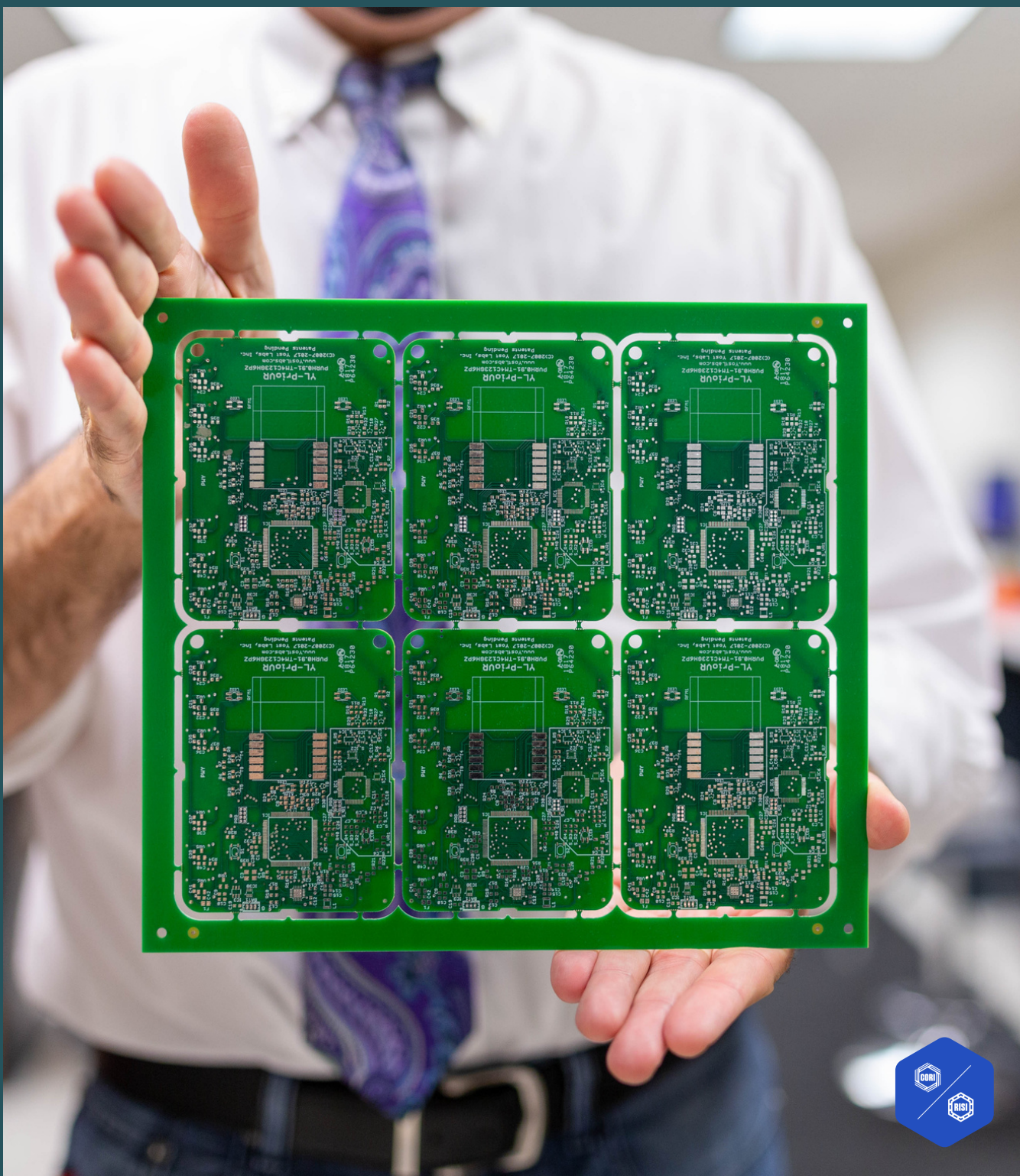


THE GEOGRAPHY OF INNOVATION IN RURAL AMERICA

A REPORT BY THE CENTER ON RURAL INNOVATION
AND RURAL INNOVATION STRATEGIES, INC.



