	-0.24823	24	Kentucky	-1.10840	49
Rhode Island	-0.30201	25	Utah	-1.29921	50

Source: Rupasingha et al. (2006).

The research questions in this study are as follows: (a) To what extent does county social capital in Colorado depend on economic factors such as physical capital, poverty, and unemployment? and (b) Has social capital in Colorado been affected by economic recession? Aspects mentioned in prompt (a) are aimed at linking social capital, measured here by the average participation in the community, with factors that community members experience in their daily lives. Overall, one can expect participation to not be a

primary / essential good in life, but a supplement. For example, we can expect that being unemployed would likely hinder one from actively participating in community activities and focus on improving their (or their families') livelihood first.

The main contribution of this study is the examination of relationship between social capital and economic variables in a panel setting, using county level data as unit of analysis, and identification of linkages in the said relationship and how it can potentially impact social policy. While the 2006 study by Rupasingha and his team can be considered as one of the most comprehensive to date, to the best of my knowledge, a panel study that I am conducting has never been produced, particularly at county level.

The remainder of this paper is outlined as follows: Section 3.2 explores existing literature; in section 3.3 I elaborate the conceptual framework. Variables and estimation methods are introduced in Section 3.4 along with the discussion on results. Section 3.5 concludes.

3.2 Literature Review

I classify literature review into four parts. First, I explore the most prominent studies on social capital that involve different definitions and contexts, how it is measured, and its conceptual and practical limitations. Second, I review articles that looked at the effects of social capital in an economy; this is important as at the end, social capital is considered a variable that has similar treatment as physical capital. Third, I explore studies that investigated aspects that influence or construct social capital- which is the focus of this study. Lastly, I highlight the notion of regional social capital with the focus on social capital differences across regions. I find the latter relevant in the context of examining county-level social capital.

Research work on social capital has been growing increasingly fast over time, particularly in the early 2000s (Scheffler & Brown (2008), Mouw (2006)). In my exploration I have encountered various sociological and political perspectives of the realm of social capital in which the presentation is often qualitative in nature, and I intend to document how it is being approached in economics, particularly the empirical side.

3.2.1 Scope and Definition of Social Capital

Some of the primary authors of social capital are notably Robert Putnam and James Coleman. Coleman's contribution is the treatment of social capital (as a social construct) using rational choice theory in economics that is based on independent, self-interested actions (Coleman, 1988). According to this thought, economic outcome is essentially impossible to achieve without the contribution of social capital, one of it being how it shapes human capital en route to economic growth. Glaeser et al. (2000) is another study on individual-level social capital; the paper argues that social capital is more individual than collective.

In a way, Putnam (1997, 2000) expanded Coleman's notion by presenting the facts that social capital is on a path of decline, particularly in the United States, which is one of the plausible explanations of why community wellbeing is on the decline. In his view, social capital is treated as a public good that is constructed away from individual interest (à la Coleman). Putnam's idea of social capital is an aggregate or collective trait that is primarily built out of civic engagement, represented primarily by norms and trust on others that becomes the drive of functioning of (economic) organizations. Putnam's idea that social capital contributes to economic outcomes implies that factors that shape social capital are also determinants to economic development.

In line with Putnam's idea, Schmid & Robison (1995) argued that social capital is part of capital inputs in agricultural production; the lack of it will lead to economic and social failures. In their argument, interpersonal trust can be a substitute for police surveillance and legal services (p. 59). In a different light, Knack & Keefer (1997) argued that economic outcomes are not associated with associational activities, which is contradictory to Putnam (1997) findings for Italy. Trust, however, is believed to lead to stronger incentives to innovate and accumulate (physical) capital and is thus linked to economic performance. Moreover, trust is also considered to improve the performance of governments (through political channels) which in turn also creates positive effects on the economy (Bouckaert & Van de Walle (2001)). From a

different perspective, Fukuyama (2000) highlighted the role of social capital in reducing transaction costs associated with hierarchical structures and bureaucracies.

As a complex notion, social capital has always been characterized by vagueness and lack of clarity. Over time, abundant studies on social capital were based on a spectrum of definitions and contexts. Related to this study's county-level as unit of analysis, Lee & Kim (2013) tested the validity of a set of measures of social capital in relation to health outcomes. In their study they looked at three different measures of social capital, one of which is Rupasingha's social capital index. Their research concluded that the indices are valid enough to be used as measure for social capital, and that they are robust enough to be considered important for health outcomes. Also focusing on local aggregates / collectives, Rupasingha et al. (2000) investigated the link between social capital and economic growth. They employed a Barro-type growth model that incorporates social capital. As proxies, they used communal establishments and organizations, as well as charitable giving and voting. Their OLS approach suggested positive and significant relationship between social capital measures and economic growth in U.S. counties. La Porta et al. (1997) asserted that social capital enhances collective action by promoting trust and cooperation; this notion implies that they treat social capital differently from trust and cooperation, whereas in other studies, the two aspects are often considered parts (or proxies) of social capital.

Not many studies, however, conclude a causal relationship between social capital and economic outcome. Specifically, Putnam (2001) stressed that the direction of causality involving social capital is very difficult to pinpoint. Regional social capital for America was assessed by Valsan et al. (2023). The study employed a two-step algorithm to create a PCA index and found that social capital can serve both as a predictor as well as an outcome variable. A qualitative study was done by Lochner et al. (1999) in attempt to identify various societal factors that might affect U.S. social capital.

3.2.2 Economic Impacts of Social Capital

There have been abundant numbers of literature that links social capital to economic outcomes, comprising of different definitions of social capital. In general, there appears to be a consensus that social

capital is positively associated with economic growth. However, economic effects of social capital on economic performance vary in terms of impact channels and how social capital is interpreted or defined. For example, social capital can be defined or measured as interpersonal trust (e.g., Whiteley (2000), Bjornskov (2008, 2012), Ueshima et al. (2010), Brewer et al. (2013), Kawachi & Berkman (2014)) while in other studies, social capital is measured by community participation / associational activities. In the latter, the argument is that the more community participation and / or establishments for activities, the higher social capital (Rupasingha (2000, 2006), Fiorillo & Sabatini (2011)). Putnam (1997, 2001) defines social capital as taking both formal and informal forms; formal social capital is represented by organizations such as labor unions and Parent-Teacher Association, while a group of churchgoers and friends' networks represent the informal ones. Putnam's studies (1997, 2000, 2001) trace trends of those formats over time and suggested that social capital and 19th century slavery are negatively correlated, and positively so with the stronger presence of the church in a State. Social capital can affect economic growth through various channels, such as education participation and performance which further impacts the accumulation of physical capital, and also crime that is potentially lower when the society is more interconnected, health (higher social capital entitles higher trust in health authorities), and lower incidences of tax evasion; all of these aspects have been shown to be associated with economic growth.

In a different angle, Bjornskov (2008) looked at cross-country comparisons and found that social capital, measured by trust, is positively associated with happiness. His study used DDB Needham data, and a further study (Bjornskov, 2012) schooling and direct rule of law were identified as transmission mechanism that links social trust and economic growth. Related to schooling, Whiteley (2000) demonstrated using a sample of 34 countries, that the impact of social capital on economic growth is at least as strong as that of education. He also showed that social capital affects the efficiency of political institutions that further shapes economic growth; this may have some connection with Bouckaert & Van de Walle (2001)'s assertion that social capital can improve government performance. Through employment and human capital, Fengqiao & Dan (2015) showed using logistic regression, OLS and ANOVA techniques

that social capital in China (individual and family's) will affect choice of employment and the desire for future study. Eventually, both aspects will impact job satisfaction and job creation. I find this an interesting transmission mechanism of how economic performance through the labor market is affected by social capital.

There is also evidence that social capital affects the economy adversely; I find it important to explore this side especially considering the complex nature of social capital. Rupasingha & Goetz (2013) found that higher social capital leads to stronger poverty. Pillai et al. (2017) conducted a qualitative review on social capital and compiled studies on the adverse effects social capital has. These adverse effects on organizations and economic performance range from groups being able to protect their self-interests (Arneil, 2006), restrict women's roles and autonomy in India (Andrist (2008)), limited opportunities in communities due to negative ties (Gabbay & Leenders, 1999), the inhibition of innovation and entrepreneurship (Lee & Tuselmann, 2013), the formation of spatial traps the constrains development when trust and connectedness generate path dependencies (Fazio & Lavecchia, 2013). On a more "neutral" side, Yoo & Lee (2009) although did not present evidence on adverse effects of social capital, argued that there is no evidence linking it to economic performance; in their study, Korea that has low level of social trust has performed well economically.

3.2.3 Factors Influencing Social Capital

At a broader macro level, while it is often postulated that social capital is one of growth drivers, it is also argued that economic conditions affect social capital. Tamilina (2008) argued for a crowding-out hypothesis in which welfare state development tends to erode social trust; this argument elaborates that spending in the social sector implies that social trust is affected (or controllable) by economic policies.

It is also argued that social capital is influenced by social / cultural factors, not only economic. For example, cultural diversity in the case of Indonesia is believed to lower social capital but promotes higher tolerance at the same time (Mavridis (2015)). That study took other variables into consideration, such as trust, perceived safety, and community participation. In that study cultural diversity is measured as clustered

standard error. Brewer et al. (2013) showed that civic engagement and lower crime rates as measures of equity are associated positively with social trust. In this fixed effect analysis, social capital is proxied by trust, while civic engagement is used as one explanatory variable³⁸. Their study demonstrated that a one per cent increase in social expenditure increases the likelihood of trust by 4.7 percent, five years later. In this context, it is economic condition that plays a role in shaping social capital, not vice versa. Although the study did not find significant reverse causality, I would like to note that a reverse causality is a plausibility.

Related to expenditure in the social sector, Rothstein & Stolle (2003) highlighted the crowding-in effect in which welfare programs, especially generous ones, can promote social capital. This works in the opposite manner compared to Tamilina (2008)'s proposition of a crowding-out effect. The authors imply that the presence of a welfare state can create an ambiguous impact on social capital. While the crowding-out effect argues that welfare recipients are stigmatized that leads to social capital being undermined, the crowding-in effect states expenditure is a tool to build it. Lochner et al. (1999) wrote a meta-study on factors that are considered to influence social capital in the United States; this study is qualitative in nature in that it identifies those factors but did not test the influence empirically.

3.2.4 Regional Social Capital

Related to this study's unit of analysis (county level) is the notion of regional social capital. Malecki (2012) argues that there are cultural differences between regions and based on that, social capital promotes "regional learning" through the development of entrepreneurship and innovation. Malecki's review suggests that social capital alongside spatial proximity, cooperation, and networking is important in inducing innovation; social capital is viewed as a bonding agent that glues those components in a region. This notion is supported by Thompson (2018) that argues that social capital promotes cooperation and information sharing, innovation activities and economic growth, despite it also can potentially trigger

³⁸ In Rupasingha et al. (2006) that initiated the UPenn social capital index project, civic or associational participation is used to measure social capital rather than one of its right-hand-side components.

monopoly profits because of capable businesses capitalizing on informational and innovation advantages. More specifically, he showed that when the ratio of output-workers to innovators increases, so does growth.

Another regional-level aspect is the connection between social capital and population density, often represented by urban (including sub-urban), and rural regions. Several studies have found or argued that there is significant difference between urban areas (with higher population density) and rural (lower density). Rural areas here denote lower population density, as less population is dispersed in a larger territory. For example, Lannoo et al. (2011) examined the case study of Belgian students and found that those living in urban areas are associated with higher individual social capital compared to their rural counterparts. In their study, social capital was measured using the position generator methodology, in which it employs occupational positions of members of social networks; those positions are then used to indicate resources available in social networks, however it does not incorporate trust and reciprocity, which are commonly used as proxy for social capital.

Debertin & Goetz (2013) explored different definitions of social capital in small rural communities, city suburbs, and urban cores. The highlight of their argument is that social capital is a product of the size and heterogeneity of the community, which leads to the argument that urban and rural areas possess different levels of social capital. Furthermore, in each different communities, social capital is constructed to achieve different economic or political outcomes; for example, in rural areas the goal might be to stimulate employment or preserve farmland, while in urban core, it might be business district revitalization or reduce homelessness. They believe that contrary to Lannoo et al. (2011), social capital in rural areas is typically higher than that in urban (noting also that the definition of social capital is different between the two studies). Hofferth & Iceland (2011) proposed similar notion that rural communities possess higher social capital, but for different reasons. In their study they found evidence that rural families are more likely to receive monetary assistance from family and relatives, compared to urban families'. Moreover, dispersion in rural areas is affected by distance, leading to less opportunities to build bonds in the community, and families tend to rely on themselves more. Although this may seem contradictory to the building of social

capital, rural residents also tend to give more to others, that originated from being responsible in their own family. Ultimately, this is the concept of social capital in their study, in that the social capital is developed through giving, which was measured using monetary gifts.

3.3 Conceptual Approach

Social capital is known to have fuzzy characteristics in that being a social construct, it is not easy to clearly define it. As such, existing studies attempted to analyze social capital from various angles and approaches, which strongly depend on the background of the researchers. In terms of the production side of social capital (or often referred to as the “determinants”), public health scientists and psychologists would focus on individual social capital that is influenced by personal and/or community treats, while economists may opt to investigate socio-demographic aspects. In my study, while I acknowledge social capital as an important factor that affects economic outcome (growth, investment, effectiveness of top-down policies, et cetera), I believe that it is also important to examine aspects that affect social capital, and therefore, I concentrate on the supply-side of social capital. Considering the fuzzy nature of the concept and the lack of clear-cut studies proposing a solid production function of social capital, I rely on relevant studies taking a similar approach. Therefore, this conceptual approach section can be somewhat regarded as a meta-study on the production of social capital.

