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FACTORS THAT INFLUENCE ENTREPRENEURSHIP AND DIGITAL TALENT IN THE RURAL HEARTLAND: MISSOURI, KANSAS, OKLAHOMA, AND ARKANSAS

by

Chett Daniel

A Dissertation Proposal

Presented to the Faculty of

The College of Education and Human Services

Department of Educational Studies, Leadership, and Counseling at Murray State University

In Partial Fulfillment of Requirements

For the Degree of Doctor of Education

P-20 & Community Leadership

Specialization: pK-12

Under the Supervision of Assistant Professor Dr. Justin Brogan, Murray State University

Murray, Kentucky

August 2021

Acknowledgments

Thank you Dr. Justin Brogan for your guidance and candor through the process of this research project and for getting me to the finish line. Thank you to Dr. Wilson and Dr. Clark for your commitment to education and the development of life-long learners through a P-20 education program.

Thank you to my parents and hometown of Wheaton, Missouri. It was in this setting and the rural hills of Barry County where I was raised that I learned the value of hard work and community. Thank you to Crowder College. As a first-generation college student that was an unprepared and unmotivated learner, your caring faculty and staff built a foundation and love of learning that remains to this day. It has been an honor to work at the college for the past four years, 25 years after beginning my educational journey here. I go to work each day excited to explore new ways to serve our communities and deliver our mission and charge of servant leadership that Mr. Tatum instilled at our institution over forty years ago.

Thank you to my children, Brecia and Cade for your patience and understanding of the time I've spent through my graduate education journey. My greatest wish is that my studies over the years have provided an example to develop your passion, set ambitious goals, and surround yourself with people who support you. I know you both will find your own way to serve others through your work and volunteer efforts.

Thank you most of all to my wife, Melissa. You have been by my side for over 25 years. We married right out of high school and put ourselves through college. You were the rock of our family as we navigated life in the military, corporate world, and you supported my decision to return to a career in education. We have built an incredible life together. I couldn't imagine this journey without you.

Abstract

The current state of many rural communities demands new, more relevant economic development strategies. Traditional models of rural economic development often rely on farming, natural resource extraction, and industrial type jobs that rely on lower-cost labor usually focused on manufacturing of product or food. Farm jobs declined decades ago. Offshoring, and more recently automation, is rapidly reducing the number of jobs available in rural areas. Jobs and economic vitality are critical to sustaining or growing communities. While traditional methods of industry attraction are still viable strategies to spur economic activity, rural areas must develop concurrent economic strategies driven by entrepreneurship and a pivot to the modern, digital economy. The purpose of this quantitative study is to examine factors associated with entrepreneurship and digital talent in the rural Heartland states of Missouri, Arkansas, Kansas, and Oklahoma. Using data largely available to the public, measures of association such as Pearson's product-moment correlations and regression analysis were used to identify variables that are relevant or predictive of entrepreneurship and digital talent in the rural Heartland.

Keywords: rural entrepreneurship, digital economy, digital talent, economic development, Heartland, Missouri, Arkansas, Kansas, Oklahoma

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Chapter I: Introduction

Context

Over the past two centuries, the history of rural communities across the United States has been defined by citizens and immigrants who created communities through industrious efforts. Rural residents developed skills in agriculture, skilled trades, and created small businesses to serve the needs of the markets that were practical to reach. During the late 19th century and early 20th century, communities emerged in what were rural areas across the landscape of the United States. As the industrial era accelerated, the United States Congress recognized the need to increase access to the knowledge and skills required to adapt to the changing economic landscape.

The Morrill Land Grant Act of 1862 provided each state with land, based on the number of congressmen, for the purposes of higher education and talent development in agriculture and mechanical arts, along with science and the liberal arts. Horace Greeley argued the liberal arts of humanities and classics should be augmented by subjects helpful to agriculture and industrial progress (Nevins, 1962). Railroad infrastructure connected communities to one another and urban cities continued to take shape to form industrialized centers that provided jobs. Rural communities, on the other hand, began to fade into the background of America's rapid economic growth. By the end of the "Roaring Twenties" and the onset of a nearly two-decade-long economic downturn, people who lived in rural areas became increasingly characterized by low-income and low-standards of living (Cowan, 2016).

The Great Depression began a series of federal programs meant to provide relief to distressed families, which were frequently found in rural areas. The programs of the Depression-era included the Federal Emergency Relief Administration, Farm Security Administration, and

Work Project Administration. These programs were all designed to spur economic growth through infrastructure and talent development. Again, in the 1950s through the 1970s, federal programs were used in attempts to assist rural areas. The Rural Development Program and the War on Poverty provided essential social relief while rural areas used industry recruitment as a strategy to lure jobs to rural communities (Cowen, 2016).

Manufacturing and other forms of industrial operations provided much needed employment for rural communities across America through the mid 20th century. Cheap land and lower-cost labor in rural areas allowed manufacturing and other types of industrial jobs to become economic drivers. While industrial and manufacturing jobs still dominate rural America, they began to decrease rapidly over the past several decades- first due to offshoring and more recently automation. Today, rural jobs have increasingly given way to lower-paying service industry jobs.

Rural America is at a critical crossroads and in need of a strategy to develop sustainable local economies. Today, the percentage of residents in rural areas who rely on farming for their livelihood has decreased drastically as farming practices have become increasingly corporate, more efficient, and the capital required to begin a farming operation is cost-prohibitive for many rural residents.

Changes in the rural workforce have accelerated during recent economic downturns and sped up technological change. During and after the Great Recession, in a three-year time period from 2007-2010, America lost nearly nine million jobs (Chart Book, 2019). Near the same time period, rapid advances in automation, machine learning, and artificial intelligence were occurring within industrial job sectors. Economic projections over the next decade provide a challenging forecast. Production and processing of goods are expected to increasingly become automated, leading to job loss in some roles, and job growth is more likely to occur in urban and suburban counties while declines and stagnation are expected in more rural counties (Manyika et al., 2017).

Rural America once depended on local, interconnected small businesses. Over time, rural economies and economic development transitioned to broad-based employment and the progressive dependence on manufacturing, service, and other types of wage employment. Fortunato and McLaughlin (2012) refer to this shift as a "company town" culture.

A company town culture has been characterized as one where residents and communities feel disempowered and develop a preference for wage employment over self-employment. The culture shift is likely a reflection of economic development strategies where communities recruit and provide incentives that have been referred to as "smokestack chasing" (McGranahan et al., 2011). When economic incentives and strategies are primarily provided to outside entities to create job growth and few policies exist to develop and promote agency among local residents to become entrepreneurs, stagnation in rural entrepreneurship and the diminishment of self-reliance is unsurprising.

Purpose of the Study

The purpose of this quantitative study is to develop a better understanding of factors associated with entrepreneurship and digital talent in rural or mixed rural areas. The study focuses on four states in the "Heartland" region. States selected for the study are Missouri, Arkansas, Kansas, and Oklahoma. This study will use publicly available data to evaluate measures of human capital, geographic profiles, broadband access, entrepreneurship, and digital talent. A clearer understanding of elements that are related to developing viable and sustainable rural economies is critical as rural America will increasingly be challenged to become more resilient and self-sufficient.

Statement of Problem

Given the culture shift from resilience and self-sufficiency to economic development strategies of smokestack chasing and dependence on wage employment that has occurred in many rural areas as well as the projected decline in jobs due to automation, understanding factors associated with higher levels of entrepreneurship in rural areas is critical. Currently, net job growth over the next decades is projected to occur largely in urban areas while most rural areas are projected to experience flat or negative job growth through 2030 (Manyika et al., 2017).

Rural communities must take proactive measures to spur job growth. Efforts to develop rural economies should adopt concurrent models of economic development focused on industry attraction and entrepreneurship. Efforts to attract larger industries will remain viable strategies for job growth. However, rural areas also need to increase efforts to create job growth through entrepreneurship and the formation of small and mid-sized firms. Small businesses have an outsized role in job creation. While small business start-ups account for only approximately 3% of total U.S. employment in a given year, they are responsible for almost 20% of gross job creation (Haltiwanger et al., 2013).

Economic development strategies should be relevant to growing sectors of the local and overall economy, especially those that are not limited by proximity to markets. Rural communities must develop a better understanding of what factors impact the presence of digital talent in rural areas. While the broadband divide in rural locations is real, talent to leverage the economic potential of digital economies is often a larger challenge (Whitacre & Manlove, 2016).

The digital divide does not just apply to infrastructure (Salemink et al.,2017). The divide also applies to the availability of digital talent. With increased digital skills, rural residents are able to pursue remote working opportunities, which are often occupations related to the growing digital economy, and they are also able to create new businesses which can serve their local area as well as markets in any part of the world through digital platforms.

Significance of the Study

Rural areas are facing tremendous economic challenges. Population decline, offshoring of manufacturing occupations that dominate the rural landscape, and automation are among the largest threats to rural areas. Numerous studies have focused on rural regions in the south as well as the Appalachian region (Cook Marshal et al., 2013; Audretsch, et al., 2017; Snow & Prater, 2018). The Appalachian region has been defined as the five central states of Kentucky, North Carolina, Tennessee, Virginia, and West Virginia (Tickamyer & Tickamyer, 1987). Given little has been written about rural entrepreneurship in areas that make up the Heartland region of mid-America, this study will explore factors that contribute to entrepreneurship and factors associated with digital talent in rural Missouri, Arkansas, Kansas, and Oklahoma.

Geographically, the four states in this study are linked through the Ozark region found in southwest and central Missouri, northwest Arkansas, southeast Kansas, and northeast Oklahoma. The shared border between most of western Missouri and eastern Kansas provides common lifestyles between the two states, and in the case of Kansas City a shared name.

The states included in this study are linked by common borders and shared economic infrastructure. Interstate I-44 crosses the states west to east while Interstate I-49 is a north-south corridor along the western border of Missouri and Arkansas. Interstate I-49 runs nearly parallel with the Kansas City Southern Railroad which weaves the eastern border of Kansas and

Oklahoma to the western borders of Missouri and Arkansas. Prior to railroad and interstate infrastructure, Missouri and Arkansas were linked economically by the Mississippi River along the eastern side of the region. While rural economies have traditionally been defined by agriculture, manufacturing industries, and service industries, this study will also explore factors associated with digital talent in rural areas.

Theoretical Framework

Gladwin et al. (1990) posited information regarding factors that contribute to successful entrepreneurship has the potential to reduce failure rates for aspiring entrepreneurs and make rural communities more viable. The use of publicly available census and labor data has been used to explore factors that contribute to rural entrepreneurship (Figueroa-Armijos et al., 2012; Low et al., 2005). Entrepreneurship in rural areas is influenced by changing demographics. Deller et al. (2019) explored the influence of population migration and local assets in rural areas and encouraged a greater focus on entrepreneurship as a rural economic development strategy and less emphasis on traditional economic development strategies to attract industry.

Rural economic development strategies that focus on entrepreneurship alone are not sufficient. Rural communities, whose access to markets is often limited due to geographic challenges, should also focus on the development of growth areas in the economy where access to markets is unlimited. According to Barefoot et al. (2018), the digital economy has the potential to have an outsized impact on rural economies. The study found over a ten-year period from 2006 through 2016, the digital economy grew at an average rate of 5.6% per year compared to 1.5% growth in the economy. However, without intentional strategies to help communities gain access to or leverage the rapidly expanding digital economies, rural America will increasingly experience a digital and economic divide in talent and infrastructure compared to non-rural areas.

Rural America was able to capitalize on the agrarian economy through strategic investment, planning, and education. These strategies helped residents in rural areas build skills and vibrant small communities. Public policy provided land grant colleges for post-secondary education of young adults, agriculture extension offices for adult, incumbent farm owners, agriculture education for young people in elementary and secondary education programs, and lending institutions to provide capital resources for aspiring farmers. Rural communities need similar broad-based strategies to develop digital skills and expand infrastructure in rural areas along with the potential of digital economies.

Research that examines factors associated with entrepreneurship, digital talent, and the impact of broadband will provide a better understanding of methods to develop more resilient, self-sufficient, and viable rural economies.

Research Questions

This study will explore factors that may influence rural economies through entrepreneurship and digital talent. The following questions will be used to guide research, explore variables, and provide insights into factors that may help inform decisions that can make rural economies more self-sufficient and resilient in a rapidly changing economic environment.

1. How do broadband, digital talent, amenities, and human capital measures predict the breadth of entrepreneurship, as measured by the ratio of non-farm proprietor employment, in the rural Heartland region of the United States?

2. Are higher levels of broadband associated with entrepreneurial breadth, as measured by the ratio of non-farm proprietor employment, in the rural Heartland region of the United States?
3. Are higher levels of broadband in the rural Heartland region of the United States associated with higher levels of digital talent related to the digital economy?
4. Are higher levels of digital talent related to the digital economy associated with entrepreneurial breadth, as measured by the ratio of non-farm proprietor employment, in the rural Heartland region of the United States?

Definition of Terms

1. Rural- Counties that have a population density of less than 500 people per square mile and 90% and the county has no urban area with a population of 10,000 people or more (Figueroa-Armijos et al., 2012).
2. Mixed rural- Counties that do not meet the urban nor the rural county criteria, and its population density is up to 320 people per square mile. That density is two acres per person (Isserman, 2005).
3. Entrepreneurship- Any attempt to create a new business or enterprise or to expand an existing business by an individual or team of individuals (Zacharis et al., 2000).
4. Digital economy- Economic output derived solely or primarily from digital technologies with a business model based on digital goods or services (Bukht & Heeks, 2017).
5. Economic development- development of capacities that expand economic actors' capabilities. These actors may be individuals, firms, or industries (Feldman et al., 2016).
6. Amenities- natural or constructed features, socio-economic composition and diversity, and values and attitudes of residents (Clark, 2011).

7. Entrepreneurial depth- a measure of earnings and GDP through self-employment or new firm growth and job creation (Low et al., 2005).
8. Entrepreneurial breadth- a measure of how many jobs are created through self-employment or new firm growth and job creation (Low et al., 2005).

Assumptions, Limitations, and Scope

This study is limited to factors that influence rural entrepreneurship and digital talent in a four-state region that includes Missouri, Arkansas, Kansas, and Oklahoma. As a result, generalizations about the results of this study should be limited to states in this region. Rural regions across the United States are distinct (Hartley, 2004). Limiting the focus to this region allows for a more focused understanding of factors that may influence entrepreneurship and digital talent in rural areas. It is assumed data is reported or collected in a consistent manner across all counties reviewed in the study.

Data for entrepreneurship in this study is somewhat limited based on the availability of absolute measures of entrepreneurial activity and digital talent. Business Formation Statistics (BFS) provided through the U.S. Census are the financial filings for new business ventures. While this data could provide early indicators of entrepreneurial activity, data sets are only available at the state level and do not provide county-level data. Additionally, financial filings only provide data related to the administrative organization of new businesses. In cases where filings are completed, but a business does not open.

Data regarding broadband availability also has limitations. Statistics on broadband coverage as reported by the Federal Communications Commission (FCC) and the National Broadband Map (NBM) may overstate the actual availability of broadband coverage. Through these agencies and reporting tools, internet service providers self-report coverage of larger geographic tracts of land where service is provided. The limitation and validity of these datasets occur when a few people are served in a particular tract, yet providers report coverage for the entire area (Whitacre et al., 2014).

The first limitation is data related to digital talent. Currently, the predominant data source available related to talent development is the National Center for Education Statistics. These data provide information for post-secondary certificates or degrees awarded through codes such as the Classification of Instructional Programs, otherwise known as CIP codes. Skills development related to the digital economy occurs regularly outside of traditional post-secondary training institutions. Adult training programs such as Code Labs One, provided by a rural-based firm Codefi located in Cape Girardeau, Missouri, and the Lambda School provide more traditional forms of learning outside of the post-secondary education system. Online courses through Coursera, Udemy, and YouTube can also be used to develop digital skills, yet there is no publicly available data source to capture the emergence of digital talent development with these learning platforms.

An additional limitation in measuring digital talent and related digital economies is visibility in the e-commerce industry. The North American Industry Classification System (NAICS) uses NAICS codes to, among other things, identify industry presence and contribution to local economies. The NAICS code for e-commerce is 454111, yet many e-commerce businesses use NAICS codes not to signal economic activity, but for the purpose of insurance classification related to primary products shipped. These limitations make it difficult to identify activity or growth in sectors of the digital economy.

Summary

One in five Americans live in rural America. Over 60 million people in rural America depend on the resilience of their communities and surrounding areas. Understanding factors related to entrepreneurship helps to create more self-sufficient rural economies. Jobs in manufacturing and other industrial sectors have continued to decline over the last several decades due to offshoring and more recently automation. Entrepreneurship and the development of digital talent have the potential to create more resilient rural economies.

Economic growth in rural America is typically slower than non-rural areas, and in many areas has not recovered since the Great Recession (Kusmin, 2017). Economic development strategies focused on industry attraction often result in a zero-sum competition where one rural community "wins" and other competing communities lose. Rural economic policy empowering local residents to identify regional market opportunities as well as strategies to leverage e-commerce to sell to global markets are plausible, self-sustaining economic strategies.

Rapid growth in occupations that intersect with the digital economy provides remote work opportunities for rural residents. As a result, individuals who have access to reliable broadband internet and digital talent development opportunities can secure well-paying jobs while remaining in rural areas where the cost of living is typically lower than non-rural areas.

Existing research on rural economic development is often focused on regions such as Appalachia, and the Delta regions (Cook Marshal, 2013; Audretsch, 2017; Snow & Prater, 2018; Robinson et al., 2011). This study will provide insight into factors that influence rural economies in the four-state Heartland region of the U.S. that includes Arkansas, Missouri, Oklahoma, and Kansas.

Four more chapters follow. Chapter II provides a comprehensive review of literature on rural entrepreneurship, rural broadband, and digital talent. In Chapter III, the focus is on the research methodology used to investigate factors related to rural entrepreneurship and digital talent, data sources, and data collection methods. Chapter IV provides the research results. Chapter V provides research findings as well as recommendations for policy and future study.

Chapter II: Literature Review

The following literature review investigates factors associated with developing entrepreneurship in rural areas and the impact of those factors on economic development. Additionally, the chapter will examine the literature to identify factors related to the development of digital talent and the potential to contribute to economic growth in rural areas.

Rural America has experienced significant losses in job and population growth over the past century. Farming has become more industrialized and automated, and traditional manufacturing jobs have declined due to offshoring and more recently factories that have become increasingly automated. Collectively, past research and new ideas and initiatives can provide potential clues to help rural areas become more vibrant and economically self-sufficient. To provide adequate background on the topic, the literature review has been divided into two main areas:

1) Entrepreneurship and its potential to contribute to economic growth along with the potential factors that contribute to entrepreneurship and economic development in rural America.

2) Digital talent and the factors that are important to developing digital economies in rural America.

Entrepreneurship in Rural America

Rural Americans are often characterized and like to think of themselves, as self-made, independent, and self-reliant. While these characteristics are often true at an individual level, economically, rural communities are not as independent and self-reliant as they once were. As manufacturing has increasingly become automated or moved offshore, family farms have declined, and natural resources are extracted, many rural areas are searching for new strategies to generate economic growth and remain viable places to live, work, and raise families. Efforts to develop rural entrepreneurship have shown promise to help non-metropolitan areas create economic growth for a rapidly changing economic landscape.

Defining Rural

The term rural is used often in research, the media, and politics as if a clear, unidimensional definition exists. Rural typically implies a non-metropolitan, less populated area. A study by Bosak and Perlman (1982) examined over 90 literature and policy documents in an effort to more clearly define rural. The study examined criteria such as population; farming versus manufacturing; socioeconomic data; geographic isolation or nearness to factors such as larger population centers, universities, and government institutions; and education and income levels. The researchers found the most common determinants used in literature were the quantitative measures of the United States Census Bureau and data from the Metropolitan Statistical Area (MSA) which represents contiguous geographic areas and the density of human populations. After reviewing the voluminous definitions and use cases of rural definitions the authors concluded there should not be a singular definition of rural and future definitions should include multidimensional definitions which focus on socio-cultural and economic factors (Bosak & Perlman, 1982).

Rural is sometimes described without using the term “rural.” In a study examining the role of broadband availability and job growth, counties were classified as metropolitan, micropolitan, and non-core. Metropolitan counties were defined as having at least one community with a population of 50,000 or more (or having at least 25% of the workforce commute to a neighboring core). Micropolitan counties were defined as having an urban core population between 10,000 and 49,999 (or having at least 25% of the workforce commute to a neighboring core). Non-core counties do not have a core community with a population of at least 10,000 (Whitacre et al., 2014).

Other researchers have approached defining rural in an even more granular level. Isserman (2005) developed a typology to indicate the variations of rural and urban areas across the United States which includes rural, rural-urban mix, urban-rural mix, and urban. Under these classifications, any county with 500 or more people per square mile, 90% of the population living in urban areas, and over 50,000 residents is classified as urban.

Mixed urban counties do not meet the urban or rural county criteria and their population density is up to 320 people per square mile. Counties classified as mixed rural do not meet the urban or rural county criteria and their population density is less than 320 people per square mile. Figueroa-Armijos et al. (2012) defined rural counties as those that have a population density of less than 500 people per square mile and 90% and the county has no urban area with a population of 10,000 people or more. For the purposes of this study, rural will be defined as counties that meet the criteria of either mixed rural or rural- a population density is less than 320 people per square mile or counties who have a population density of less than 500 people per square mile and 90% and the county has no urban area with a population of 10,000 people or more.