BUILDING INNOVATION IN RURAL AMERICA
FROM THE GROUND UP

FEBRUARY
2022

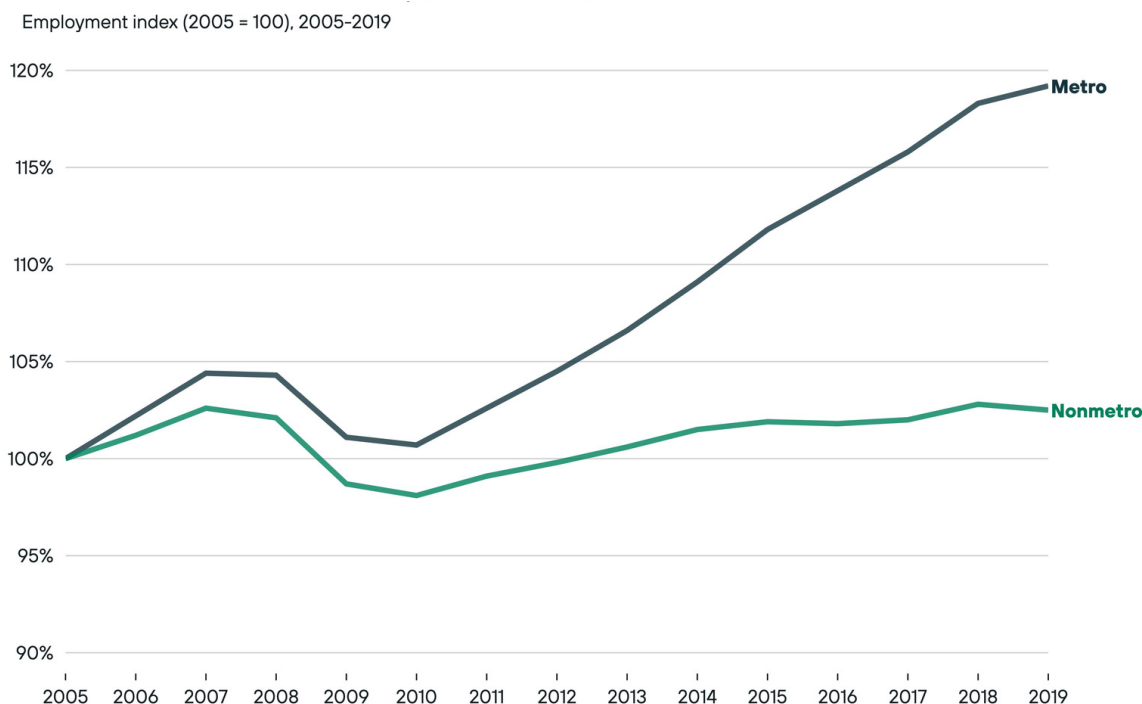


INTRODUCTION

Since 1980, the innovation economy, which encompasses how businesses and organizations invest in developing new products and services that leverage technology, has been a core driver of U.S. economic growth. Through innovation, the quality and variety of products and services grows, and the cost of production falls. These advancements create new value for businesses and consumers and contribute to the betterment of society and the lives of individuals and families, and the U.S. has made a national priority out of fostering innovation through training, education, and investment. In 2019, American public and private business and organizations spent \$656 billion on research and development (R&D) activities aimed at generating new innovations, more than any other country in the world ([Sargent Jr., 2021](#)).

Along with the benefits to businesses, individuals, and families, innovation also creates new industries, new business, and new jobs. The digital economy, for example, catalyzed the development of personal computers, cell phones, and the internet. The digital economy barely existed in 1980; today, it accounts for more than \$2 trillion in U.S. GDP (10%) and 7.7 million jobs (BEA). To put it in perspective, the digital economy — a product of the innovation economy — is more than 3 1/2 times larger than the agriculture and mining sectors combined.

**FIGURE 1:
CHANGE IN EMPLOYMENT IN METRO AND NON-METRO AREAS, 2005-2019**



Source: Bureau of Economic Analysis



While innovation has created many benefits, it has also created unintended consequences. Growing geographic economic inequality in the U.S. is one of the consequences of the disruptions caused by innovation. The transfer of revenue and employment from declining firms to growing firms can create net benefits in the long run. However, the benefits are not evenly distributed. If the firms negatively impacted are concentrated in some areas and the firms benefiting from innovation are in other areas, then innovation can drive economic disparities across the country.

This dynamic has been a key driver of the growing opportunity gap between rural and metropolitan areas in the U.S. Between 2005 and 2019, employment in metropolitan areas grew by nearly 15%, while in 2019 non-metropolitan areas employment still lagged behind 2005 levels. (Figure 1). Over that same period, nearly 500,000 innovation sector jobs were created in metropolitan areas, compared to a loss of nearly 4,000 in rural areas.

Although the U.S. innovation economy has historically been concentrated in a handful of metropolitan regions across the country, technology is creating a platform for innovation to take place in a wider variety of geographic areas. Technology itself is shifting the dynamics that have fueled innovation economies in metropolitan areas and is creating opportunities for innovation in rural areas. These trends are creating new opportunities to unleash untapped innovation potential across rural America, creating a renewed source of economic opportunity in rural communities. In this report, we offer an analysis of how innovation is distributed across the country, an explanation behind the economic reasons why this is the case, and share recommendations that we hope rural economic and workforce development leaders will consider when developing programs and strategies.

THE GEOGRAPHY OF INNOVATION

To understand the geography of innovation, we first must understand how it differs from the economic geography that defined the U.S. prior to 1980. In large part, the geography of the U.S. economy was driven by access to natural resources and transportation costs as growth largely owed to the production economy of manufacturing, agricultural, and natural resource extraction industries. In these industries, producers benefited from being close to their supply chains and resources, and needed access to transportation networks to move their product to their customers. Producers located in areas based on natural advantages like waterways (and later railroads) for transportation and



(Wilson, North Carolina (top)
Portsmouth, Ohio;
courtesy of the Center
on Rural Innovation)



(Wilson, North Carolina; courtesy of the Center on Rural Innovation)

natural resources for production. This clustering of producers around these natural advantages in turn attracted new residents, many of whom were immigrants looking for employment opportunities. Population growth attracted new entrepreneurs to open businesses in these growing areas to be close to customers, supply chains, and workers. Together, the collocation of producers and workers around areas with natural advantages led to the formation of the older industrial centers in the U.S. like New York, Boston, Chicago, Philadelphia, Detroit, and Cleveland.

These dynamics persisted throughout the 19th and most of the 20th centuries, with falling transportation costs leading to an expansion of production and economic activity across the country, and to the formation of more towns and cities. The expansion of the production economy created “convergence” across U.S. regions in which poorer and less developed areas of the U.S. grew at a faster rate than more developed areas, closing the economic divide ([Barro & Sala-i-Martin, 1992](#)). This convergence helped build prosperous rural communities across the country where employment and wealth were generated through manufacturing, natural resource extraction, and agriculture. Yet, starting in the 1980s, this long period of regional economic convergence began to slow. Instead, a small number of large and prosperous metropolitan areas started to experience rapid growth in employment and wages compared to the rest of the country ([Hendrickson, Muro & Galston, 2018](#)).