I build the estimation in this study on Rupasingha et al. (2006) that used linear regression analysis using county data for two time periods, 1990 and 1997, and incorporate different aspects motivated by other studies. Their study is one of the most comprehensive so far; in that it constructs a social capital index measuring associational activities and investigates how it associates with a wide array of socio-economic variables such as income and inequality, ethnic diversity, community attachment, education, family structure, women’s role, suburbanization, age, and homeownership. The index estimation in their study found that education is the primary factor that affects social capital; counties with more college-degree holders tend to have higher social capital. This addresses the positive externality implication that education

brings to the society, such as networking / social interaction and social responsibility. A quick summary of Rupasingha et al. (2006)'s results are in Table 3.3.

Table 3.3. Summary of Associational Impacts on Social Capital

Variable	Impact	Explanation
Ethnic Diversity (Blacks)	Positive and significant	Members of the Black race tend to participate more in community activities
Income and Inequality (endogenous), as instrument	Negative and weakly significant, and weakening over time	Income inequality increased over time.
Education (endogenous), as instrument for the human capital equation	Positive and significant	Higher people with college degrees allows better informational flow, reduce risks, greater social responsibilities and collaboration
Prior Migration / Community Attachment	Positive and significant	Lower mobility (more permanent) residents engage more in civic activities
Women's Role	Positive and significant	Higher labor force participation of women increases social contacts, leading to networking opportunities
Family Structure	Positive then negative, both significant	Counties with larger families tend to participate more in civic activities
Suburbanization	Positive and significant	Urban areas tend to have lower social capital compared to the suburbans
Median Age	Positive and significant	More elderly people in the community tend to have more social organizations
Employment Type	Positive and significant	Professional jobs tend to be associated with higher formation of social capital
Homeownership	Negative and significant	People reduce community associations with higher ownerships; homeowners with higher incomes do produce higher levels of social capital

Source: Rupasingha et al. (2006)

For other aspects that I view as important to be considered, I am motivated by Brewer et al. (2013) and Rothstein & Stolle (2003), which are previously mentioned in the previous section. Brewer's research pinpointed lower crime rates, and in my study, I incorporate poverty that is known to have positive correlation with crime rate. Social capital can also contribute to the provision of some public goods on the basis that participation can reduce free riding (Rupasingha et al. (2000)). In relation to that, Warren et al. (2001), Rupasingha & Goetz (2007), Knack (2002) and Collier (2002) argue that social capital accumulation can be used to empower society, especially poor communities, to reduce poverty.

Based on the notion that there is potential reverse causality between social capital and economic conditions / outcomes, in this study I examine how poverty affects social capital, which is the reverse of Warren et al. (2001)'s study. Knack (2002)'s research found evidence of such in several countries using Barro-type growth regression, while Rupasingha & Goetz employed spatial analysis. Nasution et al. (2015) analyzed the interconnectedness between social capital and rural poverty; taking the case of Indonesia, they found that using regression and 2-stage probit least squares for a simultaneous equation model, poverty is indeed affected by social capital. Social capital itself is an outcome of good education, household expenditure, and number of social organizations in the village, among others.

Another important factor in my study is education, which is commonly believed to generate positive impact on social capital accumulation (Helliwell & Putnam (1999), Huang et al. (2009), Rupasingha et al. (2006)). Other studies see social capital and education to be complementary goods in supporting economic growth (Temple (2002), Imandoust (2011)), and social capital as depending on education (Salinas (2013), Erkan (2011), Plagens (2011)). Helliwell & Putnam state that education is the primary factor in social engagement; they showed that improvement in average education leads to higher trust and does not affect participation in the community. In this study I examine whether this notion holds.

Shocks in the community may also influence how community participation and how members trust one another. Many studies have investigated the impact of natural disasters on social capital, and the results are ambiguous. Positive relations were found by Pena et al. (2014), Dussailant & Guzman (2015), Veszteg

et al. (2015), and Calo-Blanco et al. (2017), among others, where social capital can be enhanced by a disaster. In my study, I incorporate the 2008-2010 recession to represent an economic shock on social capital. Economic shock is most likely the only aspect that has a unidirectional linkage with social capital (that is, shocks can lead to changes in social capital, but not vice versa). While Rupasingha et al. (2006)'s study did not find relationship between social capital and home ownership, in my research I employ housing permits as proxy for physical infrastructure, following Aoyagi et al. (2014).

3.4 Empirical Framework and Results

Due to its complex nature, social capital is often seen as having roots in sociology, in which works on it are largely qualitative. Empirical studies on social capital are emerging and growing, utilizing economics and econometrics techniques, to reach more accurate measurements and impacts related to social capital. In this subsection I document several quantitative / empirical works in the field. Mouw (2006) studied the causal effects of social capital, in which the focus is homophily, the tendency of people to befriend each other. The effect of social capital is limited in the study in that it applies to a selected number of networks that were sampled non-randomly. Markeson (2016) used fixed effects and spatial dependence to analyze how social capital influences business intensity and firm entry in rural counties in the U.S.

Other studies that also applied panel data approaches, particularly fixed effect models, include Halaby (2004) on peer effects on education, and Dudley (2021) on how social capital affects financing choices among entrepreneurs. Other quantitative / empirical approaches used in social capital analysis include Principal-Component Analysis (PCA), which is a common choice in the supply- or production- side of social capital (such as in Gannon & Roberts (2018) and Saukani & Ismail (2019)). While the former used PCA, the latter extended the approach using Categorical PCA (CATPCA) that is deemed more flexible and can be applied on categorical variables. Bjornskov (2008) used Generalized Least Square and Instrumental Variable approaches to see the connection between social capital and happiness in the U.S. More recently he used 2SLS and 3SLS estimation to highlight transmission mechanisms in economic growth; in the 2SLS

estimation, he addressed the causality between social trust and political transmission mechanism, while in the 3SLS, he linked trust, transmission mechanisms, and economic growth (Bjornskov (2012)). Rupasingha & Goetz (2007) used spatial analysis to estimate the linkage between social capital, inequality, local competition in political setting, and federal grants in U.S. counties, which were found to be affect poverty, while Labonne & Chase (2011) and Dudley (2021) used difference-in-difference to analyze social capital. Labonne & Chase focused on how community projects enhance social capital in the Philippines, and Dudley looked at geographic determinants (including social capital) in determining capital structure of U.S. start-ups. Aside from these econometric-focused research, others use simple regression analysis and other statistical procedures as well, such as Fengqiao & Dan (2015) who used multiple hypothesis testings; Vaezghasemi et al. (2014) in a study employing multistage sampling and descriptive analysis, Galindo-Perez-de-Azpillaga et al. (2014) (non-parametric methods), and Hjollund & Svendsen (2000) (Path Analysis), among others.

As previously mentioned, Rupasingha et al. (2006) is one of the most prominent works on the supply side of social capital, in which a social capital index using associational participation was constructed for all U.S. counties. The index construction involved a Principal Component Analysis method that compiles 10 different types of voluntary organizations that people participate in and added three other components. Their calculated social capital index is what is employed in this investigation as the outcome variable, explained deeper in the next Section. Later, Valsan et al. (2023) constructed an extension (or replacement) to Rupasingha's PCA method by averaging the 10 components into one using dimension-reduction methodology, Partial Least Squares procedure. This method allows the components to be reduced to only four instead of 13 factors, which then is assessed again using PCA. In addition, Valsan et al.'s study also looked at spatial dependence between counties to account for spatial heterogeneity. They demonstrated that the social organizations that do not aim at rent-seeking but to foster public solidarity such as bowling alleys, bridge clubs, and religious organizations (referred to as Putnam-style organizations) embed different

social capital index compared to rent-seeking organizations (involving financial incentives such as Farm Bureau membership (Knack & Keefer (1997)), referred to as Olson-style organizations.

3.4.1 Dependent Variable

For a quantitative measure of social capital, I employ the *social capital index* developed by Pennsylvania State University's Northeast Regional Center for Rural Development (NERCRD) (Rupasingha et al. (2006)). In their framework, social capital was measured at county level for various years (1990, 1997, 2005, 2009, and 2014)³⁹. For this study I use the 2005, 2009 and 2014 data considering that for other variables used in estimation, the 1990 and 1997 data are incomplete.

Rupasingha et al. (2006) acknowledges the weakness or limitations of the notion of social capital (like Lee & Kim (2013)), in that it carries a lack of definitional consensus, which leads to different interpretations by different researchers. For example, often social capital is proxied by individual trust, and in other studies, different contexts lead to employing community participations to approach social capital. The social capital index developed by Rupasingha's team is a composite formed from involvements in community activities within counties. The index itself is constructed from number of establishments of religious organizations, civic/social, business, political, professional, labor organizations, along with centers for sports, recreations, bowling and golf (which are considered separate from the other sports), sports teams and clubs, voter turnout, census response rate, and number of non-profit organizations. In other words, community establishments are seen as proxies for community members' involvement in the said activities. This specification / definition is motivated by Putnam's notion on social capital, which is civic engagement. It was argued in their paper that better social capital can reduce transaction costs, which is positively associated with economic growth. The data except for voter turnout and response rate are divided by population per 10,000⁴⁰. The index was constructed using the Principal Component Analysis (PCA), in

³⁹ The last three years of index values computed in a study by NERCRD after the 2006 paper was published.

⁴⁰ The decomposition of the Rupasingha's index into various participation indicators can be found in Appendix C.

which the first component is a composite of participation measures as seen in the table; Participation in community activities reflects individual behavior and their choice on how much social capital to produce collectively at the community level. The second component is voter turnout, the third and fourth are response rate and number of non-profit organizations. In determining the overall social capital index, the method extracted principal components from the three variables plus the density variable, and the first principal component that emerges is then considered as the index for social capital. In their study, the county-level index was computed for all U.S. counties, from which the numbers for Colorado were extracted. Interestingly, they revealed that higher index values were found for counties in the upper Northwest and Midwest (in which the composition of population is more homogeneous), while in the southern counterparts the values were lower.

3.4.2 Explanatory Variables

The chosen predictor variables for county-level social capital are the following:

One, the share of new housing permits (per person). This variable was selected based on the notion that physical infrastructure facilitates social capital (Aoyagi et al. (2014)). Their study views physical infrastructure as a means of interaction between individuals. In this study, this is represented by houses built, which is measured by the share of housing permits. For uniform dimensionality, I calculated this share by taking the ratio of number of housing permits by the population.

Two, share of poverty in the population (rather than poverty rate). In this context, the federal definition of poverty is when the total family income is less than the federally defined threshold. I take the number of people in that category as a portion of the population, to have an indication of the group's size in county population. Milbourne (2010) argues that this size is correlated with increasing economic inequalities. Related to that, poverty is often concentrated in developed or urban areas (Wacquant, 1993). I believe that the lack of subsistence resources will lead to individuals to focus more on their well-being and not participate as much in associational activities, making social capital low(er). Moreover, poverty is often

seen as equivalent to citizens' dependence on the government, which may reduce the incentive to participate in civic activities.

Three, the share of unemployed persons (rather than unemployment rate). Here I compare the number of unemployed persons and compare it to the size of the population, so that I can maintain consistent format of normalization of variables. I want to examine whether social capital increases with this relative group size.

The *fourth* and *fifth* predictors are per capita personal income (log) and real GDP (also in log). Income is one main variable that influences economic inequality. Shen & Bian (2018) asserted that there is a positive relationship between social capital and income. Per capita personal income is taken as a measure for individual wealth and productivity, while real GDP is to represent aggregate economic performance of the area (i.e., counties) as motivated by Osberg & Sharpe (2001).

Sixth, the population group aged 26-45 (representing a more educated, or more productive, labor force, without disrespecting educated or productive labor force outside that age group). Most of this age group is presumed to have obtained a college degree and/or is the most productive portion of the labor market. I conjecture that a more educated community can see the benefit of social capital (community participation) more clearly and engage in them.

Lastly, the 2008 economic recession, as a dummy variable, represents an external shock. For the timeframe which is three different points in time (namely 2005, 2009, and 2014) I trust that the year 2008 is an appropriate proxy for that shock. The basic statistics are given in Table 3.4 below.

Table 3.4. Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Social Capital Index	189	0.7734	1.7050	-1.9671	9.1492
Share of New Housing Permits (% of population)	189	0.0056	0.0071	0.0000	0.0462
Number of people in poverty, (% of population)	189	14.2894	6.8682	2.90	53.00
Number of unemployed people (% of population)	189	0.0362	0.0434	0.0137	0.4769
Percapita personal income (log)	189	10.4909	0.3094	9.7177	11.7585
Real GDP (log, 2012=100)	189	13.5474	1.8108	10.2184	17.9023
Population aged 26 - 45 (thousands)	189	259.43	55.51	143.44	476.09
2008 Recession (dummy)	189	0.6667	0.4727	0	1

3.4.3 Estimation Procedure

In empirical procedure, I employ a multiple panel regression model with fixed effects model to capture the supply-side of social capital at county level for the State of Colorado, motivated by the studies mentioned in Section 3.3. Based on data availability on county-level social capital I use three points in time, which are the years 2005, 2009, and 2014 for 63 counties (out of 64) in Colorado⁴¹. I explore the linkage of social capital with a set of socioeconomic variables that are conjectured to have influence on it, as described in Section 3.4.2. I use the panel data consisting of the social capital index as the dependent variable and the set of explanatory variables in the fixed effect panel regression. The dimension of the panel itself is 63 x 3 (63 counties, 3 time points).

The estimation takes the following form:

$$SC_{it} = f(HS_{it}, POV_{it}, SNAP_{it}, UNEMP_{it}, PPI_{it}, RGDP_{it}, HEALTH_{it}, H_EDU_{it}, RECESSION) \quad (3.1.)$$

Where

⁴¹ Broomfield County is excluded in this study; it is a new county established in 2001 that incorporates parts of four different counties. Although it was established in 2001, the social capital dataset did not include information for this county.

