



OECD Rural Studies

# Enhancing Rural Innovation in the United States





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# Foreword

Innovation and entrepreneurial ingenuity have long been drivers of growth and prosperity in the United States (US) sustaining the US at the top of the technology frontier. Yet not all places in the US have the same opportunities to participate in, and benefit from, innovation and entrepreneurship. This, in part, explains many longstanding geographical inequalities between large metropolitan areas and rural places. Tackling geographical inequalities in innovation, including in the factors conducive to it, are therefore critical.

Rural innovation is shaped by many factors that require a better understanding of specific rural challenges and opportunities. These include issues related to access to finance and global markets, including through integration in global supply chains. However, despite these challenges, rural communities and local partners are at the forefront of many innovative solutions that are often specific to rural areas, for example, in relation to public service delivery, and indeed through innovations that have more universal application beyond rural areas. However, funding and opportunities for innovation in rural areas and indeed entrepreneurship often overlooks rural challenges and opportunities. Typically, support programmes are overly-tech focused and more suitable for science-based innovations that are more prominent in markets in metropolitan areas. Furthermore, access to basic and critical resources such as communications infrastructure and education is still a challenge for rural areas.

However, there is growing awareness that a different approach is needed for rural areas, including in addressing enabling factors. Furthermore, there is an increasing potential to embed this thinking into significant government packages, such as the Inflation Reduction Act (IRA), that can, in turn, drive innovation.

This report offers a diagnosis of innovation in the rural context with lessons drawn from similar research in other OECD countries. It provides policy recommendations on the delivery of federal programmes to support rural innovators and entrepreneurs at a time when two of the largest stimulus packages have been approved by the US congress, the Infrastructure and Investment in Jobs Act (IIJA) and the IRA. The analysis and chapters focus on innovation and entrepreneurship within the structure of rural counties, focusing on direct and indirect initiatives to support innovation. It also places a special focus on the importance of access to digital communications infrastructure and access to education and skills for rural innovation.

This work is a part of the series of reports in the OECD Enhancing Rural Innovation project. It supports the implementation of the mandate of the OECD Working Party for Rural Policy and the Regional Development Policy Committee. The report was formally approved by written procedure on 6 October 2023 [CFE/RDPC/RUR(2023)14].

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# Abbreviations and acronyms

|              |   |
|--------------|---|
| <b>ACOA</b>  | Atlantic Canada Opportunities Agency  |
| <b>ACP</b>   | Affordable Connectivity Program   |
| <b>ACS</b>   | American Community Survey   |
| <b>AI</b>    | Artificial intelligence   |
| <b>AR</b>    | Augmented reality   |
| <b>ARC</b>   | Appalachian Regional Commission   |
| <b>ARPA</b>  | American Rescue Plan Act  |
| <b>AU</b>    | Adjacent to urban   |
| <b>BDC</b>   | Indigenous Loan Fund  |
| <b>BEA</b>   | Bureau of Economic Analysis   |
| <b>BEAD</b>  | Broadband Equity, Access and Deployment Program                                     |
| <b>BSSP</b>  | Business Support Simplification Programme   |
| <b>CARES</b> | Coronavirus Aid, Relief, and Economic Security                                      |
| <b>CBP</b>   | County Business Patterns  |
| <b>CCTE</b>  | Center for Career and Technical Education   |
| <b>CCTT</b>  | <i>Centres collégiaux de transfert de technologie</i> , Technology transfer centres |
| <b>CDB</b>   | Community development bank  |
| <b>CDFI</b>  | Community Development Financial Institutions  |
| <b>CED</b>   | Canada Economic Development for Quebec Region                                       |
| <b>CEDS</b>  | Comprehensive Economic Development Strategy   |
| <b>CEGEP</b> | <i>Collège d'enseignement général et professionnel</i> , Community colleges         |
| <b>CNC</b>   | Computer numerical control  |
| <b>COG</b>   | Council of Governments  |
| <b>CRA</b>   | Community Reinvestment Act  |
| <b>CRM</b>   | Customer relationship management  |
| <b>DATA</b>  | Deployment Accuracy and Technological Availability                                  |
| <b>DCN</b>   | Dakota Carrier Network  |
| <b>DoJ</b>   | Department of Justice   |
| <b>DSL</b>   | Digital Subscriber Line/Loop  |
| <b>EC</b>    | European Commission   |
| <b>EDA</b>   | Economic Development Administration   |
| <b>EDC</b>   | Indigenous Community Business Fund  |
| <b>EDD</b>   | Economic Development District   |
| <b>EDI</b>   | Economic Development Initiative   |
| <b>ENoLL</b> | European Network of Living Laboratories   |
| <b>EODA</b>  | Eastern Ohio Development Alliance   |

|                |  |
|----------------|--|
| <b>EPB</b>     | Electric Power Board                                       |
| <b>FCC</b>     | Federal Communications Commission                          |
| <b>FTTB</b>    | Fibre-to-the-building                                      |
| <b>FTTC</b>    | Fibre-to-the-curb  |
| <b>FTTH</b>    | Fibre-to-the-home  |
| <b>FTTN</b>    | Fibre-to-the-node  |
| <b>FTTP</b>    | Fibre-to-the-premise                                       |
| <b>FUA</b>     | Functional urban area                                      |
| <b>FWA</b>     | Fixed wireless access                                      |
| <b>FY</b>      | Financial year   |
| <b>GDP</b>     | Gross domestic product                                     |
| <b>GED</b>     | Gallup Economic Development                                |
| <b>GFPB</b>    | Go Forward Pine Bluff                                      |
| <b>GGEDC</b>   | Greater Gallup Economic Development Corporation            |
| <b>GLP</b>     | Gallup Land Partners                                       |
| <b>HBCU</b>    | Historically Black Colleges and Universities               |
| <b>HERD</b>    | Higher Education and Research and Development              |
| <b>HSI</b>     | Hispanic-serving institution                               |
| <b>IEDC</b>    | International Economic Development Council                 |
| <b>IJA</b>     | Infrastructure Investment and Jobs Act                     |
| <b>IoT</b>     | Internet of Things   |
| <b>IRA</b>     | Inflation Reduction Act                                    |
| <b>ISED</b>    | Innovation, Science and Economic Development               |
| <b>ISP</b>     | Internet service provider                                  |
| <b>IXP</b>     | Internet Exchange Points                                   |
| <b>JRC</b>     | European Commission Joint Research Centre                  |
| <b>LISC</b>    | Local Initiatives Support Corporation                      |
| <b>MNO</b>     | Mobile network operator                                    |
| <b>MR</b>      | Metropolitan regions                                       |
| <b>MSA</b>     | Metropolitan statistical area                              |
| <b>NADO</b>    | National Association of Development Organizations          |
| <b>NAU</b>     | Non-adjacent to urban                                      |
| <b>NCCER</b>   | National Center for Construction Education and Research    |
| <b>NESTI</b>   | National Experts on Science and Technology Indicator       |
| <b>NGBEP</b>   | Next Generation Broadband Expansion Programme              |
| <b>NGIN</b>    | New Growth Innovation Network                              |
| <b>NGO</b>     | Non-governmental organisation                              |
| <b>NLC</b>     | National League of Cities                                  |
| <b>NMU</b>     | Northern Michigan University                               |
| <b>NOFO</b>    | Notice of Funding Opportunity                              |
| <b>NTIA</b>    | National Telecommunications and Information Administration |
| <b>NTU</b>     | Navajo Technical University                                |
| <b>NWNMCOG</b> | Northwest New Mexico Council of Governments                |
| <b>OLMC</b>    | Official language minority community                       |
| <b>OLS</b>     | Ordinary Least Squares                                     |
| <b>OVBI</b>    | OpenVault Broadband Insights                               |

|                |  |
|----------------|--|
| <b>PISA</b>    | OECD Programme for International Student Assessment    |
| <b>PPC</b>     | Persistent poverty county                              |
| <b>PPP</b>     | Public-private partnership                             |
| <b>QoS</b>     | Quality of service                                     |
| <b>R&amp;D</b> | Research and development                               |
| <b>R&amp;O</b> | Report and Order                                       |
| <b>RDA</b>     | Regional development agency                            |
| <b>RDOF</b>    | Rural Digital Opportunity Fund                         |
| <b>RIS</b>     | Regional Innovation Scheme                             |
| <b>RISE</b>    | Rural Innovation Stronger Economy                      |
| <b>RLF</b>     | Revolving loan fund                                    |
| <b>RNTA</b>    | Research and National Technical Assistance             |
| <b>RUCC</b>    | Rural-Urban Continuum Code                             |
| <b>SAIPE</b>   | Small Area Income and Poverty Estimates                |
| <b>SBA</b>     | Small Business Administration                          |
| <b>SBIC</b>    | Small Business Investment Corporation                  |
| <b>SBIR</b>    | Small Business Innovation Research                     |
| <b>SBLN</b>    | State Broadband Leaders Network                        |
| <b>SBTT</b>    | Small Business Technology Transfer                     |
| <b>SDB</b>     | Small, disadvantaged business                          |
| <b>SEAEDD</b>  | Southeast Arkansas Economic Development District, Inc. |
| <b>SEARK</b>   | Southeast Arkansas College                             |
| <b>SES</b>     | Scenario Exploration System                            |
| <b>SLFRF</b>   | State and Local Fiscal Recovery Funds                  |
| <b>SMEs</b>    | Small and medium-sized enterprises                     |
| <b>SRLI</b>    | Smart Rural Living Lab                                 |
| <b>SSBCI</b>   | State Small Business Credit Initiatives                |
| <b>SSI</b>     | Shimadzu Scientific Instruments                        |
| <b>STEM</b>    | Science, technology, engineering and mathematics       |
| <b>STTR</b>    | Small Business Technology Transfer                     |
| <b>TA</b>      | Technical assistance                                   |
| <b>TCU</b>     | Tribal Colleges and Universities                       |
| <b>UAPB</b>    | University of Arkansas at Pine Bluff                   |
| <b>UC</b>      | University center                                      |
| <b>USDA</b>    | United States Department of Agriculture                |
| <b>USF</b>     | Universal Service Fund                                 |
| <b>USPTO</b>   | United States Patent and Trademark Office              |
| <b>VC</b>      | Venture capital  |
| <b>VR</b>      | Virtual reality  |
| <b>WISP</b>    | Wireless Internet Service Provider                     |

# Executive summary

The United States (US) is a major source of global innovation, with a strong history of record-breaking patent activity and technological development. Yet innovation is not equally distributed across the country. It occurs differently in rural and urban places and often with a different emphasis. In rural counties, for example, many innovations are developed to overcome barriers in accessing basic services or in managing resources used in local supply chains.