Several forces converged to create this new economic geography:

- First, falling transportation costs and changes in trade agreements ushered in an era of globalization, leading to increased foreign competition in the manufacturing and production sectors, and increased foreign outsourcing by U.S. firms. This led to declines in U.S. manufacturing employment and slowed the spatial expansion of manufacturers across the country.
- Second, the rise of the knowledge economy offset the decline in manufacturing. The knowledge economy, which includes the finance, professional services, research, and healthcare industries, primarily focuses on processing information and applying knowledge to create economic value.
- Third, the emergence of digital technology created a new knowledge sector that would transform the economy. Additionally, digital technology accelerated the first and second dynamics: Technology-driven automation replaced workers in the manufacturing and production sectors, while technology complemented the skills of workers in the knowledge sector, increasing their productivity and driving the growth of the sector (see our [brief on the Future of Work](#) for more details).

These dynamics not only reshaped the industries, businesses, and jobs in the U.S. economy, they also reshaped its geography. Unlike production industries where key inputs include energy and natural resources, the primary inputs for the knowledge economy are information, ideas, and people. While advances in transportation greatly reduced the costs of moving raw materials and goods — leading to the dispersion of economic activity and regional economic convergence — the cost of moving people remained relatively high ([Glaeser, 2010](#)). Thus, the knowledge economy took root and grew in a small number of metropolitan areas that were already rich in people and ideas. For rural America, the culmination of these shifts was an erosion of the historic competitive advantage offered by rural areas — low-cost labor, lax environmental regulation, and a pro-business environment. Over time those metropolitan areas continued to invest and build infrastructure to attract and retain workers and firms in the knowledge economy, and continue to build on their advantages as first movers while smaller cities and rural communities struggle to catch up.

The rise of the knowledge economy catalyzed a period of rapid and intense innovation, sometimes referred to as the third industrial revolution. As demand for knowledge-based services grew, demand for tools and technologies that support the creation, processing, dissemination, and application of information and knowledge also grew. The rapidly falling size and costs of computer hardware drove the first phase of this revolution, leading to the proliferation of new devices and technology applications. The growth of the internet sparked the second phase. This produced a wave of new and innovative digital services that have reconfigured business operations, the nature of work, commerce, entertainment, and communication. These innovations around digital technologies fueled innovation in other sectors by creating new platforms and tools for research and development, spurring advancements in manufacturing, pharmaceuticals, and transportation. As a result of these shifts, a new group of “innovation industries” emerged that engage in a high degree of research and development and employ a large share of scientists, technologies, and engineers ([Atkinson, Muro, & Whiton, 2019](#)).

[Atkinson, Muro, and Whiton \(2019\)](#) identified 13 highest-tech, highest-R&D industries that represent “innovation sector” in the U.S. The criteria for this designation are: a) R&D expenditures that exceed \$20,000 per worker; and, b) a 45% STEM-worker share.

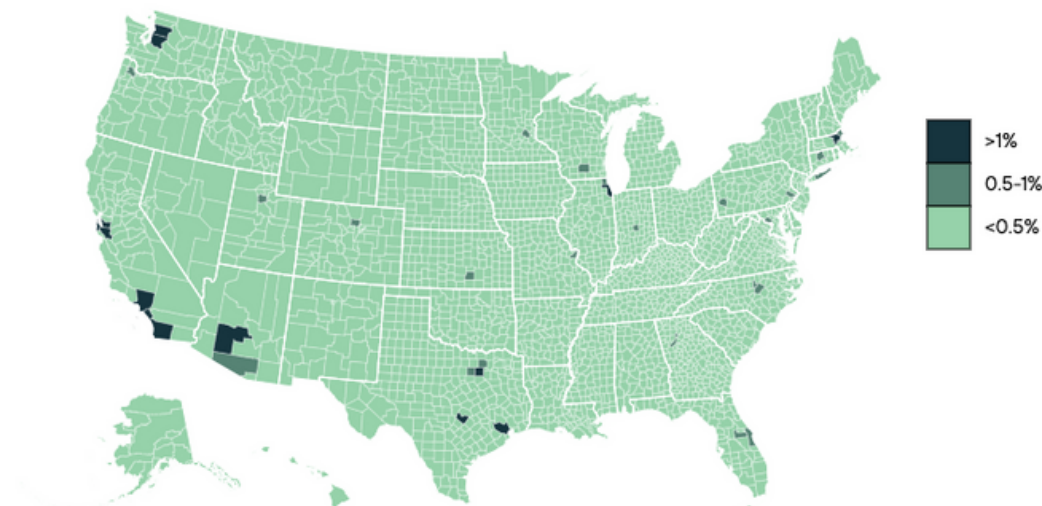
These industries include:

- Basic chemical manufacturing
- Pesticide, fertilizer, and agricultural chemical manufacturing
- Pharmaceutical and medicine manufacturing
- Computer and peripheral equipment manufacturing
- Communications equipment manufacturing
- Semiconductor and other electronic components manufacturing
- Navigational, measuring, electromedical, and control instruments manufacturing
- Aerospace product and parts manufacturing
- Software publishers
- Satellite telecommunications
- Data processing, hosting, and related services
- Other information services
- Scientific research and development services



This digital revolution continues to transform the U.S. and global society, creating many benefits that are enjoyed by people around the world, as well as new costs and risks. Yet, the economic benefits of the innovation economy through entrepreneurship, employment, income, and wealth creation have not been distributed equally. From 2005 to 2020, only five metro areas — Boston, San Francisco, San Jose, Seattle, and San Diego — accounted for over 90% of the nation's innovation-sector growth (Figure 2). These regions also lead in other dimensions of innovation. Between 2015 and 2018, San Francisco, New York, Seattle, and Boston alone accounted for nearly a third of all patents granted in the U.S., 38% of research and development expenditures by businesses, and more than 75% of all venture capital investment (Chattergoon & Kerr, 2021; Shackelford & Wolfe, 2021).