Defining Entrepreneurs and Entrepreneurship

Literature in economics, regional policy, innovation, and even literature in entrepreneurship journals have yet to establish a clear definition of entrepreneurship. Low et al., (2005) defined entrepreneurs as self-employed, innovative risk bearers who start their own businesses. Zacharis et al. (2000) provided a straightforward definition of entrepreneurship as any attempt to create a new business or enterprise or to expand an existing business by an individual or team of individuals. Often, definitions of entrepreneurship focus on economic development or activities. Ahmad and Seymour (2008) described entrepreneurs as people who design, produce, and generate value through the creation or expansion of economic activity. Kirzner (1985) offered a more practical definition of entrepreneurs as people who identify profit opportunities and act to fill unsatisfied needs in the market or to improve inefficiencies.

Just as entrepreneurship has many definitions, the literature identifies various types of entrepreneurs. Low et al. (2005) contend not all entrepreneurs are alike. Some entrepreneurs start a business to create a job for themselves to serve a local need, often referred to as lifestyle entrepreneurs. Other people create businesses that create broader, more direct economic value to the region. Businesses that generate greater wealth, jobs, and economic growth in their region are referred to as high-value entrepreneurs.

Entrepreneurship may also be categorized by the impetus of an individual's entrepreneurial endeavor. Deller et al. (2019) identified entrepreneurs who create businesses that support the owner's well-being but do not typically provide jobs for others as "survival" businesses. Individuals who develop high-income firms that spur job growth and potentially lead to additional firm growth have been identified as opportunity-driven entrepreneurs or high-impact firms (Figueroa-Armijos et al., 2012; Muñoz, & Kimmitt, 2019). Other types of entrepreneurship are defined in more binary terms, such as non-farm proprietorships and farm proprietorships (Conley, 2013).

This study will evaluate non-farm proprietorship in both opportunity-driven and high-impact firms in rural areas. The literature offers a word of caution for policy that overemphasizes a focus and support of one specific type of entrepreneurship over another that lead to narrow policy, distribution of resources, and commercial activities favoring one type of entrepreneurship over another, especially in rural areas where high-growth frameworks are even more challenging to establish (Muñoz, & Kimmitt, 2019).

Factors Associated with Building Community Entrepreneurship

What makes some areas more likely to develop entrepreneurs than others? Over the past few decades this question has been examined in the literature. As job growth has declined in rural America, researchers are now exploring factors associated with initiating economic growth through entrepreneurship in areas outside of metropolitan cities. Pages (2018) described growth-oriented programs that encourage and develop entrepreneurship as “economic gardening.” Just as plants need certain criteria to help grow, nurture, and develop sustainable growth, so do communities. The following explores factors identified by researchers and practitioners that assist in developing economies through entrepreneurship.

Research by Low et al. (2005) identified five factors associated with entrepreneurial activity, regardless of the characterization of geographic variations. The study found factors of local economy, human capital, scenic amenities, financial capital, and infrastructure were related to measures of entrepreneurial breadth and depth. Breadth is a measure of how many jobs are created (through self-employment or new firm growth and job creation) and depth is a measure of earnings and GDP. Similar variables thought to be related to entrepreneurship were examined by Mojica (2009). In a study examining entrepreneurship and economic development in Appalachia, Mojica measured economic activity with explanatory variables of the number of proprietors in a county as well as growth over time of proprietors, participation in the labor force, firm creation, expansion, and death over time, education levels, internet infrastructure, agglomeration of firms, poverty levels, and crime rates.

One study examined factors that contribute to the agglomeration of particular types of firms. Agglomeration, in economic terms, is the collection of similar or related firms in a geographic area. Agglomeration is a factor associated with growth in entrepreneurship, of particular types of firms. The study found diverse economies with nearby supporting upstream and downstream firms and available educated workforce contribute to economic growth in rural areas (Artz et al., 2016).

In a study comparing startups in rural areas versus urban areas, higher rates of startup determinants in rural areas were typically male, younger, non-white, and married. Individuals also tended to have higher levels of self-efficacy related to starting a new business (Joo, 2011). Deller et al. (2019) examined growth in rural entrepreneurship through the context of in-migration to rural areas. Their research somewhat contradicts age-related factors of entrepreneurship noted by Joo (2011) when they determined older residents between the ages of 50-74 who have accumulated wealth were more likely to create new ventures that could contribute to entrepreneurship growth in rural areas. Age and education may also impact entrepreneurial activity in rural areas. Joo’s (2011) study provided findings that indicated adults 65 or older were less likely to plan to start a business. This study also found rural residents with lower levels of education were more likely to plan to begin a business than rural residents with higher levels of education. The study concluded income and education do not appear to have a significant effect on intentions to start a new business.

In a study evaluating factors that were more place-based, McGranahan et al. (2011) found outdoor amenities, creative class workers, and the entrepreneurial context (establishments and self-employment rates) had a synergistic effect on population and economic growth in rural areas. In a related study on the impact of place, Muñoz and Kimmitt (2019) explored spatial contexts in rural entrepreneurship. They found places for collaboration, localized support, place-sensitive trading and biophysical features related to social geography and commercial activities in the area were important factors in developing entrepreneurship in rural areas. In another study that examined the spatial context of entrepreneurship in rural areas, broadband availability was found to be important to entrepreneurship and economic growth (Whitacre et al., 2014). However, broadband was not found to contribute to growth among rural, creative class entrepreneurs (Conley, 2013).

Dabson (2001) examined infrastructure profiles of areas that have robust entrepreneurial activity in rural North Carolina and cited the presence of entrepreneurial support organizations such as Small Business Development Centers (SBDCs), Community Development Corporations (CDCs), as well as access to sources of capital such as Community Development Financial Institutions (CDFIs), Individual Development Accounts (IDAs), and community credit unions as important support organizations for rural entrepreneurs.

Measuring Entrepreneurial Activity in Communities

Continued economic development is critical to the vitality of rural communities. Developing entrepreneurship is increasingly becoming a tool rural areas are using to encourage economic sustainability and growth. As a result, standard measures of entrepreneurial growth matters and allow for comparison of growth rates and associated factors in different parts of the country to identify effective policy. Two broad measures of *breadth* and *depth* serve as common benchmarks to gauge the level of entrepreneurship in an area. Low et al. (2005) define breadth as the size and variety of small businesses in a region.

Depth reflects the value or economic contribution small businesses generate in an area. Areas that have robust entrepreneurial activity are more likely to maintain sustained economic growth (Acs & Armington, 2003). Similarly, research by Goetz et al. (2010) found well-established economies benefit from agglomeration and typically have a diversity of small and large firms.

Entrepreneurial depth, a measure of economic contribution or value to an area by nonfarm proprietors, are typically measured by two measures: 1) average income, which is often converted to a ratio of a proprietor's income to proprietor employment in a county, and 2) revenue capture is measure by the ratio of income to total sales of products and services (Low et al., 2005). Breazeale et al. (2015) described the ratio of non-farm proprietorship to total non-farm employment using the Bureau of Economic Analysis data as a "proxy" for aggregate rates of entrepreneurship.

Some measures of entrepreneurial activity attempt to identify earlier measures of entrepreneurship entry. Pages (2018) suggested the use of business start-up and growth rates, measured by firm births and investment in new firms as measures of entrepreneurial activity. Goetz et al. (2010) discussed net firm creation, determined by calculating the number of firm deaths to firm births as a useful measure of entrepreneurial activity. In a study that evaluated rural entrepreneurship during a recession period, Figueroa-Armijos et al. (2012) used early-stage necessity and opportunity data from the Global Entrepreneurship Monitor as dependent variables for entrepreneurial activity.

Some measures of entrepreneurial activity may be biased against rural areas. Xue (2007) employed the use of confirmatory factor analysis using entrepreneurship as a latent variable along with variables such as technology patents, small business innovation rewards, venture capital disbursements, and technology firm establishments as indicators of entrepreneurship. Muñoz and Kimmitt (2019) warned policymakers against favoring one type of entrepreneurship over another. Measures and variables that are likely to favor high-growth technology firms may be less likely to accurately reflect entrepreneurial activities in rural areas. Goetz et al. (2010) argue that ultimately evaluation metrics and efforts should appraise related goals and consider if efforts are aimed at increasing small business formation, number of overall proprietors, profits, regional output, or other factors that affect economic development.

Challenges and Opportunities in Rural America

A quick review of predictor variables found in entrepreneurship literature illustrates many of the challenges faced in rural areas in attempts to develop entrepreneurship. Low et al. (2005) identified factors such as a vibrant local economy, an abundance and variety of human capital, scenic amenities, and access to financial capital, and adequate infrastructure have been cited as important factors in growing entrepreneurship, however, access to talent, capital, and amenities are not common descriptors in rural areas. “Brain drain” is a frequent challenge many rural areas face as younger generations who pursue education leave rural areas and move to more populated areas to seek job opportunities and amenities that are often not available in rural areas as communities face population loss and aging populations (Hassebrook, 2003; Drabenstott & Moore, 2010; Sharp et al., 2002; Deller et al., 2019). Rural localities often employ economic development tactics targeting large industries to move into a community by offering substantial tax incentives and other economic enticements but have few policies to attract and develop entrepreneurs.

Other studies have noted the challenges rural areas face due to sparse populations such as distance to markets, access to peer networks, talent, and lack of agglomeration and spillover among related industries (Pages, 2018). Artz et al. (2016) specifically researched the effect of agglomeration in urban compared to rural areas and noted the proximity of upstream related firms had a larger effect on firm growth than downstream customers. This could be related to modernizations related to new technologies such as e-commerce, and the ability to reach markets outside of rural areas.

Research by He (2019) evaluated the impact of e-commerce in rural China. The study found e-commerce has the potential to create microbusinesses connecting both local and world-wide markets. The study also found economic potential in efforts to educate rural citizens on the potential of entrepreneurship and the digital skills necessary to scale growth and increase market efficiency.

A study by Mojica (2009) cited urbanization as a factor that significantly affects growth of employment. The study also highlighted the importance of agglomeration in economic development and job growth in rural areas. However, attracting businesses in rural areas is difficult. Startup businesses and existing firms are more likely to be located in counties with higher income, greater amenities, and more tax investment in supporting infrastructure (Artz et al., 2016).

Dabson (2001) enumerated an array of challenges that make rural communities vulnerable in a study that examined how to better support rural entrepreneurship. Many rural areas lack economic diversity and are supported by a handful of industries. Rural industry is often related to agriculture, industrial manufacturing, and natural resource extraction. Over the past several decades, family farms have continued to give way to industrial farms driven by more labor efficient methods. Industrial facilities relocate, offshore, or become more automated, and natural resources are extracted from an area, less diverse rural economies struggle.

A similar trend has been occurring in retail. Historically, retail costs were higher in rural areas due to the lack of economies of scale in local business ownership. However, local retail establishments had been able to serve rural areas on slim profit margins due to distance between local markets (Dabson, 2001). Over the last several years, regional or national discount stores that can leverage economies of scale move into rural areas and sell items at a much lower cost to rural residents.

Given the poverty rates of many rural areas Mojica (2009), lower costs for goods have driven local spending decisions more than supporting locally owned businesses that cannot sustain selling products at lower prices. Lack of resources, support organizations and peer networks for startups, limited broadband availability, access to specialists to receive technical advice, and low entrepreneurial culture in many rural areas have also been cited as challenges that many rural areas face (Dabson, 2001).

In his “Four Freedoms” speech, President Franklin Roosevelt proclaimed, expectations among Americans for political and economic systems were simple. Among the simple expectations were equality of opportunity for youth and for others, jobs for those who are able to work, and the enjoyment of scientific progress “in a wider and constantly rising standard of living” (Roosevelt, 1941). Those expectations were in decline at the height of the Great Depression and again today. In the United States, approximately 14.5% of Americans are working while in poverty and the rate of working poor is approximately 17% higher in rural America compared to urban areas (Thiede et al., 2018). In 2014, rural median household income was one quarterly less, or approximately 77% of the median household income of urban areas (Economic Research Service, 2014).

Recent recessions added to the economic challenges faced in rural areas. At the conclusion of the Great Recession of 2007-2009, metropolitan counties experienced job growth at twice the rate of rural counties. After rapid job growth in the recovery years immediately following the Great Recession, job growth rates have shown virtually no growth in many rural areas since 2011 (Conley, 2013). These data suggest developing entrepreneurship in rural areas can be challenging given the inherent economic distress rural Americans face compared to non-rural areas. Thiede et al. (2018) argue if a good job is a precondition for living the good life and access to opportunities that Americans in other parts of the country enjoy, rural America has serious challenges to overcome related to declining job opportunities, declining real wage growth, and lack of policy focused on improving economies in rural areas.

While there are real challenges related to developing entrepreneurship in rural localities, rural areas increasingly present opportunities to develop rural economies. Data suggests the current generation of retirees, baby boomers, are among the most entrepreneurial retirees ever (Fairli et al., 2017). Rural areas are often characterized as having aging populations. The authors also note in-migration among pre-retirees in some rural areas has resulted in positive net population inflow and might offset the economic effects attributed to out-migration.

Deller et al. (2019) contend rural areas can also provide amenities that urban areas cannot. Abundant natural landscapes and lower costs of living are factors rural areas can leverage to attract people and businesses. McGranahan et al. (2011) supported the ability of rural areas to leverage potential outdoor amenities. The researchers found outdoor amenities provide a unique asset to rural areas in attracting members of the creative class. As a result, creative capital can provide knowledge and skills that can have a positive impact on the local economy.

Attraction and creation of new firms, especially firms that support similar industries can have an economic “broaden and build” effect. Artz et al. (2016) note rural areas that are typically higher in agglomeration levels by one standard deviation can attract up to 26% more new entry firms. The authors found rural agglomeration is more likely in rural areas that are more proximal to urban areas or in areas that have adequate levels of firm clusters, upstream suppliers, and downstream customers. Additionally, the types of businesses that are typically created in rural areas statistically have lower failure rates compared to business types that are more typical in urban areas (Fortunato, 2014).

Cultural and Social Influences on Rural Entrepreneurship

Entrepreneurship is both an economic and social process and culture is critical to the study of entrepreneurship (Spigel, 2013). Local conditions should inform the understanding of entrepreneurship in a community (Muñoz & Kimmitt, 2019). In a study that evaluated how culture affects entrepreneurship Wennberg et al. (2013) found that cultural traits of institutional collectivism and fear of failure have moderate effects on entrepreneurial entry. Further, the authors found changes in social surroundings may affect changes in how individuals with certain attributes behave and have a moderate impact on entrepreneurial self-efficacy.

Rural communities with sustaining entrepreneurial climates have stronger perceptions of social resources which influence economic development, community self-development, and perceived community satisfaction (Tajuddin, 2011). Another study found the social environment of a community affects economic development levels in a community (Sharp et al., 2002). Fortunato and McLaughlin (2012) explored cultural differences among high and low entrepreneurship in rural communities and found areas that were able to build community culture that supported economic risk-taking were more entrepreneurial and had higher levels of interaction among entrepreneurs, openness, a collaborative mentality, and acceptance of diversity. The study also noted the effect “company towns” had on a locality’s preference for wage employment over self-employment.

This finding lends support to the need for communities that aspire to become more entrepreneurial and develop alternative methods of economic development in order to shift the social context of residents' expectations or perceptions of what is possible for employment. Supporting the need for members of a given area to engage in activities related to desired future outcomes, Sutton (2010) found owners of small businesses have the ability to cultivate civic capacity and shape the business landscape in their area.

Experience also matters. Gladwin et al. (1989) found one of the largest predictors of probability in starting a new business is previous ownership of another business. Prior experience in a particular domain builds self-efficacy. Increasing self-efficacy among a few individuals in a particular desired domain may have the potential to create positive residual effects. Zhao et al. (2005) and discussed the impact of vicarious experience in entrepreneurship and developing self-efficacy. Bandura (1997) found vicarious experiences as a critical component of self-efficacy, explaining that merely seeing one coworker succeed at a particular task may boost another co-worker's self-efficacy. In a conceptual framework developed by Breazeale et al. (2015), the researchers proposed personal experiences in aspiring entrepreneurs' environments are influenced by perceptions of cultural norms. They theorized perceptions of norms as well as personality traits influence an individual's propensity to engage in entrepreneurship. This theory was also supported by research findings of Chen et al. (1998).

In any effort to develop entrepreneurship or digital talent, culture in a given location matters (Hoogstra & van Dijk, 2004). Culture is a variable that influences entrepreneurship and economic growth in communities (Stuetzer et al., 2018). Spiegel (2013) cautioned the study of entrepreneurship cannot stop short by simply citing culture as a factor that can influence economic development. Without a way to explain how individual actors are influenced by and also shape culture, we risk citing the variable without attempting to understand unexplained variations and fail to explain why certain entrepreneurial efforts emerge in particular social and cultural settings.

Using Pierre Bourdieu's theories of *fields* and *habitus,* Spiegel (2013) argued local culture is not static. Culture is a product of norms and structures and is a dynamic local process shaped by the individuals who live in a particular area. Wolf (2007) described Bourdieu's theory of fields as the implicit "rules of the game." A field represents the traditions and power structure that exist for actors in a given area and shape the *habitus*, or the internalization of rules, hierarchies, and structures of a field (Bourdieu, 1990).

In efforts to understand how desirable economic cultures were formed, or in efforts to develop entrepreneurial cultures, Spiegel (2013) used Bourdieu's approach to suggest established actors within a field shape regional culture. According to Bourdieu's theory, actors choose practices they believe are valuable to them and then decide to either follow established rules or norms or innovate to develop new practices they believe will be successful. Over time, if new practices fulfill the needs of actors, new fields emerge which shape new norms and conventions. New norms influence the habitus which in turn affect the practices of people in a region.

Rural Economic Development Policy

Economic growth often occurs as a result of innovation and adaptive strategies that solve problems or meet the needs of consumers (Bjørnskov & Foss, 2016). Ironically, past strategies related to rural economic development have seldom been innovative or adaptive. In much of rural America, economic development policy remains focused on either extraction-based methods of economic development of natural resources and farming, or industrial manufacturing (Dabson, 2001). As natural resources have depleted, farming became more industrial and less reliant on local labor, and industrial manufacturing increasingly shifts towards automation, strategies for rural economic development have lagged. Rural economic development policy should focus on both short-term and longer-term development strategies (Figueroa-Armijos et al., 2012).

Attracting industries, typically manufacturing, has remained one the most popular economic development strategies in rural regions for nearly a century. This model has been around for nearly a century. In the early 1930s, as rural Mississippi attempted to diversify their largely agriculture-based economy, the Balance Agriculture with Industry (BAWI) plan emerged as a model where rural localities courted industry to relocate to rural areas through promises of cheap labor and economic incentives (Deller et al., 2019).

The policy of industry attraction in rural economic development has added jobs but also has faced criticism as a possible factor that contributes to less endogenous communities that result in a “company town” culture (Fortunato & McLaughlin, 2012). Other studies examining the effectiveness of industrial recruitment and the bidding process that is often used examine how new strategies can become a zero-sum (and in some cases a negative-sum) game that pits one locality against another where corporations win and communities lose (McCarthy, 2018).

Rural areas with few natural amenities and further away from urban centers have historically had to depend heavily on ‘smokestack chasing’ where the only local asset may be access to cheap labor (McGranahan et al., 2011). Farming and agriculture still remain a large focus of rural economic development policy. These policies have been described as a low-priority ‘stepchild’ of agriculture policy fragmented among various government entities that can support rural initiatives and often lack a coherent strategy to leverage available resources (Dabson, 2001).

Muñoz and Kimmitt (2019) provide a critique of traditional, and sometimes ineffective economic development strategies. However, they also provided practical solutions. In the study the researchers suggest policy-makers consider the use of rural amenities and physical features, where available, as one strategy for economic development. This strategy is further supported by McGranahan et al. (2011) in research that found areas with greater levels of outdoor amenities attracted talent from the creative class. Self-development has also been suggested as a potential strategy to influence local entrepreneurship. Tajuddin, (2011) proposed self-development efforts include community revitalization strategies for downtown and other commercial districts, factors that impact quality of life, activities that influence entrepreneurial climate, and efforts to increase perceived community satisfaction, which was found to be a precursor of community attachment.

Research on the impact of amenities on community and economic development and revitalization has also included the influence of breweries. Barajas et al. (2017) found breweries are associated with higher levels of young, creative professionals and are often cited as early indicators of neighborhood revitalization. To reinforce this, Barajas et al. (2017) discussed qualitative data collected in a small survey where brewery owners suggested they were essentially proverbial canaries in the coal mine. The brewery owners said neighborhood character was essential, and in some cases, the primary reason for their location choice, and saw themselves as “pioneers and catalysts” in neglected areas where they chose to open their breweries.