At the same time, innovation in rural areas is a significant driver of growth: nearly two-thirds of all productivity growth in US non-metropolitan counties from 2010 to 2020 was associated with innovation absorption. Boosting innovation in rural areas, including through better understanding the nature of rural innovations, can help to further narrow gaps in spatial inequalities in income and well-being. Indeed, although GDP per capita growth in rural counties (1.5% per annum) between 2010 to 2020 outpaced metropolitan (urban) counties' growth (0.9%), the gap remained significant: 70% of regions in the top 20% of all regions with the highest GDP per capita were metropolitan regions, whilst 61% of the bottom 20% were rural regions. Moreover, the share of counties that are considered persistently poor is five times higher in rural counties than in metropolitan ones.

## **Productivity gains, associated with innovation adoption, is stronger in rural areas**

Not surprisingly, improvements in GDP per capita in recent years are also mirrored in productivity comparisons. Between 2015 and 2020, rural counties saw labour productivity grow by 1.7% per annum, compared to only 1.2% in metropolitan areas. The majority, nearly two-thirds, of productivity gains in rural areas was due to more efficient use of resources, primarily associated with innovation adoption.

Moreover, even when seen through the traditional lens of research and development, this report shows that investing in innovation (R&D spending) delivers greater relative outcomes in rural counties than in metropolitan counties. A one percent increase in R&D spending increases patent intensity by 0.7 units (or close to one more patent per 1 000 individuals with relevant occupations) in non-metropolitan counties, while it is closer to zero in metropolitan counties. At the same time, investing in workforce skills is also more positively associated with increases in innovation outcomes, such as productivity, in rural counties than in metropolitan counties.

## **But the scale and scope of support for innovation in rural areas needs to go beyond R&D investment**

Support for innovation in rural areas in the United States comes from both direct and indirect funding mechanisms. However, the focus on direct support is often technology-based, meaning that the potential of many other forms of innovation, including through entrepreneurship, may not be fully exploited. In this context, entrepreneurship and innovation-based policies in rural counties are not always attuned to their

specificities, realities or needs, including, for example, in enabling the provision of public and private services where there are often significant gaps with metropolitan areas. In addition, often eligibility criteria for federal programmes can prove onerous, thus hindering the participation of local governments.

## **Ensuring quality access to public services such as digital infrastructure and education is critical**

Rural counties are frequently under-served in critical public services such as access to quality education and digital infrastructure. As one of the critical enablers of building networks for innovation and the transfer of knowledge, this places rural counties at a disadvantage when it comes to innovation. For example, in terms of broadband coverage, 21% and 22% of the rural and Tribal Land population, respectively, live in areas without coverage of fixed broadband offers at 100 Mbps download speeds, compared to 1% in urban areas. Broadband adoption rates reveal even starker contrasts. In terms of experienced speeds, there was a 51-percentage point gap in download broadband speeds experienced by users between urban (metro) and rural regions by state in Q1 2021. Poorer quality digital infrastructure has a direct impact on firms in rural areas, exacerbating risks of sectoral specialisations in activities with low innovation and growth potential, and also stymying the potential for innovations in start-ups.

In terms of access to education, 57% of school districts in the United States and 32% of public schools are rural, educating about 12 million (24%) students, yet the quality and delivery of educational services is often more limited in rural regions, reflecting, in part, the impact of lower density on cost-efficiency as well as challenges in recruiting and retaining teachers. Lower education outcomes among the rural population may in part explain lower rates of entrepreneurship in rural areas, and in turn, lower innovation. In several of the case studies analysed, education providers, including traditional education providers and non-traditional providers (such as the private sector, and entrepreneurship support hubs), could be further engaged to contribute to the economic turnaround of rural areas. Yet, often innovation policies and initiatives overlook the important role private sector engagement can play in unlocking educational opportunities for innovation in rural areas. Moreover, a focus on support for innovations to help overcome these and other spatial disparities can help create a virtuous circle.

## **Policies to support innovation need to consider rural demographic trends**

In rural counties, policies to support entrepreneurship or innovation cannot ignore demographic challenges. Close to a quarter of the working age population in non-metropolitan rural counties were over the age of 55 between 2006 and 2010, and this share grew to close to 29% over the period 2016-2020. On the other hand, in the same period, the share of the working age population in metropolitan counties above the age of 55 was lower, at 22%. This trend was primarily due to a relatively low share of primary aged workers (25-54), which stood at 59% in non-metropolitan rural counties, as compared to 65% in metropolitan counties.

## **Supporting rural innovation in the United States**

With the recent federal Infrastructure and Investment in Jobs Act (IIJA) and the Inflation Reduction Act (IRA), rural counties have a new opportunity to access two large competitive federal grants to support innovation. Yet, the effectiveness of these packages depends on the capacities of local governments. Limited capacities (e.g., limited manpower, skills and time needed to carry out intensive contracting processes) can impede local governments from accessing or absorbing funding. More streamlined application processes, that are sensitive to capacity constraints, could increase programme uptake. Moreover, participation could be increased by incentivising joint municipal applications and partnerships

across federal government agencies, for example between the Department of Commerce and the United States Department for Agriculture, or by providing funding specifically for municipal capacity development, especially in persistently poor places and small rural municipalities.

## Key Recommendations

### *Improving policy design and implementation for rural innovation*

- Promote a broader view of innovation policy for diverse rural areas that **goes beyond a science and technology understanding of “innovation”** and gives broader criteria for programme design and eligibility requirements such as process innovation, social innovation and public sector innovation. In addition, **“boots-on-the ground” financial support initiatives**, that enable true partnerships, should be expanded.
- Implement programmes in accordance with different **scales of intervention** that: simplify eligibility criteria, consider more bundling, deliver programmes at higher levels of spatial aggregation and foster collaboration among local governments to develop economic development strategies.
- Ensure effective **co-ordination mechanisms** across levels of government that involve regular collaboration between regional EDA and USDA offices and improve co-ordination of public investment. Online one-stop shops could be considered in order to ease access to available resources.
- Build in **capacity development** support for municipalities and programme delivery partners that help them access competitive federal grants.
- Build a **culture of experimentation** in rural entrepreneurship that fosters rural development networks, supports regional hubs and networking, encourages challenge-based competitions, and fosters partnerships between universities, rural colleges and entrepreneurs.
- Better account for the **challenges of rural areas**, such as persistent poverty, demographic change, ageing workforce, migrant workers and the gender wage gap, by streamlining such concerns in the design of policies and programmes. Ensure programmes seek to encourage innovation and entrepreneurship, while working with local and community development organisations to consult on the best way to address the challenges for each category through bottom-up initiatives.

### *Improving access to high-quality broadband, skills and education for entrepreneurship*

- Better assess the state of **broadband connectivity** by improving broadband maps and informing users on prices; ease barriers to infrastructure deployment through bottom-up approaches; and make the most of existing funding and programmes for broadband connectivity.
- Improve **skills** needed for the local labour market through direct funding and resources to reinforce basic education and vocational education and training programmes in rural communities; support programmes for skills needed by indigenous businesses; reinforce quality controls for teacher recruitment; promote consultation and joint-collaboration with local stakeholders on skills upgrading and rural market demands.
- Promote **education for entrepreneurship** through regular consultation mechanisms with state education boards and local stakeholders to develop anticipatory skills plans for students; build more local partnerships with secondary schools for entrepreneurial training; encourage more local and regional opportunities for on-the-job training, internships and summer jobs for youth.



***Better track and measure innovation relevant to rural areas***

- **Monitor demographic and economic changes in rural areas**, for example through a Rural Observatory or similar cross-agency initiative, with the aim of better aligning the definition of innovation in rural areas with characteristics of rural areas.
- Measure, identify and adopt **indicators that are more appropriately associated with innovation priorities of rural counties**, such as indicators of new firm activities (firm births and deaths) or via community innovation surveys that have an adequate coverage of rural firms.



## 1

# Assessment and recommendations

The United States (US) is a leader of high-tech innovation amongst OECD countries, containing 14.6% of total global scientific publications in 2021, the largest share of any OECD country (OECD, 2023<sup>[1]</sup>). Such high-tech innovation, however, tends to be concentrated mainly in urban areas. For example, in 2019 while metropolitan counties in the US recorded on average 13.2 patents per 1 000 innovative occupations, this share was less than half (5.6 on average) in rural counties.

Innovation in rural areas, however, happens in different forms beyond high-tech innovation, often shaped by rural entrepreneurs to overcome challenges and harness opportunities. This means that a more broad-based definition of innovation is warranted to understand innovation in rural areas than the traditional, narrowly defined definitions based on patents or investment in research and development. Many of these types of high-tech indicators of innovation often overlook the broad-based definition of innovation that identifies innovation as the development of new products and processes that can, critically, be either *new to the market or new to the firm*. As of today, we know that many forms of innovation are relevant for rural well-being, such as public-sector innovation and community-based (or non-governmental organization based) innovation. As such, innovations to rural “markets”, not only can take the form of completely new products and processes, but also the adoption of such pre-existing innovations adapted to the local context.

Innovation also occurs to overcome rural-specific challenges—for example in access to basic government services such as infrastructure, finance education and health – or to provide services tailored to the diversity of different rural communities. Often, this type of innovation may happen through *new firm creation*, or through local entrepreneurial ingenuity and risk-taking. As such, the local conditions such as the structure of the economy and labour market, and the linkages places have with each other, can be a substantial enabler for innovation.

This report presents the state of rural innovation in the United States going beyond the science and technology lens. Through a combination of desk research and case study visits to Gallup, New Mexico, Pine Bluff, Arkansas, and Columbiana, Ohio, the report identifies the strengths and challenges of promoting innovation in rural areas. The distinct nature of these three regions offers a glimpse into the challenges of promoting rural innovation when the underlying factors and characteristics are vastly different. The report examines the drivers of rural innovation, placing particular emphasis on geographic disparities, and identifies policy responses to support rural innovation and to promote opportunities for education and entrepreneurship. It provides an overview of policies and financial initiatives aimed at supporting entrepreneurs and promoting rural innovation, as well as an assessment of the state of broadband connectivity and access to quality education in rural areas of the United States.