**FIGURE 2:
U.S. COUNTIES BY SHARE OF TOTAL INNOVATION SECTOR JOBS, 2020**



Source: CORI analysis of Moody's and CBSA data, and Brookings methodology to calculate innovation Sector*

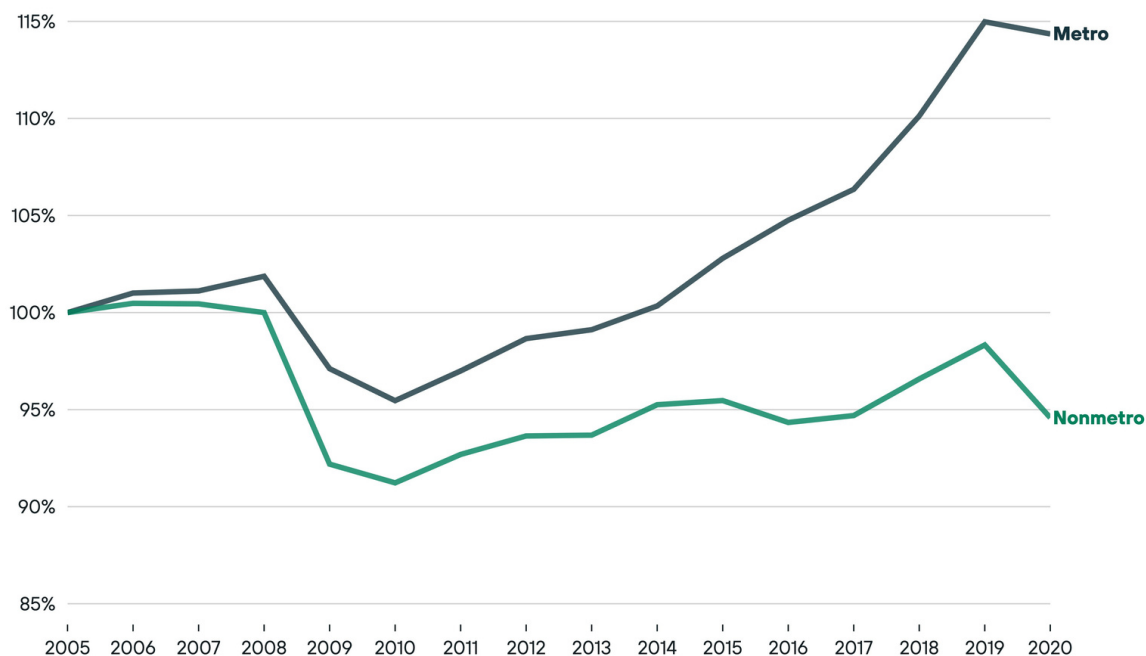
**"Innovation sector" is used to describe the high-tech subsector of the "advanced industries" sector, which includes 50 of the highest-value industries identified by the Metropolitan Policy Program at Brookings. To develop the innovation sector, the Brookings Institution isolated 13 highest tech, highest-R&D industries from the original 50 advanced industries. The 13 innovation industries represent a cohort whose R-and-D expenditures exceed \$20,000 per worker and have a STEM-worker share of 45%.*

The innovation economy fueled economic growth in these areas, resulting in new business formation and new job creation — between 2007 and 2019, the five largest innovation centers accounted for one in every 10 net new jobs created in the U.S. (BEA). As more and more businesses, investors, and talent moved from rural places to innovation centers in pursuit of opportunities, rural communities were left with fewer resources and human capital to support innovation activity in their own local contexts.

Given these trends — and without targeted policy interventions — rural America has largely been left out of the innovation economy. During the Great Recession, rural America lost a larger share of innovation sector employment compared to metropolitan areas and was

slower to recover those jobs (Figure 3). By 2019, innovation sector employment in non-metropolitan areas had still not returned to pre-recession levels, and the pandemic further decreased employment.

**FIGURE 3:
INNOVATION SECTOR EMPLOYMENT, 2005-2020**



Source: CORI analysis of Moody's and CBSA data, and Brookings methodology to calculate innovation Sector*

*"Innovation sector" is used to describe the high-tech subsector of the "advanced industries" sector, which includes 50 of the highest-value industries identified by the Metropolitan Policy Program at Brookings. To develop the innovation sector, the Brookings Institution isolated 13 highest tech, highest-R&D industries from the original 50 advanced industries. The 13 innovation industries represent a cohort whose R-and-D expenditures exceed \$20,000 per worker and have a STEM-worker share of 45%.

Despite these trends, there are non-metro areas in which the innovation economy was thriving over this period. For example, Los Alamos, New Mexico, experienced a 2,000% increase in innovation sector jobs, going from 183 innovation sector jobs in 2005 to almost 4,000 innovation sector jobs in 2020, driven largely by the Los Alamos National Laboratory, one of the world's largest science and technology institutions. Other micropolitan areas such as Whitman County and Grant County, Washington, Troup County, Georgia, and Allegan County, Michigan, all experienced between 53-212% increases in innovation sector jobs, driven by industries like scientific research, electrical equipment, microprocessor production, pharmaceuticals, and chemical production (Table 1).