- $i \in [1,63]$ and $t \in [2005, 2009, 2014]$;
- SC = the social capital index
- HS = housing share
- POV = poverty
- UNEMP = share of the unemployed in population
- PPI = Percapita personal income (log, 2012=100)
- RGDP = Real GDP (log, 2012=100)
- H_EDU = productive / more educated age group in population (26-45 years)
- RECESSION = 2008 recession dummy

The fixed effect specification is aiming at controlling individual observations' characteristics that may bias the outcome variables. For the panel regression, a fixed effect specification is used, as the Hausman test concluded that the F test is statistically significant, suggesting that fixed effect regression outperforms the random effect version. Considering the data limitation (the dataset is a short panel), it is expected that the estimated coefficients may be on the weaker side. In the case of Colorado counties, unobserved heterogeneity may involve aspects that are not captured in the model, such as a county having a Creative District that can influence labor productivity (a predictor in the model), while others do not. A parsimonious estimation is also included to allow for looking at each variable's relationship with social capital in a simplistic fashion (i.e., applying the principle of parsimony).

To account for the different urbanization regions within Colorado, regressions were run for three different area categories: all counties (63), rural counties (36), and combined metropolitan & micropolitan counties (Urban Core (27)). The purpose of this breakdown classification is to detect if social capital accumulation varies across different population densities.

3.4.4 Results and Discussion

Table 3.5 summarizes the parsimonious estimation of each individual variable, and the complete panel regression is presented in Table 3.6. The notion of “share” in the estimation is referring to taking a portion over 1000 people. The regression outcomes illustrate that the social capital index is overall influenced by the predictors⁴².

Physical capital, represented by housing share, decreases social capital significantly, indicating that family (or personal) time may be preferred over participating in social / civic activities. In my case, an increase of 1 residential permit issued associates with a decline of 0.04 in the social capital index. This is stronger in the Rural areas compared to the Urban areas, considering the distances between places and density of Rural areas that are lower; in the Urban counties the decline is slightly lower at 0.03 (as suggested by the complete panel regression in Table 3.6), suggesting that it is less responsive to additions of residential units. This may implicate the need for community reach-out programs that incentivize families toward communal activities.

Poverty also decreases social capital index (between 0.04 – 0.06 in the index. This suggests that improvements in poverty rates (i.e., smaller poverty rates) contribute to a better social capital index, particularly in the Rural counties at only 0.01 decline. That is, better livelihood is associated with more civic involvement. For the Urban areas, the outcome appears to be the opposite- stronger state of poverty drives people to be more engaged in civic activities.

For demographic setup I use a certain age group as control variable. This age group is selected to represent a group in the population that has recently graduated college or is within that age, and more likely to have grown a family. This group is likely to have different life choices compared to an older age group in which the group members have more time to be more active in community organizations and activities. As a baseline, it is believed that an expansion of this age group may lead to more engagement in community

⁴² The Pearson correlation table is included in Appendix C.

activities that facilitate networking and sharing family values. The result indicates that the growing size of this age group does not appear to have meaningful relationship with the social capital index, based on the three years of data; there is some indication that it tends to reduce participation in community activities, which is contradictory to the initial conjecture in which more educated age group may value community engagement more.

A plausible reason for this result is that people in that age group are taking more time to focus on raising family and accumulating personal wealth, leaving less desire for civic engagement. I also suspect that this may be related to the dominant agricultural industry in Colorado, in which productivity is geared toward agricultural production, leading to lesser time spent in community activities that are used to build social capital index. For these three years of observation, there is no indication of which area (Rural or Urban) is driving the negative coefficient.

Lastly, I also include a dummy variable to represent an external shock to the system. For that, I chose the 2008 recession. I would like to know if this economic shock was sufficient to shift the direction of social capital afterwards. The result suggests that Urban counties are indeed affected, where the social capital index has declined by 0.2 scale point in the Urban areas parsimoniously, and 0.6 when estimated in the complete panel model. Rural counties do not seem to be affected. The result for Urban regions is expected, considering recession decreases livelihood, which reduces the incentive to engage socially in activities, and likely substitute them with job searches instead. At the broader State level, there is no apparent linkage between the 2008 recession and social capital index.

Table 3.5. Estimation Results

VARIABLES	All Counties						
Housing Permits	-						
	0.0398**						
	(0.0186)						
Poverty		-6.66e-05**					
		(0.0000)					
Unemployed Persons			0.00184				
			(0.0022)				
Per Capita Personal Income (Log)				1.822			
				(1.4120)			
Real GDP (Log)					-0.162		
					(0.1740)		
Age 26-45						0.00425	
						(0.0039)	
2008 Recession							0.177
							(0.1290)
Constant	1.466***	0.998***	0.519***	-18.28	2.763	-0.607	0.578***
	(0.3500)	(0.1660)	(0.1190)	(14.6600)	(2.3300)	(1.1150)	(0.0790)
Observations	189	189	189	189	189	189	189
R-squared	0.125	0.167	0.092	0.127	0.093	0.103	0.091
Number of Counties	63	63	63	63	63	63	63
VIF	2.37	1.09	1.48	3.08	2.93	2.44	2.00
1/VIF	0.42134	0.9204	0.6777	0.3248	0.341867	0.4092	0.5000

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3.5. Estimation Results (continued)

VARIABLES		Rural					
Housing Permits	-0.0472* (0.0247)						
Poverty		-7.56e- 05** (0.0000)					
Unemployed Persons			0.0293** (0.0135)				
Per Capita Personal Income (Log)				2.3 (2.2860)			
Real GDP (Log)					-0.198 (0.2010)		
Age 26-45						0.00666 (0.0063)	
2008 Recession							0.440** (0.2050)
Constant	2.255*** (0.4500)	1.505*** (0.1940)	0.234 (0.4600)	-22.47 (23.4500)	3.486 (2.4360)	-0.667 (1.6510)	1.041*** (0.1260)
Observations	108	108	108	108	108	108	108
R-squared	0.205	0.255	0.193	0.196	0.165	0.178	0.162
Number of Counties	36	36	36	36	36	36	36
VIF	2.45	1.07	3.09	3.09	2.99	2.48	2.00
1/VIF	0.407851	0.9318	0.3235	0.3234	0.3339	0.4039	0.5000

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3.5. Estimation Results (continued)

VARIABLES		Urban Core					
Housing Permits	-0.0348**						
	(0.0145)						
Poverty		1.81E-05					
		(0.0000)					
Unemployed Persons			0.000896				
			(0.0007)				
Per Capita Personal Income (Log)				-0.0998			
				(0.4570)			
Real GDP (Log)					-0.304		
					(0.4490)		
Age 26-45						-	
						0.00265	
						(0.0027)	
2008 Recession							-0.173*
							(0.0940)
Constant	-0.215	0.362**	-0.0725	1.011	4.524	0.779	-0.0387
	(0.3460)	(0.1510)	(0.0616)	(4.8060)	(6.7500)	(0.7980)	(0.0544)
Observations	81	81	81	81	81	81	81
R-squared	0.123	0.22	0.122	0.12	0.127	0.138	0.12
Number of Counties	27	27	27	27	27	27	27
VIF	2.81	1.13	1.35	3.06	2.97	2.46	2.00
1/VIF	0.3558	0.8871	0.7414	0.3265	0.3372	0.4071	0.5000

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3.6. Panel Regression

VARIABLES	Dependent Var: Social Capital Index		
	All Counties	Rural	U.Core
Share of New Housing Permits (% of Population)	-0.0412** (0.0184)	-0.0455** (0.0209)	-0.0338** (0.0141)
Number of People in Poverty, (% of Population)	-4.56e-05*** (0.0000)	-4.31e-05** (0.0000)	5.47E-06 (0.0000)
Number of Unemployed people (% of Population)	0.00115 (0.0019)	0.0263 (0.0170)	0.00107* (0.0006)
Percapita Personal Income (log)	1.742 (1.3790)	2.489 (2.2440)	0.476 (0.6350)
Real GDP (2012=100) (Log)	-0.405 (0.3170)	-0.407 (0.2700)	-0.264 (0.5240)
Population Aged 26 - 45 (thousands)	0.00489 (0.0033)	0.00924 (0.0056)	-0.00157 (0.0023)
2008 Recession (dummy)	-0.411 (0.5040)	-0.369 (0.7900)	-0.597** (0.2680)
Constant	-12.34 (13.2000)	-21.34 (22.6200)	-0.289 (9.0270)
Observations	189	108	81
R-squared	0.246	0.368	0.236
Number of cntynum	63	36	27

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

The fact that some determinants are causing social capital to decline, and some have enhancing features to it, makes the implications for policy very complex and challenging. For example, strategies aimed at reducing unemployment may positively impact social capital in Urban areas, but it will lead to higher real GDP, which is negatively associated with social capital. On the other hand, a comprehensive county policy package that addresses poverty reduction may improve social capital, which dynamically can

also increase community capacity to further pull the society from poverty (Nasution et al. (2015), Rupasingha & Goetz (2007)).

3.4.5 Limitations and Implications

There are some limitations of the notion of social capital that may yield over- or under-estimation of its impacts and factors. First and foremost, the definition of social capital is acknowledged to be vague and unclear. While this allows for a great degree of flexibility in utilizing different proxies, it also blurs the accurate interpretation of how it affects economic outcomes, and the policy implications that follow. Malecki (2012) asserted that when bonding social capital becomes excessive, it has the potential to generate restrictions on individual freedom and business initiatives as entrepreneurship is inhibited rather than facilitated.

In many studies social capital is believed to influence human capital / education (e.g., Coleman (1988)). However, it is also important to note that it may be the case that education contributes to social capital- better educated individuals and / or communities may possess higher interpersonal understanding and involvement in associational activities (Helliwell & Putnam, 1999). This bi-directional association / impact / causality also occurs in other dimensions in social capital analysis, such as in the linkages between social capital and poverty, spending on public support system, and productive labor class. This highlights the complex and fuzzy nature of social capital, and the challenges that come with attempts to yield a clear-cut estimation.

Various analytical approaches can be undertaken given the fuzziness and flexibility of the construct of social capital. As social capital is affected by economic factors and shapes them in return, bidirectionality can be addressed using different methodologies such as experimenting with different covariates and proxies for social capital, as Section 3.2. discussed earlier. For U.S. covariates it is intriguing to examine the relationship between social capital and partisanship and different beliefs in religion, ethnic backgrounds, and environmentalism, as well as demographic composition such as family size. Similarly, should relevant data become available, using different proxies for social capital (such as trust) may yield different results.

The trust variable itself can be further decomposed into different types, such as interpersonal trust, trust on government, etcetera, which can refine the relational outcomes.

3.5 Conclusion

This study focuses on estimating the socio-economic determinants of social capital in Colorado counties. Using data spanning across three years a fixed effect panel estimation and a pooled regression were performed. The results indicate that poverty and economic shock have the tendency to reduce social capital in Colorado in the form of civic engagement particularly in Urban regions, while larger pool of the unemployed in the society indicates a positive relationship with civic participation. Physical infrastructure, proxied by new housing permits, is negatively associated with civic participation in all three regions.

The short panel dataset poses limitation to the accuracy of the model. Future research in a similar field should be equipped with a longer timeframe, particularly because social capital is not expected to change in a short period. Another conceptual limitation of this research is from how social capital index is defined. Different definitions such as general trust is an option that can potentially give a different perspective on its determinants, providing that the relevant data exists for the unit of analysis. Additionally, the empirical approach used here was chosen in conjunction with the limited available data. When more information is available, a causal analysis that links the production side of social capital and the demand side in which social capital affects economic outcome can be a valuable research avenue.

Conclusion

This dissertation explores the dynamics in the Creative Sector and social capital, both of which are interconnected in the local economic development spectrum. The Creative Sector is discussed in the first two chapters, while social capital is the topic of the last. Data used in all three chapters is at county-level.

In Chapter 1, based on a fixed-effect panel regression involving five dependent variables to represent economic performance, Creative Districts and Main Street Communities are found to be influential, although in different magnitudes, significance, and directions. Holding everything else constant, Creative Districts are positively associated with a few establishments, while for MS Communities it is the opposite. Co-location of the two programs is associated with increasing business establishments in Urban areas, but the opposite in Rural counties. This implies that Urban establishments are more capable to capitalize on community initiatives relative to those in Rural.

On average, Creative Districts are also positively influencing job creation, while MS Communities are not. A further look at Rural counties and Urban Cores reveals that MS Communities can be influential on job creation when supported by income and population density, while in Urban areas, it is Creative Districts that play a role when supported by income and population density. Regarding sectoral employment, the influence is small in general for Urban counties, while in Rural counties there does not appear to be significant role of the two initiatives.

Marginal effects of the two initiatives indicate that Rural counties are more benefiting, in which Creative Districts play a role in the increase in the number of business establishments and net job creation, with the latter picking up the momentum and increasing faster over time. In Urban areas, the influence of Creative District is larger than that of MS Communities', albeit still very small. Creative Districts are also associated with a decline in Sector 71 employment in the Rurals and with an improvement in that in the Urban counties. MS Communities' influence on Sector 71 is the opposite: it benefits in the Rurals, but not

in Urban counterparts. It is apparent that the creative initiatives are each more suited for different county characteristics, whether Rural or Urban. This implies the need for further place-based policies that can support that suitability; that is, supporting policies should be differentiated and catered to specific needs of the county.

The spatial model of Chapter 2 is a relatively more involved one as it must consider dependence between counties. Employed here based on the notion of the Economic Base Model, The Spatial Durbin Model here analyzed sectoral employment's direct effect (within county, or "Local") and the indirect effect (the spillover) across counties. The Creative Sector and Sector 71 employments are viewed as the base sectors, while Other Employment is the non-base one.

The spatial specification is considerably improving the accuracy of the estimation; the global Moran's I statistic indicates that spatial treatment is justified. The economic base multiplier of the Creative Sector appears consistent across the two models, whereas the multiplier of Sector 71 is not significant when a different (i.e., logarithmic) specifications were implemented. In addition, inconclusive (insignificant) results emerged from the Creative District variable.

The county level social capital analysis in Chapter 3 explores the supply-side of social capital, linking socio-economic variables to a social capital index, an empirical measure based on civic participation. The relationship is examined using a pooled regression for the State of Colorado. The results suggest a negative relationship between Colorado's civic participation and several predictors (poverty, physical infrastructure measured by housing permits, and economic shock), and a positive one with other variables (unemployed pool and personal income).