## Assessments

### ***Rural counties are growing but disparities between places are increasing.***

In the United States, 15.6% of individuals lived in non-metropolitan and rural regions in 2020, down from 16.1% in 2010.<sup>1</sup> This share is relatively small when compared to most OECD countries, where close to

29% of individuals live in non-metropolitan and rural regions, based on OECD-wide harmonised definitions.<sup>2</sup>

There is strong evidence of economic growth in rural counties in the States. They have had, in particular, high per capita GDP growth in the decade to 2020. This is the case even when counties with a strong oil and gas sector are excluded, due to the outlier effects exerted by price fluctuations and volatility of outputs.

However, this trend masks increasing social and economic disparities between top performing and bottom performing counties in the United States. The gap between the top- and bottom- performing counties is 12% greater than the average of OECD countries. Of the regions reported to be in the top 20% of GDP, 70% are in metropolitan regions<sup>3</sup> and 26% are in rural regions (NMR-R), against 26% and 61% for the bottom 20%, respectively.

### *There is convergence in productivity between rural and metropolitan counties*

Convergence in labour productivity between counties is led by rural growth. Labour productivity in rural counties surged between 2009 and 2020, averaging 1.7% annually, as it converged towards that of metropolitan counties. Likewise, non-metropolitan counties adjacent to cities caught up to non-metropolitan counties *not* adjacent to cities, although at a slower annualised rate of 0.9%. Across the decade, productivity disparity remained the highest in rural counties, which have the greatest share of both the most and least productive firms.

### **However, structural change is impacting rural counties...**

Structural change is a phenomenon of long-term change to the dominant industries, as indicated by the shift from primarily agriculture to primarily service-oriented activities. As a share of the total economy in 2020, rural counties in the United States are dominated by finance, insurance and real estate (24%),<sup>4</sup> agriculture (23%), and manufacturing (13%), a ranking unchanged from 2010. However, even these sectors are employing less workers in 2020 than in 2010, and 9 out of the 12 aggregated sectors<sup>5</sup> in rural counties have lost workers across the decade. In rural counties, the top employers are in education and social services (24%), manufacturing (13%), and retail trade (11%). Thus, despite rural counties often being viewed as agrarian, manufacturing and services employ more workers than the agriculture sector in rural counties. This is a consistent observation in many OECD countries.

### **...and, productivity growth is coinciding with a relative decline in employment**

Productivity growth is coinciding with a relative drop in employment: 9 out of 12 sectors in rural counties have lost in terms of shares of workers across the decade, including in agriculture and construction. Despite the relative fall in labour resources, the remaining share of employment within non-metropolitan counties still leads to productivity gains. There is some evidence to suggest that most of the growth in productivity is due to more efficient use of pre-existing resources within each type of county, that also includes productivity gains from intangible assets such as intellectual property and social connections.<sup>6</sup> In fact, over the past 10 years, most of productivity growth in non-metro counties has been primarily due to more efficient use of resources, despite the measured negative impact of the reallocation of production factors, such as labour or capital.

### **Productivity gains, in part due to innovation adoption, is stronger in rural areas...**

While high-tech innovation is more prevalent in metropolitan counties, there is some evidence to suggest that innovation absorption, as a driver of productivity growth, is stronger in rural and non-metropolitan counties. As mentioned previously, there are on average 13.2 patents per 1 000 innovative occupations in metropolitan counties, while this ratio is 5.6 on average in rural counties. At the same time, nearly

two-thirds of overall productivity growth from 2010 to 2020 was due to innovation absorption in non-metropolitan areas.

**...and, there still remains a margin of opportunity to invest in innovation in rural counties**

There is more room for gains from innovation in rural and non-metropolitan counties. On average, rural and non-metropolitan counties have less patent intensity as compared to metro counties. Yet patent intensity in non-metropolitan counties is still positively correlated with R&D, firm intensity, and investment in education, whereas this is not as strongly the case in metropolitan counties. For every one percent increase in R&D spending, patent intensity increases by 0.7 units<sup>7</sup> in non-metropolitan counties, while it is close to zero in metropolitan counties. Investing in the education of the workforce is also associated with higher innovation outcomes, such as productivity, in non-metropolitan regions. While it is true that rural counties have lower traditional (high-tech) innovation outcomes as compared to metro counties, other equally positive outcomes such as increases in productivity, new innovations through research and development, and a more skilled workforce are still positive outcomes in rural places.

***Equal opportunities for innovation and entrepreneurship across metropolitan and non-metropolitan counties is critical***

*The share of persistently poor counties is 5 times higher in rural counties than in metropolitan counties*

Compared with 18 other OECD countries, overall inequality in the US is above average, driven by high disparities in rural counties and non-metropolitan counties not adjacent to cities. Inequality is also growing, with relatively high levels in the more remote counties. Strikingly, 20% of rural counties are considered persistently poor, as compared to only 4% of metropolitan counties.<sup>8</sup> Persistent poverty is associated with lower entrepreneurial opportunities and innovation outcomes across all types of counties, reinforcing the importance of socio-economic conditions to support innovation. Because a relatively larger share of persistently poor counties are also rural, federal and state priorities to support these areas should be re-enforced with a place-based approach, targeted at delivering equitable access to services to overcome generations of unequal access to opportunities.

*Workers in rural counties are ageing faster*

While the workforce in the United States is ageing, this trend is more pronounced in non-metropolitan regions and compounded by a lower share of primary-aged workers. For example, close to a quarter of the working age population in non-metropolitan rural areas was over the age of 55 from 2006-2010, while in the period of 2016-20, close to 29% of the population was over the age of 55. This aging trend was primarily due to a loss of prime aged workers (25-54 years of age), rather than a loss of younger workers (those between 15-24 years of age). This trend is expected to continue (Martinez-Fernandez et al., 2012<sup>[2]</sup>), aggravating pre-existing challenges in regional innovation that depend on a pool of qualified workers. As consequence, there is heightened need for programmes that encourage life-long learning and upskilling programmes for older workers for non-metropolitan regions. At the same time, programmes and policies to encourage entrepreneurship should consider the importance of involving the youth from an early age.

There is still room to improve innovation outcomes by drawing from a more diverse pool of talent. For example, promoting gender diversity can bring new skills and opportunity to rural regions. Despite progress, according to analysis in this report, between 2016 and 2020, men were on average paid 31% more than women in the US, and the farther away counties are from metropolitan regions, the more likely greater gender disparity in wages. More can be done to promote diversity initiatives for women, foreign workers and people of colour alongside policies to support counties identified as persistently poor.

## ***The scale and scope of innovation in rural areas in the United States***

*Innovation in rural America is supported by direct and indirect funding and support from federal agencies*

Rural policy in the United States has evolved from a focus on the agricultural sector towards a more multi-functional view of rural development. The United States Department of Agriculture (USDA) has a key role in supporting rural innovation, alongside the Economic Development Administration (EDA), the Small Business Administration (SBA) and the Department of the Interior, which oversees Tribal Lands. Because local governments in rural regions are fiscally constrained and typically depend upon transfers from other levels of government for a major share of their funding, these federal agencies have a large role to play in promoting innovation and entrepreneurship.

Support for rural innovation can be categorized as *direct* and *indirect*, with the latter subdivided as “rural business” and “ancillary” support. *Direct* support refers to the resources and programmes that specifically target rural innovation, such as the Build to Scale programme of the EDA’s Office of Innovation and Entrepreneurship. *Indirect* support comprises support to the day-to-day activities of starting and maintaining rural businesses, for instance loans at low interest rates. *Ancillary* opportunities, which are also part of the indirect support, refer to factors that are necessary for businesses to thrive, such as high-quality broadband, transportation, and housing. One example is the USDA Rural Utilities Service, which provides financing for the construction, maintenance, improvement and expansion of telephone service and broadband in rural areas.

While each agency has its own areas of programmatic focus, it remains important that resources and interventions are coordinated, towards a more effective rural innovation ecosystem. One example of this is the Appalachian Regional Commission (ARC), a federal-state partnership for economic development which spans across 13 states and 423 counties – among them Columbiana.<sup>9</sup> The ARC adopts a collaborative approach to invest in rural communities, by providing grants, publishing research, and sponsoring learning experiences related to innovation, workforce training and business opportunities.

### **However, the focus on direct support for technology-based innovation is at odds with how rural innovation occurs**

Innovations in rural places are in some cases disruptive, while in most other cases they serve the purpose of satisfying an unmet demand within the local economy. An example of disruptive innovation takes place in Columbiana, where Youngstown State University and the company Humtown Product partnered to develop new applications for additive manufacturing using 3-D sand printers. An example of a scenario where innovation satisfied an unmet need takes place in Gallup, New Mexico, where the company Sacred Winds Communication is applying fixed-wireless broadband within the Navajo Nation to connect widely dispersed settlements, which is a novel way to apply a well-known but little-used technology.

In this sense, policies for encouraging entrepreneurship and innovation in rural counties may overlook the specific needs of the areas if they continue to focus primarily on technology-based innovation. *Product* and *process* innovation must be considered, along with connections to broader rural economic development actions. Innovation in the provision of public and private services is especially important in rural areas due to its under-provision relative to urban counterparts. *A broader rural innovation policy* that better reflects the complex innovation systems and territorial linkages across areas is needed.

The direct and indirect support mechanisms may also overlook challenges in multi-level governance and rural municipal capacity to apply for competitive funding. For example, the recent Inflation Reduction Act, a landmark federal legislation aiming to tackle inflation and promote the green transition identifies the agricultural sector to invest in innovations to reduce greenhouse gases, carbon storage and innovation absorption for increased productivity, as well as increase resilience of rural lands to climate impact, and

energy producing communities but, without specific considerations for alleviating challenges related to scale and capacity of rural municipalities, it is unclear whether rural communities will be able to receive equal support in applying for grants and support.

### **Eligibility for federal programmes varies across spatial scales, which hinders participation of local governments**

Currently, a number of different spatial units are used to define eligibility for federal programmes, including counties, multi-county regions, and municipalities of differing sizes. Almost all USDA rural development support is capped at places of fewer than 50,000 inhabitants, while the majority of programmes are restricted to places of fewer than 35,000 inhabitants. It can be hard for local governments to apply to multiple forms of support and construct a development strategy when some of the specific programmes that they need are not available according to the existing selection criteria. One option for the government is to consider adapting the existing eligibility criteria to make programmes more widely available for areas in need, including by creating more opportunities for joint applications. Moreover, the bundling or stacking of programmes between agencies could help rural communities access funding for innovation and entrepreneurship, especially in persistently poor counties. In creating more joint programmes that involve the participation of several municipalities and regional authorities, the government could incentivize regional cohesion rather than competition between areas that are in proximity.