While recent trends have led to the concentration of innovation sector employment in a few metropolitan areas, these trends are not inevitable. There are signs that the innovation economy is becoming more dispersed, creating new economic development opportunities for rural and micropolitan areas across the country.

TABLE 1: NON-METRO INNOVATION SECTOR EMPLOYMENT, 2020

Industry	2020 employment	Share of non-metro innovation sector employment
Scientific research and development services	37,655	21%
Navigational measuring, electromedical, and control instruments manufacturing	35,270	20%
Semiconductor and other electronic component manufacturing	30,186	17%
Aerospace product and parts manufacturing	26,086	14%
Basic chemical manufacturing	23,688	13%
Pharmaceutical and medicine manufacturing	21,847	12%
Data processing hosting and related services	11,851	7%
Pesticide fertilizer and other agricultural chemical manufacturing	7,000	4%
Communications equipment manufacturing	6,706	4%
Software publishers	6,386	4%
Computer and peripheral equipment manufacturing	6,093	3%
Other information services	5,280	3%
Satellite telecommunications	457	0%

Source: Moody's

INNOVATION AND AGGLOMERATION

The concentration of the innovation activity in a few metro areas has been driven by agglomeration effects. Agglomeration effects emerge when workers and firms experience unique benefits when located in close proximity to one another. When agglomeration economies are in effect, businesses become more productive because they are able to share infrastructure and resources. As businesses in a region become more productive, the region attracts skilled workers seeking higher wages and broader employment opportunities. This increased access to talent, in turn, makes businesses more productive and spurs the creation of new firms (or relocation of existing firms), adding value to the economy. These dynamics can result in an evolving cycle of economic development.

There are several agglomeration effects that have benefited urban areas, particularly the five innovation hubs mentioned above:

Knowledge spillovers

- Innovation is born out of new ideas, and new ideas are often generated by engaging with people with diverse backgrounds and experiences. Cities facilitate the sharing of ideas by bringing people together in workplaces, bars, cafes, and neighborhoods. The unexpected interactions facilitated by large cities increase the potential that knowledge spillovers will occur, sparking new ideas and innovation. Knowledge spillovers are also



(Katie Hardyman; Red Wing, Minnesota; courtesy of the Center on Rural Innovation)

supported by the presence of colleges and universities, where faculty and students leverage the assets at these institutions to facilitate research, development, and the commercialization of emergent technology. The opportunity to engage attracts potential innovators to cities, further increasing the chance that new ideas will emerge. For example, as the number of inventors in an area increases, the number of patents produced per inventor also increases ([Moretti, 2021](#)).

Talent

- When entrepreneurs seek to commercialize innovations, they typically require business and technical talent on their teams. Startups benefit from locating near large talent pools where they can rapidly hire the talent they need. Highly populated cities facilitate connections to large talent pools. As startups in a region realize success and grow, they create lucrative employment opportunities, increasing the demand for talent and attracting new workers to the region. This grows the talent pool, making the location more attractive for startups, driving further innovation ([Kerr et. al., 2017](#)).

Access to capital

- Startups that are commercializing innovations need access to venture capital in order to rapidly scale the business to reach profitability. As centers of wealth and finance expertise, cities offer large capital pools that entrepreneurs can leverage. Given the high-risk nature of venture capital, investors often play an active role in supporting startups in their portfolio through board membership, management recruiting, management coaching, and making introductions and connections. These activities have historically been most effective when investors and their portfolio companies are in the same area ([Chen et. al., 2010](#)). Thus, venture capitalists have historically opened offices in areas where there is a high degree of startup activity. This increases the pool of venture capital in the area, attracting startups seeking investment, which in turn attracts more venture capital.

Access to customers

- Startups that are commercializing innovations need access to customers to grow. Cities facilitate access to customers as centers of commercial activity, particularly firms in the knowledge economy that process and create information and have historically benefited most from utilizing innovative technologies. As new technologies boost the productivity of knowledge economy firms in a region, demand increases for technology, attracting more startups to the region.

Together, these agglomeration dynamics have built upon and reinforced each other, contributing to the concentration of the innovation economy within a small number of metro areas. As a result, much of the country, particularly rural areas, have been missing out on the employment and wealth-creation benefits of the innovation economy. Yet, the dynamics of agglomeration are not always permanent. As we noted, firms and manufacturers once clustered around rivers, ports, and natural resources, resulting in agglomeration dynamics which led to the formation and growth of many of the largest cities in the U.S. Over time, these agglomeration effects declined, leading to a decline in the concentration of manufacturing activity as firms spread into rural areas and smaller cities in the south. Technology advancements are now impacting the innovation economy in similar ways, changing the dynamics of agglomeration and creating the potential for a new geography of innovation.



(Guy Sewell; Ada, Oklahoma; courtesy of the Center on Rural Innovation)

A NEW GEOGRAPHY OF INNOVATION

While the innovation economy has largely been concentrated in a few areas of the country, there are signs that the geography of innovation is shifting. These shifts are driven by technological innovations that are facilitating connections and collaborations across space, creating benefits for workers, firms, and investors regardless of location.