There are similar limitations in the three essays, the most notable being the limited scope of data and model specifications. All three exercises utilized a short panel; for the Creative Sector and Sector 71's case, it is mostly due to the creative districts still being awarded at the end of estimation period, leading to incomplete capture of their effects or role. For the social capital analysis, it is due to limited data that very

little possibility of being updated. In terms of analytical approaches, both topics are acknowledged as being not-well defined (fuzzy), making each approach vary based on specific contexts. On the other hand, this flexibility opens a wide opportunity for further inquiry into the topics as well as alternative empirical approaches for each, and implications for policy should be derived accordingly.

Bibliography

- Andrist, L. H. (2008). *Social Capital's Dark Side and Patriarchy in India*. University of Maryland, College Park.
- Anselin, L., Gallo, J. L., & Jayet, H. (2008). Spatial panel econometrics. In *The Econometrics of Panel Data: Fundamentals and Recent Developments in Theory and Practice* (pp. 625-660). Berlin, Heidelberg: Springer Berlin Heidelberg.
- Anselin, L. (1993). The Moran scatterplot as an ESDA tool to assess local instability in spatial association: regional research institute. *West Virginia University Morgantown, WV*.
- Anselin, L. (1996). The Moran scatterplot as an ESDA tool to assess local instability in spatial association. In *Spatial Analytical Perspectives on GIS* (pp. 111-126). Routledge.
- Anselin, L. (1999). The future of spatial analysis in the social sciences. *Geographic Information Sciences*, 5(2), 67-76.
- Anselin, L. (2003). Spatial externalities, spatial multipliers, and spatial econometrics. *International Regional Science Review*, 26(2), 153-166.
- Aoyagi, K., Sawada, Y., & Shoji, M. (2014). Does infrastructure facilitate social capital accumulation? Evidence from natural and artefactual field experiments in a developing country. *JICA-RI Working Papers*, (65).
- Arellano, M. (2003). *Panel Data Econometrics*. OUP Oxford.
- Arneil, B. (2006). *Diverse Communities: The problem with Social Capital*. Cambridge University Press.
- Bai, C. E., Ma, H., & Pan, W. (2012). Spatial spillover and regional economic growth in China. *China Economic Review*, 23(4), 982-990.
- Bakhshi, H., Hargreaves, I., & Mateos-Garcia, J. (2013). A manifesto for the Creative Economy. www.nesta.org.uk
- Balaguer, J., & Cantavella-Jordá, M. (2002). Tourism as a long-run economic growth factor: The Spanish case. *Applied Economics*, 34(7), 877-884. <https://doi.org/10.1080/00036840110058923>
- Balassa, B. (1978). Exports and economic growth: Further evidence. *Journal of Development Economics*, 5(2), 181-189.
- Basile, R. (2008). Regional economic growth in Europe: A semiparametric spatial dependence approach. *Papers in Regional Science*, 87(4), 527-544.

- Baumont, C., Ertur, C., & Le Gallo, J. (2004). Spatial analysis of employment and population density: the case of the agglomeration of Dijon 1999. *Geographical Analysis*, 36(2), 146-176.
- Beer, C., & Riedl, A. (2012). Modelling spatial externalities in panel data: The Spatial Durbin model revisited. *Papers in Regional Science*, 91(2), 299-318.
- Belotti, F., Hughes, G., & Mortari, A. P. (2017). Spatial panel-data models using Stata. *The Stata Journal*, 17(1), 139-180.
- Bernini, C., Cerqua, A., & Pellegrini, G. (2020). Endogenous amenities, tourists' happiness and competitiveness. *Regional Studies*, 54(9), 1214-1225.
- Beyers, William B. (2008). Cultural and recreational industries in the United States. *Service Industries Journal*, 28(3), 375–391. <https://doi.org/10.1080/02642060701856266>
- Biles, J. J. (2003). Using spatial econometric techniques to estimate spatial multipliers: An assessment of regional economic policy in Yucatán, Mexico. *Review of Regional Studies*, 33(2), 121-141.
- Bjørnskov, C. (2008). Social capital and happiness in the United States. *Applied Research in Quality of Life*, 3(1), 43-62.
- Bjørnskov, C. (2012). How does social trust affect economic growth?. *Southern Economic Journal*, 78(4), 1346-1368.
- Bollinger, C. R., & Ihlanfeldt, K. R. (2003). The intraurban spatial distribution of employment: which government interventions make a difference?. *Journal of Urban Economics*, 53(3), 396-412.
- Boschma, R. A., & Fritsch, M. (2009). Creative Class and regional growth: Empirical evidence from seven European countries. *Economic Geography*, 85(4), 391–423. <https://doi.org/10.1111/j.1944-8287.2009.01048.x>
- Bouckaert, G., & Van de Walle, S. (2001). Government performance and trust in government. In *Ponencia Presentada en la Annual Conference of the European Group on Public Administration, Vaasa (Finlandia) 2: 19-42*.
- Bowen, H., Moesen, W., & Sleuwaegen, L. (2008). A composite index of the creative economy with application to regional best practices. *Review of Business and Economics*, (4), 375-397.
- Brewer, K. B., Oh, H., & Sharma, S. (2014). “Crowding in” or “crowding out”? An examination of the impact of the welfare state on generalized social trust. *International Journal of Social Welfare*, 23(1), 61-68.
- Brida, J. G., Cortes-Jimenez, I., & Pulina, M. (2016). Has the tourism-led growth hypothesis been validated? A literature review. *Current Issues in Tourism*, 19(5), 394–430. <https://doi.org/10.1080/13683500.2013.868414>

- Brooks, A. C., & Kushner, R. J. (2001). Cultural districts and urban development. *International Journal of Arts Management*, 3(2), 4–15.
- Buis, M. L. (2010). Stata tip 87: Interpretation of interactions in nonlinear models. *The Stata Journal*, 10(2), 305-308.
- Calo-Blanco, A., Kovářik, J., Mengel, F., & Romero, J. G. (2017). Natural disasters and indicators of social cohesion. *PloS One*, 12(6).
- Castillo, V., Figal Garone, L., Maffioli, A., & Salazar, L. (2017). The causal effects of regional industrial policies on employment: A synthetic control approach. *Regional Science and Urban Economics*, 67, 25–41.
- Charles, M. (2019, November 5). *13 Key Industries in Colorado: Front Range Community College Blog*. Front Range Community College Blog | Writing the Front Range. <https://blog.frontrange.edu/2019/11/06/13-key-industries-in-colorado/>
- Chhetri, P., Butcher, T., & Corbitt, B. (2014). Characterising spatial logistics employment clusters. *International Journal of Physical Distribution & Logistics Management*, 44(3), 221-241.
- Chuluunbaatar, E., Luh, D. B., & Kung, S. F. (2014). The role of cluster and social capital in cultural and creative industries development. *Procedia-Social and Behavioral Sciences*, 109, 552-557.
- Cohen, D., & Prusak, L. (2002). *In Good Company: How Social Capital Makes Organizations Work*. Harvard Business School.
- Coleman, J. S. (1988). Social capital in the creation of human capital. *American Journal of Sociology*, 94, S95-S120.
- Collier, P. (2002). Social capital and poverty: a microeconomic perspective. *The Role of Social Capital in Development: An Empirical Assessment*, 19-41.
- Colorado.com Staff Writer. (2024, May 20). *Colorado Creative Districts*. Colorado.com. <https://www.colorado.com/articles/colorado-creative-districts>
- Colorado Office of Economic Development & International Trade. (n.d.-a). *Colorado creative districts*. Colorado Creative Districts | Colorado Office of Economic Development and International Trade. <https://oedit.colorado.gov/colorado-creative-districts>
- Colorado Office of Economic Development & International Trade. (n.d.-b). *Major Industries in Colorado*. <https://choosecolorado.com/key-industries/>
- Colorado Office of Economic Development & International Trade. (n.d.-c). *Tourism and Outdoor Recreation*. <https://choosecolorado.com/wp-content/uploads/2016/06/CO-Tourism-and-Outdoor-Rec-Profile.pdf>

- Colorado Department of Local Affairs (2024). *Main Street Communities*. <https://dlg.colorado.gov/main-street-communities>
- Corrado, L., & Fingleton, B. (2012). Where is the economics in spatial econometrics?. *Journal of Regional Science*, 52(2), 210-239.
- Cosci, S., & Mirra, L. (2018). A spatial analysis of growth and convergence in Italian provinces: The role of road infrastructure. *Regional Studies*, 52(4), 516-527.
- Crone, L. K., Haynes, R. W., & Reyna, N. E. (1999). *Different Perspectives on Economic Base*. (PNW-RN-538; p. PNW-RN-538). U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. <https://doi.org/10.2737/PNW-RN-538>
- Cubukcu, K. Mert. (2011). The spatial distribution of economic base multipliers: A GIS and spatial statistics-based cluster analysis. *A|Z ITU Journal of Faculty of Architecture*. 8. 49-62.
- Currid, E. (2007). How art and culture happen in New York: Implications for urban economic development. *Journal of the American Planning Association*, 73(4), 454-467. <https://doi.org/10.1080/01944360708978526>
- De Groot, H. L., Poot, J., & Smit, M. J. (2009). Agglomeration externalities, innovation and regional growth: theoretical perspectives and meta-analysis. In *Handbook of Regional Growth and Development Theories*. Edward Elgar Publishing.
- De Groot, H. L., Poot, J., & Smit, M. J. (2009). Agglomeration externalities, innovation and regional growth: theoretical perspectives and meta-analysis. In *Handbook of Regional Growth and Development Theories*. Edward Elgar Publishing.
- Debertin, D. L., & Goetz, S. J. (2013). *Social capital formation in rural, urban and suburban communities* (No. 1639-2016-135196). University of Minnesota Agricultural Economics Research.
- Dormann, C., & Griffin, M. A. (2015). Optimal time lags in panel studies. *Psychological Methods*, 20(4), 489.
- Dudley, E. (2021). Social capital and entrepreneurial financing choice. *Journal of Corporate Finance*, 70, 102068.
- Dussaillant, F., & Guzman, E. (2015). Disasters as an opportunity to build social capital. *International Journal of Emergency Mental Health and Human Resilience*, 17(3), 661-663.
- Eilers, L. (2019). *Spatial Autocorrelation and the Spatial Durbin Model*. Essen, Germany: ROBUST Workshop.
- Elhorst, J. P. (2014). Spatial panel data models. *Spatial Econometrics: From Cross-Sectional Data to Spatial Panels*, 37-93.

- Elhorst, J. P. (2010). Applied spatial econometrics: Raising the bar. *Spatial Economic Analysis*, 5(1), 9-28.
- Erkan, A. (2011). Effects of social capital on academic success: A narrative synthesis. *Educational Research and Reviews*, 6(6), 456-461.
- Feng, Z., & Chen, W. (2018). Environmental regulation, green innovation, and industrial green development: An empirical analysis based on the Spatial Durbin model. *Sustainability*, 10(1), 223.
- Fengqiao, Y., & Dan, M. (2015). The impact of social capital on the employment of college graduates. *Chinese Education & Society*, 48(1), 59-75.
- Fingleton, B., & López-Bazo, E. (2006). Empirical growth models with spatial effects. *Papers in Regional Science*, 85(2), 177-198.
- Fiorillo, D., & Sabatini, F. (2011). Quality and quantity: the role of social interactions in self-reported individual health. *Social Science & Medicine*, 73(11), 1644-1652.
- Florida, R. (2002). Bohemia and economic geography. *Journal of Economic Geography*, 2(1), 55-71.
- Florida, R. (2014). The creative class and economic development. *Economic Development Quarterly*, 28(3), 196-205. <https://doi.org/10.1177/0891242414541693>
- Florida, R., Mellander, C., & King, K. (2015). *The Global Creativity Index 2015*. Martin Prosperity Institute.
- Fukuyama, F. (2001). Social capital, civil society and development. *Third World Quarterly*, 22(1), 7-20.
- Gabbay, S. M., & Leenders, R. T. (1999). CSC: The structure of advantage and disadvantage. In *Corporate Social Capital and Liability* (pp. 1-14). Boston, MA: Springer US.
- Galindo-Pérez-de-Azpillaga, L., Foronda-Robles, C., & García-López, A. (2014). The value of trust: An analysis of social capital in natural areas. *Social Indicators Research*, 118, 673-694.
- Gannon, B., & Roberts, J. (2020). Social capital: exploring the theory and empirical divide. *Empirical Economics*, 58(3), 899-919.
- Garidzirai, R. (2018). *Analysis of key economic sectors promoting local economic development (LED) for strategy development in the Capricorn region, Limpopo Province*. Doctoral dissertation, North-West University.
- GIS Geography. (2024, March 9). *Inverse Distance Weighting (IDW) Interpolation*. GIS Geography. <https://gisgeography.com/inverse-distance-weighting-idw-interpolation/>
- Glaeser, E. L., Laibson, D. I., Scheinkman, J. A., & Soutter, C. L. (2000). Measuring trust. *The Quarterly Journal of Economics*, 115(3), 811-846.