*Rural innovators' barriers to finance can be overcome by involving a wider pool of stakeholders*

### **Non-bank financial intermediaries can help overcome barriers for access to finance**

Although most rural communities have access to various options of bank credit, they often are focused on consumer or household credit and can be reluctant to fund new businesses. In rural places where incomes and wealth are low, business creation is often blocked by an inability of the enterprise to assemble sufficient equity funds to allow a bank or other lender to provide a loan. Access to finance and credit is particularly difficult for small and medium enterprises (SME) that represent the lion's share of enterprises in non-metropolitan areas. The typical challenges for SMEs already include under-collateralisation, high transaction costs, and lack of financial skills. In communities with high rates of persistent poverty and where discrimination has a long history, the problem of access is even greater.

In this respect, new forms of financial intermediation can help bridge rural "capital access gaps". The OECD identified non-traditional financing instruments as particularly helpful for SMEs that share a large part of rural economies in the G20/OECD High Level Principles on SME Financing (OECD, 2015<sup>[3]</sup>). In addition, rural entrepreneurs may need to work with financial intermediaries that better understand the risks in rural areas. Non-bank financial intermediaries include community development corporations, small business investment corporations, rural-focused venture capital firms, credit unions and cooperatives, rural loan funds, and angel investors. These actors tend to have a good understanding of the local economy and are able to provide targeted services to their clientele. However, given that their services are not widely available, greater support for this type of financial innovation could make a significant difference in rural areas.

### **With more support, non-governmental organisations (NGO) and community-based organisations can continuously contribute to foster community development**

Where access to resources from government are limited, or not in the mandate, NGOs and community-based organisations can help develop solutions to challenges and take advantage of opportunities. The presence of non-profits in the three case study counties – Columbiana, Gallup and Pine Bluff – seemed to be instrumental to the success of community development strategies. Nonetheless, inadequate access to

finance, programmes and services can limit the capacity of non-profits, community-based organisations and NGOs to support such endeavours.

Programmes and services that support civil society, or are delivered through them, should be considered as a priority approach in rural communities. Additional funding and capacity building opportunities for community-based organisations, non-profits and NGOs can be provided by reinforcing legal status for such entities as delivery partners of innovation and entrepreneurship programmes, expanding federal or state agencies' "boots-on-the-ground" work. Support may be targeted to entrepreneurs, local community outreach organisations, NGOs that work in rural areas and other community outreach organisations, as well as to various forms of social enterprise (OECD, 2022<sup>[4]</sup>). Because each state administers its own programmes to support rural development, opportunities for aligning federal and state efforts have to be built into policy and programme design.

***Broadband connectivity is an important condition for innovation, yet there are substantial gaps to high-quality broadband access in rural and Tribal Land areas, in comparison with urban areas***

*Rural areas in the United States have lower broadband coverage, less choice of internet providers and lower speed rates than urban regions*

As in other OECD countries, rural areas in the US have a higher proportion of population without access to internet or with limited digital literacy skills, which is known as the digital divide. In terms of broadband coverage, 21% and 22% of the rural and Tribal Land population, respectively, live in areas without coverage of fixed broadband offers at 100 Mbps download speeds, while in urban areas this rate is 1%. Moreover, even if they are covered, they often have a limited choice of providers. Broadband adoption rates reveal even starker contrasts. In terms of experienced speeds, there was a 51-percentage point gap in download broadband speeds experienced by users between urban (metro) and rural regions by state in Q1 2021. This was similar to the findings on rural and urban areas in G20 countries, where there was, on average, a net 52-percentage point deviation in fixed download speeds between rural areas and cities in Q4 2020. This impacts opportunities for rural communities to grow, and is a key condition for the adoption of increasingly digital services being provided in education, labour, health and other services activities.

*The United States government has recognised the importance of broadband connectivity for all, regardless of where they live*

To avoid deepening existing digital and economic divides, access to high-quality broadband at affordable prices in rural areas of the United States is paramount. As such, the United States Government has a myriad of programmes. The Infrastructure and Investment Jobs Act (IIJA) allocates USD 65 billion to expand broadband infrastructure and bridge digital divides by funding digital equity and inclusion programs. The National Telecommunications and Information Administration (NTIA) will manage around USD 48 billion in the context of the IIJA through four programmes to expand access, affordability and adoption of high-quality broadband services (i.e. the Broadband Equity, Access and Deployment [BEAD] programme, the Digital Equity Act, the Tribal Connectivity Technical Amendments, and the Enabling Middle Mile Infrastructure programme). Out of the four, the largest is the BEAD programme, which provides USD 42.45 billion to be distributed among states and territories to expand broadband deployment and adoption in underserved and unserved areas. Through the Digital Equity Act, administered by the NTIA, USD 2.75 billion will be allocated to promote digital inclusion, including the promotion of digital skills and digital literacy. Measures to reduce broadband deployment costs and address affordability from the consumer side, such as the Affordable Connectivity Program, are also on the agenda. Close collaboration across agencies and levels of government should amplify the impact of such measures.



## **Access to quality education has been a barrier for many rural counties**

*Access to education in rural counties is more expensive and of lower quality than in urban counties*

In the United States, 57% of school districts and 32% of public schools are rural, and they educate about 12 million (24%) students, however, the quality and delivery of educational services is often more limited in rural regions (OECD/EC-JRC, 2021<sup>[11]</sup>). This is rooted in the territorial challenges of rural counties; whereby lower density makes services less cost efficient, and challenges related to providing adequate staff are persistent. While having more teachers per pupil is often associated with better conditions for learning, the shares of student-teacher ratios are lower in regions (TL2 level) that have a lower share of individuals living in functional urban areas. In the Pine Bluff School District, Arkansas, it has been reported that students could go through the whole K-12 (early education) system without interacting with a certified teacher. Addressing these challenges is necessary for rural school districts to increase quality of education and contribute to building a skilled workforce.

*Skills training needs to match local labour market demands*

Skills are one of the biggest challenges for rural communities, which often starts from early education. Challenges are proliferated through difficulties in teacher recruitment and certification, and lack of well-targeted skills training programmes. In the Pine Bluff School District, only 12% of the high school students tested at or above the proficient level for reading, and 8% tested at or above that level for math. This limits their ability to benefit from vocational and entrepreneurship training in the first place, and therefore to contribute to the local economy and workforce. It is necessary to provide a basic education that motivates students to study, training to give them skills for working, and opportunities for some to pursue higher education.

Moreover, the curricula of vocational training and education institutions need to be adapted to the needs of the local labour market. Regular consultations can be held between state education boards, departments of commerce and local business leaders to better understand the demand. Anticipatory skills plans can be jointly developed to trace a strategy. These measures could contribute to increase workforce retention in rural places, boosting the local economy.

*Higher education and R&D institutions can have a positive impact on local innovation*

Higher education institutions have a key role in promoting innovation. Universities and colleges are well placed to develop initiatives to improve workforce development, knowledge generation and dissemination. Currently, there is an unequal role of Higher Education and Research and Development (HERD) institutions across counties. While an increase in the number of HERD institutions is associated with a 1.6% increase in productivity in metropolitan regions, it is not similarly associated with productivity in non-metropolitan regions. Its effect on patent intensity is positive in metropolitan counties, but non-significant for both metropolitan and non-metropolitan counties. Evidence on the impact of Land Grant universities in the United States suggests that higher education institutions with close ties to the economy in rural counties may have a more positive impact on local innovation. Furthermore, evidence from outside of the US in the Québec province of Canada, has similar findings. In Québec, community colleges (CEGEPs) and their technology transfer centres (CCTTs) combine applied research with industry support and workforce training in rural communities and there are other examples of higher education universities such as the University of Quebec at Rimouski that are especially designed to connect with territories. In Québec, the university incentive system for researchers is tied to how well they serve needs of local (and in some cases rural) communities (OECD, forthcoming<sup>[5]</sup>).

Regions that contain an important share of institutional innovation partners, such as educational institutions, research universities or laboratories, tend to have an advantage in building connections and sharing of resources. However, it's not only the existence of the institutional innovation partners that matters but also how to cater to the needs of rural areas, including through Vocational Education and Training programmes. As such, such institutions are better positioned to take advantage of resources and knowledge spill-overs that can often lead to economic growth and innovation. In Gallup, New Mexico, the Navajo Technical University provides opportunities for tribal youth to gain a university degree in a STEM related discipline. Its Center for Advanced Manufacturing provides job-focused experience for students in additive metal manufacturing.

In addition, encouraging joint initiatives between universities and firms can drive rural and regional innovation. Governments can support these types of linkages through a variety of tools that include subsidies for joint endeavours, creating platforms to connect entrepreneurs and research institutes, networking events, or other kinds of in-kind and programme support. One example is EDA's University Center programme, which offers grants to create centres of expertise, applied research, and technical assistance that can help develop and implement regional strategies for innovation. Programmes such as this can considerably support innovation across rural places. Another example from outside of the US comes from Scotland, where a national programme, Interface, is a platform for bringing rural entrepreneurs and institutional research partners together. Similar initiatives linking rural firms to research institutes, often through the help of regional development agencies, also exist in the provinces of Quebec and Ontario in Canada, and within the mandate of the Regional Innovation System in Switzerland.

## Recommendations

The United States has a strong ecosystem for innovation, with funding for technological development, involvement of higher education institutions and market support. However, policies and programmes for innovation in the country do not always consider the specific needs and challenges of rural areas – for example, that innovation may not be STI-related and that economies of agglomeration may not be present. As such, a strategy that adopts a broader based definition of innovation while working to overcome challenges of scale should be prioritized. By definition, the low density and in many cases, large distances, in rural places create a less optimum environment for benefiting from advantages that come with agglomeration including innovation and productivity spill-overs. Nevertheless, a strategy that takes into consideration a functional approach and builds scale for small cities and towns can, in part, overcome some of the challenges related to scale and networks. An example of a strategy that takes this kind of approach into consideration is in Korea, the only OECD country that does not have major gaps in labour productivity among rural and urban regions, and where rural regions display higher levels of labour productivity than urban regions (OECD, 2021<sup>[6]</sup>).