Technology is shifting the agglomeration dynamics discussed above in the following ways:

Knowledge spillovers

- The internet has massively expanded access to information, ideas, and knowledge over broad geographical areas. For those connected to high-speed broadband, the internet is often used as the primary source for learning and ideas. As the internet has developed, the quality of knowledge has increased along with quantity. For example, the growth in online video has made it easier to communicate knowledge that is difficult to put into words — also known as tacit knowledge. In the early phases of the internet, the only way that information could be shared was through text. Video has greatly expanded the knowledge and ideas that can be exchanged, allowing viewers to learn through observation. For example, YouTube reports that searches for how-to videos have increased more than 70% year over year, that more than 100 million hours of how-to videos were watched in the U.S. in 2015, and that 91% of smartphone users report using their phone to find ideas while completing a task. As the forms of information and idea exchange expand — from text, to video, to podcasts, to virtual reality — potential innovators no longer need to be in population or innovation centers

to learn from others or exchange ideas. Social media platforms help the knowledge and idea sharing online. For example, there are rich and active communities on Twitter that generate a constant feed of information and ideas related to industries and emerging technologies like artificial intelligence and blockchain.

Talent

- Agglomeration dynamics have led to the concentration of people with technical, business, and finance skills in big cities with large innovation sectors. As a result, startups located in other areas have historically faced a disadvantage because they lacked access to talent. The rise of remote work has the potential of countering this urban advantage. The pandemic showed that many of the key occupations needed by startups — workers who build and maintain technologies, management professionals, finance professionals — can be done remotely. During the height of the pandemic, workers in these occupations worked remotely at a much higher rate than in other occupations ([Rembert, Osinubi, & Douglas, 2022](#)). The rapid growth in remote work during the pandemic has led to a growth in new technologies and services to support remote work, making businesses and startups who leverage remote workers more productive. Remote work both enables people with the skills needed to support innovation to live in more diverse areas and allows startups to tap into national talent pools. Both effects expand the opportunity for startups to thrive outside of innovation centers.

Access to capital

- While venture capital investors have historically been more likely to invest in startups in their geographic vicinity, the pandemic has shifted investing practices. A survey of 100 venture capital firms in May 2021 found that 97% reported completing a fully remote investment, compared to just 40% a year earlier ([Spagnolo, 2021](#)). As venture capital investors become more accustomed to completing deals and supporting founders in a remote environment, it opens the opportunity to source promising investments from a much broader geography. Venture capital in rural areas grew from \$3.2 billion in 2017 to \$42.5 billion in 2021, which represents an increase from 0.5% to 2.5% of total venture capital across the U.S. ([Robb, 2021](#)). This dynamic creates the potential for more startups outside of innovation centers — including in rural America — to access the venture capital they need to scale.

Access to customers

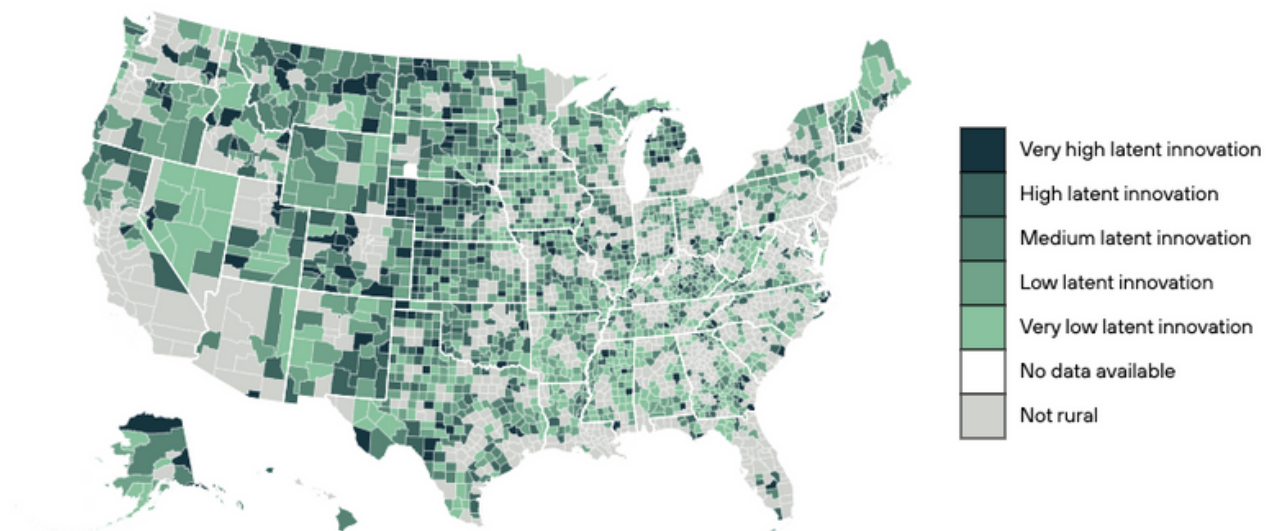
- Proximity to customers offered an advantage to startups located in large cities, yet the internet is making it easier for businesses to reach customers at a distance. Professional networking platforms like LinkedIn have made it possible to find and network with potential customers, while customer relationship systems like HubSpot or Salesforce allow businesses to track and engage potential customers through online channels with detailed analytics. Additionally, startups developing innovations for consumers can leverage social media marketing channels to find and engage potential customers. These technologies are enabling businesses to find and build a customer base from a distance.



These dynamics could unleash innovation potential in rural areas and expand access to participation in the innovation economy. While the statistics shared in the previous sections paint a stark difference between the growth of the innovation economy in rural areas compared to metropolitan areas, it does not mean that there are not significant opportunities for innovation in rural areas. Traditional innovation measures also overlook many other potentially important forms of innovation, like product improvement, and other services and processes that may increase firms' profits and increase economic efficiency (Goetz & Han, 2019). To address the restrictive nature of conventional innovation measures, Goetz and Han introduce a measurement of latent or "hidden" innovation. The latent innovation measure considers the potential innovation that can emerge when businesses in different industries engage in inter-industry sales and purchases within a geographic area (Goetz & Han, 2019). When businesses in the same area buy and sell to one another, and as workers move across businesses and industries, it creates the conditions for new ideas and innovations to emerge that improve quality, lower costs, or introduce new products or services.