- Glaeser, E. L., Kolko, J., & Saiz, A. (2001). Consumer city. *Journal of Economic Geography*, 1(1), 27-50.
- Goldstein, J. R., & Klüsener, S. (2014). Spatial analysis of the causes of fertility decline in Prussia. *Population and Development Review*, 40(3), 497-525.
- Goodchild, M. F., Anselin, L., Appelbaum, R. P., & Harthorn, B. H. (2000). Toward spatially integrated social science. *International Regional Science Review*, 23(2), 139-159.
- Granato, J., Inglehart, R., & Leblang, D. (1996). The effect of cultural values on economic development: Theory, hypotheses, and some empirical tests. *American Journal of Political Science*, 607-631.
- Griffith, D. A., & Arbia, G. (2010). Detecting negative spatial autocorrelation in georeferenced random variables. *International Journal of Geographical Information Science*, 24(3), 417-437.
- Halaby, C. N. (2004). Panel models in sociological research: Theory into practice. *Annual Review of Sociology*, 30, 507-544.
- Hall, C. M. (2012). Spatial analysis: A critical tool for tourism geographies. In *The Routledge Handbook of Tourism Geographies* (pp. 178-188). Routledge.
- Harris, T. R., Ebai, G. E., & Shonkwiler, J. S. (1998). A multidimensional estimation of export base. *Journal of Regional Analysis and Policy*, 28(1100-2016-89662), 3-17.
- Hansen, H. K., Vang, J., & Asheim, B. (2005). The creative class and regional growth: Towards a knowledge based approach. *Papers in Innovation Studies*, Article 2005/15. https://ideas.repec.org/p/hhs/lucirc/2005_015.html
- Harris, C., Collins, M., Cheek, D., & Coalition, C. E. (2013). America's creative economy: A study of recent conceptions, definitions, and approaches to measurement across the USA. *Kansas City, OK: National Creativity Network*.
- Hazari, B. R., & Kaur, C. (1995). Tourism and welfare in the presence of pure monopoly in the non-traded goods sector. *International Review of Economics & Finance*, 4(2), 171-177.
- Hazari, B. R. & A. Ng (1993). An analysis of tourists' consumption of non-traded goods and services on the welfare of the domestic consumers. *International Review of Economics & Finance*, 2(1), 43-58.
- Helliwell, J. F., & Putnam, R. D. (1999). Education and social capital. *NBER w7121*.
- Hjollund, L., & Svendsen, G. T. (2000). *Social Capital: A Standard Method of Measurement* (No. 00-9). RePEC paper.
- Hofferth, S. L., & Iceland, J. (1998). Social capital in rural and urban communities 1. *Rural Sociology*, 63(4), 574-598.

- Huang, J., Van den Brink, H. M., & Groot, W. (2009). A meta-analysis of the effect of education on social capital. *Economics of Education Review*, 28(4), 454-464.
- Imandoust, S. B. (2011). Relationship between education and social capital. *International Journal of Humanities and Social Science*, 1(12), 52-57.
- Jackson, M. R., Herranz, J., & Kabwasa-Green, F. (2003). *Art and Culture in Communities: A Framework for Measurement*. Urban Institute. <https://doi.org/10.1037/e717562011-001>
- Jeguirim, K. (2021). An inquiry into the regional unemployment disparities in Tunisia: a spatial Durbin model. *Middle East Development Journal*, 13(2), 265-291.
- Kadiyali, V., & Kosová, R. (2013). Inter-industry employment spillovers from tourism inflows. *Regional Science and Urban Economics*, 43(2), 272-281.
- Katz, B., & Wagner, J. (2014). *The Rise of Innovation Districts: A New Geography of Innovation in America*. The Brookings Institute.
- Kawachi, I., & Berkman, L. (2000). Social cohesion, social capital, and health. *Social Epidemiology*, 17(4), 290-319.
- Khaksar, A. (2023). Social capital in knowledge management systems for the creative industry sector. *Brazilian Creative Industries Journal*, 3(2), Article 2. <https://doi.org/10.25112/Bcij.V3i2.3484>
- Knack, S. (2002). Social capital, growth and poverty: A survey of cross-country evidence. *The Role of Social Capital in Development: An Empirical Assessment*, 42-82.
- Knack, S., & Keefer, P. (1997). Does social capital have an economic payoff? A cross-country investigation. *The Quarterly Journal of Economics*, 112(4), 1251-1288.
- Krikelas, A. C. (1992). Why regions grow: A review of research on the economic base model. *Economic Review*, (Jul), 16-29.
- Kumlin, S., & Rothstein, B. (2005). Making and breaking social capital: The impact of welfare-state institutions. *Comparative Political Studies*, 38(4), 339-365.
- La Porta, R., Lopez-de-Silanes, F., Shleifer, A., & Vishny, R. W. (1996). Trust in large organizations. *NBER w5864*.
- Labonne, J., & Chase, R. S. (2011). Do community-driven development projects enhance social capital? Evidence from the Philippines. *Journal of Development Economics*, 96(2), 348-358.
- Lai, S., Zhang, S., Zhang, L., Tseng, H.-W., & Shiao, Y.-C. (2021). Study on the influence of cultural contact and tourism memory on the intention to revisit: A case study of cultural and creative districts. *Sustainability*, 13(4), Article 4. <https://doi.org/10.3390/su13042416>

- Lannoo, S., Verhaeghe, P. P., Vandeputte, B., & Devos, C. (2012). Differences in social capital between urban and rural environments. *Journal of Urban Affairs*, 34(4), 373-394.
- Lee, C. J., & Kim, D. (2013). A comparative analysis of the validity of US state-and county-level social capital measures and their associations with population health. *Social Indicators Research*, 111(1), 307-326.
- Lee, R., & Tuselmann, H. (2013). Entrepreneurship, occupational division and social capital differentials. *Journal of Small Business and Enterprise Development*, 20(3), 661-680.
- Leeper, T. J. (2024). Interpreting regression results using average marginal effects with R's margins. *Available at the Comprehensive R Archive Network (CRAN)*, 32, 1-32.
- Light, I., & Dana, L. P. (2013). Boundaries of social capital in entrepreneurship. *Entrepreneurship Theory and Practice*, 37(3), 603-624.
- Lloyd, R., & Clark, T. N. (2001). The city as an entertainment machine. *Critical Perspectives on Urban Redevelopment*, 6(3), 357-378.
- Lochner, K., Kawachi, I., & Kennedy, B. P. (1999). Social capital: A guide to its measurement. *Health & Place*, 5(4), 259-270.
- Lorenzini, E. (2011). The extra-urban cultural district: An emerging local production system: Three Italian case studies. *European Planning Studies*, 19(8), 1441-1457. <https://doi.org/10.1080/09654313.2011.586179>
- Malecki, E. J. (2012). Regional social capital: Why it matters. *Regional Studies*, 46(8), 1023-1039.
- Manski, C. F. (1993). Identification of endogenous social effects: The reflection problem. *The Review of Economic Studies*, 60(3), 531-542.
- Markeson, B. O. (2016). *Social Capital, Communities, and the Firm: A Spatial Panel Study of Small Business Intensity and Firm Entry and Exit in Rural US Counties* (Doctoral dissertation, The University of Wisconsin-Madison).
- Markusen, A., & Gadwa, A. (2010). Arts and culture in urban or regional planning: A review and research agenda. *Journal of Planning Education and Research*, 29(3), 379-391. <https://doi.org/10.1177/0739456X09354380>
- Markusen, A., & Schrock, G. (2006). The artistic dividend: Urban artistic specialisation and economic development implications. *Urban Studies*, 43(10), 1661-1686. <https://doi.org/10.1080/00420980600888478>
- Markusen, A., Wassall, G. H., DeNatale, D., & Cohen, R. (2008). Defining the creative economy: Industry and occupational approaches. *Economic Development Quarterly*, 22(1), 24-45. <https://doi.org/10.1177/0891242407311862>

- Mavridis, D. (2015). Ethnic diversity and social capital in Indonesia. *World Development*, 67, 376-395.
- Mayasari, Y., & Chandra, T. (2020). Social capital for knowledge management system of the creative industry. *Journal of Enterprising Communities: People and Places in the Global Economy*, 14(4), 481-494.
- McCann, Philip (2001). *Urban and Regional Economics*. Oxford University Press.
- McElroy, M. W., Jorna, R. J., & van Engelen, J. (2006). Rethinking social capital theory: A knowledge management perspective. *Journal of Knowledge Management*, 10(5), 124-136.
- McGranahan, D., & Wojan, T. (2007). Recasting the creative class to examine growth processes in rural and urban counties. *Regional Studies*, 41(2), 197-216.
<https://doi.org/10.1080/00343400600928285>
- McGranahan, D. A. (2009). Scenic landscapes enhance rural growth. *Amber Waves*, 7(2), 9.
- McGranahan, D. A., Wojan, T. R., & Lambert, D. M. (2011). The rural growth trifecta: Outdoor amenities, creative class and entrepreneurial context. *Journal of Economic Geography*, 11(3), 529-557.
<https://doi.org/10.1093/jeg/lbq007>
- McLafferty, S., & Preston, V. (1996). Spatial mismatch and employment in a decade of restructuring. *The Professional Geographer*, 48(4), 420-431.
- Milbourne, P. (2010). The geographies of poverty and welfare. *Geography Compass*, 4(2), 158-171.
- Mouw, T. (2006). Estimating the causal effect of social capital: A review of recent research. *Annual Review of Sociology*, 32, 79-102.
- Mur, J., & Angulo, A. (2005). A closer look at the Spatial Durbin Model. *Conference Paper*, ERSA 2005 - 45th Congress of the European Regional Science Association, Amsterdam, 2005.
<http://hdl.handle.net/10419/117593>
- Nasution, A., Rustiadi, E., Juanda, B., & Hadi, S. (2015). Two-way causality between social capital and poverty in rural Indonesia. *Asian Social Science*, 11(13), 139.
- Ogden, J., Morrison, K., & Hardee, K. (2014). Social capital to strengthen health policy and health systems. *Health Policy and Planning*, 29(8), 1075-1085.
- Osberg, L., & Sharpe, A. (2001). Comparisons of trends in GDP and economic well-being; The impact of social capital. In *The Contribution of Human and Social Capital to Sustained Economic Growth and Well Being*. Organization for Economic Co-operation and Development and Human Resource Development, Canada.
- Pena, A. A., Zahran, S., Underwood, A., & Weiler, S. (2014). Effect of natural disasters on local nonprofit activity. *Growth and Change*, 45(4), 590-610.

- Perrailon, M. C. (2019). Interpreting model estimates: Marginal effects. *University of Colorado Anschutz Medical Campus, Nova School of Business and Economics Lisbon, Portugal*.
- Pickett, K. E., & Wilkinson, R. G. (2015). Income inequality and health: a causal review. *Social Science & Medicine*, 128, 316-326.
- Piergiiovanni, R., Carree, M. A., & Santarelli, E. (2012). Creative industries, new business formation, and regional economic growth. *Small Business Economics*, 39(3), 539–560.
- Pillai, K. G., Hodgkinson, G. P., Kalyanaram, G., & Nair, S. R. (2017). The negative effects of social capital in organizations: A review and extension. *International Journal of Management Reviews*, 19(1), 97-124.
- Plagens, G. K. (2011). Social capital and education: Implications for student and school performance. *Education and Culture*, 27(1), 40-64.
- Porter, M. (1990). Competitive advantage of nations. *Competitive Intelligence Review*, 1(1), 14–14. <https://doi.org/10.1002/cir.3880010112>
- Porter, M. E. (2000). Location, competition, and economic development: Local clusters in a global economy. *Economic Development Quarterly*, 14(1), 15-34.
- Portillo, J. E., & Wagner, G. A. (2021). Do cultural districts spur urban revitalization: Evidence from Louisiana. *Journal of Economic Behavior & Organization*, 188, 651–673. <https://doi.org/10.1016/j.jebo.2021.05.039>
- Potts, J., & Cunningham, S. (2008). Four models of the creative industries. *International Journal of Cultural Policy*, 14(3), 233-247.
- Pratt, A. C., & Hutton, T. A. (2013). Reconceptualising the relationship between the creative economy and the city: Learning from the financial crisis. *Cities*, 33, 86-95.
- Putnam, R. (1997). The prosperous community: social capital and public life. *Frontier issues in economic thought*, 3, 211-212.
- Putnam, R. (2000). *Bowling alone: The Collapse and Revival of American Community*. Simon and Schuster.
- Putnam, R. (2001). Social capital: Measurement and consequences. *Canadian Journal of Policy Research*, 2(1), 41-51.
- Ramirez, M. T., & Loboguerrero, A. M. (2002). Spatial dependence and economic growth: Evidence from a panel of countries. *Borradores de Economia Working Paper* 206.
- Richards, G. (2020). Designing creative places: The role of creative tourism. *Annals of Tourism Research*, 85, 102922. <https://doi.org/10.1016/j.annals.2020.102922>

- Richardson, H. W. (1985). Input-output and economic base multipliers: Looking backward and forward. *Journal of Regional Science*, 25(4), 607-661.
- Rothstein, B., & Stolle, D. (2003). Social capital, impartiality and the welfare state: An institutional approach. In *Generating Social Capital: Civil Society and Institutions in Comparative Perspective* (pp. 191-209). New York: Palgrave Macmillan US.
- Rupasingha, A., Goetz, S. J., & Freshwater, D. (2000). Social capital and economic growth: a county-level analysis. *Journal of Agricultural and Applied Economics*, 32(3), 565-572.
- Rupasingha, A., Goetz, S. J., & Freshwater, D. (2006). The production of social capital in US counties. *The Journal of Socio-Economics*, 35(1), 83-101.
- Rupasingha, A., & Goetz, S. J. (2013). Self-employment and local economic performance: Evidence from US counties. *Papers in Regional Science*, 92(1), 141-162.
- Rüttenauer, T. (2022). Spatial regression models: A systematic comparison of different model specifications using Monte Carlo experiments. *Sociological Methods & Research*, 51(2), 728-759.
- Salinas, J. P. (2013). The impact of social capital on the education of migrant children. *Family and Consumer Sciences Research Journal*, 42(1), 29-39.
- Saukani, N., & Ismail, N. A. (2019). Identifying the components of social capital by categorical principal component analysis (CATPCA). *Social Indicators Research*, 141, 631-655.
- Schaffer, W. A. (2020). *Regional impact models*. The Research Repository @ WVU. <https://researchrepository.wvu.edu/rri-web-book/7/>
- Schmid, A. A., & Robison, L. J. (1995). Applications of social capital theory. *Journal of Agricultural and Applied Economics*, 27(1), 59-66.
- Scott, A. J. (2000). The cultural economy of cities: Essays on the geography of image-producing industries. https://www.researchgate.net/profile/Allen-Scott-2/publication/4910368_The_Cultural_Economy_of_Cities/links/00b7d53ad95af40da7000000/The-Cultural-Economy-of-Cities.pdf
- Seif, A. M., Panahi, H., & Hamidi Razi, D. (2017). Regional economic growth and spatial spillover effects in MENA area. *Iranian Economic Review*, 21(4), 765-787.
- Seman, M. (2015). What if Hewlett and Packard had started a band instead? An examination of a music scene as economic cluster. *Artivate*, 4(2), 33-49.
- Seman, M. (2010). How a music scene functioned as a tool for urban redevelopment: A case study of Omaha's Slowdown project. *Energy Policy - ENERG POLICY*, 1, 207-215. <https://doi.org/10.1016/j.ccs.2011.01.001>