Co-ordination on investments in jobs, the green transition, broadband connectivity, other infrastructure, housing and education are the backbones to sustain long-term progress in rural innovation. There are already several direct and indirect federal and state agencies in place to support innovation and entrepreneurship in rural areas. However, support for innovation requires support for direct, indirect and auxiliary mechanisms. To improve outcomes for implementation of such programmes, federal departments need to pay more attention to coordination efforts with other federal departments, and local governments need to work on co-ordination across levels of government. For example, the recent federal Infrastructure and Investment in Jobs Act (IIJA) as well as the Inflation Reduction Act (IRA), are two laws that create competitive federal grants to which municipalities can apply. The IRA is unprecedented in scale, however, as in the case of the post-global financial crisis stimulus, their effectiveness depends on the capacity of local governments to tailor investments for real progress and, in this case, the transition to net-zero (or green transition). It can be more difficult to access for rural counties who may lack the trained manpower needed to carry out intensive contracting processes, and the capacity to absorb funding. For example, the

Notice of Funding Opportunities (NOFOs) related to the IRA funding could be a.) streamlined to increase programme uptake – encouraging joint municipal applicants – and b.) encouraged through collaborative partnerships across federal government agencies. Such a collaboration, for example between the Department of Commerce and the United States Department for Agriculture, could be built to foster place-based visions for rural innovation.

Based on the findings of the report, key recommendations include developing policies and programs that are tailored to the unique needs and challenges of rural areas, expanding access to capital and resources for entrepreneurs in rural areas, investing in physical and digital infrastructure to improve connectivity, and supporting skills development and entrepreneurship as a means of addressing service delivery and well-being challenges in rural communities. By doing so, the US can unlock the full potential of rural innovation and entrepreneurship, contributing to the overall economic and social well-being of the country.

### ***Improving policy design and implementation for rural innovation***

The United States is a federal country with strongly devolved powers to the states. Devolution is also a characteristic of the regional development arms of the major agencies that support rural innovation, the USDA and the EDA. In this context, the recommendations below offer guidelines to the different agencies in charge of rural innovation but also to state agencies with regional development mandates.

#### *Promoting a broader view of innovation policy for diverse rural areas*

To ensure that policies for innovation are place-based and contain the appropriate scope and target, the government should encourage that investments related to encouraging innovation and entrepreneurship should:

- **Broaden the scope of “innovation”** in criteria for programme design and eligibility for funds to include social innovation, public sector innovation and innovation that goes beyond science and technology -related types of innovation.
- Reinforce **place-based programmes** to support innovative behaviour in all types of rural business, but including those that produce tradable outputs.
- Expand **“boots-on-the ground” financial support initiatives**, including revolving loan funds, that enable true partnerships where programmes are built with and are flexible enough to respond to local communities and NGOs, to improve awareness and programme uptake.
- Account for the **challenges of rural areas**, such as persistent poverty, demographic change, aging workforce, migrant workers and the gender wage gap, by:
  - streamlining such concerns in the design of policies and programmes that seek to encourage innovation and entrepreneurship, or
  - working with local and community development organisations to consult on the best way to address the challenges for each category through bottom-up initiatives.
- Follow the **G20/OECD High-Level Principles on SME Financing** (2022) using a rural lens in order to develop cross-cutting policy strategies to enhance SME access to finance. This can be applied to strategies for financial institutions such as Community Development Financial Institutions (CDFIs), State Small Business Credit Initiatives (SSBCIs), Small Business Innovation Research (SBIR) or Small Business Technology Transfer programmes (STTR). Among other principles, this can include:
  - Identifying SME financing needs and gaps to improve the evidence base in rural areas.
  - Strengthening SME access to traditional banking finance in rural areas, for example through rural finance roundtables, as is the case in the rural regions of Gaspé, Québec.

- Promoting financial inclusion for SMEs and easing access to formal financial services, including for informal firms, for example, through local brokers and community-based bank partnerships.
- Enhancing SME financial skills and strategic vision, in partnership with local rural education and skills providers.
- Designing public programmes for SME finance which ensure additionality, cost effectiveness and user-friendliness for rural entrepreneurs,

### *Implementing programs in accordance with different scales of intervention*

Building in consideration for the scale of interventions can create new opportunities. Rural innovation programmes should take into consideration both differences in size of place and the availability of linkages to other places. To illustrate, areas in proximity to urban counties may have different opportunities than those in remote areas, and economic opportunities vary across the nation. To ensure the territorial aspects of rural and non-metropolitan regions are continuously reviewed and addressed, the government should:

- **Simplify eligibility criteria** to increase programme uptake, **or consider bundling programmes**. Consider harmonising the spatial unit (county, multi-county region or municipality) that is used as eligibility criteria for federal programmes. While statutory eligibility rules may be difficult to change, the bundling or stacking of programmes could be another option to increase rural communities' access to funding for innovation and entrepreneurship.
- Consider **delivering programmes at a higher level of spatial aggregation**. For creating scale and overcoming fragmentation of small areas, the government could promote strategies across key government agencies relevant for rural development to deliver programmes at a higher level of aggregation, such as is done by the EDA's Economic Development Districts (EDDs).
- Foster **collaboration among local governments to create economic development strategies**. In rural America, many local governments serve populations that are too small to have a viable economic development strategy on their own. EDA's approach of fostering collaboration within regions could serve as a model for other agencies to move towards.

### *Ensuring effective co-ordination mechanisms across levels of government and capacity for multi-level governance*

Building on the federal structure of the United States, the role of co-ordination mechanisms is critically important to reduce duplication and encourage more efficient programme implementation. Alongside co-ordination mechanisms, ensuring municipalities in rural areas have the capacity to implement policies, programmes and get access to federal grants is critical. Ensuring co-ordination mechanisms are in-line with best practices and updated to reflect changes in demographics and priorities across regions is important. Foresight practices could likewise revisit co-ordination mechanisms to ensure they are able to adapt to change. In order to better ensure vertical and horizontal co-ordination mechanisms and adequate capacity between state, federal and local governments, the government should:

- **Increase regular collaboration between regional EDA and USDA offices** to facilitate greater impact on innovation and entrepreneurship, including with state economic development agencies.
- Draw lessons that scale-up from successful programs that provide **direct funding** to local governments, instead of reliance on sub-allocation or competitive processes.
- Implement the principles of the **OECD Recommendation of the Council on Effective Public Investment Across Levels of Government** (2014) on how to co-ordinate public investment across levels of government and policies. This can occur, for example through:
  - Early-stage co-ordination on federal level strategies for innovation and regional development. An example of this related to regional and rural innovation comes from Switzerland, where

innovation strategies and the new regional development policies are coordinated with each other at an early consultative stage.

- Creating incentives for bundling programs, or incentivizing cross-municipal coordination for accessing funding, as was the case in the \$1B Build Back Better Regional Challenge in the United States. An example of this in Scotland, can be found through region-city deals, which are local government collaborations that facilitates jointly attaining government funding for shared local priorities.
- **Build capacities of municipalities and programme delivery partners for accessing competitive federal grants in rural areas.** This can include stipulations facilitating accessing grants at a larger scale (jointly with other municipalities; supporting rural communities to identify complementary programs that can help leverage or maximize federal and state funding and programmes, such as for broadband investments; and direct funding available specifically for building municipal capacity. As demonstrated with the 2008 Financial crisis recovery initiatives, distressed and small municipalities have less capacity and face absorption challenges for large competitive grants (Mizell and Allain-Dupré, 2013<sup>[7]</sup>; OECD, 2011<sup>[8]</sup>). This is the case especially for those in persistently poor counties that could most benefit from innovation and entrepreneurial support through competitive federal grants of large programmes such as infrastructure and relief funds. Two recent examples of large federal competitive initiatives that may be more difficult for rural municipalities to apply to and access include the Inflation Reduction Act (IRA) and the Infrastructure and Investment in Jobs Act (IIJA).
- Create **online one-stop shops to facilitate access to resources** related to innovation for entrepreneurs and NGOs. In Scotland, for instance, entrepreneurs looking for support can turn to *Business Gateway*, an online platform for entrepreneurial support, as a point of first entry.

#### *Building a culture of experimentation in rural entrepreneurship*

A culture of experimentation can enable businesses and local governments to develop innovative solutions to local challenges related to public service delivery and quality of life in rural areas. In order to build a culture of experimentation in the public sector and among entrepreneurs, the government should:

- **Foster rural development networks** to encourage mutual learning from best practices across the federal and state public sector.
- **Support regional hubs and networking hubs** among rural leaders and potential entrepreneurs that can enable them to share expertise and create business opportunities. An example is Go Forward Pine Bluff, a Public-Private partnership lead by community organisations that encourages the development of new firms by youth.
- Continue to **encourage open competitions** for rural entrepreneurs, such as hackathons and other challenge-based initiatives, as is done through Innosuisse's Innovation Booster initiatives in Switzerland.
- **Foster partnerships** between universities and rural colleges on one side and entrepreneurs and business owners on the other side to increase innovation matched to the needs on the ground. For example, this can be done through:
  - support for *early access to research internships and apprenticeship programmes* in accessible rural areas, such as Columbiana, Ohio, or more remote, but well-connected areas, such as Gallup, New Mexico.
  - *research partnerships* for more remote rural areas further from relatively larger population centres.

## ***Improving access to high-quality broadband in rural areas***

Expanding high-quality broadband connectivity in rural areas can help alleviate the barriers of increased geographical distance and transport costs. It leads to greater access to opportunities and services in a remote manner, such as health, education, banking, and government services. Broadband connectivity also helps to prepare rural economies for the digital transformation, boosts rural innovation, and aids them in disaster relief and emergencies, which in turn increases their resilience and productivity. This could contribute to the regional appeal of rural communities, for example by attracting private sector investments or encouraging regional mobility. To this end, the following section outlines recommendations to expand broadband connectivity in rural areas, which are directed to the Federal Communications Commission (FCC), the National Telecommunications and Information Administration (NTIA), the United States Department of Agriculture (USDA) and the Economic Development Administration (EDA).

### *Better assessing the state of broadband connectivity*

To accurately assess the state of broadband of connectivity as a compass for broadband policies as a tool to strengthen end-user transparency, the FCC, NTIA, USDA and EDA should:

- Continue the laudable efforts to **improve broadband maps** in the United States in terms of availability and quality of broadband, as the efficient use of public funds depends on them.
- Develop a government-sponsored tool to **inform end users on broadband prices** (both fixed and mobile) available in their area, which although a complex endeavour, will be important moving forward.