Figure 4 shows the estimated level of latent innovation in rural counties due to the relationships between businesses in an area. Around 57% of rural counties in the U.S. have medium to very high latent innovation levels.

**FIGURE 4:
LATENT INNOVATION IN RURAL COUNTIES**



Source: CORI analysis of Penn State and Goetz and Han (2020) data

Along with the latent innovation potential that exists through business interactions, there is also significant household innovation that occurs — referring to how new processes or products are developed by individuals on their own time, as opposed to by firms and their paid employees (de Jong et. al., 2021). It is estimated that in 2017, 16 million U.S. household innovators invested more than \$47 billion in household R&D activities, equivalent to 50% of

what producers spent in the same year to develop new products for consumers ([Sichel & von Hippel, 2019](#)). Much of this innovation activity is unmeasured, and ideas are often applied in a local context. Just 9% of household innovations are secured by intellectual property protections, yet this does not mean the household innovations lack potential to become scalable startups. Case studies on the banking industry found that 44% of the most important innovations related to the digitization of retail banking and 50% of the most important innovations in mobile banking originated from household innovators ([Sichel & von Hippel, 2019](#)). The innovations were often implemented by individuals that were “hacking” together solutions to meet their own needs.

IMPLICATIONS FOR RURAL AMERICA

There is no lack of ideas and innovation potential across America. Instead, economic dynamics have led to the concentration of the innovation economy in a few areas, cutting off many areas of the country from the resources needed to bring new ideas and innovations to market. As technology shifts these dynamics, there are opportunities to unleash the innovative potential of the rest of the country, creating new business, employment, and wealth in rural areas.

We recommend rural economic development leaders consider the following strategies to introduce an innovation strategy into a comprehensive economic development strategy (CEDS):

Ensure high-quality broadband access.

Internet technology is shifting where innovation can occur by facilitating knowledge spillovers or connections to talent, capital, and customers. For potential innovators to take advantage of these opportunities in rural areas, they must have access to high-speed internet, likely at speeds that can only be delivered by fiber. It is critical that broadband infrastructure be established before a rural area can seek to spark entrepreneurship and job creation through an innovation-driven strategy. For example, [Wilson, North Carolina](#), was one of the first municipalities in the country to ensure broadband connectivity for everyone in the community by building a fiber-to-the-home network. The city is now working to leverage this unique asset to spur innovation by opening the [GigEast Exchange](#) coworking space and partnering with the [RIoT Accelerator Program \(RAP\)](#) to provide intensive entrepreneurship support to local innovators. These investments in building an innovation economy have already started to pay off. In 2020, [Shyft Auto](#) founder Marcus Aman participated in the first Wilson accelerator program to refine his startup's innovative approach to helping auto shops seamlessly engage with their customers. Shortly after finishing the program, Shyft Auto experienced rapid growth, raised a round of venture capital, and established its growing headquarters in Wilson's Opportunity Zone.





(Daniel Trujillo; Taos, New Mexico; courtesy of the Center on Rural Innovation)

Identify and build off of local innovation assets.

For some rural areas, there are opportunities to unlock innovation potential by building on the strengths of local industries. Areas that are already rich in businesses in the innovation industries mentioned previously, or areas with a high degree of latent innovation arising from cross-industry interactions can build upon these assets by providing targeted support to businesses and entrepreneurs around commercializing innovation. We would recommend that communities start by using an existing planning process, like when updating a Comprehensive Economic Development Strategy (CEDS), to intentionally work to identify innovation assets in your region. A dedicated process focused on developing an innovation strategy is critical to advancing an innovation-based strategy.

One of the most critical assets to engage in the process are colleges and universities. Colleges and universities are not only a potential source of talent and new ideas, but they can also leverage their resources and programs to help create new innovation assets in a region:

- In Marquette, Michigan, Northern Michigan University, a central community partner in the Marquette ecosystem, established the U.P. Cyber Security Institute in 2019 and has been seeking to support and attract cybersecurity firms to the area to build a community of cybersecurity specialists. By allocating resources and expertise designated to a very specific tech-centric industry, Marquette has been able to facilitate knowledge sharing, team collaboration, and budding entrepreneurship in its community. NMU's efforts have already paid off, helping to attract cybersecurity firm Northcross Group to open a regional office in downtown Marquette to take advantage of the growing innovation ecosystem.

- In Platteville, Wisconsin, the University of Wisconsin-Platteville (UW-Platteville), is leveraging local programs to drive innovation. A nonprofit called WiSys was created in 2000 as a technology transfer organization to facilitate the patenting process for all inventions across the UW system. WiSys reported that out of all of the affiliated universities besides the main campus in Madison, Platteville produces the largest number of patents, in large part because of its strong engineering program, chemistry program, and ecosystem of support in which faculty also support students in filing patents. In 2021, UW-Platteville leveraged a Build to Scale grant from the Economic Development Administration (EDA) to launch the IDEA Hub accelerator program to support the commercialization of innovations generated at the university and from entrepreneurs across the region.

Build entrepreneurship ecosystems through strong regional partnerships.