- Seman, M., & Carroll, M. C. (2017). The creative economies of Texas metropolitan regions: A comparative analysis before, during, and after the recession. *Growth and Change*, 48(4), 831–852. <https://doi.org/10.1111/grow.12198>
- Seman, M. (2020). *2020 City of Denver Creative Economy Report with Initial Impacts of the COVID-19 Crisis*. <https://doi.org/10.13140/RG.2.2.22548.94084>
- Shen, J., & Bian, Y. (2018). The causal effect of social capital on income: A new analytic strategy. *Social Networks*, 54, 82-90.
- Smit, A. J. (2011). The influence of district visual quality on location decisions of creative entrepreneurs. *Journal of the American Planning Association*, 77(2), 167–184. <https://doi.org/10.1080/01944363.2011.567924>
- Soot, S. and Sen, A. (1991). A Spatial Employment and Economic Development model. *Papers in Regional Science*, 70, 149–166 . <https://doi.org/10.1007/BF01434326>
- Subramaniam, M., & Youndt, M. A. (2005). The influence of intellectual capital on the types of innovative capabilities. *Academy of Management Journal*, 48(3), 450-463.
- Tamilina, L. (2008). *The Analysis of Welfare State Effects on Social Trust in A Multidimensional Approach*. Luxembourg Institute of Socio-economic Research. <https://liser.elsevierpure.com/fr/publications/the-analysis-of-welfare-state-effects-on-social-trust-in-a-multid>
- Temple, J. (2002). Growth effects of education and social capital in the OECD countries. *Historical Social Research / Historische Sozialforschung*, 5-46.
- Thompson, M. (2018). Social capital, innovation and economic growth. *Journal of Behavioral and Experimental Economics*, 73, 46-52.
- Thornton, S. (2012). Cultural districts and the potential for urban development. *Advocates' Forum*, 2012. from <https://www.ssa.uchicago.edu/cultural-districts-and-potential-urban-development>
- Tientao, A., Legros, D., & Pichery, M. C. (2016). Technology spillover and TFP growth: A Spatial Durbin Model. *International Economics*, 145, 21-31.
- U.S. Census Bureau. (n.d.). *NAICS 2012 Industry Definition 71 - Arts, Entertainment, and Recreation*. <http://www.vtlmi.info/naicsdef.cfm?naics=71>
- U.S. Bureau of Labor Statistics (2024). Industries at a Glance: Arts, entertainment, and recreation: NAICS 71. <https://www.bls.gov/iag/tgs/iag71.htm>
- Ueshima, K., Fujiwara, T., Takao, S., Suzuki, E., Iwase, T., Doi, H., ... & Kawachi, I. (2010). Does social capital promote physical activity? A population-based study in Japan. *PloS one*, 5(8).

- Vaezghasemi, M., Öhman, A., Eriksson, M., Hakimi, M., Weinehall, L., Kusnanto, H., & Ng, N. (2014). The effect of gender and social capital on the dual burden of malnutrition: a multilevel study in Indonesia. *PloS One*, 9(8).
- Válsán, C., Goschin, Z., & Druică, E. (2023). The measurement of social capital in America: A reassessment. *Social Indicators Research*, 165(1), 135-161.
- Veszteg, R. F., Funaki, Y., & Tanaka, A. (2015). The impact of the Tohoku earthquake and tsunami on social capital in Japan: Trust before and after the disaster. *International Political Science Review*, 36(2), 119-138.
- Walsh, R. (2007). Endogenous open space amenities in a locational equilibrium. *Journal of Urban Economics*, 61(2), 319-344.
- Wacquant, L. J. (1993). Urban outcasts: stigma and division in the black American ghetto and the French urban periphery. *International Journal of Urban and Regional research*, 17(3), 366-383.
- Warren, M. R., Thompson, J. P., & Saegert, S. (2001). The role of social capital in combating poverty. *Social Capital and Poor Communities*, 3, 1-28.
- Watson, P., & Deller, S. (2022). Tourism and economic resilience. *Tourism Economics*, 28(5), 1193–1215. <https://doi.org/10.1177/1354816621990943>
- Wedemeier, J. (2009). The impact of creativity on growth in German regions. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.1607655>
- Westlund, H., Andersson, M., & Karlsson, C. (2014). Creativity as an integral element of social capital and its role in economic performance. In *Handbook of Research on Entrepreneurship and Creativity* (pp. 60-96). Edward Elgar Publishing.
- Wheeler, C. H. (2001). A note on the spatial correlation structure of county-level growth in the U.S. *Journal of Regional Science*, 41(3), 433-449.
- Whiteley, P. F. (2000). Economic growth and social capital. *Political Studies*, 48(3), 443-466.
- Yoo, T., & Lee, S. H. (2009). In search of social capital in state-activist capitalism: Elite networks in France and Korea. *Organization Studies*, 30(5), 529-547.
- Zhang, C. (2012). Spatial weights matrix and its application. *Journal of Regional Development Studies*, 15, 85-97.

Appendix A Chapter 1: Estimation Output Tables

MODEL 1

Appendix Table 1. Regression Output Table: Business Establishments

VARIABLES (1-year lag)	Number of Establishments			Establishment Birth Rate		
	All Counties	Rural	U.Core	All Counties	Rural	U.Core
Creative Districts	585.7** (270.7000)	132.8** (49.9200)	769.8*** (166.1000)	0.804 (0.6120)	5.486 (4.3620)	1.092 (0.6950)
MS Community	-148.8** (57.9500)	-26.15*** (5.8120)	-353.1*** (112.8000)	0.622 (0.5150)	-2.288** (0.9400)	0.371 (0.5670)
Real GDP (2012=100)	0.000144*** (0.0000)	0.000 (0.0000)	0.000129*** (0.0000)	-5.55E-08 (0.0000)	-6.89E-07 (0.0000)	8.04E-09 (0.0000)
Percapita Income	-0.001 (0.0007)	0.000 (0.0001)	-0.002 (0.0019)	2.99E-05 (0.0000)	2.72E-05 (0.0001)	4.52E-05 (0.0000)
Youth Population (0-18), share	-14.720 (22.5900)	-2.269 (6.7270)	-178.400 (187.0000)	-1.162 (0.8630)	0.264 (2.8480)	0.662 (0.9800)
19-25 y.o. Population, share	-188.500 (167.3000)	5.414 (17.5100)	-219.700 (1691.0000)	22.20** (9.4330)	23.66** (8.7370)	-7.615 (5.5670)
26-45 y.o. Population, share	-12.810 (59.0300)	10.81* (5.6920)	-488.100 (779.2000)	3.746 (3.6620)	6.751** (3.2860)	-4.024 (5.0790)
46-64 y.o. Population, share	16.140 (14.7900)	1.691 (1.8650)	-76.140 (262.9000)	1.999* (1.0030)	1.377 (0.8570)	-1.08 (1.2660)
65-90 y.o. Population, share	-5.819 (10.3500)	-0.405 (0.8440)	-799.8* (437.7000)	0.402 (0.7540)	0.691 (0.6450)	-1.371 (4.0450)
Median Home Values, \$	0.00110* (0.0006)	0.000 (0.0001)	0.00252** (0.0011)	5.19E-06 (0.0000)	7.02E-06 (0.0000)	4.75E-07 (0.0000)
Population Density	2.252** (0.8610)	29.55*** (6.2330)	2.253*** (0.6850)	-0.000188 (0.0023)	0.558 (0.5660)	-0.00121 (0.0019)
Creative District * MS Community	61.260 (72.3300)	-45.14** (22.1100)	233.4* (136.8000)	0.0184 (0.3440)	-0.66 (0.9750)	0.0449 (0.6220)
Creative District * Percapita Income	-0.0107** (0.0047)	-0.00106** (0.0004)	-0.0169*** (0.0034)	-2.84e-05** (0.0000)	-8.41E-05 (0.0001)	-2.41E-05 (0.0000)
Creative District * Population Density	0.051 (0.0463)	-4.132** (1.6360)	0.122* (0.0608)	0.000559*** (0.0002)	-0.144 (0.1070)	0.000378 (0.0003)
MS Community * Percapita Income	-0.000182** (0.0001)	0.000 (0.0000)	0.000 (0.0002)	-2.75e-06** (0.0000)	6.85E-06 (0.0000)	-5.28E-07 (0.0000)
MS Community * Population Density	3.037*** (1.0850)	0.377 (0.6040)	3.722** (1.3980)	-0.0018 (0.0056)	0.269** (0.1050)	-0.00781 (0.0051)
Constant	1,109*** (170.9000)	45.580 (45.9700)	2,951*** (646.9000)	-5.669 (5.5910)	-21.87*** (7.0580)	11.26*** (3.7190)
Observations	576	324	252	576	324	252
R-squared	0.877	0.577	0.92	0.126	0.164	0.119
Number of cntynum	64	36	28	64	36	28

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

MODEL 2

Appendix Table 2. Regression Output Table: Job Creation

VARIABLES (1-year lag)	Net Job Creation			Net Job Creation Rate		
	All Counties	Rural	U.Core	All Counties	Rural	U.Core
Creative Districts	1,662* (870.3000)	531.900 (361.2000)	2,593*** (624.5000)	1.061 (1.0500)	12.11*** (3.5750)	0.591 (0.8830)
MS Community	-162.500 (248.8000)	29.470 (39.6900)	-95.510 (551.9000)	0.494 (0.9530)	-4.019*** (1.2320)	1.508** (0.6200)
Real GDP (2012=100)	0.000 (0.0002)	0.000 (0.0002)	-0.000426* (0.0002)	8.49e-08** (0.0000)	0.000 (0.0000)	0.000 (0.0000)
Percapita Income	0.003 (0.0028)	0.000 (0.0009)	0.011 (0.0157)	0.000 (0.0000)	-5.69e-05** (0.0000)	0.000 (0.0000)
Youth Population (0-18), share	-115.500 (102.9000)	-77.570 (85.1600)	148.800 (1244.0000)	0.127 (0.2720)	-0.037 (0.8930)	-0.064 (0.6210)
19-25 y.o. Population, share	-731.500 (904.1000)	107.400 (113.8000)	-9044.000 (11535.0000)	-1.041 (1.4600)	-1.848 (1.9270)	1.178 (3.8640)
26-45 y.o. Population, share	153.400 (223.2000)	152.3* (75.3900)	-4116.000 (4987.0000)	0.116* (0.0611)	1.174** (0.4700)	2.603 (2.1120)
46-64 y.o. Population, share	-7.777 (84.7700)	20.280 (19.3900)	-2588.000 (2515.0000)	-0.101** (0.0455)	-0.058 (0.0689)	-0.908 (1.8600)
65-90 y.o. Population, share	-71.730 (59.6100)	-20.13* (11.3300)	-1141.000 (2128.0000)	0.0686*** (0.0201)	0.0718*** (0.0151)	-1.296*** (0.2310)
Median Home Values, \$	-0.005 (0.0040)	-0.00131* (0.0007)	-0.004 (0.0059)	4.05e-06** (0.0000)	0.000 (0.0000)	0.000 (0.0000)
Population Density	6.681 (5.4270)	54.88* (31.1200)	9.945 (6.6990)	-0.001 (0.0006)	-0.085 (0.0794)	0.000 (0.0005)
Creative District * MS Community	-437.200 (305.0000)	-246.7** (104.5000)	-86.500 (704.2000)	0.658 (1.5980)	-0.473 (1.9670)	-1.055 (0.7920)
Creative District * Percapita Income	-0.023 (0.0149)	-0.005 (0.0050)	-0.0325** (0.0141)	0.000 (0.0000)	-0.000133** (0.0001)	0.000 (0.0000)
Creative District * Population Density	1.693*** (0.2030)	-23.68** (9.2210)	1.347*** (0.3800)	0.000 (0.0005)	-0.363*** (0.0984)	0.000 (0.0002)
MS Community * Percapita Income	0.000879* (0.0005)	-0.000461*** (0.0001)	0.002 (0.0014)	0.000 (0.0000)	0.000 (0.0000)	-3.29e-06** (0.0000)
MS Community * Population Density	5.481 (8.8520)	13.76*** (1.9350)	0.233 (6.8690)	-0.00415* (0.0024)	0.644*** (0.1710)	-0.002 (0.0014)
Constant	2,231** (875.4000)	-166.000 (170.2000)	6929.000 (4146.0000)	-1.264 (0.8580)	1.410 (2.0690)	-0.614 (0.9480)
Observations	576	324	252	576	324	252
R-squared	0.13	0.147	0.176	0.051	0.090	0.209
Number of cntynum	64	36	28	64	36	28