While industrial recruiting has received criticism in rural entrepreneurship literature, policy recommendations related to talent recruitment and strategic industry recruitment based on agglomeration continue to be supported. One strategy is leveraging potential entrepreneurial talent among in-migrants to rural areas. Studies have found states with the highest levels of diversity have greater levels of entrepreneurial activity (Sobel et al., 2010; Low et al., 2005). Glaeser (2007) found entrepreneurship rates tend to be higher in urban areas. Additionally, findings by Goetz and Rupasingha (2014) suggest there is a positive relationship between migrants and entrepreneurship in rural areas. Rural migrants are not limited to ethnic minorities. In-migrants can also represent non-minorities who move in from other areas. Deller et al. (2019) discussed retirement migration has a positive effect on local economies and rates of self-employment increase significantly among those 50 or older who have experience in a marketable skill or trade, with higher levels of income. The researchers noted these outsiders may also be better able to recognize opportunity as they bring fresh perspectives.

Where rural areas have proximity to larger population areas, strategic recruitment to foster agglomeration economies and economic spillover has also been proposed as a policy recommendation to increase rural economic growth and entrepreneurship. Startups that are diverse in the services they provide, yet aligned to meet the needs of downstream customers or upstream suppliers in a locality have been cited as a successful rural economic development strategy (Artz et al., 2016).

Developing Digital Talent in Rural America

Defining Digital Talent

The Cambridge Dictionary defines an economy as the system of trade and industry by which the wealth of a country is made and used (Economy: Cambridge English Dictionary, n.d.). Over time, the nature of how wealth is broadly created becomes an adjective to the term economy. Barter economy, agriculture or agrarian economy, and industrial economy have all been used to describe sectors of the American economy. More recently, economists and social science researchers have begun to study the digital economy. One of the largest challenges in studying the digital economy is a precise universal definition (Barefoot et al., 2018).

Gustavsson and Ljungberg (2018) discussed the intersection of entrepreneurship and information systems as cyber entrepreneurship, internet entrepreneurship, and e-commerce entrepreneurship as potential ways to define how economies are created on a digital platform and the digital talent related to this more recent form of economy.

The cyber market is a term used by He (2019) to describe trading and market activities over the internet. Bukht and Heeks (2017) provided a specific definition related to the digital economy and defined it as that part of economic output derived solely or primarily from digital technologies with a business model based on digital goods or services. The Bureau of Economic Activity (BEA) defined the digital economy while borrowing from the Organization for Economic Cooperation and Development (OECD). The BEA defined the digital economy in three parts: the digital-enabling infrastructure needed for a computer network to exist and operate, the digital transactions of goods and services that take place using that system ("e-commerce"), and the content that digital economy users create and access ("digital media") such as digital media content and "big data" for customer data analysis or customer data as a commodity (Barefoot et al., 2018).

For the purpose of this study, talent related to the digital economy will be defined using Bukht and Heeks (2017) definition: economic output derived solely or primarily from digital technologies with a business model based on digital goods or services.

Impact of the Digital Economy on Broader Economy

If leveraged properly, the digital economy has the potential to have an outsized impact on rural economies. According to Barefoot et al. (2018), over a ten-year period from 2006 through

2016, the digital economy grew at an average rate of 5.6% per year compared to 1.5% growth in the economy overall- accounting for 6.5% of the current dollar GDP in 2016. Employees in the digital economy typically earn considerably more than non-digital talent workers. In the same study by the BEA, the average compensation for employees working in the digital economy was approximately $114,000 per year compared to $66,000 per worker in the total U.S. economy (Barefoot et al., 2018).

Rural Digital Talent Development

Talent pipelines are the institutions, methods, or initiatives that can be leveraged to develop, attract, and retain individuals with the knowledge, skills, and abilities needed to solve workforce and community challenges. In rural areas, local schools and institutions of higher education are the most logical source of developing talent. Educational institutions can be a pipeline to develop both entrepreneurial and digital skills. When designed appropriately, entrepreneurship can be taught (Henry et al., 2005). Beaulieu (2002, p. 3) argued “sustained economic growth in rural America will only be possible when the human capital conditions of all of its residents have been improved.”

The sustainability of rural communities does not simply depend on jobs. Nearly 20 years ago Beaulieu (2002) warned rural policymakers that if rural America was going to be engaged in the global marketplace, drastic changes needed to be made to improve access to information technologies as well as training on the best way to leverage resources related to the growing digital economy. Echoing that warning, Fortunato et al. (2013) found while America is closing the gap in broadband availability between rural and urban, the digital talent and literacy gap may be opening. Combining skills to develop entrepreneurship, innovation, and digital talent may provide a pathway to generate economic growth by connecting rural areas to the world market (He, 2019).

Historically, America's education system has attempted to impart trade and life skills that are relevant to the economic surroundings of students. Just after the turn of the 20th century, rural schools across the country began adopting agriculture education programs where students in junior high and high school learned effective practices related to livestock and crop production as well as agricultural mechanical skills. These programs remain today even while the number of students participating in the agriculture economy continues to decline.

Aligning education offerings to the digital economy has not been widely adopted in public education. Schools in rural areas have been slow to implement digital skill development, specifically, computer science, that is more relevant to the economics of the time. Among the many roles that education has on society, economically one of the most critical roles is allowing local economies to absorb new technologies while building and integrating the capacity to grow local economies through the use of new technologies (Stankic et al., 2018). Furthermore, research by the International Commission on Financing Global Education Opportunity (2016) found investing in education may provide an earning and healthy return on investment of up to ten times the amount initially invested depending on the economic development level in a country.

In European countries, such as Serbia, educational policy has adapted to match the economic and social needs of their time by establishing goals maintain a modern education system adapted to the needs of an information society, enabling the use of information and communication technologies in the workforce in ways that increase efficiency, improve work and job quality, and provide improved e-learning and open distance learning opportunities. These educational efforts begin as early as first grade and continue throughout a student's educational experience (Stankic et al., 2018). Efforts in East Africa to access information communication technologies along with digital technology adoption strategies resulted in a 2.5% improvement in poverty status in households over a three-year time period (May et al., 2011).

The technology education and literacy in schools (TEALS) program provided by Microsoft is one example of the potential to develop relevant digital skills among rural students. TEALS is a free program provided by Microsoft Philanthropies available to participating schools. TEALS provides a lower-cost method of introducing computer science (CS) to students at an early age. This early exposure can build student self-efficacy and interest in the study of CS (Ibe et al., 2018). Rural schools in Kentucky have leveraged video conferencing and professional development workshops for classroom teachers to develop CS instructional skills in rural areas where experienced CS volunteers may not be available. High school students in these programs are incorporating what they have learned in programming to help solve business and community issues as they learn to incorporate market solutions through CS skills (Stringer, 2019).

Digital talent development may not take place in formal education settings such as schools and colleges. Fortunato et al. (2013) found public spaces designed to promote growth in digital talent and allowed information silos to "spill over" among individuals who may not regularly collaborate regarding the ability to leverage technology to solve challenges or create new opportunities could be effective methods for digital education and innovation.

Entrepreneurship and job growth in a digital society can exist in many forms. Gustavsson and Ljungberg (2018) presented a framework for digital entrepreneurship suggesting five mediums to create businesses through digital entrepreneurship: programmable, combinatorial, interoperable, editable, and interactive.

Programmable software is the most common form of digital entrepreneurship and has been used to develop business applications, websites, and databases among many other forms of programmable technology. Combinatorial integrate various forms of digital information to create new products. Google maps combine a web interface with geographic information systems (GIS) or application programming interface (API) information sources. Interoperable technology is one of the most rapidly growing forms of digital technology through the internet of things (IOT). The logistics industry is adopting IOT rapidly integrating radio frequency information (RFID) tags to automate tracking shipping and receiving of freight. Editable technology has allowed anyone with an internet connection to create content that can be used to share information, build a following, and promote products. Interactive technologies have grown rapidly in the last decade. Applications on smartphones and tablets are examples of interactive technologies. Interactive technologies often leverage a variety of other forms of digital technologies.

All of these examples have the potential to be integrated in any industry, at nearly any location that can connect to the internet to create value in the marketplace. Rural America has the ability to leverage all of these digital technologies with the right resources and infrastructure. Research by Stankic et al. (2018) cited these mediums of information technology and also noted the potential of data analysis, business analytics, e-commerce, and digital marketing as promising opportunities in the digital economy.

The US Chamber Technology Chamber Center commissioned a study through Amazon and reached the conclusion that access to digital tools and proper training in technology in rural areas could unlock potential in small businesses across rural America. The report estimated as much as one-third of small businesses in rural areas rely heavily on in-person or telephone sales. Reinforcing the over-reliance on traditional forms of commerce, the report found only 13% of rural businesses sell products through third-party websites, such as Amazon. Compounding this gap, digital tools are estimated to have contributed a 17% boost to rural small business sales in 2019 and may have added an additional 18% if rural areas were better trained in the use of digital tools and resources (U.S. Chamber Technology Engagement Center, 2019).

Further illustrating the need to develop rural talent, one study found roughly 75% of outsourcing businesses would be interested in bringing back some outsourced labor to the United States if rural employees could fill the roles (Stenberg et al., 2009). Even if rural areas do attempt to leverage digital tools, rural digital infrastructure may be a barrier. A study by Whitacre et al. (2014) reported rural business owners are more likely to outsource work to other areas that have higher levels of broadband connectivity. However, even when broadband is available in rural areas, the existence of broadband shows very little relationship with economic growth in rural areas. To realize the economic benefit broadband can provide, rural areas require strategies to increase the adoption of broadband technologies as well as specific training to promote talent development in digital technologies in order to generate economic growth, especially in higher-skilled occupations (Conley, 2013; Whitacre et al., 2014).

Remote work should not necessarily be associated with the ability to offshore an occupation. Blinder and Krueger (2013) distinguished the "offshorability" of jobs in a study and noted jobs such as manufacturing can be offshored, but they are unlikely to be performed remotely by working at home. A recent study by Dingel and Neiman (2020) evaluated occupations that can plausibly be performed in a remote work setting as a result of COVID-19. The study found roughly 37% of US occupations can be performed either partially or fully in a remote work setting. Knowledge workers in professional fields were more likely to be able to work remotely while skilled trade occupations, as well as farm or agriculture-related occupations, were less likely to be able to work remotely.

Occupations, where remote work is possible, were also more likely to provide higher wages. These findings present both challenges and opportunities in rural areas. The challenge rural areas face is traditional occupations in rural areas have focused on skilled trade and agriculture-related jobs. Rural opportunity is available where broadband is present and talent has been developed to allow residents to participate in remote work.

Broadband Infrastructure

Digital infrastructure typically refers to the fixed structure that supports the transfer of standardized data along with physical devices such as fiber optics, cables, routers, and switches where the components contribute to infrastructure as a whole (Gustavsson & Ljungberg, 2018). While there are many factors that could be classified as infrastructure, for the purpose of this study, infrastructure will largely focus on digital infrastructure and access to broadband, high-speed internet services.

The worldwide web began to become more mainstream by the mid-1990s along with the broad-based adoption of the internet. During this time, the internet infrastructure and data transfer were largely through telephone lines and dial-up modems. The worldwide web was accessible to most Americans, regardless of rural or urban location, due to the ubiquity of telephone service to most homes. require.

The late 1990s and early 2000s led to ADSL and the use of broadband internet. Unfortunately, broadband infrastructure required new infrastructure and larger population centers provided the greatest return on investment while rural areas began to experience a digital divide.

Private companies have hesitated to develop broadband in rural areas with low population as there is little chance for profit absent public investment (Fortunato et al., 2013).

One of the largest periods of public investment in broadband was during the Great Recession. The American Recovery and Reinvestment Act (ARRA) provided 7.2 billion dollars to communities across the United States to develop broadband as well as programs for sustainable broadband adoption. Even so, there are approximately 100 million Americans across the United State, many in rural areas, without access to broadband (Martin, 2010).

Currently, the Federal Communication Commission (FCC) established the benchmark for fixed broadband connection speed at 25 megabits per second for downloads and three megabits per second for upload speeds. However, as recently as 2018, the FCC found over 25% of rural Americans have no access to broadband internet compared to approximately 95% availability among urban populations (U.S. Chamber Technology Engagement Center, 2019).

Mobile data providers may be the most immediate practical solution of filling gaps in broadband coverage to rural areas that lack fixed coverage. Mobile data speeds increased from 3G to 5G in less than a decade and are often able to permeate rural areas faster than fixed broadband. Prieger (2013) estimated nearly 96% of people living in areas without fixed broadband have access to mobile broadband data.. Graydon and Parks (2020) believe ‘global connectivity’ through satellite internet service is closer than ever as the cost of manufacturing and launching satellites has decreased substantially over the past several years. Questions regarding cost distribution, future demand capabilities, and congested orbital congestion appear to be the largest hurdles to overcome at this time.

Statistics on broadband coverage as reported by the FCC can be problematic. According to Prieger (2013) FCC reporting on broadband availability may overstate the actual availability of broadband coverage. Other datasets have similar challenges. The National Broadband Map (NBM) provides detailed information about broadband coverage by allowing internet service providers to self-report coverage. Service providers report larger geographic tracts of land where coverage is provided. In some cases, if only one person can be served in a particular tract, providers will report coverage for the area (Whitacre et al., 2014).

Household income also appears to have an impact on broadband availability. Research by Prieger (2013) found rural, low-income, low-density areas experience disproportionately lower rates of broadband availability compared to rural areas with greater density or higher income levels. In a related study, Savage and Waldman (2005) found larger income and household size were associated with increased broadband accessibility and usage. While the internet may provide the promise of equalizing opportunity, geographic location and an individual's economic status may act as a gatekeeper to opportunity.

While geography can act as a barrier to broadband development, telecommunication, and municipal providers have also acted as barriers to high-speed internet expansion. In the early 2000s, many lobbyist groups petitioned state legislators to restrict the ability of competing broadband providers to compete for market share. Changes to these decades-old infrastructure hurdles will require legislative changes and likely require public, partner partnership (Fortunato et al., 2013).

Broadband and Economic Growth

The literature presents a strong case supporting the relationship of digital infrastructure, economic growth, and employment. For example, research by Whitacre et al. (2014) found income growth to be causally related to broadband when adopted in rural areas. Findings also indicated broadband adoption negatively influenced unemployment growth (Atasoy, 2013).

The opposite effect was found in rural areas with low levels of broadband adoption. Rural areas where broadband was adopted more slowly, or not adopted at all, experienced declines in the number of firms and total employment. Another study by Minges (2015) examined an array of available literature regarding the impact of broadband and reported regardless of the methodology used or the location of the study, broadband had a positive impact on economic activity. Greenstein and McDevitt (2011) estimated the impact of broadband on US GDP was between eight to ten billion dollars.

While fixed broadband is considered by many to be the most reliable form of digital connectivity, other forms of broadband, such as mobile, have the ability to stimulate economic growth as well (Prieger, 2013). Thompson and Garbacz (2011) estimated mobile broadband, but not fixed broadband utilization, has a positive effect on household GDP, especially in less developed areas.

The United States government also believes broadband connectivity is an economic essential service. The State Department wrote ‘connectivity is as critical to economic development as other forms of infrastructure, like roads, ports, and electricity (US Interagency Steering Group, 2016). If rural areas are able to leverage broadband infrastructure and adopt economic use cases of technology, increases in productivity and essential services may also emerge.

Prieger (2013) argued information communication technologies (ICT) and associated services raise productivity in occupations that employ their use. When ICT is adopted in areas such as telemedicine, distance learning, supplier and retail networks, and tourism-related industries, the cost of services can be diffused while access to knowledge increases. Meanwhile, for both products and services, production and transaction costs are lowered due to increased efficiency.

Kolko (2010) compared employment growth in areas without broadband with other areas that had between one and three broadband providers and found areas with at least one provider had over 6% growth in employment and just over 2% growth in population. High-speed internet was also found to be an important location factor for knowledge-based firms (Mack et al., 2011). As rural areas attempt to attract industries that will be relevant in the digital economy, broadband availability will be essential.

Broadband contributes to increases in more than one type of capital. While most research on the economic effects of broadband has focused on the relationship with financial capital, increases in ICT may also lead to increases in social capital. Stern and Adams (2010) found increases in broadband led to expansion in personal social networks and increased participation at the local level.

Broadband may also have a downstream impact on raising capital through the use of social networks. Research by Sorenson (2018) explored the social networks and the geography of entrepreneurship and found social relationships are critical to entrepreneurship. Friends, family, and close contacts often provide critical early investments and guidance to aspiring entrepreneurs. Broadband is critical in economic development to virtually connect rural areas, but it can also be critical to socially connect entrepreneurs to essential support networks which can increase social capital.

The presence of broadband does not guarantee economic success and broadband access alone is not a viable economic and community development strategy. Policies and strategies around broadband access should incorporate meaningful uses of technology that empower and enfranchise rural community government organizations, businesses, and other groups interested in both economic and social development (Fortunato et al., 2013).

Stankic et al. (2018) warned investment in broadband technologies would be lost if infrastructure and digital talent growth did not complement one another. Whitacre et al. (2014) echoed a similar finding in the importance of broadband utilization when he reported nonmetropolitan counties with high levels of broadband adoption (but not availability) are associated with higher numbers of businesses and jobs.

The age of broadband users has also demonstrated a relationship to broadband utilization. A study by Goldfarb and Prince (2008) found populations over the age of 45 typically utilized broadband less than their peers. These findings suggest broadband utilization strategies may benefit from use case scenarios based on the age of users in a particular area. Government policy could also benefit from strategies focused on broadband adoption. In 2009, ARRA allocated $7 billion to expand rural broadband. However, only seven percent of the funds could be used for broadband adoption (Dickes et al., 2010).

Within the literature available on rural entrepreneurship, factors such as geographic location, human capital, amenities, age, broadband, migration rates, and foreign-born populations were all identified as factors that may moderate rates of entrepreneurship in rural areas. In addition, entrepreneurial breadth has been used to measure the ratio of entrepreneurs in geographic areas. Measures of these factors were included in this study. The literature also provided support of factors such as culture, entrepreneurial support organizations, and financial capital as moderating variables that can impact entrepreneurship. However, these factors were not measured in the study.

Regarding digital talent and broadband infrastructure, the literature illuminated challenges rural areas face in broadband availability as well as difficulty in simply identifying coverage using publicly available information. At the time of this research, density of population appeared to drive broadband coverage more than any other factor. The literature discussed the challenges that contribute to the urban-rural gap in broadband infrastructure as well as digital talent as well as practical suggestions to address these challenges.

Chapter III: Research Methodology

The purpose of this chapter is to outline and discuss the research methodology used in this quantitative study on rural entrepreneurship and digital talent in rural areas. The approach presented in this study will provide a better understanding of potential factors associated with economic development in rural counties across a four-state region in the rural Heartland region of the United States.

Public data available for research can provide insights to help understand factors and resources needed to increase economic activity, economic self-sufficiency, and economic diversity through entrepreneurship and preparation for an increasingly digital economy. The primary focus of this study is entrepreneurship and digital talent development among rural counties in a four-state region located in the Heartland region within the Midwest.

Through a well-developed and articulated methodology, a secondary purpose is to outline how other regions in the United States can evaluate conditions and resources needed to develop rural areas for increased entrepreneurial activity and participation in an increasingly digital economy.

The methodology section begins with a review of the research questions followed by a description of the population sample chosen for the study. The next portion of the section provides an in-depth overview of the measures and data sources used in the study. Finally, the chapter concludes with the procedures used to examine the research questions.

Research Questions

1. How do broadband, digital talent, amenities, and human capital measures predict the breadth of entrepreneurship, as measured by the ratio of non-farm proprietor employment, in the rural Heartland region of the United States?

2. Are higher levels of broadband associated with entrepreneurial breadth, as measured by the ratio of non-farm proprietor employment, in the rural Heartland region of the United States?
3. Are higher levels of broadband in the rural Heartland region of the United States associated with higher levels of digital talent related to the digital economy?
4. Are higher levels of digital talent related to the digital economy associated with entrepreneurial breadth, as measured by the ratio of non-farm proprietor employment, in the rural Heartland region of the United States?

Population

The Heartland region is a subset of states within the American Midwest. In a Brookings Institute study by Muro et al. (2018), researchers identified Alabama, Arkansas, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Michigan, Minnesota, Mississippi, Missouri, Nebraska, North Dakota, Ohio, Oklahoma, South Dakota, Tennessee and Wisconsin as Heartland region states. Due to the broad nature of attempting to measure factors associated with entrepreneurship and digital talent across rural areas, the central portion of the Heartland region, four Heartland states were selected to provide variability among data points in rural areas. The states and rural counties of Missouri, Arkansas, Kansas, and Oklahoma were selected as the population of this study.

Portions of the Heartland region have an abundance of literature on rural entrepreneurship and economic development. The Appalachian region and Delta region, the eastern portion of the Heartland region, have designated public funding and supporting research that can help inform economic and community policy decisions (Audretsch, 2017; Cook Marshal, 2013; Morin & Partridge, 2019; Pender & Reeder, 2011; Snow & Prater, 2018). This study attempts to address the dearth of research within the central portion of the region and provide insight to regional factors that influence rural economic development in this four-state section of the Heartland region.