### *Extending connectivity by easing barriers to infrastructure deployment and complementing measures through local bottom-up approaches*

To narrow the rural-urban connectivity divide, the government needs to ease barriers to infrastructure deployment by involving local governments and continuing to promote efficient spectrum management. It also needs to support bottom-up approaches, such as municipal and community-led initiatives, known as small Internet service providers (ISPs). To this end, the FCC, the NTIA, the USDA and the EDA should:

- Build on existing efforts to reduce the **administrative burden** and costs associated with broadband deployment at the local level.
- Enhance collaboration at national, state, and local levels to **streamline access to rights of way**, for example, through a task force including representatives from local and state authorities.
- Increase the **transparency on public assets available** to be leased by communication operators to set up network infrastructure, such as towers.
- Continue to promote **spectrum management policies** that grant access to spectrum resources to users in rural areas and in Tribal Lands.
- Encourage states to reconsider **bans against small Internet service providers** (ISPs), given that municipal and community-led broadband initiatives are important players in extending broadband access in rural areas. State bans are a significant barrier for competition and may contribute to higher prices for broadband services at lower quality of service.
- Increase access and interconnection to **“middle-mile” fibre wholesale connectivity** and promote **regulatory forbearance** (e.g. leaner reporting obligations) to create an enabling environment for local networks to flourish.

### *Making the most out of existing funding and programmes for broadband connectivity*

To amplify the impact of current broadband deployment initiatives and funds to rural areas, and considering local capacity constraints, where relevant, the FCC, the NTIA, the USDA and the EDA should:

- Continue supporting states in implementing **Broadband Equity, Access, and Deployment (BEAD) funds**, in particular regarding the dimensions of affordability, open access obligations and preferences for future proof broadband access technologies, such as fibre, as part of the selection criteria.
- **Leverage synergies** of programmes undertaken by the Federal Communications Commission, such as the Rural Digital Opportunity Funds (RDOF) and universal service provisions, with existing grants of the Infrastructure and Investment Jobs Act.
- **Assist small rural communities** in navigating, building capacity for applying to the different broadband funding programmes, and determining the ones that best fit their local needs. Initiatives from the NTIA, such as the State Broadband Leaders Network (SBLN), are a welcomed development in this regard.

### **Supporting students in skills development and entrepreneurship training**

Access to education is a framework condition for innovation. In this respect, strengthening the early (K-12) education system can be a turning point for rural communities. Investing in vocational education in rural areas should be a priority to enable more diverse training options. Providing skills training, guidance and new partnership opportunities to develop entrepreneurial skills can create new opportunities. Finally, higher education institutions have a role to play in promoting innovation, but the offer of services that they provide needs to be aligned with labour market demands. The following sections provide recommendations to strengthen education in rural areas in the United States.

#### *Improving skills needed for the local labour market and for higher education*

To ensure that education services are apt to reinforce locally based skills programme, the United States, through state education boards, the Department of Education and regional development agencies in USDA and EDA, should:

- Consider resources to reinforce basic education by encouraging partnerships between the private sector, community organisations and high school level students to motivate students to **learn skills** for the local labour markets and to pursue higher education.
- Direct funding and resources to support education programmes **driven by demand for skills needed to develop Indigenous business** in Indigenous communities.
- Reinforce **quality controls for teacher recruitment and certification** in rural communities.
- Reinforce **vocational skills training programmes** in rural communities, in line with the **OECD Skills Strategy (2019)** and in consultation with local Indigenous community representatives when relevant.
- Require states to promote **consultation and joint collaboration** with civil society and local leaders, especially in counties and communities with strong Indigenous populations, so that the offer of local skills upgrading is aligned with opportunities in the local market.

#### *Promoting education for entrepreneurship*

To promote education for entrepreneurship in rural communities, state education boards, the Department of Education and regional development agencies in USDA and EDA, should:

- Support regular **consultation mechanisms** between state education boards, leaders from the local private sector, business associations and departments of commerce, to develop anticipatory skills plans for students from a young age to engage in entrepreneurship.
- Build more **local partnerships with secondary schools** to provide programmes for entrepreneurial training, including challenge-based programmes. An example is Columbiana, Ohio where local companies regularly work with secondary schools to provide challenge-based programmes in entrepreneurial courses, among other initiatives.
- Provide local and regional opportunities for **on-the-job training, internships and summer jobs** for youth to gain experience.
- Implement the **OECD Recommendation of the Council on SME and Entrepreneurship Policy** (2022) to developing coherent, effective and efficient SME and entrepreneurship policies.

### ***Tackling the challenge of measuring innovation in rural areas***

Innovation in rural areas is less dependent on the direct effects of R&D investment than in urban areas. This does not mean, however, that innovation does not occur in rural places. Innovative processes and products happen even when they are not associated with patent-generating activity or when they involve high-tech sectors. In fact, innovation absorption was one of the main causes of productivity growth in rural counties in the past decade. Yet, it remains challenging to measure innovation outside of these proxies. As a consequence, the opportunities to adjust policies to encourage entrepreneurship and innovation in light of the characteristics of rural innovation remain limited. To encourage a better understanding of innovation in rural regions and therefore increase access to public services, including for innovation and entrepreneurship, the government should:

- **Monitor demographic and economic changes in rural areas**, for example through a Rural Observatory or similar cross-agency initiative, with the aim of better aligning the definition of innovation in rural areas with their characteristics.
- Measure, identify and adopt **indicators that are more appropriately associated with innovation priorities of rural counties**, such as indicators of new firm activities (firm births and deaths) or via community innovation surveys that have an adequate coverage of rural firms. Examples include:
  - encouraging statistical departments such as the Census Bureau to administer regular and timely questionnaires on innovation, with a large enough sample size, through the American Community Survey, or other surveys administered through the Bureau of Economic Analysis, or
  - co-ordinating on administering surveys on innovation and entrepreneurship with the state-level economic or labour analysis agencies.
- Mainstream **policy evaluation methods** that differentiate between metropolitan and non-metropolitan regions across the various government departments that work with rural areas.

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## Notes

<sup>1</sup> A recent report from using postal code statistics on the movement of individuals across counties in the United States found that there was a particularly striking trend of urban outflow from the onset of the COVID-19 crisis in January 2020, that remained elevated until January 2022. After this time, requests to relocate out of urban areas slowed down drastically. Unfortunately, further information on county level statistics after the COVID-19 lockdown period was not available at the time of the publication of this report. For further information, please see Marshalian, M., P. Chan and M. Bournisien de Valmont (2023), "Networks and rural-urban linkages for rural innovation", *OECD Regional Development Papers*, No. 53, OECD Publishing, Paris, <https://doi.org/10.1787/4928f26b-en>.

<sup>2</sup> The report mainly uses the USDA's Rural-Urban Classification Continuum, which is a system of classification of rural areas based on counties (or municipalities). However, when comparative analysis with other OECD countries are conducted, the analysis refers to large regions identified as Territorial Level 3 (TL3). In the United States, the TL3 is associated with an economic development district, as defined by the US Department of Commerce. More information on classifications are outlined in Chapter 2.

<sup>3</sup> These refer to two categories of metropolitan regions, further elaborated in the report. They include small administrative regions (Territorial Level 3) that are classified as a large metropolitan region (MR-L) having

a functional urban area with a population larger than 1.5 million; or a metropolitan region (MR-M) classified as having a functional urban area with population larger than 250 000.

<sup>4</sup> Financial and real estate services also include imputed rents.

<sup>5</sup> The 12 sectors include Agriculture; Construction; Education and social services; Finance, insurance and real estate; Information; Manufacturing; Mining, oil and gas; Other services (non-public); Professional Services; Recreation; Retail trade; Transportation and utilities; and Wholesale trade.

<sup>6</sup> Factors like intangible resources such as intellectual property, as well as brand recognition and local relationships could also be deepening the gains to productivity of firms, even if products and services innovation have not further developed.

<sup>7</sup> This is close to 1 patent per 1 000 individuals in occupations that are more likely to file patents. Further details on how this is calculated is available in chapter 2 and its annex.

<sup>8</sup> The definition adopted for “persistently poor” counties is defined by congress and used by departments such as the US Department of Commerce. According to a Congressional requirement, a county (or a county-level equivalent) is experiencing Persistent Poverty if their most recent poverty rate estimate, within the margin of error, equates to 20 percent, while also evidencing poverty rates of at least 20 percent in the 1990 and 2000 decennial censuses (i.e., 20 percent or greater poverty over the last 30 years).

<sup>9</sup> Columbiana County is classified by ARC as "a transitional county in fiscal year 2023. The maximum ARC share for projects funded in this county is **50%**. This county has 4 distressed areas in fiscal year 2023.

# **2** Understanding innovation in rural United States

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This chapter undertakes a diagnosis of productivity and innovation levels in the United States, by comparing metropolitan and non-metropolitan counties with predominantly urban or rural characteristics. It identifies strengths and challenges for innovation in rural areas, and sets the scene for the policy discussions of the report. It pays special regard to geographic disparities and to equal opportunities for education, entrepreneurship and innovation in rural counties.

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## Key messages

### There is convergence in productivity between counties, bringing urban and rural parts of the country closer together

- There is a gap in performance of rural vis-à-vis metropolitan regions.<sup>1</sup> In the United States, the gap between the top- and bottom-performing regions is 12% greater than the average of OECD countries. The GDP gap, which measures the difference in real GDP per capita between the richest (top 20%) and poorest (bottom 20%) regions, averaged USD 30 890 for 26 OECD countries with available regional data from 2008 to 2020. At USD 34 551, The US GDP gap was higher than 18 countries and lower than 7 others. Taking the size of GDP into account, the US gap is 62% of its GDP per capita, against an international average of 85%. Of the regions reported to be in the top 20% of GDP, 70% are in metropolitan regions (MR-L and MR-M) and 26% are in rural regions (NMR-R), against 26% and 61% for the bottom 20%, respectively.
- In county level analysis, the gap in GDP per capita is declining, but in a volatile way. While contributing the smallest share of GDP of the total economy, rural counties led in GDP per capita growth in the decade between 2010 to 2020, averaging 1.5% per year against metropolitan (urban) counties' 0.9%. At the same time, growth in completely rural counties and other non-metropolitan counties was more volatile than growth in metropolitan counties owing to their exposure to global market conditions in sectors such as agriculture and manufacturing.
- Convergence in labour productivity between counties is led by rural growth. Labour productivity in rural counties surged between 2009 and 2020, averaging 1.7% annually as it converged towards that of metropolitan counties. Likewise, non-metropolitan counties adjacent to cities caught up to non-metropolitan counties *not* adjacent to cities, albeit at a slower annualised rate of 0.9%. Across the decade, productivity disparity remained the highest in rural counties, having the greatest share of the most and least productive firms.