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

MODEL 3

Appendix Table 3. Regression Output Table: Creative Sector Employment

VARIABLES	Dependent Variable:					
	Creative Sector Employment (share)			Creative Sector Employment (share)		
	Contemporaneous			1-year Lag		
	All Counties	Rural	U.Core	All Counties	Rural	U.Core
Creative Districts	-0.000824 (0.0012)	0.0109* (0.0063)	-0.00254*** (0.0009)	-0.000497 (0.0013)	0.00637 (0.0077)	-0.00184** (0.0008)
MS Community	-0.00269** (0.0013)	-0.003 (0.0032)	-0.00254** (0.0012)	-0.00263** (0.0011)	-0.00398 (0.0025)	-0.00304* (0.0015)
Real GDP (2012=100)	2.06E-10 (0.0000)	6.24E-10 (0.0000)	1.03E-10 (0.0000)	2.05E-10 (0.0000)	-4.78E-09 (0.0000)	1.52E-10 (0.0000)
Percapita Income	-4.95E-08 (0.0000)	-7.15E-08 (0.0000)	3.04E-08 (0.0000)	-1.11E-08 (0.0000)	1.95E-08 (0.0000)	1.52E-08 (0.0000)
Youth Population (0-18), share	-0.00143 (0.0011)	-0.00212 (0.0037)	0.00156 (0.0020)	-0.00224 (0.0018)	0.000384 (0.0046)	0.000889 (0.0018)
19-25 y.o. Population, share	0.00232 (0.0093)	0.00288 (0.0105)	-0.0343 (0.0211)	0.00901 (0.0120)	0.00923 (0.0137)	-0.0269 (0.0185)
26-45 y.o. Population, share	0.00439 (0.0027)	0.00418 (0.0038)	-0.0091 (0.0136)	0.00921 (0.0062)	0.0101 (0.0093)	-0.000473 (0.0154)
46-64 y.o. Population, share	0.00319*** (0.0010)	0.00358** (0.0014)	0.0120** (0.0046)	0.00302** (0.0012)	0.00245 (0.0017)	0.0107** (0.0045)
65-90 y.o. Population, share	-0.00167*** (0.0004)	-0.00148*** (0.0004)	-0.00921* (0.0048)	-0.00272*** (0.0006)	-0.00276*** (0.0007)	-0.0041 (0.0047)
Median Home Values, \$	-1.56E-08 (0.0000)	6.42E-09 (0.0000)	-1.43E-08 (0.0000)	-2.90e-08** (0.0000)	-3.08E-08 (0.0000)	-2.16E-08 (0.0000)
Median Household Income, \$	-2.48E-09 (0.0000)	-9.66E-09 (0.0000)	4.45E-09 (0.0000)	4.05E-09 (0.0000)	2.26E-08 (0.0000)	-6.62E-09 (0.0000)
Population Density	-1.28E-06 (0.0000)	0.000151 (0.0010)	-5.04E-08 (0.0000)	-1.80E-06 (0.0000)	0.000424 (0.0010)	9.13E-07 (0.0000)
Creative District * MS Community	-0.000284 (0.0019)	-0.00123 (0.0030)	-0.00318 (0.0020)	0.000658 (0.0015)	-0.00047 (0.0030)	-0.00191 (0.0018)
Creative District * Percapita Income	2.63E-10 (0.0000)	-1.66e-07** (0.0000)	4.53e-08** (0.0000)	-1.72E-08 (0.0000)	-1.25E-07 (0.0000)	4.04e-08* (0.0000)
Creative District * Population Density	3.17E-07 (0.0000)	-0.00021 (0.0002)	-1.90E-07 (0.0000)	7.72E-07 (0.0000)	-0.000113 (0.0002)	-3.41E-07 (0.0000)
MS Community * Percapita Income	2.39E-09 (0.0000)	-1.12E-08 (0.0000)	5.56E-09 (0.0000)	3.39e-09* (0.0000)	3.08E-09 (0.0000)	5.22E-09 (0.0000)
MS Community * Population Density	1.64E-05 (0.0000)	0.000159 (0.0003)	2.82E-05 (0.0000)	1.40E-05 (0.0000)	0.000192 (0.0002)	2.69E-05 (0.0000)
Constant	0.0192*** (0.0029)	0.0125 (0.0092)	0.0247** (0.0092)	0.0165** (0.0064)	0.00857 (0.0135)	0.0208** (0.0094)
Observations	640	360	280	576	324	252
R-squared	0.135	0.166	0.307	0.169	0.204	0.293
Number of cntynum	64	36	28	64	36	28

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

MODEL 4

Appendix Table 4. Regression Output Table: Sector 71 Employment

VARIABLES	Dependent Variable:					
	Sector 71 Employment (share)			Sector 71 Employment (share)		
	Contemporaneous			1-year Lag		
	All Counties	Rural	U.Core	All Counties	Rural	U.Core
Creative Districts	0.00235 (0.0022)	-0.00621 (0.0125)	0.00177 (0.0028)	0.0013 (0.0023)	-0.000255 (0.0127)	-0.00147 (0.0024)
MS Community	0.00652 (0.0044)	0.00661* (0.0034)	0.0126 (0.0076)	0.0063 (0.0053)	0.00348 (0.0027)	0.0107 (0.0110)
Real GDP (2012=100)	-1.42E-10 (0.0000)	-8.08E-09 (0.0000)	-3.86E-10 (0.0000)	-2.03E-10 (0.0000)	-1.82E-09 (0.0000)	-8.90E-10 (0.0000)
Percapita Income	-5.96E-08 (0.0000)	1.62E-09 (0.0000)	-5.26E-08 (0.0000)	-3.91E-08 (0.0000)	-3.18E-08 (0.0000)	9.14E-08 (0.0000)
Youth Population (0-18), share	-0.0435*** (0.0062)	-0.0189*** (0.0047)	-0.0441*** (0.0138)	-0.0427*** (0.0056)	-0.0219*** (0.0056)	-0.0506*** (0.0097)
19-25 y.o. Population, share	0.00367 (0.0113)	0.000778 (0.0081)	-0.00531 (0.0919)	0.000411 (0.0105)	-0.00131 (0.0086)	0.00359 (0.0941)
26-45 y.o. Population, share	0.00487 (0.0058)	0.00605 (0.0046)	0.0216 (0.0573)	0.0049 (0.0065)	0.00717 (0.0059)	-0.0113 (0.0384)
46-64 y.o. Population, share	0.00993*** (0.0017)	0.00461*** (0.0017)	-0.00744 (0.0189)	0.00781*** (0.0012)	0.00352** (0.0014)	-0.00245 (0.0120)
65-90 y.o. Population, share	-0.0011 (0.0009)	-0.00111 (0.0007)	0.0449 (0.0560)	-0.000744 (0.0006)	-0.000611 (0.0008)	-0.0124 (0.0195)
Median Home Values, \$	2.71E-08 (0.0000)	-2.54E-08 (0.0000)	-9.75E-09 (0.0000)	2.95E-08 (0.0000)	-3.93E-08 (0.0000)	3.51E-08 (0.0000)
Median Household Income, \$	-6.15e-08* (0.0000)	-3.61E-08 (0.0000)	-3.79E-08 (0.0000)	-4.82E-08 (0.0000)	-8.98E-09 (0.0000)	-5.06E-08 (0.0000)
Population Density	4.99E-06 (0.0000)	0.00366* (0.0019)	1.74E-05 (0.0000)	5.57E-06 (0.0000)	0.00302 (0.0020)	1.52E-05 (0.0000)
Creative District * MS Community	0.00198 (0.0027)	0.000312 (0.0029)	0.00637 (0.0045)	0.00225 (0.0032)	0.0024 (0.0037)	0.00246 (0.0031)
Creative District * Percapita Income	-5.39E-08 (0.0000)	4.95E-08 (0.0000)	5.01E-09 (0.0000)	-3.86E-08 (0.0000)	-5.80E-08 (0.0000)	3.51E-08 (0.0000)
Creative District * Population Density	1.23E-06 (0.0000)	0.000169 (0.0003)	-4.47E-07 (0.0000)	1.03E-06 (0.0000)	0.000142 (0.0003)	2.84E-07 (0.0000)
MS Community * Percapita Income	-1.65e-08*** (0.0000)	2.28e-08** (0.0000)	-2.55E-08 (0.0000)	-1.07e-08** (0.0000)	3.69e-08*** (0.0000)	-1.26E-08 (0.0000)
MS Community * Population Density	-5.40E-05 (0.0000)	-0.000701** (0.0003)	-0.000150* (0.0001)	-6.30E-05 (0.0000)	-0.000658** (0.0003)	-0.000123 (0.0001)
Constant	0.0719*** (0.0087)	0.0320** (0.0150)	0.0655 (0.0531)	0.0709*** (0.0087)	0.0390* (0.0200)	0.0916*** (0.0279)
Observations	640	360	280	576	324	252
R-squared	0.56	0.206	0.704	0.55	0.226	0.69
Number of cntynum	64	36	28	64	36	28

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

MODEL 5

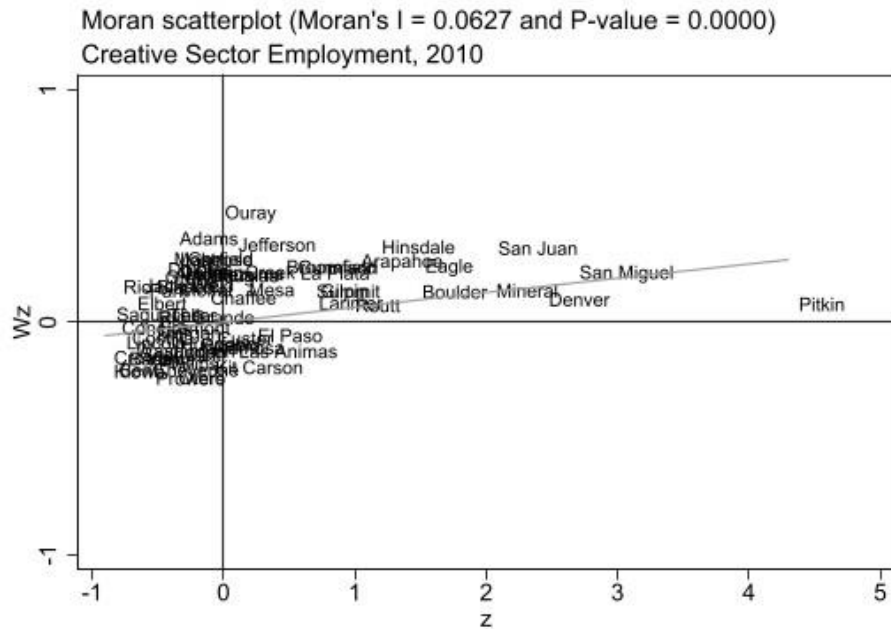
Appendix Table 5. Regression Output Table: Other Sectors' Employment

VARIABLES	Dependent Variable:					
	Other Sectors' Employment (share)			Other Sectors' Employment (share)		
	Contemporaneous			1-year Lag		
	All Counties	Rural	U.Core	All Counties	Rural	U.Core
Creative Districts	-0.00225 (0.0025)	-0.00587 (0.0116)	-6.22E-05 (0.0029)	-0.00124 (0.0028)	-0.00471 (0.0084)	0.00264 (0.0025)
MS Community	-0.00455 (0.0047)	-0.00418 (0.0061)	-0.0106 (0.0067)	-0.00434 (0.0051)	-0.000553 (0.0042)	-0.0083 (0.0097)
Real GDP (2012=100)	-8.26E-11 (0.0000)	3.70E-09 (0.0000)	2.23E-10 (0.0000)	0.0000 (0.0000)	4.87E-09 (0.0000)	6.84E-10 (0.0000)
Percapita Income	1.13e-07** (0.0000)	9.07E-08 (0.0000)	2.56E-08 (0.0000)	4.82E-08 (0.0000)	2.23E-08 (0.0000)	-1.15E-07 (0.0000)
Youth Population (0-18), share	0.0449*** (0.0058)	0.0228*** (0.0055)	0.0419*** (0.0147)	0.0446*** (0.0055)	0.0243*** (0.0075)	0.0488*** (0.0092)
19-25 y.o. Population, share	-0.00834 (0.0158)	-0.00763 (0.0141)	0.0344 (0.0937)	-0.0109 (0.0183)	-0.0108 (0.0151)	0.0212 (0.0862)
26-45 y.o. Population, share	-0.0065 (0.0041)	-0.00833** (0.0032)	-0.0202 (0.0577)	-0.00960* (0.0051)	-0.0135** (0.0065)	0.00866 (0.0393)
46-64 y.o. Population, share	-0.0109*** (0.0020)	-0.00624*** (0.0023)	-0.00707 (0.0179)	-0.00891*** (0.0017)	-0.00460** (0.0021)	-0.00993 (0.0115)
65-90 y.o. Population, share	0.00189** (0.0008)	0.00170** (0.0008)	-0.037 (0.0573)	0.00229*** (0.0008)	0.00228** (0.0010)	0.0174 (0.0187)
Median Home Values, \$	-2.01E-08 (0.0000)	2.19E-08 (0.0000)	8.73E-09 (0.0000)	-9.71E-09 (0.0000)	6.89E-08 (0.0000)	-2.65E-08 (0.0000)
Median Household Income, \$	6.09e-08* (0.0000)	3.88E-08 (0.0000)	3.86E-08 (0.0000)	3.52E-08 (0.0000)	-2.53E-08 (0.0000)	5.61E-08 (0.0000)
Population Density	2.20E-06 (0.0000)	-0.00389** (0.0018)	-1.02E-05 (0.0000)	2.67E-07 (0.0000)	-0.00359* (0.0019)	-1.01E-05 (0.0000)
Creative District * MS Community	-0.00245 (0.0034)	0.000296 (0.0052)	-0.0042 (0.0043)	-0.00332 (0.0037)	-0.00248 (0.0042)	-0.00156 (0.0029)
Creative District * Percapita Income	8.43E-08 (0.0000)	1.73E-07 (0.0000)	-1.20E-08 (0.0000)	7.58E-08 (0.0000)	1.96E-07 (0.0000)	-3.95E-08 (0.0000)
Creative District * Population Density	-2.01e-06* (0.0000)	-1.57E-05 (0.0003)	-6.19E-08 (0.0000)	-1.90E-06 (0.0000)	-0.000146 (0.0002)	-4.47E-07 (0.0000)
MS Community * Percapita Income	1.51e-08*** (0.0000)	-1.56E-08 (0.0000)	1.99E-08 (0.0000)	8.74e-09* (0.0000)	-4.11e-08*** (0.0000)	7.30E-09 (0.0000)
MS Community * Population Density	4.54E-05 (0.0001)	0.00056 (0.0005)	0.000128* (0.0001)	5.53E-05 (0.0000)	0.000516 (0.0004)	0.000103 (0.0001)
Constant	0.911*** (0.0082)	0.958*** (0.0130)	0.921*** (0.0561)	0.916*** (0.0097)	0.954*** (0.0201)	0.896*** (0.0316)
Observations	640	360	280	576	324	252
R-squared	0.539	0.189	0.697	0.523	0.224	0.685
Number of cntynum	64	36	28	64	36	28