Rural counties that meet the criteria of either mixed rural or rural in this four-state Heartland region were included in this study. Rural counties have a population density of less than 500 people per square mile and 90% and the county has no urban area with a population of 10,000 people or more. Mixed rural counties are identified by counties where the population density is less than 320 people per square mile (Figueroa-Armijos et al., 2012). Of the 75 counties in the state of Arkansas, 74 are classified as rural or mixed rural. In the state of Kansas, 101 of the 105 counties are rural or mixed rural. Missouri has a total of 115 counties, of which 108 are rural or mixed rural. Oklahoma's 77 counties with 74 of those counties classified as rural or mixed rural. See Appendix A for more information regarding counties within each state that were included in this study and classified as rural or mixed rural.

Measures and Data Sources

A detailed overview regarding sources of data used to evaluate factors associated with human capital, amenities, entrepreneurship, and digital talent can be found in Appendix B. Low (2005) identified measures of human capital as well as amenities as factors potential predictors of entrepreneurial activity in rural areas. Broadband infrastructure and human capital have also been identified as factors associated with rural entrepreneurship (Mojica, 2009; Fortunato et al., 2013). Stankic et al. (2018) explored the relationship between broadband presence and economic growth, while other studies have examined various forms of digital talent and the formation of digital economies (Beaulieu, 2002; He, 2019; Gustavsson & Ljungberg, 2018; Conley, 2013; Whitacre et al., 2014; Mack et al., 2011).

The USDA's Atlas of Rural and Small-Town America aggregates and provides public information with variables related to people, jobs, county classifications, income, and veteran data. These categories can be used to conduct county-level research.

The human capital data originates from the American Community Survey (ACS), an annual demographic survey administered by the United States Census Bureau. The Census Bureau selects random households in each county throughout the United States to survey. Respondents answer questions related to educational attainment, veteran status, occupation, household size, ethnicity, among many other factors. For the purpose of this study, ACS survey variables within the USDA's Atlas of Rural and Small-Town America include measures of age, race and ethnicity, migration, and immigration percentages within rural counties.

Human capital measures from the Atlas of Rural and Small-Town data set are also a subset of the ACS survey. Variables within this study include the following measures of education: less than high school education (Ed1LessThanHSPct), high school graduates (Ed2HSDiplomaOnlyPct), some college (Ed3SomeCollegePct), associate degree (Ed4AssocDegreePct), and four-year degree or higher (Ed5CollegePlusPct). Population change data include the following: net migration 2010-2018 (NetMigrationRate1018), existing resident population changes (NaturalChangeRate1018), and percentage of residents who were foreign-born between 2010-2018 (ForeignBornPct). Variables related to age reviewed in this study include the percent of residents below the age of 18 (Under18Pct2010) as well as the percent of population over the age of 65 (Age65AndOlderPct2010).

Measures of amenities include both public and private county-level datasets. Amenities are natural or constructed features, socio-economic composition and diversity, and the values and attitudes of residents (Clark, 2011). Public amenity data is provided by the USDA variable

(HiAmenity). This measure within the USDA's Atlas of Rural and Small-Town America originates from the UDSA's Economic Research Service (ERS). These data are based on natural amenities such as varied topography, accessibility to recreational waterways, such as lakes and oceans, and temperate climates.

The other amenity included in the study is the presence of breweries within the county. Research by Barajas et al. (2017) discussed evidence that suggests breweries can be early indicators of economic and community revitalization and are associated with increases in young, creative talent. The Brewers Association website provides public-facing information of breweries by city and state across the United States. This data was scraped from the website with the permission of the company and each city and state was assigned corresponding Federal Information Processing Standard (FIPS) codes to allow research at the county level.

Broadband infrastructure data was obtained from the United States Census household ACS 2018 five-year survey. This particular survey is titled the Presence and Types of Internet Subscriptions in Household. A sample of counties are surveyed annually for population areas with 65,000 or more residents. Every five years the survey is administered to all counties, regardless of size. Data available through the ACS surveys are based on sample data and are subject to sampling variability. The survey question evaluated in this study is the category "Broadband of any type." This question identifies those who said "Yes" to at least one of the following types of Internet subscriptions: Broadband such as cable, fiber optic, or DSL; a cellular data plan; satellite; a fixed wireless subscription; or other non-dial up subscription types.

The researcher chose to use the ACS broadband data rather than the FCC's Fixed Broadband Deployment Data due to the over-representation of coverage in the FCC's dataset. FCC Broadband Deployment Data is sourced from broadband providers. Broadband providers often report coverage for an entire county even if only a small portion of the county has access to broadband coverage. In contrast, the ACS survey is a household survey of county residents. As a result, ACS broadband data can be utilized as both a measure of availability as well as a measure of adoption of broadband use by county residents, not internet providers.

Two broad measures of entrepreneurial breadth and depth are commonly used to measure the level of entrepreneurship in rural areas. These data were available through the Bureau of Economic Analysis (BEA) Regional Economic Information System (REIS) CAINC4: Personal Income and Employment by Major Component by County dataset. According to the BEA, "local area personal income statistics provide a framework for analyzing current economic conditions in local economies and can serve as a basis for decision making" (Bureau of Economic Analysis, n.d.). Breadth is the number of small businesses in a region while depth reflects the value or economic contribution small businesses generate in an area (Low et al., 2005). The breadth of entrepreneurship was determined by calculating the number of non-farm proprietors, or self-employed individuals in a county, divided by total employment in the county.

Measures used to evaluate talent related to digital economies in rural areas are from two private sources that aggregate county-level data from federal datasets. One source was Emsi, or Economic Modeling LLC. The other source of digital talent information was The Center on Rural Innovation (CORI) Tech Tracker Talent data source.

Emsi is a software tool that aggregates public data from the Bureau of Labor Statistics and other public datasets as well as professional social profiles. The Illinois Science and Technology Coalition (ISTC) occupation codes in science, technology, engineering, and math (STEM) related occupations were used to identify county-level digital talent (Illinois Innovation Index, 2018). The Illinois Science and Technology Coalition regularly publishes the Illinois

Innovation Index with a list of Standard Occupational Classification (SOC) codes from the Standard Occupational Classification Policy Committee (See Appendix C). STEM-related SOC codes are defined by The Bureau of Labor Statistics.

Rural designations as either rural or mixed rural were assigned using calculations for the US Census data sets County Look-Up table as well as USA Counties dataset. These data sources provide information regarding the population within a given county as well as the population per square mile that can be used to determine the rurality of counties.

Procedures

Datasets that are largely government sources of public data were chosen as the data sources for this study. These data sources were chosen due to their ability to provide county-level data on measures of human capital, amenities, broadband, the presence of jobs related to the digital economy, and levels of entrepreneurship. According to the United States Census, publicly available data, such as the ACS survey, provide insights into economic and demographic characteristics and answer questions about differences in communities and how those differences can affect the local places. These datasets are commonly used to assist policymakers, researchers, community and economic development professionals, and third parties working to help communities make data-informed decisions (US Census Bureau, 2020).

All data measures used in the study are quantitative, interval scales of measure representing either the percent of the population in a county represented by a particular variable, such as the percent of residents under 18, or the raw number of residents within a county represented, such as non-farm proprietors. Quantitative studies utilize numerical data that is objective in nature in an attempt to explain a particular phenomenon or generalize statistically significant findings across a population sample (Babbie, 2015).

Data from the USDA’s Atlas of Rural and Small Town America, which collects subsets of data from the United State Census Bureau’s ACS demographic study as well as the USDA’s ERS dataset, provided data used to measure human capital, amenities, and broadband availability.

Measures of entrepreneurial activity were derived from the BEA’s REIS dataset. Occupational codes related to digital talent were identified using the Illinois Science and Technology Coalition Innovation Index. A complete list of STEM occupations used to identify the presence of digital talent can be found in Appendix C.

Once project approval from Murray State University's Institutional Review Board was obtained, the researcher began the study. Data sources were organized electronically as tables in a database. The researcher queried the US Census County Look-Up table identifying mixed rural counties with less than 320 people per square mile. Among the 372 total counties in the four states of Missouri, Arkansas, Kansas, and Oklahoma, 357 total counties were identified as rural or mixed rural. The researcher utilized FIPS codes to compare variables among the various datasets to rural counties in the population sample. This methodology allowed the researcher to evaluate each county along with the variables selected from various datasets in an effort to identify factors that may be associated with higher levels of entrepreneurship, digital talent associated with digital economies in rural areas. Once the data was electronically organized in the database, the researcher imported the dataset to the IBM software tool SPSS Statistics in preparation to conduct statistical analysis.

This post-facto research study used ratio scales of measurement evaluating each hypotheses of association. Given the multiple explanatory variables and predictive nature in the first research question, a multiple linear regression (MLR) analysis evaluating broadband, digital talent, amenities, and human capital to identify which variables may predict levels of entrepreneurship in the rural Heartland region.

An MLR can be used in an attempt to model the relationship between two or more independent, or explanatory variables and a response variable by fitting a linear equation to observed data on a criterion or dependent variable (Rencher & Schaalje, 2008). The strength of the relationship among predictor variables is indicated by correlation coefficients. Using the beta values in a regression, a researcher can identify the relative importance of a predictor variable when attempting to predict the criterion. The larger the absolute value of beta, the more influence the variable has on potentially predicting the criterion (Guion, 2011). Prior research examining factors associated with rural entrepreneurship has used similar methodologies to examine factors associated with entrepreneurship in rural areas (Low et al., 2005; Breazeale et al., 2015; Mojica, 2009).

The study uses a Pearson's product-moment correlation (PPMC) to evaluate the second research question and the relationship between broadband and entrepreneurship. A Spearman's Rank Correlation, or Spearman's rho, was used to explore research questions three and four: the relationship between broadband and digital talent, and the relationship between digital talent, related to the digital economy, to entrepreneurship, respectively.

Quantitative research is a method to collect data on predetermined instruments that yield statistical data while determining factors that influence or best predict an outcome (Cresswell & Cresswell, 2017). In an attempt to measure and identify the strength of association or relationship between two variables that are non-normally distributed, a PPMC and Spearman's rho analysis can be used to represent the strength and the direction, either positive or negative, of the correlation (Corty, 2008). Numerous studies found in the entrepreneurial literature have used correlations to evaluate factors associated with levels of entrepreneurial activity (Acs et al., 2012; Sebora et al., 2009; Baniasadi et al., 2013). Pearson's correlation coefficient provides a measure of association for distributions with moderate skewness or excess kurtosis, however, it has a sensitivity to outliers. Spearman's rho is less sensitive to outliers and is a more appropriate statistical test for distributions with extreme skewness or excess of kurtosis where the datasets with outliers are more likely (Corty, 2008).

Ethical Considerations

Studying geographic areas, such as the Heartland region and the centrally adjacent four-state area within the region, creates a potential selectivity issue for studying results and the generalizability of the data since the states and their counties included in this study were not randomly assigned. Randomly assigned probability studies allow assumptions to produce population estimates within a given population. Non-probability studies require researchers to consider the "fit for purpose" within the study (Baker et al., 2013). However, non-probability studies can provide an efficient method to evaluate broad hypotheses that can be later evaluated using probability sampling methods (Wiśniowski et al., 2020).

Research often involves collecting data from people, about people and it is incumbent for researchers to protect the anonymity of participants, promote the integrity of the research, and guard against misconduct and impropriety (Creswell & Creswell, 2017). The design of this study mitigated common ethical considerations in research in data collection. Federal datasets aggregated at the county level are publicly available. These data are anonymous by nature and broadly used for research and analysis.

Summary

The goal of this chapter is to outline and discuss the research methodology used in this quantitative study on rural entrepreneurship and the development of digital talent in rural areas. A discussion of the methodology, research design, population, variables and sources, and data analysis methods provides future researchers an opportunity to validate or replicate findings in this study. Measures of association, such as Pearson's product-moment correlation, Spearman's rho, and regression analysis were applied to identify factors that influence entrepreneurship and digital talent in rural areas. The subsequent chapter provides findings as a result of the methodology outlined in this chapter.

Chapter IV: Results

This chapter provides the results of this quantitative study using publicly available datasets to identify factors that may influence rural entrepreneurship or are related to digital talent in rural areas. Information within this chapter summarizes the inferential statistical tests and measures of association used to identify factors hypothesized to predict the breadth of entrepreneurship in rural areas, the relationship between broadband internet and entrepreneurship, the relationship between broadband and digital talent, and the correlation between digital talent and entrepreneurship in the rural Heartland region.

After approval from Murray State University's IRB, datasets were organized in a database aligned using FIPS codes for the purpose of data analysis. The organized datasets were imported to SPSS to conduct multiple regression analysis for the first research questions and Pearson's correlation for research question two. Spearman's rho was utilized for research questions three and four. Each hypothesis, descriptive statistics, and brief descriptions of findings for each of the research questions follow. A more detailed discussion of the results of this study can be found in chapter five.

Research Question 1

How do broadband, digital talent, amenities, and human capital measures predict the breadth of entrepreneurship, as measured by the ratio of non-farm proprietor employment, in the rural Heartland region of the United States?

Hypothesis 1

The factors of broadband, digital talent, amenities, and human capital predict entrepreneurial breadth in the rural Heartland Region of the United States.

The first research question evaluates variables that may predict the breadth of entrepreneurship in rural areas. Given the predictive nature of the hypothesis, a multiple linear regression (MLR) analysis was used. When using an MLR, the researcher must evaluate a number of assumptions. The first assumption is, the variables used in analysis should be linear in nature. Another assumption is data within the regression model should have normal distributions. Researchers must also test for multicollinearity among the independent variables as well as ensuring the dependent variable is a continuous variable.

The regression model used entrepreneurial breadth, as measured by the number of non-farm proprietorships divided by the number of total non-farm proprietors in a county, as the dependent variable. Entrepreneurial breadth is a continuous variable as it can represent an unlimited number of values between its highest and lowest value. Descriptive statistics for the dependent variable and independent variables can be found in Table 1.

Table 1

Descriptive statistics for multilinear regression analysis tested in question 1 (N=357)

Variables	Minimum	Maximum	Mean	SD
High natural amenities	0.0	1.0	0.17	0.37
Number of breweries	0.0	11.0	0.46	1.05
Education high school or less	22.5	69.0	50.31	8.62
Education college plus	8.9	50.4	18.83	6.14
Net migration rate	-25.8	18.8	-2.41	4.98
Net international migration rate	-0.6	9.0	0.52	1.02
Natural Population change rate	-6.4	18.3	0.29	2.81
Foreign born percent	0.1	30.2	3.07	3.96
Age 17 or less	17.3	32.0	23.85	2.53
Age 65 or older	7.2	29.6	17.19	3.81
Entrepreneurial breadth	85.2	589.7	338.45	104.22
STEM jobs	10.1	6060.4	242.32	540.96
Urban influence	1.0	12.0	6.73	3.36

The predictor or independent variables used in the regression model were urban influence, natural amenities, presence of craft breweries, education level (high school or less and college graduate plus), net migration rate, net international migration rate, foreign-born percent, percent of the population under 18 years old, percent of the population 65 or older, STEM jobs, and percent of broadband presence in a county. Results of the MLR are reported in Table 2.

Table 2

Regression Analysis Summary for Broadband, Digital talent, Amenities, and Human Capital Predicting Entrepreneurial Breadth

Variable	*B*	95% CI	β	*t*	*p*
Urban influence	-2.55	-.6.04, 0.95	-0.08	-1.43	0.15
High natural amenities	-35.06	-60.21, -9.91	-0.13	-2.74	0.00
Number of breweries	0.55	-9.27, 10.38	0.01	0.11	0.91
Education high school or less	2.49	0.35, 4.62	0.21	2.29	0.02
Education college plus	5.58	2.29, 8.85	0.33	3.34	0.00
Net migration rate	3.58	1.21, 5.94	0.17	2.97	0.00
Net international migration rate	2.59	-9.84, 15.02	0.03	0.41	0.68
Natural Population change rate	6.64	-0.33-12.60	0.18	1.87	0.06
Foreign born percent	-0.99	-4.37, 2.40	-0.04	-0.57	0.56
Age 17 or less	9.59	4.40, 14.77	0.23	3.64	0.00
Age 65 or older	22.22	17.43, 27.00	0.81	9.13	0.00
STEM jobs	-0.03	-.068, 0.00	-0.17	-1.88	0.06
Percent broadband	-107.05	-215.45, 1.35	-0.12	-1.94	0.05

Note: R^2 =.42 (N = 357, *p* < .001). CI = confidence interval for *B*

The regression model explained over forty percent of the variance in entrepreneurial breadth, (R^2 = .42, F(13, 342) = 14.22, p < .05). Age 65 or older significantly predicted entrepreneurial breadth (β = .81, p < .05). The independent variable Education college plus also explained a significant proportion of variance in entrepreneurial breadth (β = .32, p < .05), as did predictor variables Age 17 or less ($\beta = .23$, $p < .05$), Education high school or less ($\beta = .20$, $p < .05$), Net migration rate ($\beta = .17$, $p < .05$) and High natural amenities ($\beta = -.13$, $p < .05$)

An examination of multicollinearity and tolerance statistics confirmed no violations of multicollinearity. All tolerance values were above 0.10. The minimum tolerance value was 0.61. No Variance Inflation Factors (VIF) exceeded 10. The largest VIF among the predictor variables was Education college plus 5.93. Additionally, the dependent variable was evaluated for normal distributions and the presence of bivariate outliers. Tabachnick, et al. (2007) advised continuous variables in excess of $z = \pm 3.29$ ($p < .01$) may be outliers. While the dependent variable of entrepreneurial breadth had a large range and standard deviation, (M = 338.450, SD = 104.227), after the values were standardized they fell within acceptable levels $z = \pm 3.29$ ($p < .01$). As a result, Hypothesis 1 was accepted.

Research Question 2

<u>Are higher levels of broadband associated with entrepreneurial breadth, as measured by the ratio of non-farm proprietor employment, in the rural Heartland region of the United States?</u>

Hypothesis 2

<u>Higher levels of broadband are associated with entrepreneurial breadth.</u>

To evaluate the relationship between broadband and entrepreneurial breadth in the rural Heartland, the researcher conducted a Pearson's correlation. Both variables of broadband and entrepreneurial breadth are continuous and random. As noted in the previous research question, the variable of entrepreneurial breadth had a normal distribution. The percent of broadband coverage among the 357 rural counties included in the dataset was also normally distributed. The two variables of entrepreneurial breadth and percent broadband coverage provided a statistically significant, weak negative correlation, r = -.13, n = 357, $p < .05$. While the association between the two variables had a marginal, inverse relationship, Hypothesis 2 was accepted.

Research Question 3

Are higher levels of broadband in the rural Heartland region of the United States associated with higher levels of digital talent related to the digital economy?

Hypothesis 3

Higher levels of broadband are associated with higher levels of digital talent.

Broadband is the digital infrastructure that is necessary for rural communities to participate in the digital economy. However, even when digital infrastructure for broadband is present and normally distributed across rural counties, digital talent, as measured by STEM jobs is not. Initial descriptive statistics on STEM jobs suggested a large positive skew (M = 242.32, SD = 540.96). The substantial standard deviation indicated a non-normal distribution of STEM jobs across counties in the rural Heartland. Figure 1 illustrates a substantially, positively skewed, right distribution while Figure 2 provides observed and expected values based on the mean and standard deviation.