Innovators need a range of resources and support to successfully commercialize new innovations — incubators and accelerator programs, angel investors, venture capital, talent, and mentorship, to name a few. It is unlikely that a single entity in a rural area can provide all these services on their own. Instead, an ecosystem approach — which describes a network of organizations aligned around supporting innovation by contributing resources and services — is required to meet the needs of innovators and entrepreneurs. In larger metropolitan areas, these entrepreneurship ecosystems can take shape within a city, or even within a few blocks. In rural areas, regional partnerships can help to leverage a broader set of resources to create an ecosystem that can deliver all of the resources and services that entrepreneurs need. In Red Wing, Minnesota, a nonprofit organization called Red Wing Ignite is leveraging an i6 grant (a predecessor to the Build to Scale program) from the Economic Development Administration to coordinate a group called Entrepreneurs First (E1) Collaborative, which is designed to link up entrepreneurs with organizations and resources across rural areas in southeast Minnesota. The E1 Collaborative represents a partnership of 15 regional organizations that coordinate support to ensure that entrepreneurs have a local single point of access that allows them to connect with startup support, mentorship, and funding guidance offered across the region.

Develop an innovation hub to serve as a focal point for an entrepreneurship ecosystem.

When many organizations come together to provide services and resources, it can be helpful to have a centralized hub that entrepreneurs can tap into to connect to all the ecosystem support partners. Innovation hubs can serve as the physical connecting point for an ecosystem and host key programming, like incubator or accelerator programs. When innovation hubs provide flexible coworking and office space and high-speed internet, they can also deliver critical services that innovators need to start a growth venture in a rural area. In Springfield, Vermont, the Black River Innovation Campus (BRIC) serves this role. Making its home in an old school building, BRIC provides coworking and office space to startups, 10-gig internet speeds, as well as other amenities like a recording studio to produce high-quality digital marketing content. BRIC also hosts the Actuator Accelerator program which attracts new entrepreneurs to the hub, who then take advantage of BRIC's coworking and office space to start and grow their business.



Leverage federal funding for rural innovation.

Adopting an innovation-driven economic strategy can require developing new programs and resources to support rural innovators. The federal government offers several programs through the Economic Development Administration (EDA) and the U.S. Department of Agriculture (USDA) that rural economic development leaders can leverage to catalyze an innovation economy:

- The EDA's Build to Scale program awards competitive grants to further technology-based economic development initiatives focused on commercializing scalable technologies and increasing firms' access to equity capital.
- The EDA's STEM Talent Challenge program awards competitive grants for the development of STEM empowered, industry-aligned workforce development programs.
- The EDA's Economic Adjustment Assistance program is the agency's broadest grant opportunity, targeting distressed communities with support for planning, technical assistance, and construction projects that generate jobs and private investment.
- The USDA's Rural Innovation Stronger Economy (RISE) program provides funding for distressed rural areas to accelerate the formation of new businesses commercializing innovation.
- The USDA's Rural Business Development Grant program offers grant funding for a wide range of support for technical assistance and training for small businesses.
- The USDA's Community Facilities Direct Loan and Grant Program recognizes business incubators as essential community facilities and offers loans, grants, and loan/grant combinations for purchasing, constructing, or improving these buildings.



(Gig East Exchange; Wilson, North Carolina; courtesy of the Center on Rural Innovation)

REFERENCES

- Atkinson, R., Muro, M. & Whiton, J. (2019). The Case for Growth Centers: How to spread tech innovation across America. Brookings.
- Barro, J. & Sala-i-Martin, X. (1992). Convergence. *Journal of Political Economy*, 100(2): 223-251.
- Chattergoon, B. & Kerr, W. (2021). Winner Takes All? Tech Clusters, Population Centers, and the Spatial Transformation of U.S. Invention. Harvard Business School.
- Chen, H., Gompers, P., Kovner, A., & Lerner, J. (2010). Buy local? The geography of venture capital. *Journal of Urban Economics*, 67(1), 90-102.
- de Jong, J. P. J., Ben-Menahem, S. M., Franke, N., Füller, J., & von Krogh, G. (2021). Treading new ground in household sector innovation research: Scope, emergence, business implications, and diffusion. *Research Policy*, 50(8), 104270.
- Glaeser, E. L. (Ed.). (2010). Agglomeration economics. University of Chicago Press.
- Goetz, S. & Han, Y. (2020). Latent innovation in local economies. *Research Policy*, 49(2), 103909.
- Hendrickson, C., Muro, M. & Galston, W. (2018). Countering the Geography of Discontent: Strategies for left-behind places. Brookings.
- Kerr, S. P., Kerr, W., Özden, Ç., & Parsons, C. (2017). High-skilled migration and agglomeration. *Annual Review of Economics*, 9, 201-234.
- Moretti, E. (2021). The Effect of High-Tech Clusters on the Productivity of Top Inventors. *American Economic Review*, 111(10), 3328-3375.
- Rembert, M., Osinubi, A. & Douglas, D. (2022). The Rise of Remote Work: The Future of Work in Rural America. Center on Rural Innovation.
- Robb, A. (2021). Rural Entrepreneurship and the Challenges Accessing Financial Capital. U.S. Securities and Exchange Commission.
- Sargent Jr., J. (2021). U.S. Research and Development Funding and Performance: Fact Sheet. Congressional Research Service.
- Shackelford, B. & Wolfe, R. (2021). Businesses Performed 60% of Their U.S. R&D in 10 Metropolitan Areas in 2018. National Center for Science and Engineering Statistics.
- Sichel, D. & von Hippel, E. (2019). Household Innovation, R&D, and New Measures of Intangible Capital. National Bureau of Economic Research.
- Spagnolo, A. (2021). One year into remote venture deals; what's changed? OMERS Ventures.





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