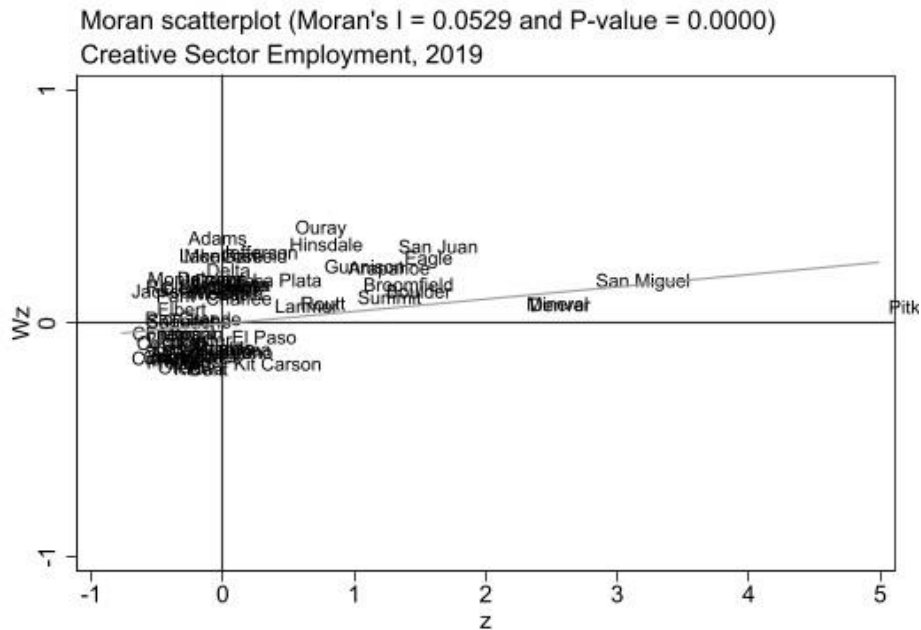
Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

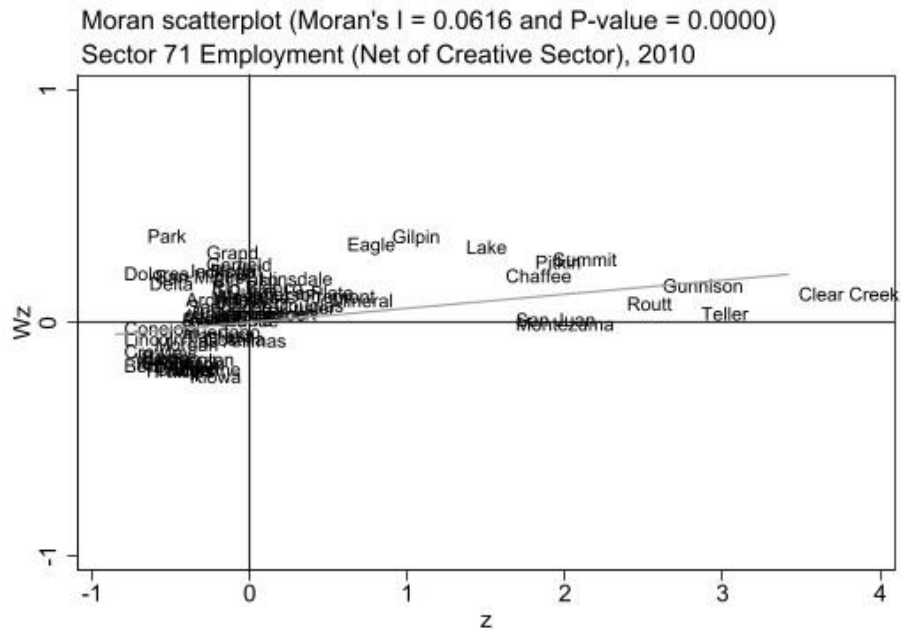
Appendix B Chapter 2: Moran's I Scatterplots



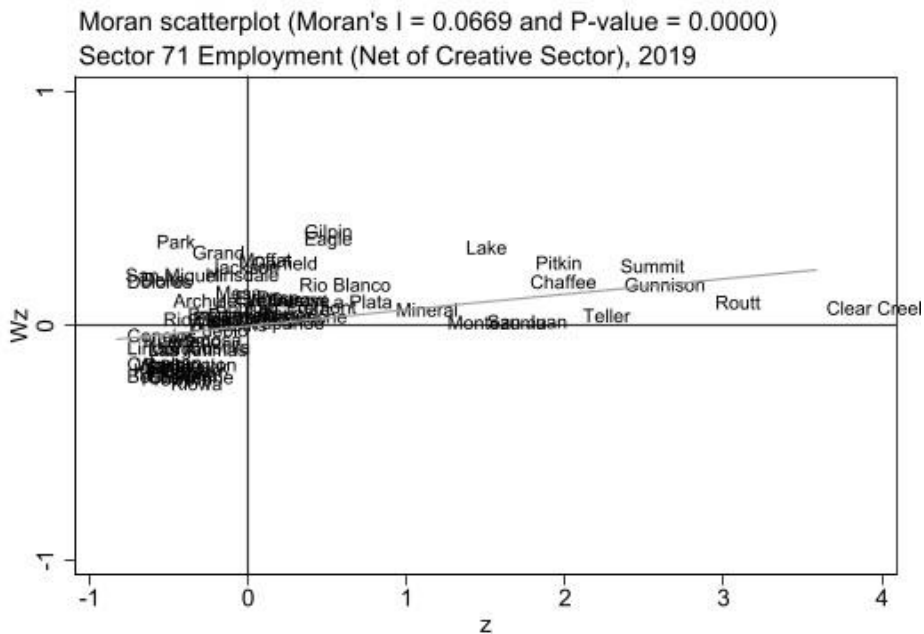
Appendix Figure 1. Moran's I for Creative Sector Employment, 2010



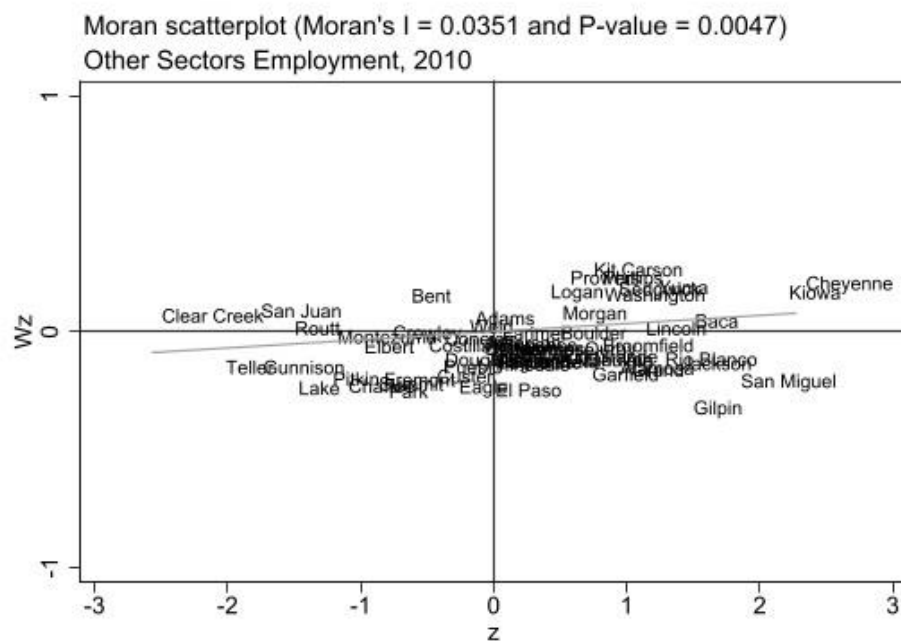
Appendix Figure 2. Moran's I for Creative Sector Employment, 2019



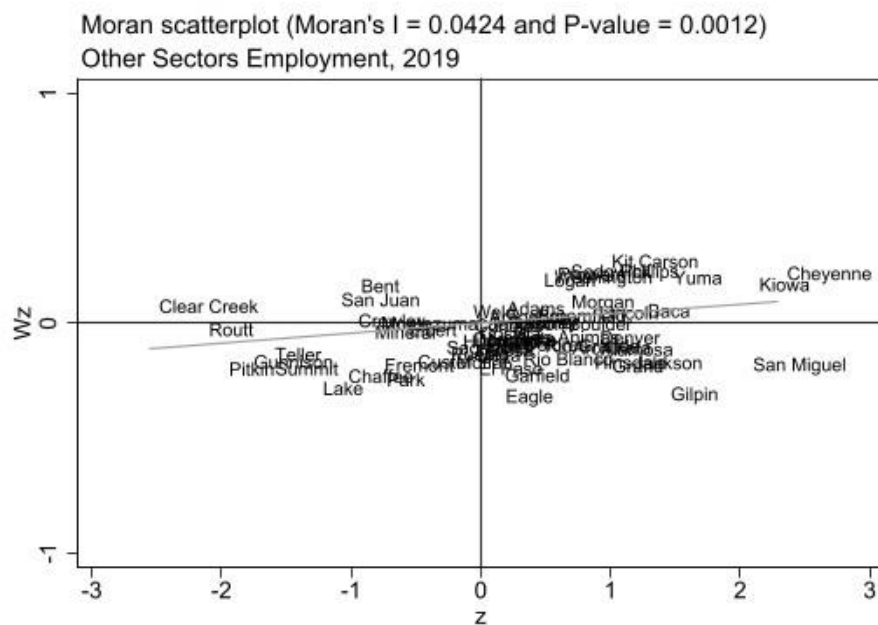
Appendix Figure 3. Moran's I for Sector 71 Employment, 2010



Appendix Figure 4. Moran's I for Sector 71 Employment, 2019



Appendix Figure 5. Moran's I for Other Sectors' Employment, 2010



Appendix Figure 6. Moran's I for Other Sectors' Employment, 2019

Appendix C Chapter 3: Construct of the Social Capital Index

Appendix Table 6. Components of Social Capital Index

Variable	Variable Name Designations, by Year				
	1990	1997	2005	2009	2014
Religious Organizations	relig90	relig97	relig05	relig09	religious2014
Civic & Social Organizations	civic90	civic97	civic05	civic09	civic2014
Business Organizations	bus90	bus97	bus05	bus09	business2014
Political Organizations	pol90	pol97	pol05	pol09	political2014
Professional Organizations	prof90	prof97	prof05	prof09	professional2014
Labor Organizations	labor90	labor97	labor05	labor09	labor2014
Bowling Centers	bowl90	bowl97	bowl05	bowl09	bowling2014
Physical Fitness Facilities	fitns90	fitnes97	fitns05	fitns09	recreational2014
Public Golf Courses	golf90	golf97	golf05	golf09	golf2014
Sport Clubs, Managers, And Promoters	sport90	sport97	sport05	sport09	sports2014
Membership Sport & Rec Clubs	memspt90	memspt97			
Membership Organizations not Elsewhere Classified	memnec90	memnec97			
The Aggregate for All Above (Divided By Pop Per 10,000) Divided by 12 (For 1997), or by 10 (2005, 2009) (1st Factor)	assn90	assn97	assn05	assn09	assn2014
Population	pop90	pop97	pop05	pop09	pop2014
Voter Turnout (2nd Factor)	pvote88 pvote92	pvote96	pvote04	pvote08	pvote2012
Census Response Rate (3rd Factor)	respn90	respn00	respn05	respn10	respn2010
# of Nonprofit Organizations W/O Including Those with An International Approach, Divided by Pop Per 10,000 (4th Factor)	nccs90	nccs97	nccs05	nccs09	nccs2014
SC Index (PCA) - The 1st Principal Component is Considered The Index of SC	ski90pcm ski90std	sk97	sk05	sk09	sk2014

Source: Pennsylvania State University's Northeast Regional Center for Rural Development
(Rupasingha et al. (2006))

Appendix D Chapter 3: Correlation Table and VIF Table

Appendix Table 7. Correlation Coefficients

	Social Capital Index	Housing Permits (Share)	Poverty (Share)	Unemployed People (Share)	Per Capita Personal Income (log)	Real GDP (2012=100) (Log)	Age 26-45	2008 Recession
Social Capital Index	1							
Housing Permits (Share)	0.1130	1						
Poverty (Share)	-0.2036	-0.2822	1					
Unemployed People (Share)	-0.0245	-0.0593	-0.0244	1				
Per Capita Personal Income (log)	0.2141	0.0370	-0.6189	0.1147	1			
Real GDP (2012=100) (Log)	-0.5174	-0.0255	-0.3258	0.2273	0.3608	1		
Age 26-45	-0.3281	0.1901	-0.1045	0.04	0.1771	0.4215	1	
2008 Recession	0.0812	-0.5	0.0979	0.0694	0.3244	0.0251	-0.2485	1

Appendix Table 8. Variance Inflation Factor (VIF), by Area

Variable	All Counties		Rural Counties		Urban Core	
	VIF	1/VIF	VIF	1/VIF	VIF	1/VIF
Housing Permits (Share)	2.43	0.4121	2.1	0.4754	5.29	0.1890
Poverty (Share)	5.69	0.1757	7.41	0.1350	10.94	0.0914
Unemployed (Share)	1.85	0.5412	13.77	0.0726	1.62	0.6161
Per Capita Personal Income (log)	96.91	0.0103	186.46	0.0054	143.61	0.0070
Real GDP (2012=100) (Log)	86.34	0.0116	161.82	0.0062	144.57	0.0069
Age 26-45 (Share)	31.68	0.0316	27.1	0.0369	49.75	0.0201
2008 Recession	5.57	0.1796	5.3	0.1886	7.33	0.1365
Mean VIF	29.07		50.84		45.67	