Figure 1

Histogram of the Distribution of STEM Jobs in the rural Heartland of Missouri, Kansas, Oklahoma, and Arkansas

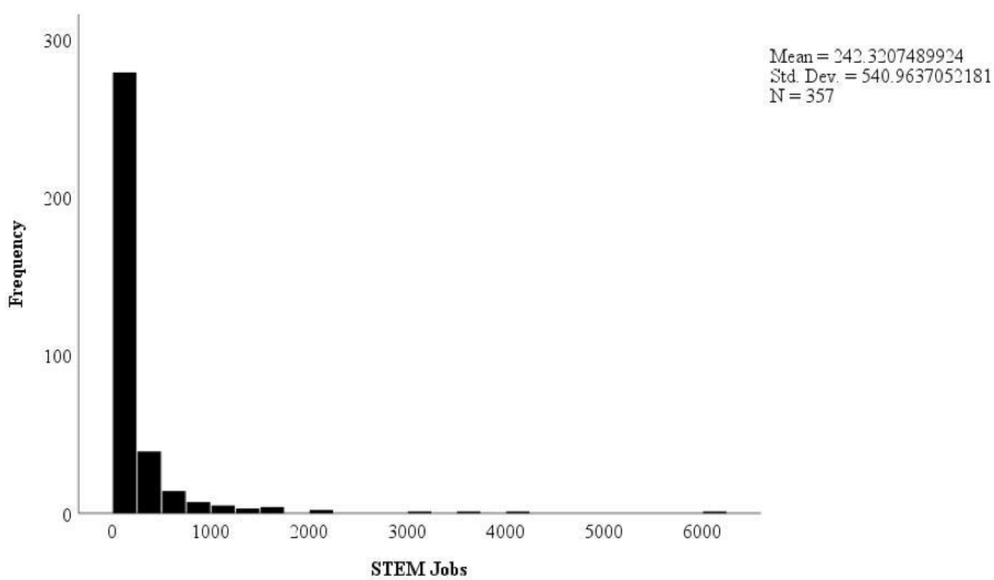
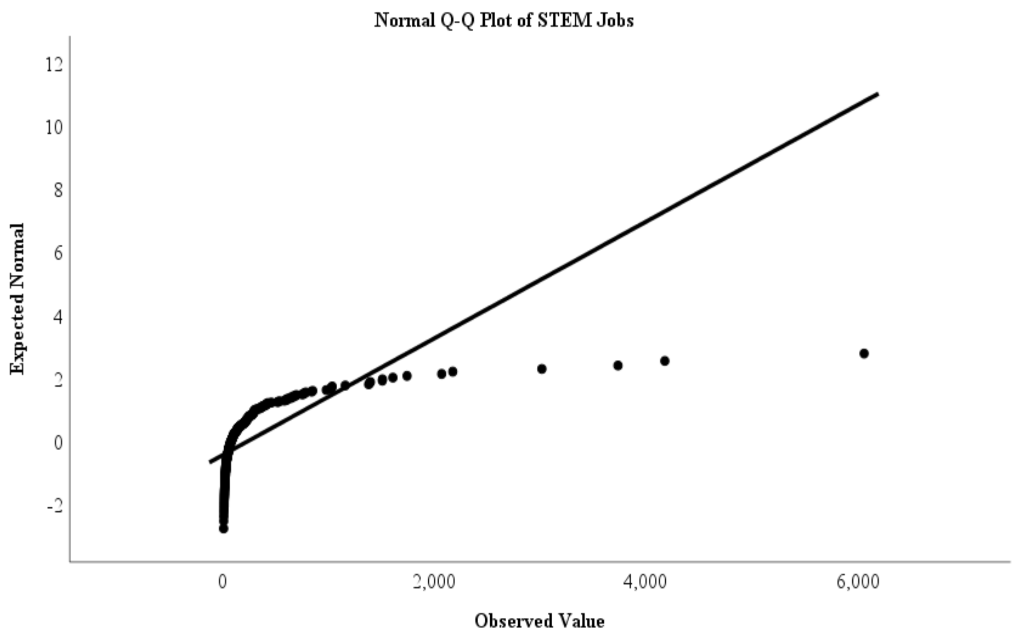


Figure 2

Q-Q Plot of the Expected and Observed distribution of STEM Jobs in the rural Heartland of Missouri, Kansas, Oklahoma, and Arkansas



A distribution that lacks symmetry and has more cases, or a tail, toward one end of the distribution, can be described as “skewed” (Norusis, 1994). Using a method to measure skewness suggested by Tabachnick, et al. (2007) labeled as a skewness standard score, the researcher divided the skewness of the variable STEM Jobs by the standard error. The skewness standard result was well above the suggested threshold of $z = \pm 3.29$ ($p < .001$). Given the non-normal distribution of data, a Spearman’s rho was used to assess the relationship between levels of broadband and digital talent. There was a statistically significant positive correlation between the two variables $r = .23$, $n = 357$, $p < .05$. As a result, Hypothesis 3 was accepted.

Research Question 4

<u>Are higher levels of digital talent related to the digital economy associated with entrepreneurial breadth, as measured by the ratio of non-farm proprietor employment, in the rural Heartland region of the United States?</u>

Hypothesis 4

<u>Higher levels of digital talent are associated with entrepreneurial breadth.</u>

The final research question which explored factors that influence entrepreneurship in the rural heartland examined the relationship between digital talent and entrepreneurial breadth. The researcher wanted to identify how well rural areas in the Heartland have been able to participate in the growing digital economy as traditional rural industries of manufacturing and farming have produced fewer employment opportunities. A Spearman's rho was again used to identify the variance shared between the digital talent or STEM jobs, represented by the Illinois Science and Technology Coalition (ISTC) occupation codes in science, technology, engineering, and math (STEM) related occupations, and entrepreneurial breadth.

As noted in research question three, the variable of STEM jobs initially had a large standard deviation (M = 242.32, SD = 540.96) and was substantially skewed with a non-normal distribution of data. As a result, Spearman's rho was again used to assess the relationship between levels of broadband and digital talent. There was a statistically significant negative correlation between the two variables $r = -.68$, n = 357, $p < .05$. The negative correlation between these two variables indicates, as the ratio of entrepreneurial breadth increases, the number of people employed in the digital economy decreases. The two variables had a statistically significant, inverse relationship. As a result, Hypothesis 4 was accepted.

Chapter V: Discussion

Economically vibrant communities have robust and diverse economies at their core. The rural Heartland, like much of rural America, faces challenges on multiple fronts. Many rural economies are narrowly dependent on a handful of industries, such as agriculture, which has become largely industrialized and centralized as corporate farms and manufacturing jobs, which are largely driven by wage-based labor and projected to decline due to automation. Over the past several decades, rural economic development efforts have largely focused on incentive-based industry attraction strategies.

The vitality of rural areas will increasingly depend on the ability to create jobs through entrepreneurship and the capacity to develop digital talent and infrastructure to participate in the growing digital economy. The primary purpose of this study was to identify factors that influence rural entrepreneurship and digital talent in the Heartland four-state region that includes Missouri, Arkansas, Kansas, and Oklahoma.

Summary of Literature Review

Research by Low et al. (2005) discussed the importance of measuring the depth of entrepreneurship to reflect the ratio of the economic contribution of entrepreneurs in rural areas. Additionally, Low et al. (2005) found human capital, amenities, financial capital, and infrastructure were factors related to rural entrepreneurship. Mojica (2009) examined similar variables in a study on rural Appalachia that included education levels, internet infrastructure, and agglomeration of firms. Growth of related upstream or downstream firms in an agglomeration economy was also examined by Artz et al. (2016) and found available, educated workforce contributes to economic growth in rural areas. Many rural areas have a disproportionate population of older residents.

Joo (2011) found rural residents aged 65 or older are less likely to start a business. However, older residents with lower levels of education in rural areas are significantly more likely to begin a new business than their higher-educated peers. A study by Deller et al. (2019) found older populations of residents between the ages of 50-74 who have accumulated more wealth are more likely to create new ventures that can contribute to growing local economies.

Outdoor amenities were an additional factor found to be related to entrepreneurship by McGranahan et al. (2011) and local features, the impact of “place,” and localized support have also been attributed to developing entrepreneurship in rural areas (Muñoz and Kimmitt, 2019).

Other factors associated with entrepreneurship are technology patents, innovation rewards, capital disbursements, and technology firms, but as Xue (2007) noted, these measures are not common in rural areas. While some economic researchers have chosen to narrow entrepreneurial research on high-growth firms, Muñoz and Kimmitt (2019) warn against favoring one type of entrepreneurship over another in research and that excluding areas that may have fewer technology and high-growth firms may be less likely to reflect rural entrepreneurial activity.

Rural areas face more challenges in developing entrepreneurship as an economic development strategy compared to urban areas. One of the largest challenges facing rural areas is “brain drain.” Brain drain is a term used to describe locations where young people with high potential in a community leave the area they were raised, go to college, and choose not to return due to lack of opportunities or culture (Hassebrook, 2003; Drabenstott & Moore, 2010; Sharp et al., 2003; Deller et al., 2019).

Unfortunately, many rural communities focus community and economic development efforts largely on industry attraction by offering tax incentives or other economic incentives but do little to attract or retain talent and entrepreneurs. These practices are nearly a century old and can be traced back to the 1930s and the Balance Agriculture with Industry plan (Deller et al., 2019). Today, these practices have been described as “smokestack chasing” and in some areas have developed a culture similar to “company towns” where residents in localities prefer wage labor, are more averse to risk and do not see the opportunity entrepreneurship provides.

Rural areas are often characterized by little economic diversity and typically supported by agriculture, industrial manufacturing, and resource extraction (Dabson, 2001; Fortunato & McLaughlin, 2012; McGranahan et al., 2011). Limited economic diversity, difficulty in attracting and retaining talent as well as networking, and lack of agglomeration can lead to stagnate economic growth (Pages, 2018). Entrepreneurial support organizations, peer networks, startup mentorship, lack of financial support from investors, and limited broadband have also been cited as challenges to develop rural economies through entrepreneurship (Dabson, 2001).

Rural areas are also challenged by higher levels of poverty. The median household income for rural households is roughly 25% less than urban households (Economic Research Service, 2014). Even more, the economic recovery rate after the Great Recession of 2007-2009 was twice as fast in metropolitan areas compared to rural areas. In many rural areas, job growth rates have shown virtually no growth over the last decade (Conley, 2013).

Even though rural areas face many challenges, they also have assets that can be leveraged over more urban areas. Rural areas can provide outdoor amenities, lower cost of living, and have the potential to attract baby boomer retirees, which are among the most entrepreneurial retirees ever (Fairli et al., 2017). Deller et al. (2019) found retirement migration has a positive effect on local economies and residents 50 or older who have marketable skills are associated with higher levels of income and may be more likely to start businesses.

Tajuddin (2011) suggests community revitalization strategies that impact quality of life and an entrepreneurial culture could help rural areas attract and retain talent. Additionally, Sobel et al. (2010) and Low et al. (2005) found higher levels of diversity and in-migration have higher levels of entrepreneurship. Similarly, other research has found a positive relationship between migrants and rural entrepreneurship (Goetz & Rupasingha, 2014).

The lack of broadband infrastructure presents economic and entrepreneurial challenges for rural areas. The U.S. Chamber Technology Engagement Center (2019) found over one-fourth of rural Americans have no access to broadband while nearly 95% of urban residents have broadband availability. Even more concerning, Prieger (2013) found the FCC allows broadband providers to self-report coverage. These providers may overstate the actual availability of coverage in rural areas. Whitacre et al. (2014) had similar concerns and reported in some cases when only a small section of a county has coverage, broadband providers can report coverage is available for the entire county.

Compounding the rural broadband gap, broadband availability and usage is disproportionately lower in low-income, low-population density areas compared to higher-income areas that have more dense population per square mile density (Prieger, 2013; Savage & Waldman, 2005). Research by Koldo (2010) suggests broadband availability can actually drive population growth in rural areas and, not surprisingly, can be an important factor knowledge-based firms consider when choosing operating locations. The US State Department shared this concern as well stating broadband connectivity is similar to highways, ports, and electricity as a critical component of economic infrastructure (US Interagency Steering Group, 2016).

While the last century was largely driven by the industrial economy, increasingly the United States and global economy is rapidly merging with the digital economy. Over the ten-year period from 2006-2016, the digital economy grew at a rate 5% greater than the overall economy (Barefoot et al., 2018). On average, individuals who work in the digital economy earn approximately 43% more in annual income compared to those employed in occupations outside the digital economy (Barefoot et al., 2018). As the digital sector of the economy has increased, rural areas have largely not participated due to a lack of digital talent development and broadband infrastructure. Beaulieu (2002) offered a caution for rural policymakers that sustained economic growth would not be possible without human capital development and the ability for rural residents to participate in the digital economy.

A decade after Beaulieu's caution, Fortunato et al. (2013) noted the digital talent and literacy gap between rural and urban areas was increasing. Stankic et al. (2018), as well as Gustavsson and Ljungberg (2018), provide a framework for rural areas to develop talent and increase their capacity to grow local economies through digital entrepreneurship and digital talent development. Conley (2013) and Whitacre et al. (2014) urged rural economic policy that not only addressed the rural gap for broadband infrastructure but promoted opportunities in the digital economy as well as digital talent development to generate economic growth.

Findings and Interpretations

The four research questions in this study explored factors that influence entrepreneurship and digital economies in the rural heartland. For the purpose of this study, the primary measure of entrepreneurship among counties in the rural Heartland was entrepreneurial breadth. Breadth of entrepreneurship was determined by calculating the ratio of self-employed individuals in a county by the total employment in a county.

In research Question 1, the hypothesis was accepted. The factors of broadband, digital talent, amenities, and human capital predicted entrepreneurial breadth in the rural Heartland

Region of the United States. An MLR to examine if the factors of broadband, digital talent, amenities, and human capital predict the breadth of entrepreneurship, as measured by the ratio of non-farm proprietor employment, in the rural Heartland region of the United States.

The multiple regression model used entrepreneurial breadth as the dependent variable and predictor variables of urban influence, natural amenities, presence of craft breweries, education level (high school or less and college graduate plus), net migration rate, net international migration rate, foreign born percent, percent of the population under 18 years old, percent of the population 65 or older, STEM jobs, and percent of broadband presence in a county. The regression model provided statistically significant results and explained more than one-third of the variance between entrepreneurial breadth and the predictor variables ($R^2 = .42$, $F(13, 342) = 14.22$, $p < .01$). The strongest predictors of entrepreneurial breadth was Age 65 or older ($\beta = .81$, $p < .01$), followed by Education college plus ($\beta = .32$, $p < .01$), Age 17 or less ($\beta = .23$, $p < .01$), Education high school or less ($\beta = .20$, $p < .005$), Net migration rate ($\beta = .17$, $p < .05$) and High natural amenities ($\beta = -.13$, $p < .01$).

Some of the predictor variables from the regression model provided unexpected results. Upon further exploration of potential hidden variables that may have influenced the measure of entrepreneurial breadth, the researcher examined the relationship between total population and entrepreneurial breadth using Pearson's correlation. Results indicated entrepreneurial breadth in rural counties has an inverse, statistically significant correlation with a county’s overall population $r = -.49$, n = 357, $p < .05$.

In other words, as entrepreneurial breadth increases, the overall population of a county is more likely to decrease. Further review of literature focused on rural entrepreneurship supports this conclusion. Low (2004) concluded the breadth of entrepreneurship is particularly high in less densely populated rural areas and small businesses in more sparsely populated areas make communities work and provide a seed for proprietorship.

The high predictive value in the regression model of Age 65 or older was contrary to findings by Joo (2011), but consistent with a study by Deller et al. (2019) that also found rates of entrepreneurship were higher in areas with older rural residents.

The high predictive value of education levels of high school or less on entrepreneurial breadth was also surprising. Rural landscapes typically have fewer institutions of higher learning. Even so, findings in this study were consistent with Joo (2011) that lower levels of education do not negatively impact levels of entrepreneurship in rural areas. One possibility for this finding is the lack of job opportunities for residents who have not earned a post-secondary credential. Employment density in rural counties is often driven by professional, service sector jobs in education, healthcare, and criminal justice. These occupations are typically wage employment job opportunities. Rural residents without formal post-secondary education may be more likely to create lifestyle, sole proprietor businesses to provide income.

The incremental predictive value of Net migration rate on rural entrepreneurship is also worth noting. Joo (2011) found tenure of living in a particular rural area for five years or more reduced the likelihood of later choices to become an entrepreneur. One conclusion that could be made is that rural areas that are able to attract and increase residents from outside the area may also be able to incrementally increase rates of entrepreneurship.

Surprisingly, the measure of High natural amenities had a marginal, negative predictive value. Amenities provide a component of recreation, tourism, and retirement development. Amenities are also believed to impact perceptions about quality-of-life as well as a potential role in human migration and firm location decisions (Kim, et al, 2005). The marginal, inverse relationship may be influenced by low population density in areas with high natural amenities. Even so, given the literature's support of the ability of amenities to attract talent and the incremental impact that migration may have on entrepreneurial breadth, as found in the regression model in the first research question, a further examination of factors that may influence the relationship between amenities and entrepreneurial activity is warranted.

To evaluate the predictive value of a measure of entrepreneurship that was not biased by counties with low population density, the variable of non-farm proprietorship employment from the BEA REIS data served as the dependent variable in an MLR. Non-farm proprietorship provides the raw number of non-farm proprietors in a county rather than a ratio. The same independent variables from research question one were used in the regression model. Using non-farm proprietorship as the criterion variable, the results provided an even stronger predictive model ($R^2 = .85$, $F(13, 342) = 138.48$, $p < .01$).

Interestingly, predictor variables that had relatively low or negative beta weights in the regression model that used entrepreneurial breadth as the dependent variable were among the largest predictors in the model with non-farm proprietorship as the dependent variable. For example, STEM jobs had the highest beta coefficient in the non-farm proprietor employment model ($\beta = .66$, $p < .05$) compared to ($\beta = -.17$, $p < .05$) in the entrepreneurial breadth regression model. Another large contrast in the MLR model with non-farm proprietor employment as the criterion variable, Age 65 or older returned a value of ($\beta = -.14$, $p < .05$) compared to ($\beta = .81$, $p < .05$) in the model with entrepreneurial breadth as the dependent variable. Research by Deller et al. (2019) supports this result as the study indicated older residents were more likely to create new entrepreneurial ventures in rural areas.

Research questions two and three evaluated the entrepreneurial and economic impact of broadband in rural Heartland counties. The hypothesis of research Question 2 was higher levels of broadband are associated with entrepreneurial breadth. This hypothesis was accepted. This question measured the association between broadband and entrepreneurial breadth using PPMC among the rural counties in the Heartland region. The results of the statistical test provided a marginal, but statistically significant negative correlation, $r = -.13$, n = 357, $p < .05$. Given the strong relationship between entrepreneurial breadth and less dense population in a county, this finding is not surprising. Kolko (2012) found that broadband is correlated with population density. Essentially, areas with higher ratios of entrepreneurial breadth are typically less dense in population and less likely to have broadband coverage.

One possible explanation for this result is that those who are most likely to influence entrepreneurial breadth, rural citizens 65 or older, are less likely to use broadband in their entrepreneurial ventures. Atkinson (2007) reported senior citizens are often intimidated by technology. As a result, those most likely to create new businesses in rural areas may be less likely to use broadband in the creation or development of their business.

The hypothesis of research Question 3 was higher levels of broadband are associated with higher levels of digital talent. This hypothesis was also accepted. The research question evaluated the correlation between broadband and digital talent in the rural Heartland. The results of Spearman's rho indicated a reasonably strong and statistically significant relationship $r = .23$, n = 357, $p < .05$.

The nature of this question did not consider entrepreneurial breadth. In a way, this allowed the researcher to control for the effect of population density. The presence of broadband in a county accounted for approximately 5% of the shared variance with STEM-related digital talent. This result was expected given the foundational nature of broadband to those working in the digital economy. Given the rural focus of this study, the results were also encouraging.

Many rural counties lack formal digital talent development programs in traditional K-12 education, career and technical education, or adult education learning programs (Roberts, 2010). Yet, higher levels of broadband appear to be related to higher levels of digital talent in the rural Heartland. Education policy will need to develop concurrent growth strategies with broadband and digital talent development to ensure that as broadband expands to more rural residents, both traditional age and adult learners have skill development opportunities that allow them to participate in the growing digital economy.

Research Question 4 investigated the relationship between digital talent, related to the digital economy, with entrepreneurial breadth. The hypothesis was higher levels of digital talent are associated with entrepreneurial breadth. This hypothesis was also accepted. The result identified a negative, statistically significant relationship.

Similar to research question one, the population of rural counties appears to be a factor in the variable of entrepreneurial breadth and its relationship with STEM talent. The shared variance between STEM jobs, or digital talent and entrepreneurial breadth provided a statistically significant negative correlation $r = -.68$, n = 357, $p < .05$. This relationship illustrates an inverse relationship. As the ratio of entrepreneurial breadth increases, the number of people employed in the digital economy decreases.

Given the predictive level of older populations on the measure of entrepreneurial breadth, this result is not surprising. Those who are most likely to contribute to the entrepreneurial breadth of an area, residents 65 or older, are less likely to have an occupation classified as digital talent. Additionally, given the inverse relationship of broadband and entrepreneurial breadth in research question two, it is somewhat expected that the impact of digital talent would be compounded as the presence of broadband is the infrastructural underpinning of digital talent.

The researcher attempted to validate and further investigate the potential association between STEM talent and the impact of population on entrepreneurial breadth by using the variable non-farm proprietorship. The results provided a statistically significant result that accounted for approximately three-fourths of the shared variance between STEM talent and non-farm proprietor employment $r = .87$, n = 357, $p < .05$. This finding suggests STEM talent is more likely to be found in areas that have more people employed as non-farm proprietors, which are typically more densely populated areas.

To further support the relationship between the population of a county and levels of entrepreneurship, as measured by entrepreneurial breadth and the raw number of non-farm proprietors, the researcher conducted two Pearson's correlations evaluating the total number of entrepreneurs in a county and county population as well as entrepreneurial breadth and county population. While the measure of entrepreneurial breadth had an inverse relationship with the population of counties $r = -.49$, n = 357, $p < .05$, the number of non-farm proprietors was positively correlated with the population of counties $r = .96$, n = 357, $p < .05$.

These findings appear to validate the role population density has on entrepreneurial breadth in research question four. Consequently, the population of rural counties appears to be tangentially related to levels of STEM talent. Overall, population, which was not a variable included in this particular study, acted as a latent variable in measures of entrepreneurial breadth. Clearly, population moderates both the strength and direction of measures of entrepreneurship and digital talent in rural areas.

Practical Application

This study provides important considerations for education institutions, government entities at the state and local level, and rural policymakers. The first area of application is the need to develop K-12, post-secondary, and community education programs to further develop digital skills in counties with higher levels of broadband coverage. This study demonstrates that Heartland counties, which possess digital infrastructure, demonstrate a positive, statistically significant relationship with higher levels of digital talent. However, the regression model indicated broadband had a negative association with entrepreneurial breadth.