### Structural change is impacting economic activity in rural areas

- The face of the rural economy is changing. In 2020, as a share of the total economy, rural counties in the United States were dominated by finance and real estate (24%), agriculture (23%), and manufacturing (13%), a ranking unchanged from 2010. However, even these sectors are employing a lower share of workers in 2020 than in 2010, and 9 out of 12 sectors in rural counties shed their share of jobs across the decade. In rural counties, the top employers are in education and social services (24%), manufacturing (13%), and retail trade (11%). Thus, despite often being viewed as agrarian, manufacturing and services sectors actually employ more workers than the agriculture sector in rural counties.
- Productivity growth is coinciding with a relative drop in employment in non-metropolitan counties as compared to previous years. Despite the reduction in relative labour resources, the remaining share of employment within non-metropolitan counties still leads to productivity gains. Decomposition analysis that separates the effects of more efficient use of resources (“within” effect) versus reallocation of resources across typologies of counties (“between” effect) finds that most productivity growth is primarily due to more efficient use of resources within each type of county. In fact, over the past 10 years, most of the productivity growth in non-metro counties has been primarily due to more efficient use of resources within counties, despite the negative impact of the reallocation of production factors, like labour or capital in non-metropolitan areas.

### The context for innovation is different in non-metropolitan and metropolitan counties

- Innovation happens through interactions between people and firms in places that are able to provide the right setting (Crescenzi, Nathan and Rodríguez-Pose, 2016<sup>[1]</sup>). At the same time, new jobs bring in a new mix of individuals who have the potential to innovate. Counties with larger shares of inventive workers also tend to have high number of employed individuals, but not necessarily equally higher labour productivity.
- Places where there are high levels of firm activity (clustering) are often associated with local innovation outcomes (Delgado, Porter and Stern, 2014<sup>[2]</sup>). In non-metropolitan areas, there can be a penalty associated with this in part because of fewer interactions and interconnectedness with firms elsewhere, especially when it comes to science- and technology-based innovation.
- High-tech innovation is less prevalent in rural areas. On average, individuals with inventive occupations (as described in Annex 2.C) living in non-metropolitan and rural counties have applied for fewer patents than those in metropolitan areas. There are 1.3 fewer patents per 1 000 “inventive” individuals in non-metropolitan areas, as compared to metropolitan areas, despite controlling for standard sectoral and economic factors.
- On the other hand, innovation absorption, a driver of overall productivity and growth, is stronger in rural and non-metropolitan counties. For example, nearly two-thirds of overall productivity growth from 2010 to 2020 was due to innovation absorption in non-metropolitan areas.
  - There is more room for gains from innovation in rural and non-metropolitan counties. On average, rural and non-metropolitan counties have less patent intensity as compared to metro counties. Yet patent intensity in non-metropolitan counties is still positively correlated with R&D expenditure per worker, whereas this is not the case in metropolitan counties.
- There is a margin of opportunity for innovation in non- metropolitan counties.
  - For every 1% increase in R&D spending, patent intensity increases by 0.7 units in non-metropolitan counties, while it is close to zero, and more spurious in metropolitan counties.
  - Investing in the education of the workforce is also associated with higher patent intensity and productivity in non-metropolitan regions.
    - Investing in education is positively associated with increases in productivity in non-metropolitan counties. A 1% increase in government spending in education (per capita) is associated with a 0.54% increase in productivity (output per worker) in non-metropolitan counties. As compared to metropolitan counties, the marginal increase to the additional percentage of government spending is lower, at 0.30%.
    - A 1 unit increase in the share of tertiary educated workforce is associated with 1.1 increase in patent intensity in non-metropolitan counties. However, the magnitude in non-metropolitan counties is lower than in metropolitan counties where the magnitude of the relation is at 2.1, suggesting that one may need to look beyond tertiary education for innovation in non-metropolitan counties.
- Critically, for innovation in non-metropolitan areas, educational institutions need to be suitable for local communities. Higher Education and Research and Development (HERD) institutions play an unequal role across counties. While an increase in the number of HERD institutions is associated with a 1.6% increase in productivity in metropolitan regions, it does not drive productivity in non-metropolitan regions. Its effect on patent intensity is positive in metropolitan counties, but non-significant for both metropolitan and non-metropolitan counties. Evidence suggests that higher education institutions with close ties to the economy in rural counties may have a more positive impact on local innovation.

**Equitable opportunities for innovation and entrepreneurship is an important factor to consider**

- Compared with 18 other OECD countries, overall GDP inequality in the US is above average, driven by high disparities in rural counties and non-metropolitan counties not adjacent to cities. Furthermore, inequality in the US is growing, with relatively high levels in the more remote counties.
- Government support often targets places that have demographic challenges or have systematically been left behind. Indeed, the share of persistently poor<sup>2</sup> counties is five times higher in rural counties than in metropolitan counties. Enabling equal opportunities for access to entrepreneurship and innovation should be a priority across counties, especially considering that:
  - The United States has an aging workforce, with non-metropolitan counties having a relatively larger share of older workforce population than metropolitan counties.
  - While gender inequality has lessened, on average, women in rural counties still face larger wage inequality than those in metropolitan counties.
  - Priority should be placed on policies aiming to deliver equitable access to services in non-metropolitan regions to support the efforts in reducing persistent poverty within counties.

The United States is one of the global leaders in the field of innovation. Its high levels of protection for intellectual property rights, quality of higher education institutions, and levels of competition between firms lends itself to creating an environment for cutting-edge research and high-tech innovation. However, innovation is not equally distributed across areas, with high-tech innovation clustered in a few states with relatively large metropolitan populations. Geographical clustering is consistent across most OECD countries and can be a challenge for policymakers. A particular challenge is how innovation and entrepreneurship can be promoted within districts or states that have low density and are far from metropolitan centres where access to services and supply chains may be less challenging.

The United States has a strong federal mandate to promote innovation and entrepreneurship. It is a responsibility shared by several government departments including the Department of Commerce, the Department of Agriculture, the National Science Foundation, Department of Defense, Department of Energy and National Aeronautics and Space Administration.

There is no national strategy that considers innovation and entrepreneurship with a rural lens. For government officials focused on regional and rural development, larger scale projects for high-tech innovation often overlook the structure of rural and regional economies, and the characteristics of innovation across geographies. Despite that, the Economic Development Administration (EDA) of the Department of Commerce and, to a larger extent, the United States Department of Agriculture (USDA) are often tasked with understanding how to promote innovation and entrepreneurship in rural areas.

As in other federal OECD countries, co-ordination and collaboration on joint priorities between the federal and state governments can be a challenge (OECD, 2022<sup>[3]</sup>; OECD, forthcoming<sup>[4]</sup>). In addition, difficulties related to scale and state hegemony over key framework conditions such as access to finance, education and digital infrastructure, can make addressing bottlenecks for promoting innovation and entrepreneurship more complicated.

This chapter sets the scene for understanding rural and non-metropolitan counties, trends in innovation and a few drivers of innovation and equitable opportunities in non-metropolitan regions. Drawing on broad trends, it focuses on evidence and analysis in non-metropolitan counties, as well as their characteristics and capacity to innovate.

To explore trends and set the scene for the rest of the chapter, the analysis uses pooled data from the American Community Survey (ACS), the Bureau of Economic Analysis (BEA), the U.S. Decennial Census and the United States Patent and Trademark Office (USPTO). For the most part, analysis is conducted from 2000 to 2020, or the most recent year available at county level. There are usually over 3 000 observations per year, although in some cases data may be missing for some counties. County-level data is then reported on an aggregated level based on geographical classifications. The ACS provides statistics on employees and in some cases firms, but the majority of the data on firms is gathered from the BEA regional tables.

## Setting the scene for rural innovation in the United States

No examination of rurality could start without an appropriate definition of “rural” and “urban”. In this report, we adopt the United States Department of Agriculture (USDA)’s classification to distinguish between rural and urban counties,<sup>3</sup> known as the Rural-Urban Continuum Codes (RUCC). It assigns each county in the United States to nine different codes, taking into account the degree of urbanisation and adjacency to metro areas, as demonstrated in Table 2.1. The latest version of the RUCC was published in 2013 and classifies all 1 167 metropolitan counties and 1 976 non-metropolitan counties in the United States, including 69 metro municipalities and 9 non-metro municipalities in Puerto Rico and each Census Bureau-designated county-equivalent area of the Virgin Islands and other inhabited island territories of the United States (USDA, 2013<sup>[5]</sup>). The analysis in this chapter will use a simplified version of the classification

as indicated in the fifth column of Table 2.1. Further description of this classification system and those used in wider OECD work are described in detail in Annex 2.A.

**Table 2.1. 2013 Rural-Urban Continuum Codes**

| Code                      | Description  | Number of counties | 2010 population (on which the classification is based) | Simplified classification (used in report)                  |
|---------------------------|--|--------------------|--|---|
| <b>Metro counties</b>     |  |                    |  |   |
| 1                         | Counties in metro areas of 1 million population or more                            | 432                | 168 523 961  | Metropolitan (Metro)  |
| 2                         | Counties in metro areas of 250 000 to 1 million population                         | 379                | 65 609 956   | Metropolitan (Metro)  |
| 3                         | Counties in metro areas of fewer than 250 000 population                           | 356                | 28 318 215   | Metropolitan (Metro)  |
| <b>Total</b>              |  | <b>1 167</b>       | <b>262 452 132</b>                                     |   |
| <b>Non-metro counties</b> |  |                    |  |   |
| 4                         | Urban population of 20 000 or more, adjacent to a metro area                       | 214                | 13 538 322   | Non-metropolitan adjacent to urban area (Non-metro AU)      |
| 5                         | Urban population of 20 000 or more, not adjacent to a metro area                   | 92                 | 4 953 810  | Non-metropolitan non-adjacent to urban area (Non-metro NAU) |
| 6                         | Urban population of 2 500 to 19 999, adjacent to a metro area                      | 593                | 14 784 976   | Non-metropolitan adjacent to urban area (Non-metro AU)      |
| 7                         | Urban population of 2 500 to 19 999, not adjacent to a metro area                  | 433                | 8 248 674  | Non-metropolitan non-adjacent to urban area (Non-metro NAU) |
| 8                         | Completely rural or less than 2 500 urban population, adjacent to a metro area     | 220                | 2 157 448  | Non-metropolitan, completely rural (Rural)                  |
| 9                         | Completely rural or less than 2 500 urban population, not adjacent to a metro area | 424                | 2 610 176  | Non-metropolitan completely rural (Rural)                   |
| <b>Total</b>              |  | <b>1 976</b>       | <b>46 293 406</b>                                      |   |
| <b>US total</b>           |  | <b>3 143</b>       | <b>308 745 538</b>                                     |   |

Source: Based on USDA (2013<sup>[5]</sup>), *Rural-Urban Continuum Codes*, <https://www.ers.usda.gov/data-products/rural-urban-continuum-codes>.