While the presence of STEM talent is associated with broadband coverage, it does not appear to be contributing to entrepreneurship, and as a result economic growth, in the rural Heartland. Research by Barefoot et al. (2018) indicates individuals who are employed or have created business related to the digital economy earn 42% more in annual income compared to those not employed in the digital economy. However, according to Low (2004) rural, less densely populated areas lag in entrepreneurial depth which limits their prosperity.

These findings in this study, along with existing literature, illustrate a potential need for K-12 school districts, institutions of higher education, and rural community and economic development organizations or non-profits to provide programs of study and support networks among rural counties with broadband coverage focused on the creation and development of businesses related to the digital economy.

Programs such as the Network for Teaching Entrepreneurship could be leveraged along with career and technical education funding through the Carl D. Perkins to deliver digital technical skills through regional technical education centers (Funk, 2019). Research by Hadlock, et al (2008) identified strategies to help students develop digital technical skills in emerging technical education to participate in the digital economy or create new business ventures. Other organizations such as Codefi, a rural technology education and development firm, have a mission to partner with private and public groups to deploy innovation ecosystems to train digital workers and entrepreneurs, build and attract software-focused companies, and create community spaces to expand the digital economy in rural communities.

Over the past forty years, public secondary and post-secondary schools have been developing agriculture, manufacturing, and healthcare skills aligned to industry and local economic needs through regional technical education centers through the Carl D. Perkins Vocational and Technical Education Act. These programs have allowed educational institutions to develop skills and career pathways to occupations serving the local workforce needs that provide living wages. Intentional efforts to further incorporate programs that provide skill development in STEM-related careers as well as entrepreneurship can provide students pathways to both local and remote working opportunities and new firm development that can allow rural economies to increasingly participate in the digital economy.

This study found broadband has an inverse relationship entrepreneurial breadth. Yet the study also found the age group of 17 and under significantly predicted increases in entrepreneurial breadth in rural counties. Educational programs that develop an entrepreneurial culture and illustrate opportunities to develop digitally based businesses could allow rural areas that possess broadband to increasingly realize economic benefits of broadband infrastructure.

Over the last several decades, rural economies have faced economic challenges due to offshoring, especially in the manufacturing sector. The technology industry, often concentrated in urban areas where wages are higher, has also turned to offshoring to hire or contract talent for digital skills. Offshoring is typically a strategy to identify adequate talent at lower wages.

The digital economy provides rural areas an opportunity to use a "farmshoring" strategy. Farmshoring was described by Belson (2020) as an employment strategy where jobs are outsourced to lower-cost rural areas in the United States rather than to foreign countries. Other than lower wages compared to urban areas, farmshoring offers advantages of similar time zones, common culture and language, reduction of compliance-related issues regarding legal systems and data privacy requirements of other countries, and most importantly, a stronger US economy that reduces the opportunity gap between urban and rural areas.

This study found migration rates incrementally predict increases in the ratio of entrepreneurial breadth in rural counties. However, Joo (2011) found rates of entrepreneurial intentions were lower among those who live in rural areas for five years or more years. This contrast highlights the need for rural areas to focus on community development efforts. As digital jobs and business opportunities become less "place-based" rural areas that have broadband infrastructure become viable, lower-cost places to live and work. However, communities that lack amenities will struggle to attract new residents that work in the digital economy.

Strategies regarding economic development are shifting to talent attraction. Aaron Bolzle, Tulsa Remote's executive director, explains the shift by noting that in prior decades, talent went where the jobs were. Today, jobs go to where the talent is and talent goes to where the culture is. Community development is economic development. The economic interest of communities should be to create a community that someone would want to move to and call home (Holder, 2020).

A recommendation for rural and federal policymakers is to develop better measures for amenities. In this study two measures of amenities at the county level were used: outdoor amenities, provided through the USDA Atlas Rural and Small Town America, and the presence of breweries, a private data set that was coded at the county level. While these are two factors that add to local amenities, factors such as bike trails, the presence of an arts culture, quality parks, cultural vibrancy, walkable communities, an assortment of locally-owned food establishments, and evening activities can also contribute to perceptions of quality local amenities. The US Census ACS could add questions that ask residents to identify perceptions of amenities with specific examples of amenities that contribute to quality of life. A scale or Likert measure would provide a measure of perceptions that could be compared to existing measures and potentially provide more valid measures of amenities.

Related to migration rates in counties, additional education and support opportunity may be effective for immigrant residents in counties with less dense populations. Fairlie and Lofstrom (2015) provide data that found rates of entrepreneurship are approximately 5% higher among immigrant residents compared to native residents in the United States. However, the findings in this study indicate there is no statistically significant relationship between the percent of foreign-born residents in a county and entrepreneurial breadth. Research by Studdard, et al. (2013) suggests common barriers for minority aspiring entrepreneurs are education and access to capital. Their findings also indicated early entrepreneurship education has the potential to increase the rate of business growth and success in communities. Given the inverse relationship between entrepreneurial breadth and population, counties with low populations, but representative communities of foreign-born residents may be well-served by programs focused specifically on developing entrepreneurship among immigrant populations.

Limitations

One of the largest limitations of the study was confining variables used to examine rural entrepreneurship and digital economies to county-level data. Many of the factors evaluated in the study vary widely among communities within the same county.

Another limitation is the challenge of measuring entrepreneurship. For the purpose of this study, levels of entrepreneurship were derived from federal data sources based on registered businesses. Many small business entrepreneurs in the United States operate in a quasi "cottage industry" (Schramm, 2004). These small businesses range from services like repairs, personal care, digital services, consulting, and a wide range of other product and service businesses.

An additional limitation of the study is the influence county population has on measures of entrepreneurship. Areas that are more densely populated are likely to have a greater total number of entrepreneurs. However, areas that have a lower density population are likely to have greater levels of entrepreneurial breadth. Population density in a particular county is more likely to lead to biased inferences regarding entrepreneurship measures due to the relationship with population.

There are also limitations regarding digital talent and the infrastructure that supports digital talent. Levels of broadband provided by the FCC as well as the ACS survey rely largely on self-reported data. The FCC data allows broadband providers to self-report levels of coverage in the counties that serve. The ACS dataset, while likely more accurate than the FCC, also relies on self-reported data from household respondents. STEM talent is an indicator of the presence of a digital economy. This measure can be a limitation as it is a lagging measure. In some professions, it may take four or more years to develop and employ someone in a STEM related career.

Measures of amenities used in the study were limited to two county-level variables: outdoor amenities, provided through the USDA Atlas Rural and Small Town America, and the presence of breweries. There are many other amenities that may impact an entrepreneurial or creative culture such as a vibrant arts and cultural presence, bike trails, museums, theater, music, or other performing arts, and other “place-based” initiatives factors could impact levels of entrepreneurship that may not be measured at the county level (Audretsch et al., 2019).

The final limitation of this study is the challenge of identifying regional factors that may influence levels of entrepreneurship and digital economies. Studying geographic areas, such as the Heartland region and the centrally adjacent four-state area within the region, creates a potential selectivity issue for studying results and the generalizability of the data since the states and their counties included in this study were not randomly assigned.

A section of the Heartland region was chosen due to the lack of research available in the literature and shared economic infrastructure and boundaries. However, even within the Heartland region there are additional subculture regions such as the Ozarks in southwest Missouri, northeast Oklahoma, and northwest Arkansas. Large sections of Kansas are divided into various plains such as the Till Plains in the northeast, the Osage Plains that spans into Missouri, and the Flint Hills to the mid-section of Kansas and the Great Plains to the west. Finally, portions of southeast Arkansas are influenced by the Delta region. Subcultures within these regions may limit inferences that could be made regarding the broader Heartland region.

External validity is the inference of the causal relationships that can be generalized to different measures, persons, settings, and times (Cook & Campbell, 1976), and one of the largest considerations of external validity is the population group of the study. Limitations such as the ability to accurately identify comprehensive measures of entrepreneurship, digital talent, and amenities, the moderating impact of population, and contextual factors within subsets of the broader Heartland region may prevent or limit the external validity of the findings in this study.

Loewenstein (1999) described internal validity as the extent to which a research instrument accurately measures all aspects of a construct and draws confident, causal conclusions from the research. While all questions had statistically significant results, there is moderate internal validity in measures of entrepreneurial breadth and digital talent. The regression model explained 42% of the variance in entrepreneurial breadth, though later analysis found the measure of entrepreneurial breadth was highly correlated with population. The relationship between digital talent and broadband provided a moderate, positive statistically significant correlation while the relationship between digital talent and entrepreneurial breadth resulted in a significant inverse relationship. While these results do not illuminate broad evidence of factors that contributed to entrepreneurship and digital talent in the rural Heartland, they do provide incremental external validity that can serve future research efforts.

There are ethical considerations for those who may use findings within this research. While the population sample and collection were, to an extent, mitigated by the nature of the aggregated publicly available data, findings in this study used out of context could present ethical challenges. Given the finding that amenities negatively predicted entrepreneurial breadth, rural policymakers may contend efforts in community development and amenities do not provide a worthwhile return on investment. Similarly, this study found broadband is negatively associated with entrepreneurial breadth and also found a significant, negative correlation between entrepreneurial breadth and digital talent. Without context regarding the moderating effect, population has on entrepreneurial breadth, these findings could be used by researchers to suggest investments in entrepreneurship and digital talent in rural areas are bad investments.

Research Recommendations

While there were several limitations within the study, the ultimate goal of developing a better understanding of factors associated with entrepreneurship and digital talent, in rural or mixed rural areas in the rural Heartland was achieved. Additionally, the findings within this study as well as some limitations illuminate research recommendations for future studies.

The first recommendation is to replicate the regression model but explore factors that can predict entrepreneurial depth. Entrepreneurial depth is a measure of earnings and GDP, or the economic contributions of entrepreneurs (Low et al., 2005; Mojica, 2009). This research would allow policymakers in the rural Heartland to understand factors that contribute to the development of high-value firms in rural areas. Examining the relationship with entrepreneurial depth with digital talent could also provide insight into the economic contributions of the digital economy in the Heartland region.

Another recommendation for future research is to examine factors that could be leading indicators of digital talent. Current measures that rely on employment data from the Bureau of Labor Statistics as well as federal education for formal degrees or certificates from higher learning institutions, such as data from Integrated Postsecondary Education Data System (IPEDS). Data from IPEDS is a lag measure and does not provide insights into factors that could influence the potential of digital talent in rural areas. State standardized math or science scores, cultural attitudes towards careers related to the digital economy, an examination of K-12 education policy related to digital skill development, or early digital education programs like Microsoft’s TEALS program may provide leading indicators related to digital talent.

The regression model in this study was able to identify factors that explain over 40% of the variance in entrepreneurial breadth. While the regression model accounts for a significant portion of the variance among factors that influence entrepreneurial breadth, clearly there are missing variables that could better inform rural economic policy related to entrepreneurship. Muñoz and Kimmitt (2019) believe local conditions can inform the understanding of entrepreneurship in a community and Wennberg et al. (2013) evaluated how culture affects entrepreneurship. An examination of cultural factors in the Heartland region may add predictive validity to future regression models that build on this study.

As mentioned in the limitations, subcultures within smaller regions inside the Heartland region may provide additional insights into regional differences. Factors that influence levels or the economic impact of entrepreneurship or the digital economy may be different in the Ozarks compared to the Delta region of eastern Arkansas or other cultural and geographic regions within the four states examined in this study.

Finally, future studies may want to design research studies that control for the influence of population on factors related to rural entrepreneurship and digital economies. While rural implies less-populated areas, the lack of a clear, agreed-upon definition of rural creates a wide variation of population among rural counties. As noted in this study, population appears to influence measures of entrepreneurial breadth as well as digital talent. An examination of less populated counties with higher levels of broadband and levels of digital talent and entrepreneurship could also illuminate future studies.

Conclusion

This study furthers understanding of factors associated with entrepreneurship and digital economies and adds value to economic regional studies in the rural Heartland region. The findings in this study contribute to the literature by providing a statistically significant model of factors that may predict entrepreneurial breadth as well as factors that are associated with digital talent in the Heartland region among rural counties in Missouri, Arkansas, Kansas, and Oklahoma.

Rural policymakers and researchers can use the findings in this study to develop a better understanding of factors that may lead to economic growth through entrepreneurship and digital talent in the rural Heartland. Researchers can explore how findings in this study compare or contrast to other rural Midwestern and southern regions that have been widely researched throughout the literature such as the Appalachian or Delta regions.

Rural, manufacturing economies will increasingly be disrupted by automation, AI, and machine learning. Rural leaders in public education, private business, and government at all levels should diligently explore how entrepreneurship, broadband infrastructure, and digital talent can be leveraged to develop policy, tools, and resources to create more vibrant and resilient rural economies.

References

Acs, Z. J., Audretsch, D. B., Braunerhjelm, P., & Carlsson, B. (2012). Growth and entrepreneurship. *Small Business Economics, 39*(2), 289-300.

Acs, Z. J., Estrin, S., Mickiewicz, T., & Szerb, L. (2018). Entrepreneurship, institutional economics, and economic growth: an ecosystem perspective. *Small Business Economics, 51*(2), 501-514.

Ahmad, N., & Seymour, R.G. (2008). *Defining entrepreneurial activity: Definitions supporting frameworks for data collection*. OECD Statistics Working Papers. OECD Publishing.

Artz, G. M., Kim, Y., & Orazem, P. F. (2016). Does agglomeration matter everywhere?: New firm location decisions in rural and urban markets. *Journal of Regional Science, 56*(1), 72-95.

Atasoy, H. (2013). The effects of broadband internet expansion on labor market outcomes. *ILR Review, 66*(2), 315-345.

Atkinson, J. K. (2007). Potential solutions to rural broadband Internet deployment. CIS Faculty Publications, 1.

Audretsch, D. B., Lehmann, E. E., & Seitz, N. (2019). Amenities, subcultures, and entrepreneurship. *Small Business Economics*, 1-21.

Audretsch, D. B., Obschonka, M., Gosling, S. D., & Potter, J. (2017). A new perspective on entrepreneurial regions: linking cultural identity with latent and manifest entrepreneurship. *Small Business Economics, 48*(3), 681-697.

Babbie, E. R. (2015). *The practice of social research*. Cengage learning.

Bandura, A. (1997). *Self-Efficacy: The exercise of control*. W.H. Freeman.

Baniasadi, N., Sadegh, E., & Ahmad, K. (2013). Factors influencing the development of rural entrepreneurship: A case study of Iran. *Advances in Environmental Biology, 7(*8), 1930-1936.

Barajas, J. M., Boeing, G., & Wartell, J. (2017). Neighborhood change, one pint at a time: The impact of local characteristics on craft breweries. *Untapped: Exploring the cultural dimensions of craft beer,* 155-176.

Barefoot, K., Curtis, D., Jolliff, W., Nicholson, J. R., & Omohundro, R. (2018). Defining and measuring the digital economy. *US Department of Commerce Bureau of Economic Analysis*, Washington, DC, 15.

Beaulieu, L. J. (2002). *Creating vibrant communities & economies in rural America*.

Belson, N. A. (2020, January 7). *Promoting rural entrepreneurship and rural economic development* . Third way. https://www.thirdway.org/report/promoting-rural-entrepreneurship-and-rural-economic-development.

Bjørnskov, C., & Foss, N. J. (2016). Institutions, entrepreneurship, and economic growth: What do we know and what do we still need to know?. *Academy of Management Perspectives, 30*(3), 292-315.

Blinder, A. S., & Krueger, A. B. (2013). Alternative measures of offshorability: A survey approach. *Journal of Labor Economics, 31*(S1), S97-S128.

Bosak, J., & Perlman, B. (1982). A review of the definition of rural. *Journal of Rural Community Psychology, 3*(1), 3-34.

Bourdieu, P. (1990). Structures, habitus, practices. *The Logic of Practice*. Stanford University Press, 52-65.

Braunerhjelm, P., Acs, Z. J., Audretsch, D. B., & Carlsson, B. (2010). The missing link: Knowledge diffusion and entrepreneurship in endogenous growth. *Small Business Economics, 34*(2), 105-125.

Breazeale, N., Fortunato, M. W. P., Allen IV, J. E., Hustedde, R. J., & Pushkarskaya, H. (2015). Constructing a multi-dimensional measure of local entrepreneurial culture. *Community Development*, *46*(5), 516-540.

Bukht, R., & Heeks, R. (2017). *Measuring the Digital Economy* (No. 68). Working Paper.

Chart Book. (2019, June 6). *The legacy of the great recession*. https://www.cbpp.org/research/economy/chart-book-the-legacy-of-the-great-recession.

Bureau of Economic Analysis. (n.d.). Personal income by county and metropolitan area, 2019. https://www.bea.gov/news/2020/personal-income-county-and-metropolitan-area-2019

Center on Rural Innovation. (n.d.). Tech talent tracker. https://ruralinnovation.us/post/tech-talent-tracker/.

Changyong, F., Hongyue, W., Naiji, L., Tian, C., Hua, H., & Ying,. (2014). *Log-transformation and its implications for data analysis*. Shanghai archives of psychiatry, 26(2), 105.

Chen, C. C., Greene, P. G., & Crick, A. (1998). Does entrepreneurial self-efficacy distinguish entrepreneurs from managers?. *Journal of Business Venturing*, *13*(4), 295-316.

Clark, T. N. (2011). Urban amenities: Lakes, opera, and juice bars – Do they drive development? In T. N. Clark (Ed.), *The city as an entertainment machine* (pp. 97–134). Plymouth: Lexington Books.

Conley, K. (2013). *Does broadband matter for rural entrepreneurs or creative class employees*? [Master's thesis, Oklahoma State University].

Cook, T. D., & Campbell, D. T. (1979). The design and conduct of true experiments and quasi-experiments in field settings. *In Reproduced in part in Research in Organizations: Issues and Controversies. Goodyear Publishing Company*.

Cook Marshall, C., McKinney, L., Moles, J., Emrich, D., Edwards, S., & McCormick, D. (2017, March 9-12). *Reinventing Appalachia: Five community and social entrepreneurship models* [Conference presentation]. Appalachian Studies Association Annual Conference 2017, Blacksburg, Virginia.

Corty, EW. (2007). *Using and interpreting statistics: A practical text for the health, behavioral, and social sciences*. Mosby.

Cowan, T. (2016). *An overview of USDA rural development programs*. February 10, 2016, Retrieved from: Congressional Research Digital Collection: https://fas.org/sgp/crs/misc/RL31837.pdf

Creswell, J. W., & Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches*. (5th ed.). Sage Publications.

Dabson, B. (2001). *Supporting rural entrepreneurship. Exploring policy options for a new rural America*. Proceedings of a conference sponsored by Federal Reserve Bank of Kansas City, Center for the Study of Rural America, pp. 35-48.

Deller, S., Kures, M., & Conroy, T. (2019). Rural entrepreneurship and migration. *Journal of Rural Studies*, *66*, 30-42.

Dickes, L. A., Lamie, R. D., & Whitacre, B. E. (2010). The struggle for broadband in rural America. *Choices, 25*(316-2016-7507), 1-8.

Dingel, J. I., & Neiman, B. (2020). *How many jobs can be done at home*? (No. w26948). National Bureau of Economic Research.

Drabenstott, M. R., & Moore, S. (2010). *Past silos and smokestacks: Transforming the rural economy in the Midwest*. The Chicago Council on Global Affairs. https://www.thechicagocouncil.org/sites/default/files/Heartland%20Paper%20-%20Rural%20Development%2010.pdf

Duranton, G., & Puga, D. (2014). The growth of cities. In *Handbook of economic growth* (Vol. 2, pp. 781-853). Elsevier.

Economic Research Service. (2014*). Rural Poverty and Well-being*. http://ers.usda.gov/topics/rural-economy-population/rural-poverty-wellbeing/income.aspx

Economy: Definition in the Cambridge English Dictionary. (n.d.). Retrieved August 01, 2020, from https://dictionary.cambridge.org/us/dictionary/english/economy

Fairlie, R. W., & Lofstrom, M. (2015). Immigration and entrepreneurship. In *Handbook of the economics of international migration* (Vol. 1, pp. 877-911). North-Holland.

Fairlie, R. W., Morelix, A., & Tareque, I. (2017). *2017 Kauffman Index of Startup Activity: National Trend*s.

Feldman, M., Hadjimichael, T., Lanahan, L., & Kemeny, T. (2016). The logic of economic development: A definition and model for investment. *Environment and Planning C: Government and Policy, 34*(1), 5-21.

Figueroa-Armijos, M., Dabson, B., & Johnson, T. G. (2012). Rural entrepreneurship in a time of recession. *Entrepreneurship Research Journal, 2*(1).

Florida, R. (2014). *The rise of the creative class--revisited*: *Revised and expanded*. Basic Books (AZ).

Fortunato, M. P. (2014). Rural entrepreneurship matters, but why. *Texas Town & City*.

Fortunato, M. P., Bridger, J. C., Alter, T. R., Emmerling, G. M., Ortbal, K. J., Schwartz, M., ... & Shuffstall, W. (2013). Promoting fair local organizing for broadband delivery: Suggestions for community-level action in persistently underserved communities. *Journal of Information Policy*, *3*, 158-180.

Fortunato, M. W., & McLaughlin, D. K. (2012). Interaction and purpose in highly entrepreneurial communities. *Entrepreneurship Research Journal*, 2(1).

Funk, C. (2019, January 24). *How to instill an entrepreneurial mindset district-wide*. E School News. https://www.eschoolnews.com/2019/01/21/how-to-instill-an-entrepreneurial-mindset-district-wide/.

Gladwin, C. H., Long, B. F., Babb, E. M., Beaulieu, L. J., Moseley, A., Mulkey, D., & Zimet, D. J. (1989). Rural entrepreneurship: one key to rural revitalization. *American Journal of Agricultural Economics*, *71*(5), 1305-1314.

Glaeser, E. L. (2007). Entrepreneurship and the city (No. w13551). *National Bureau of Economic Research*.

Glaeser, E. L., & Gottlieb, J. D. (2008). The economics of place-making policies (No. w14373). *National Bureau of Economic Research*.

Goetz, S. J., Partridge, M., Deller, S. C., & Fleming, D. A. (2010). Evaluating US rural entrepreneurship policy. *Journal of Regional Analysis & Policy*, *40*(1), 20-33.

Goetz, S. J., & Rupasingha, A. (2014). The determinants of self-employment growth: Insights from county-level data, 2000-2009. *Economic Development Quarterly*, *28*(1), 42-60.

Goldfarb, A., & Prince, J. (2008). Internet adoption and usage patterns are different: Implications for the digital divide. *Information Economics and Policy*, *20*(1), 2-15.

Graydon, M., & Parks, L. (2020). Connecting the unconnected: A critical assessment of US satellite Internet services. *Media, Culture & Society*, *42*(2), 260-276.

Greenstein, S., & McDevitt, R. C. (2011). The broadband bonus: Estimating broadband Internet's economic value. *Telecommunications Policy*, *35*(7), 617-632.

Guion, R. M. (2011). *Assessment, measurement, and prediction for personnel decisions*. Taylor & Francis.

Gustavsson, M., & Ljungberg, J. (2018). *Entrepreneurship in the digital society*. [Conference presentation]. Thirty-ninth International Conference on Information Systems, San Francisco, California, United States.

Hadlock, H., Wells, S., Hall, J., Clifford, J., Winowich, N., & Burns, J. (2008). *From practice to entrepreneurship: rethinking the learning factory approach*. In Proceedings of the 2008 IAJC-LJME International Conference ISBN (pp. 978-1).

Haltiwanger, J., Jarmin, R. S., & Miranda, J. (2013). Who creates jobs? Small versus large versus young. *Review of Economics and Statistics, 95*(2), 347-361.

Hartley, D. (2004). Rural health disparities, population health, and rural culture. *American Journal of Public Health, 94*(10), 1675-1678.

Hassebrook, C. (2003). Strategies to revitalize rural America. *Center for Rural Affairs*, 1-25.

He, X. (2019). Digital entrepreneurship solution to rural poverty: Theory, practice and policy implications. *Journal of Developmental Entrepreneurship*, *24(*01), 1950004.

Henry, C., Hill, F., & Leitch, C. (2005). Entrepreneurship education and training: can entrepreneurship be taught? Part I. *Education & Training*.

Holder, S. (2020, February 28). *The great Tulsa remote worker experimen*t. Bloomberg.com. https://www.bloomberg.com/news/features/2020-02-28/the-great-tulsa-remote-worker-experiment.

Hoogstra, G. J., & van Dijk, J. (2004). Explaining firm employment growth: does location matter?. *Small Business Economics, 22*(3-4), 179-192.

Howell, D.C. (2007). *Statistical methods for psychology* (6^{th} ed.). Belmont, CA: Thompson Wadsworth.

Ibe, N. A., Howsmon, R., Penney, L., Granor, N., DeLyser, L. A., & Wang, K. (2018, February). Reflections of a diversity, equity, and inclusion working group based on data from a national CS education program. In *Proceedings of the 49th ACM Technical Symposium on Computer Science Education* (pp. 711-716).

Illinois Innovation Index: 2018 Talent Index (Rep.). (2018). Illinois: Illinois Science and Technology Coalition. doi:https://www.istcoalition.org/wp-content/uploads/Talent-Index-Methodology-2018.pdf

International Commission on Financing Global Education Opportunity. (2016). The learning generation: Investing in education for a changing world. New York: *International Commission on Financing Global Education Opportunity*.

Isserman, A.M. (2005). In the national interest: defining rural and urban correctly in research and public policy. *International Regional Science Review 28(*4), 465–99.

Joo, H. (2011). *Comparative analysis of rural and urban start-up entrepreneurs* [Unpublished master's thesis, University of Kentucky].

Kaziukenas, J. (2020, February 05). *15,000 American Sellers on Amazon Exceeded $1 Million*. Marketplace pulse. https://www.marketplacepulse.com/articles/15000-american-sellers-on-amazon-exceeded-1-million

Kim, K. K., Marcouiller, D. W., & Deller, S. C. (2005). Natural amenities and rural development: understanding spatial and distributional attributes. *Growth and change*, *36*(2), 273-297.

Kirner, I.M. (1985). *Discovery and the capitalist process*. University of Chicago Press.

Kolko, J. (2010). *Does broadband boost local economic development*?. San Francisco, CA: Public Policy Institute of California.

Kolko, J. (2012). Broadband and local growth. *Journal of Urban Economics*, *71*(1), 100-113.

Kusmin, P. by L. (2017, February 21). *Rural America in the post-recession years*. https://www.usda.gov/media/blog/2015/12/08/rural-america-post-recession-years

Loewenstein, G. (1999). Experimental economics from the vantage-point of behavioural economics. *The Economic Journal*, 109(453), F25-F34.

Low, S. (2004). Regional asset indicators: entrepreneurship breadth and depth. *Main Street Economist*, (Sep).

Low, S., Henderson, J., & Weiler, S. (2005). Gauging a region's entrepreneurial potential. *Economic Review-Federal Reserve Bank of Kansas City*, *90(*3), 61.

Mack, E. A., Anselin, L., & Grubesic, T. H. (2011). The importance of broadband provision to knowledge intensive firm location. *Regional Science Policy & Practice*, *3*(1), 17-35.

Martin, M. S. (2010). The FCC's national broadband plan. *The Business Lawyer*, 255-260.

May, J., Dutton, V., & Munyakazi, L. (2011, October). Information and communication technologies as an escape from poverty traps: Evidence from East Africa. In *International Conference on New Evidence on Poverty Traps*, Paris (pp. 6-7).

Manyika, J., Lund, S., Chui, M., Bughin, J., Woetzel, J., Batra, P., & Sanghvi, S. (2017, November). *Jobs lost, jobs gained: What the future of work will mean for jobs, skills, and wages.* McKenzie & Company. https://www.mckinsey.com/featured-insights/future-of-work/jobs-lost-jobs-gained-what-the-future-of-work-will-mean-for-jobs-skills-and-wages

McCarthy, L. (2018). Should state and local government bidding for big businesses be more like eBay?. *Growth and Change*, *49(*3), 400-412.

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.

Minges, M. (2015). Exploring the relationship between broadband and economic growth. *World Development Report, 2016.*

Mojica, M. (2009). *Examining the role of entrepreneurship in economic development in Appalachia* [Doctoral dissertation, West Virginia University].

Morgan, J. Q., Lambe, W., & Freyer, A. (2009). Homegrown responses to economic uncertainty in rural America. *Rural Realities, 3*(2), 1-15.

Morin, T., & Partridge, M. (2019). The Economic Impact of Small Regional Commissions: Evidence from the Delta Regional Authority.

Muñoz, P., & Kimmitt, J. (2019). Rural entrepreneurship in place: An integrated framework. *Entrepreneurship & Regional Development, 31*(9-10), 842-873.

Muro, M., Whiton, J., Maxim, R., & DeVol, R. (2018, October). *The state of the heartland factbook 2018*. https://www.brookings.edu/wp-content/uploads/2018/10/Heartland_Factbook_2018_Full_Report.pdf.

Nevins, A. (1962). *The origins of the land-grant colleges and state universities: A brief account of the Morrill Act of 1862 and its results*. Civil War Centennial Commission.

Nooteboom, B. & Stam, E. (2008). *Micro-foundations for innovation policy*. Amsterdam University Press.

Norusis, M.J. (1994). *SPSS 6.1 base system user's guide, part 2*. Chicago, Il: SPSS Inc.

Pages, E. R. (2018). Igniting rural entrepreneurship: Where do workforce development programs fit in?. In S. Andreason (Ed.). *Investing in America's workforce: Improving outcomes for workers and employers*. (213-225). W.E. Upjohn Institute for Employment Research.

Pender, J., & Reeder, R. (2011). *Impacts of Regional Approaches to Rural Development: Initial Evidence on the Delta Regional Authority* (No. 1477-2017-4006).

Prieger, J. E. (2013). The broadband digital divide and the economic benefits of mobile broadband for rural areas. *Telecommunications Policy*, *37*(6-7), 483-502.

Puga, D. (2010). The magnitude and causes of agglomeration economies. *Journal of Regional Science*, *50*(1), 203-219.

Rencher, A. C., & Schaalje, G. B. (2008). *Linear models in statistics*. John Wiley & Sons.

Roberts, J. L. (2010). Talent Development in STEM Disciplines: Diversity--Cast a Wide Net. *NCSSSMST Journal*, *16*(1), 10-12.

Robinson, K. L., Abrokwah, E., Liang, I., Sanders, S., Wang, M., & McNeil, K. (2011). The Arkansas Delta produce marketing association: rural entrepreneurship in the US delta region. *The handbook of research on entrepreneurship in agriculture and rural development*. Cheltenham: Edward Elgar, 180-198.

Roosevelt, F. D. (1941*). The Four Freedoms*: Address to 77th United States Congress. American Rhetoric.https://www.americanrhetoric.com/speeches/PDFFiles/FDR%20-%20Four%20Freedoms.pdf

Salemink, K., Strijker, D., & Bosworth, G. (2017). Rural development in the digital age: A systematic literature review on unequal ICT availability, adoption, and use in rural areas. *Journal of Rural Studies, 54*, 360-371.

Savage, S. J., & Waldman, D. M., (2010). Broadband Internet access, awareness, and use: Analysis of United States household data. *Telecommunications Policy, 29*(8), 615-633. doi: 10.1016/j.telpol.2005.06.001. ISSN: 0308-5961.

Schramm, C. J. (2004). Building entrepreneurial economies. *Foreign Affairs*, 104-115.

Sebora, T. C., Lee, S. M., & Sukasame, N. (2009). Critical success factors for e-commerce entrepreneurship: an empirical study of Thailand. *Small Business Economics, 32*(3), 303-316.

Sharp, J. S., Agnitsch, K., Ryan, V., & Flora, J. (2002). Social infrastructure and community economic development strategies: The case of self-development and industrial recruitment in rural Iowa. *Journal of Rural Studies, 18*(4), 405-417.

Snow, D., & Prater, J. (2018). Entrepreneurship elsewhere: Examining the entrepreneurial characteristics of eastern Kentucky adolescents. *Small Business Institute Journal, 13*(2), 1-14.

Sobel, R. S., Dutta, N., & Roy, S. (2010). Does cultural diversity increase the rate of entrepreneurship?. *The Review of Austrian Economics, 23*(3), 269-286.

Sorenson, O. (2018). Social networks and the geography of entrepreneurship. *Small Business Economics, 51*(3), 527-537.

Spigel, B. (2013). Bourdiean approaches to the geography of entrepreneurial culture. *Entrepreneurship & Regional Development*, 25:9-10, 804-818.

Stam, F. C., & Spigel, B. (2016). *Entrepreneurial Ecosystems*. USE Discussion paper series, *16*(13).

Stankic, R., Jovanovic-Gavrilovic, B., & Soldic-Aleksic, J. (2018). Information and communication technologies in education as a stimulus to economic development. *Economic Horizons*, *20*(1), 61-73.

Stern, M. J., & Adams, A. E. (2010). Do rural residents really use the internet to build social capital? An empirical investigation. *American Behavioral Scientist, 53*(9), 1389-1422.

Stevens, J. (2002). *Applied multivariate statistics for the social sciences* (4th ed.). Mahwah, NJ: Lawrence Erlbaum Associates, Publishers.

Stolarick, K. M., Denstedt, M., Donald, B., & Spencer, G. M. (2011). Creativity, tourism and economic development in a rural context: The case of Prince Edward County. *Journal of Rural and Community Development*, *5*(1).

Strange, M. (1996). Transforming the rot belt: Sustainable rural communities. *Northwest Report*, *19*, 16-21.

Stringer, K. (2019, June 07). *How the tech industry created a teaching corps for rural schools*. https://www.fastcompany.com/90361450/how-the-tech-industry-created-a-teaching-corps-for-rural-schools

Stuetzer, M., Audretsch, D. B., Obschonka, M., Gosling, S. D., Rentfrow, P. J., & Potter, J. (2018). Entrepreneurship culture, knowledge spillovers and the growth of regions. *Regional Studies*, *52*(5), 608-618.

Studdard, N. L., Dawson, M., & Jackson, N. L. (2013). Fostering entrepreneurship and building entrepreneurial self-efficacy in primary and secondary education. *Creative and Knowledge Society*, 3(2), 1-14.

Sutton, S. A. (2010). Rethinking commercial revitalization: A neighborhood small business perspective. *Economic Development Quarterly*, *24*(4), 352-371.

Tabachnick, B. G., Fidell, L. S., & Ullman, J. B. (2007). *Using multivariate statistics* (Vol. 5, pp. 481-498). Boston, MA: Pearson.

Tajuddin, R. (2011). *Social capital and rural community self- development: Understanding community satisfaction and its impact on entrepreneurial climate and community outcomes.* [Unpublished doctoral dissertation, Iowa State University].

Thiede, B. C., Lichter, D. T., & Slack, T. (2018). Working, but poor: The good life in rural America?. *Journal of Rural Studies*, *59*, 183-193.

Thompson Jr, H. G., & Garbacz, C. (2011). Economic impacts of mobile versus fixed broadband. *Telecommunications Policy*, *35*(11), 999-1009.

Tickamyer, A. R., & Tickamyer, C. (1987). Gender, family structure, and poverty in central Appalachia. In *Proceedings of the Conference on Land and Economy in Appalachia. Appalachian Center: University of Kentucky* (pp. 80-90).

US Census Bureau. (2020, September 21). *Understanding and Using ACS Data: What All Data Users Need to Know*. https://www.census.gov/programs surveys/acs/guidance/handbooks/general.html.

US Chamber Technology Engagement Center. (2019). *Unlocking the digital potential of rural America*. https://americaninnovators.com/wp-content/uploads/2019/03/Unlocking-the-Digital-Potential-of-Rural-America.pdf

US Interagency Steering Group (2016) *The global connect initiative: Accelerating entrepreneurship and economic opportunity by expanding Internet access globally*. U.S. Interagency Steering Group. https://staticshare.america.gov/uploads/2017/01/ Final-version-of-the-GCI-Report-2016-01-115PM.pdf

Wennberg, K., Pathak, S., & Autio, E. (2013). How culture moulds the effects of self-efficacy and fear of failure on entrepreneurship. *Entrepreneurship & Regional Development*, *25*(9-10), 756-780.

Whitacre, B., Gallardo, R., & Strover, S. (2014). Does rural broadband impact jobs and income? Evidence from spatial and first-differenced regressions. *The Annals of Regional Science*, *53(*3), 649-670.

Whitacre, B. & Manlove, J. (2016). Broadband and civic engagement in rural areas: What matters?. *Community Development*, *47*(5), 700-717.

Wiśniowski, A., Sakshaug, J. W., Perez Ruiz, D. A., & Blom, A. G. (2020). Integrating probability and nonprobability samples for survey inference. *Journal of Survey Statistics and Methodology*, *8*(1), 120-147.

Wolf, M. (2007). Bourdieu's rules of the game: An introspection into methodological questions of translation sociology. *Matraga, 14*(20), 130-141.

Xue, J. (2007). *Three essays on entrepreneurship: theory, measurement, and environment* [Doctoral dissertation, University of Missouri—Columbia].

Zacharis, A.L., William, D.B., & Shepherd, D.A. (2000). Global entrepreneurship monitor: National entrepreneurship assessment, United States, 2000 executive report. *Kauffman Center for Entrepreneurial Leadership at the Ewing Marion Kauffman Foundation*.

Zhao, H., Seibert, S. E., & Hills, G. E. (2005). The mediating role of self-efficacy in the development of entrepreneurial intentions. *Journal of Applied Psychology*, *90*(6), 1265.

Appendix A

Heartland Region Rural Population Classification based on 2010 United States Census

FIPS	State	County	Total Population	Rural Population	Percent Rural	Population Per Sq Mile
05001	AR	Arkansas	19019	6601	34.7	19
05003	AR	Ashley	21853	11294	51.7	24
05005	AR	Baxter	41513	27333	65.8	75
05007	AR	Benton	221339	55689	25.2	261
05009	AR	Boone	36903	22953	62.2	63
05011	AR	Bradley	11508	5707	49.6	18
05013	AR	Calhoun	5368	5368	100.0	9
05015	AR	Carroll	27446	19990	72.8	44
05017	AR	Chicot	11800	6405	54.3	18
05019	AR	Clark	22995	12504	54.4	27
05021	AR	Clay	16083	9466	58.9	25

FIPS	State	County	Total Population	Rural Population	Percent Rural	Population Per Sq Mile
05023	AR	Cleburne	25970	19613	75.5	47
05025	AR	Cleveland	8689	8689	100.0	15
05027	AR	Columbia	24552	14114	57.5	32
05029	AR	Conway	21273	15001	70.5	39
05031	AR	Craighead	96443	31024	32.2	136
05033	AR	Crawford	61948	32189	52.0	104
05035	AR	Crittenden	50902	10632	20.9	83
05037	AR	Cross	17870	10148	56.8	29
05039	AR	Dallas	8116	4272	52.6	12
05041	AR	Desha	13008	4087	31.4	17
05043	AR	Drew	18509	8997	48.6	22
05045	AR	Faulkner	113237	43891	38.8	175
05047	AR	Franklin	18125	14972	82.6	30
05049	AR	Fulton	12245	11378	92.9	20
05051	AR	Garland	96024	35436	36.9	142

FIPS	State	County	Total Population	Rural Population	Percent Rural	Population Per Sq Mile
05053	AR	Grant	17853	13395	75.0	28
05055	AR	Greene	42090	17470	41.5	73
05057	AR	Hempstead	22609	12609	55.8	31
05059	AR	Hot Spring	32923	21719	66.0	54
05061	AR	Howard	13789	9310	67.5	23
05063	AR	Independence	36647	25134	68.6	48
05065	AR	Izard	13696	13696	100.0	24
05067	AR	Jackson	17997	11709	65.1	28
05069	AR	Jefferson	77435	23940	30.9	89
05071	AR	Johnson	25540	18227	71.4	39
05073	AR	Lafayette	7645	7645	100.0	14
05075	AR	Lawrence	17415	11069	63.6	30
05077	AR	Lee	10424	6620	63.5	17
05079	AR	Lincoln	14134	14134	100.0	25
05081	AR	Little River	13171	9025	68.5	25

FIPS	State	County	Total Population	Rural Population	Percent Rural	Population Per Sq Mile
05083	AR	Logan	22353	15875	71.0	32
05085	AR	Lonoke	68356	30632	44.8	89
05087	AR	Madison	15717	15717	100.0	19
05089	AR	Marion	16653	16653	100.0	28
05091	AR	Miller	43462	17390	40.0	69
05093	AR	Mississippi	46480	16857	36.3	52
05095	AR	Monroe	8149	5621	69.0	13
05097	AR	Montgomery	9487	9487	100.0	12
05099	AR	Nevada	8997	6224	69.2	15
05101	AR	Newton	8330	8330	100.0	10
05103	AR	Ouachita	26121	14719	56.3	36
05105	AR	Perry	10445	10445	100.0	19
05107	AR	Phillips	21757	10436	48.0	31
05109	AR	Pike	11291	11291	100.0	19
05111	AR	Poinsett	24583	17488	71.1	32

FIPS	State	County	Total Population	Rural Population	Percent Rural	Population Per Sq Mile
05113	AR	Polk	20662	15163	73.4	24
05115	AR	Pope	61754	33652	54.5	76
05117	AR	Prairie	8715	8715	100.0	13
05121	AR	Randolph	17969	12115	67.4	28
05123	AR	St. Francis	28258	14568	51.6	45
05125	AR	Saline	107118	38734	36.2	148
05127	AR	Scott	11233	7903	70.4	13
05129	AR	Searcy	8195	8195	100.0	12
05131	AR	Sebastian	125744	26170	20.8	236
05133	AR	Sevier	17058	10849	63.6	30
05135	AR	Sharp	17264	13821	80.1	29
05137	AR	Stone	12394	12394	100.0	20
05139	AR	Union	41639	22695	54.5	40
05141	AR	Van Buren	17295	17295	100.0	24
05143	AR	Washington	203065	51771	25.5	216

FIPS	State	County	Total Population	Rural Population	Percent Rural	Population Per Sq Mile
05145	AR	White	77076	41866	54.3	74
05147	AR	Woodruff	7260	7260	100.0	12
05149	AR	Yell	22185	17554	79.1	24
20001	KS	Allen	13371	7642	57.2	27
20003	KS	Anderson	8102	4766	58.8	14
20005	KS	Atchison	16924	5780	34.2	39
20007	KS	Barber	4861	4861	100.0	4
20009	KS	Barton	27674	8788	31.8	31
20011	KS	Bourbon	15173	7278	48.0	24
20013	KS	Brown	9984	6833	68.4	17
20015	KS	Butler	65880	26664	40.5	46
20017	KS	Chase	2790	2790	100.0	4
20019	KS	Chautauqua	3669	3669	100.0	6
20021	KS	Cherokee	21603	10599	49.1	37
20023	KS	Cheyenne	2726	2726	100.0	3

FIPS	State	County	Total Population	Rural Population	Percent Rural	Population Per Sq Mile
20025	KS	Clark	2215	2215	100.0	2
20027	KS	Clay	8535	4228	49.5	13
20029	KS	Cloud	9533	4193	44.0	13
20031	KS	Coffey	8601	6098	70.9	14
20033	KS	Comanche	1891	1891	100.0	2
20035	KS	Cowley	36311	11256	31.0	32
20037	KS	Crawford	39134	13669	34.9	66
20039	KS	Decatur	2961	2961	100.0	3
20041	KS	Dickinson	19754	12700	64.3	23
20043	KS	Doniphan	7945	5577	70.2	20
20045	KS	Douglas	110826	12205	11.0	243
20047	KS	Edwards	3037	3037	100.0	5
20049	KS	Elk	2882	2882	100.0	4
20051	KS	Ellis	28452	7272	25.6	32
20053	KS	Ellsworth	6497	3515	54.1	9

FIPS	State	County	Total Population	Rural Population	Percent Rural	Population Per Sq Mile
20055	KS	Finney	36776	6834	18.6	28
20057	KS	Ford	33848	6532	19.3	31
20059	KS	Franklin	25992	13542	52.1	45
20061	KS	Geary	34362	4011	11.7	89
20063	KS	Gove	2695	2695	100.0	3
20065	KS	Graham	2597	2597	100.0	3
20067	KS	Grant	7829	1550	19.8	14
20069	KS	Gray	6006	6006	100.0	7
20071	KS	Greeley	1247	1247	100.0	2
20073	KS	Greenwood	6689	4098	61.3	6
20075	KS	Hamilton	2690	2690	100.0	3
20077	KS	Harper	6034	6034	100.0	8
20079	KS	Harvey	34684	10724	30.9	64
20081	KS	Haskell	4256	4256	100.0	7
20083	KS	Hodgeman	1916	1916	100.0	2

FIPS	State	County	Total Population	Rural Population	Percent Rural	Population Per Sq Mile
20085	KS	Jackson	13462	10217	75.9	21
20087	KS	Jefferson	19126	18900	98.8	36
20089	KS	Jewell	3077	3077	100.0	3
20093	KS	Kearny	3977	3977	100.0	5
20095	KS	Kingman	7858	4880	62.1	9
20097	KS	Kiowa	2553	2553	100.0	4
20099	KS	Labette	21607	11309	52.3	33
20101	KS	Lane	1750	1750	100.0	2
20103	KS	Leavenworth	76227	22154	29.1	165
20105	KS	Lincoln	3241	3241	100.0	5
20107	KS	Linn	9656	9656	100.0	16
20109	KS	Logan	2756	2756	100.0	3
20111	KS	Lyon	33690	8860	26.3	40
20113	KS	McPherson	29180	12692	43.5	32
20115	KS	Marion	12660	9845	77.8	13

FIPS	State	County	Total Population	Rural Population	Percent Rural	Population Per Sq Mile
20117	KS	Marshall	10117	7180	71.0	11
20119	KS	Meade	4575	4575	100.0	5
20121	KS	Miami	32787	16705	51.0	57
20123	KS	Mitchell	6373	3078	48.3	9
20125	KS	Montgomery	35471	15403	43.4	55
20127	KS	Morris	5923	5923	100.0	9
20129	KS	Morton	3233	3233	100.0	4
20131	KS	Nemaha	10178	7658	75.2	14
20133	KS	Neosho	16512	7453	45.1	29
20135	KS	Ness	3107	3107	100.0	3
20137	KS	Norton	5671	2778	49.0	6
20139	KS	Osage	16295	13612	83.5	23
20141	KS	Osborne	3858	3858	100.0	4
20143	KS	Ottawa	6091	6091	100.0	8
20145	KS	Pawnee	6973	2209	31.7	9

FIPS	State	County	Total Population	Rural Population	Percent Rural	Population Per Sq Mile
20147	KS	Phillips	5642	3033	53.8	6
20149	KS	Pottawatomie	21604	12728	58.9	26
20151	KS	Pratt	9656	3110	32.2	13
20153	KS	Rawlins	2519	2519	100.0	2
20155	KS	Reno	64511	20191	31.3	51
20157	KS	Republic	4980	4980	100.0	7
20159	KS	Rice	10083	6431	63.8	14
20161	KS	Riley	71115	9846	13.8	117
20163	KS	Rooks	5181	5181	100.0	6
20165	KS	Rush	3307	3307	100.0	5
20167	KS	Russell	6970	2862	41.1	8
20169	KS	Saline	55606	8113	14.6	77
20171	KS	Scott	4936	1289	26.1	7
20175	KS	Seward	22952	2623	11.4	36
20179	KS	Sheridan	2556	2556	100.0	3

FIPS	State	County	Total Population	Rural Population	Percent Rural	Population Per Sq Mile
20181	KS	Sherman	6010	1457	24.2	6
20183	KS	Smith	3853	3853	100.0	4
20185	KS	Stafford	4437	4437	100.0	6
20187	KS	Stanton	2235	2235	100.0	3
20189	KS	Stevens	5724	1788	31.2	8
20191	KS	Sumner	24132	15168	62.9	20
20193	KS	Thomas	7900	2437	30.8	7
20195	KS	Trego	3001	3001	100.0	3
20197	KS	Wabaunsee	7053	7053	100.0	9
20199	KS	Wallace	1485	1485	100.0	2
20201	KS	Washington	5799	5799	100.0	6
20203	KS	Wichita	2234	2234	100.0	3
20205	KS	Wilson	9409	6839	72.7	16
20207	KS	Woodson	3309	3309	100.0	7
29001	MO	Adair	25607	9693	37.9	45

FIPS	State	County	Total Population	Rural Population	Percent Rural	Population Per Sq Mile
29003	MO	Andrew	17291	10596	61.3	40
29005	MO	Atchison	5685	5685	100.0	10
29007	MO	Audrain	25529	10517	41.2	37
29009	MO	Barry	35597	26080	73.3	46
29011	MO	Barton	12402	7932	64.0	21
29013	MO	Bates	17049	13174	77.3	20
29015	MO	Benton	19056	16491	86.5	27
29017	MO	Bollinger	12363	12363	100.0	20
29019	MO	Boone	162642	30554	18.8	237
29021	MO	Buchanan	89201	11928	13.4	219
29023	MO	Butler	42794	22331	52.2	62
29025	MO	Caldwell	9424	9424	100.0	22
29027	MO	Callaway	44332	27498	62.0	53
29029	MO	Camden	44002	32662	74.2	67
29031	MO	Cape Girardeau	75674	23083	30.5	131

FIPS	State	County	Total Population	Rural Population	Percent Rural	Population Per Sq Mile
29033	MO	Carroll	9295	5999	64.5	13
29035	MO	Carter	6265	6265	100.0	12
29037	MO	Cass	99478	32233	32.4	143
29039	MO	Cedar	13982	10528	75.3	29
29041	MO	Chariton	7831	7831	100.0	10
29043	MO	Christian	77422	34682	44.8	138
29045	MO	Clark	7139	7139	100.0	14
29049	MO	Clinton	20743	15808	76.2	50
29051	MO	Cole	75990	22094	29.1	193
29053	MO	Cooper	17601	9364	53.2	31
29055	MO	Crawford	24696	18104	73.3	33
29057	MO	Dade	7883	7883	100.0	16
29059	MO	Dallas	16777	13746	81.9	31
29061	MO	Daviess	8433	8433	100.0	15
29063	MO	DeKalb	12892	8045	62.4	31

FIPS	State	County	Total Population	Rural Population	Percent Rural	Population Per Sq Mile
29065	MO	Dent	15657	10736	68.6	21
29067	MO	Douglas	13684	10827	79.1	17
29069	MO	Dunklin	31953	16122	50.5	59
29071	MO	Franklin	101492	56428	55.6	110
29073	MO	Gasconade	15222	12310	80.9	29
29075	MO	Gentry	6738	6738	100.0	14
29079	MO	Grundy	10261	4665	45.5	24
29081	MO	Harrison	8957	6305	70.4	12
29083	MO	Henry	22272	11035	49.5	32
29085	MO	Hickory	9627	9627	100.0	24
29087	MO	Holt	4912	4912	100.0	11
29089	MO	Howard	10144	6498	64.1	22
29091	MO	Howell	40400	29158	72.2	44
29093	MO	Iron	10630	7957	74.9	19
29097	MO	Jasper	117404	27815	23.7	184

FIPS	State	County	Total Population	Rural Population	Percent Rural	Population Per Sq Mile
29101	MO	Johnson	52595	26531	50.4	63
29103	MO	Knox	4131	4131	100.0	8
29105	MO	Laclede	35571	21525	60.5	47
29107	MO	Lafayette	33381	19010	56.9	53
29109	MO	Lawrence	38634	22673	58.7	63
29111	MO	Lewis	10211	10211	100.0	20
29113	MO	Lincoln	52566	39335	74.8	84
29115	MO	Linn	12761	8480	66.5	21
29117	MO	Livingston	15195	5562	36.6	29
29119	MO	McDonald	23083	23081	100.0	43
29121	MO	Macon	15566	10552	67.8	19
29123	MO	Madison	12226	8009	65.5	25
29125	MO	Maries	9176	9176	100.0	17
29127	MO	Marion	28781	7128	24.8	66
29129	MO	Mercer	3785	3785	100.0	8

FIPS	State	County	Total Population	Rural Population	Percent Rural	Population Per Sq Mile
29131	MO	Miller	24748	19744	79.8	42
29133	MO	Mississippi	14358	4695	32.7	35
29135	MO	Moniteau	15607	8225	52.7	38
29137	MO	Monroe	8840	8840	100.0	14
29139	MO	Montgomery	12236	9607	78.5	23
29141	MO	Morgan	20565	20565	100.0	34
29143	MO	New Madrid	18956	10779	56.9	28
29145	MO	Newton	58114	37447	64.4	93
29147	MO	Nodaway	23370	10150	43.4	27
29149	MO	Oregon	10881	8763	80.5	14
29151	MO	Osage	13878	13878	100.0	23
29153	MO	Ozark	9723	9723	100.0	13
29155	MO	Pemiscot	18296	9014	49.3	37
29157	MO	Perry	18971	10552	55.6	40
29159	MO	Pettis	42201	15943	37.8	62

FIPS	State	County	Total Population	Rural Population	Percent Rural	Population Per Sq Mile
29161	MO	Phelps	45156	20873	46.2	67
29163	MO	Pike	18516	10069	54.4	28
29165	MO	Platte	89322	14120	15.8	213
29167	MO	Polk	31137	21444	68.9	49
29169	MO	Pulaski	52274	23017	44.0	96
29171	MO	Putnam	4979	4979	100.0	10
29173	MO	Ralls	10167	9771	96.1	22
29175	MO	Randolph	25414	11481	45.2	53
29177	MO	Ray	23494	17672	75.2	41
29179	MO	Reynolds	6696	6696	100.0	8
29181	MO	Ripley	14100	14100	100.0	22
29185	MO	St. Clair	9805	9805	100.0	15
29186	MO	Ste. Genevieve	18145	13816	76.1	36
29187	MO	St. Francois	65359	25989	39.8	145
29195	MO	Saline	23370	10705	45.8	31

FIPS	State	County	Total Population	Rural Population	Percent Rural	Population Per Sq Mile
29197	MO	Schuyler	4431	4431	100.0	14
29199	MO	Scotland	4843	4843	100.0	11
29201	MO	Scott	39191	16285	41.6	93
29203	MO	Shannon	8441	8441	100.0	8
29205	MO	Shelby	6373	6373	100.0	13
29207	MO	Stoddard	29968	20915	69.8	36
29209	MO	Stone	32202	28559	88.7	69
29211	MO	Sullivan	6714	6714	100.0	10
29213	MO	Taney	51675	22665	43.9	82
29215	MO	Texas	26008	25803	99.2	22
29217	MO	Vernon	21159	12327	58.3	26
29219	MO	Warren	32513	20496	63.0	76
29221	MO	Washington	25195	20276	80.5	33
29223	MO	Wayne	13521	13521	100.0	18
29225	MO	Webster	36202	26764	73.9	61

FIPS	State	County	Total Population	Rural Population	Percent Rural	Population Per Sq Mile
29227	MO	Worth	2171	2171	100.0	8
29229	MO	Wright	18815	14417	76.6	28
40001	OK	Adair	22683	18894	83.3	40
40003	OK	Alfalfa	5642	5642	100.0	7
40005	OK	Atoka	14182	14182	100.0	15
40007	OK	Beaver	5636	5636	100.0	3
40009	OK	Beckham	22119	7223	32.7	25
40011	OK	Blaine	11943	6859	57.4	13
40013	OK	Bryan	42416	26014	61.3	47
40015	OK	Caddo	29600	23671	80.0	23
40017	OK	Canadian	115541	26006	22.5	129
40019	OK	Carter	47557	26669	56.1	58
40021	OK	Cherokee	46987	28215	60.0	63
40023	OK	Choctaw	15205	10177	66.9	20
40025	OK	Cimarron	2475	2475	100.0	1

FIPS	State	County	Total Population	Rural Population	Percent Rural	Population Per Sq Mile
40029	OK	Coal	5925	5925	100.0	11
40031	OK	Comanche	124098	27041	21.8	116
40033	OK	Cotton	6193	3687	59.5	10
40035	OK	Craig	15029	9027	60.1	20
40037	OK	Creek	69967	37743	53.9	74
40039	OK	Custer	27469	8330	30.3	28
40041	OK	Delaware	41487	33653	81.1	56
40043	OK	Dewey	4810	4810	100.0	5
40045	OK	Ellis	4151	4151	100.0	3
40047	OK	Garfield	60580	12971	21.4	57
40049	OK	Garvin	27576	18945	68.7	34
40051	OK	Grady	52431	33496	63.9	48
40053	OK	Grant	4527	4527	100.0	5
40055	OK	Greer	6239	3285	52.7	10
40057	OK	Harmon	2922	2922	100.0	5

FIPS	State	County	Total Population	Rural Population	Percent Rural	Population Per Sq Mile
40059	OK	Harper	3685	3685	100.0	4
40061	OK	Haskell	12769	9926	77.7	22
40063	OK	Hughes	14003	8235	58.8	17
40065	OK	Jackson	26446	6546	24.8	33
40067	OK	Jefferson	6472	6472	100.0	9
40069	OK	Johnston	10957	10957	100.0	17
40071	OK	Kay	46562	11396	24.5	51
40073	OK	Kingfisher	15034	10890	72.4	17
40075	OK	Kiowa	9446	5824	61.7	9
40077	OK	Latimer	11154	8175	73.3	15
40079	OK	Le Flore	50384	36728	72.9	32
40081	OK	Lincoln	34273	31569	92.1	36
40083	OK	Logan	41848	23173	55.4	56
40085	OK	Love	9423	9423	100.0	18
40087	OK	McClain	34506	26627	77.2	60

FIPS	State	County	Total Population	Rural Population	Percent Rural	Population Per Sq Mile
40089	OK	McCurtain	33151	22958	69.3	18
40091	OK	McIntosh	20252	17680	87.3	33
40093	OK	Major	7527	7527	100.0	8
40095	OK	Marshall	15840	11421	72.1	43
40097	OK	Mayes	41259	31934	77.4	63
40099	OK	Murray	13488	6164	45.7	32
40101	OK	Muskogee	70990	29189	41.1	88
40103	OK	Noble	11561	6509	56.3	16
40105	OK	Nowata	10536	6104	57.9	19
40107	OK	Okfuskee	12191	9039	74.1	20
40111	OK	Okmulgee	40069	19454	48.6	57
40113	OK	Osage	47472	28233	59.5	21
40115	OK	Ottawa	31848	15704	49.3	68
40117	OK	Pawnee	16577	13449	81.1	29
40119	OK	Payne	77350	26093	33.7	113

FIPS	State	County	Total Population	Rural Population	Percent Rural	Population Per Sq Mile
40121	OK	Pittsburg	45837	23797	51.9	35
40123	OK	Pontotoc	37492	20092	53.6	52
40125	OK	Pottawatomie	69442	35187	50.7	88
40127	OK	Pushmataha	11572	11572	100.0	8
40129	OK	Roger Mills	3647	3647	100.0	3
40131	OK	Rogers	86905	43709	50.3	129
40133	OK	Seminole	25482	16480	64.7	40
40135	OK	Sequoyah	42391	28243	66.6	63
40137	OK	Stephens	45048	19517	43.3	52
40139	OK	Texas	20640	9302	45.1	10
40141	OK	Tillman	7992	4093	51.2	9
40145	OK	Wagoner	73085	27384	37.5	130
40147	OK	Washington	50976	12174	23.9	123
40149	OK	Washita	11629	8753	75.3	12
40151	OK	Woods	8878	3258	36.7	7

FIPS	State	County	Total Population	Rural Population	Percent Rural	Population Per Sq Mile
40153	OK	Woodward	20081	8737	43.5	16

Appendix B

Variables and Sources within the Study

Category	Variable	Source
Human capital	Less than high school	USDA Atlas Rural and Small Town America
Human capital	High school graduates	USDA Atlas Rural and Small Town America
Human capital	Some college	USDA Atlas Rural and Small Town America
Human capital	Associate’s degree	USDA Atlas Rural and Small Town America
Human capital	Four-year degree or higher	USDA Atlas Rural and Small Town America
Human capital	High creative class	USDA Atlas Rural and Small Town America
Human capital	Net migration 2010-2018	USDA Atlas Rural and Small Town America
Human capital	Foreign born percent	USDA Atlas Rural and Small Town America
Human capital	Under 18 percent	USDA Atlas Rural and Small Town America
Human capital	Age 65 and older percent	USDA Atlas Rural and Small Town America
Amenities	High amenity	USDA Atlas Rural and Small Town America
Amenities	Breweries	Brewers Assocation.org Directories
Broadband	Estimate with broadband of any type	US Census 5 Yr ACS Survey 2018

Category	Variable	Source
Entrepreneurship	Non-farm proprietorship	BEA REIS Data
Digital talent	Digital talent occupation codes	Emsi and Illinois Innovation Index SOC Codes
Digital talent	Percent of emp in tech enabled industries	Center for Rural Innovation Tech Talent Tracker

Appendix C

Illinois Innovation Index for STEM Occupation Codes

Occupation	SOC Code
Computer and information systems managers	11-3021
Architectural and engineering managers	11-9041
Natural sciences managers	11-9121
Computer and information research scientists	15-1111
Computer systems analysts	15-1121
Information security analysts	15-1122
Computer programmers	15-1131
Web developers	15-1134
Computer Programmers	15-1131
Software developers, applications and systems software	15-1132
Database administrators	15-1141
Network and computer systems administrators	15-1142
Computer network architects	15-1143
Computer support specialists	15-1150
Computer occupations, all other	15-1199
Actuaries	15-2011
Mathematicians	15-2021
Operations research analysts	15-2031

Occupation	SOC Code
Statisticians	15-2041
Surveyors, cartographers, and photogrammetrists	17-1020
Aerospace engineers	17-2011
Agricultural engineers	17-2021
Biomedical engineers	17-2031
Chemical engineers	17-2041
Civil engineers	17-2051
Computer hardware engineers	17-2061
Electrical and electronics engineers	17-2070
Environmental engineers	17-2081
Industrial engineers, including health and safety	17-2110
Marine engineers and naval architects	17-2121
Mechanical engineers	17-2141
Mining and geological engineers, including mining safety engineers	17-2151
Nuclear engineers	17-2161
Petroleum engineers	17-2171
Engineers, all other	17-2199
Drafters	17-3010
Engineering technicians, except drafters	17-3020
Surveying and mapping technicians	17-3031
Agricultural and food scientists	19-1010

Occupation	SOC Code
Biological scientists	19-1020
Conservation scientists and foresters	19-1030
Medical scientists	19-1040
Life scientists, all other	19-1099
Astronomers and physicists	19-2010
Atmospheric and space scientists	19-2021
Chemists and materials scientists	19-2030
Environmental scientists and geoscientists	19-2040
Physical scientists, all other	19-2099
Economists	19-3011
Survey researchers	19-3022
Psychologists	19-3030
Sociologists	19-3041
Urban and regional planners	19-3051
Miscellaneous social scientists and related workers	19-3090
Agricultural and food science technicians	19-4011
Biological technicians	19-4021
Chemical technicians	19-4031
Geological and petroleum technicians	19-4041
Nuclear technicians	19-4051
Social science research assistants	19-4061

Occupation	SOC Code
Miscellaneous life, physical, and social science technicians	19-4090
Sales engineers	41-9031