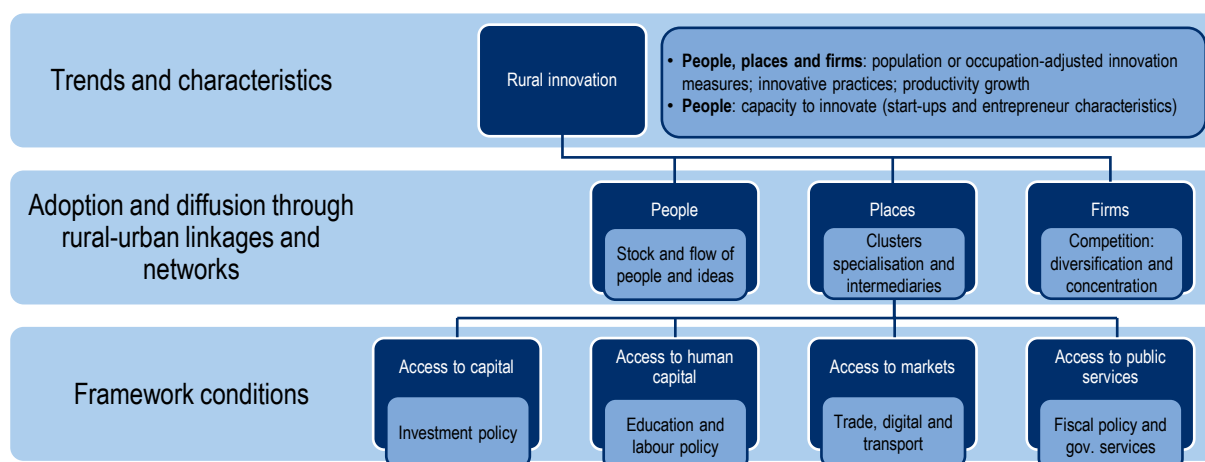
This report approaches innovation through a framework that places a focus on the capacity for people to innovate in non-metropolitan areas. For this purpose, individuals and their characteristics feature in measurement approaches, and when this is not possible, we also include demographic characteristics of places. Approaching the measurement of innovation from a rural perspective requires understanding the structure, opportunities and strengths of rural regions and reflecting on whether commonly accepted indicators of innovation adequately reflect innovation in rural areas. One possible strategy is to use survey-based methods that define innovation in a commonly accepted way. To this day, the most commonly used definition of innovation is the Oslo definition, as described in Annex 2.B. However, no one single innovation survey exists with a large enough sample size in rural areas to make it representative for rigorous analysis, thus creating a barrier to its application to policies and programmes in rural areas.



Other measurement methods could include product-level data, research and development investment and jobs, patents, high-growth or productivity, or start-up entrepreneurship statistics that each proxy some measurement of innovation (OECD, 2022<sup>[6]</sup>). However, when using non-survey-based methods, analysis should be nuanced to avoid the exclusion of the types of innovation that are not easily measurable in rural areas, and where measurement meets policy, to focus on the capacity to innovate.

When possible, the report adjusts innovation statistics using a rural lens as described in Annex 2.B. The decision to frame this discussion was based on consultation with business and academic experts in the OECD Enhancing Rural Innovation project advisory committee. Figure 2.1 describes the proposed framework for understanding innovation within the rural context that sets the scene throughout the report. It takes a more critical view of the different forms of innovation in a rural setting, identifies the place-based framework conditions such as access to human capital, financial capital, markets and public services, as well as the critical role of linkages and networks for building scale in places with low density and large distances to urban centres.

**Figure 2.1. Analytical framework for understanding the drivers of innovation in rural areas**



Note: Public services include direct support mechanisms.

Source: OECD (2022<sup>[6]</sup>), *Unlocking Rural Innovation*, <https://doi.org/10.1787/9044a961-en>.

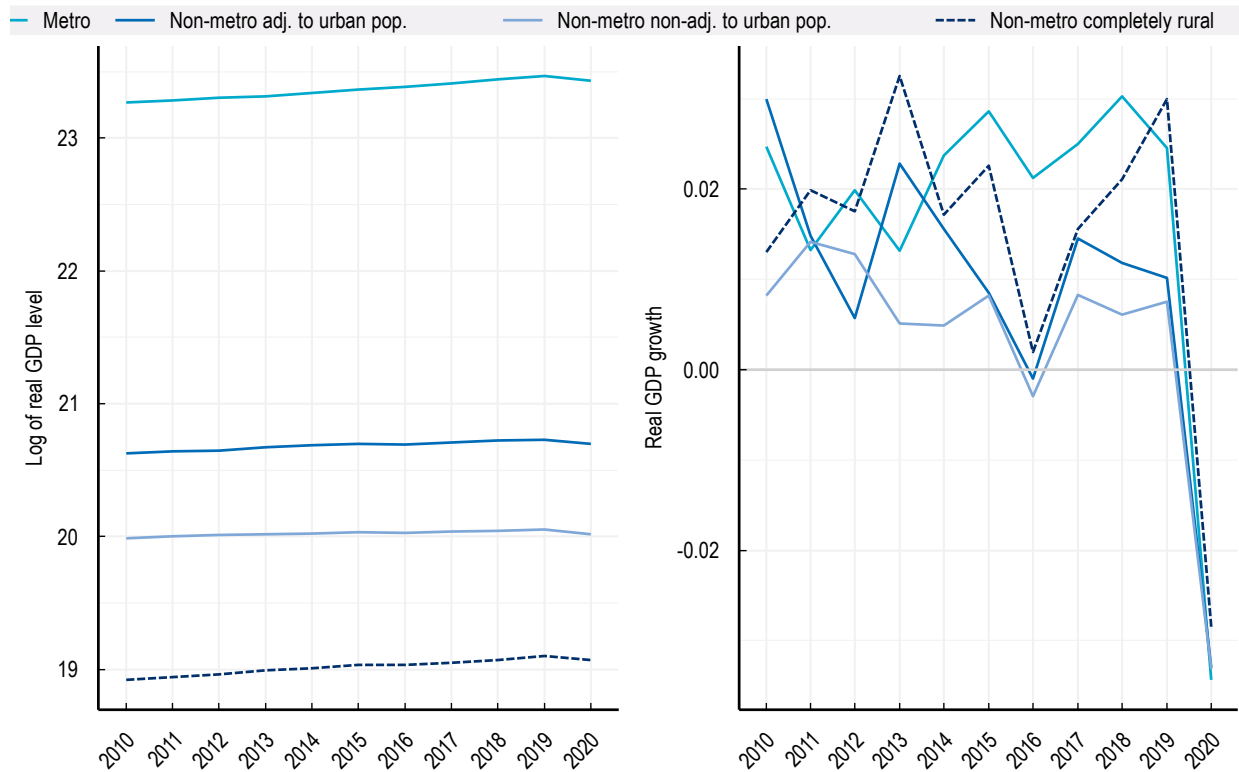
### ***Understanding economic activities and rural well-being in the United States***

The data used in this section's analysis is sourced from the American Community Survey 5-year estimates (ACS) (2022<sup>[7]</sup>) and the Bureau of Economic Analysis' (BEA) Regional Economic Accounts (2022<sup>[8]</sup>). Of the 3 141 counties in the United States (Table 2.1), data was available for the majority of counties and years (between 2010 and 2020), but not in all cases. For data from the BEA, where statistics on regional GDP and employment are generated, the percentage of missing data is around 3.1% for metro, 1.6% for non-metro adjacent to urban (AU), 0.8% for non-metro non-adjacent to urban (NAU), and 0% for metro. For the ACS, from which the population series is sourced, coverage is nearly 100%.

Perhaps unsurprisingly, metropolitan counties of the United States generate the lion's share of all private economic activity and employment. Metropolitan areas, according to the simplified classification, accounted for almost 90% of the economy in 2020 (Figure 2.2, left). Of the remaining 10%, Non-metro AU contributed 5.8%, followed by Non-metro NAU (3.3 %), and Rural counties (1.2%). While the spatial distribution of non-government GDP has remained stable when compared to 2010, we observe that increases in GDP shares took place in metro counties (0.7 percentage points) and rural counties (0.1 percentage points). Non-metro AU and non-metro NAU saw a shrinkage of 0.4 and 0.3 percentage points, respectively.

While there is a large population living in non-metropolitan areas of the United States, the share of individuals living in non-metropolitan areas is relatively small as compared to most OECD countries. In OECD countries, we observe close to 29% of individuals living in non-metropolitan and rural areas based on OECD-wide harmonised definitions (Fadic et al., 2019<sup>[9]</sup>; OECD, 2022<sup>[3]</sup>).<sup>4</sup> In the United States, using the same definition, only 15.6% of individuals were living in non-metropolitan and rural areas in 2020, down from 16.1% in 2010 (U.S. Census Bureau, 2022<sup>[7]</sup>).

**Figure 2.2. Real GDP, logged level (left) and year-on-year growth (right), 2010-20**



Note: Counties with the highest concentration of jobs in oil and gas extraction, as reported by BLS (2015<sup>[10]</sup>), were removed from the analysis. Source: BEA (2022<sup>[8]</sup>), *Regional Economic Accounts*, <https://www.bea.gov/data/economic-accounts/regional>.

Metro and rural areas had a greater share of GDP relative to their share of workers in 2020.<sup>5</sup> Comparing the share of worker to share of GDP, in 2020 Metro counties hosted 88% of workers while producing 1.7 percentage points more in output. Rural counties observe the same phenomenon, although at a more subdued difference of 0.1 percentage points. Compared to a decade ago where rural counties contributed 1.3% of workers against an output share of 1.1%, productivity has improved in recent years, although this result weakens when extraction-dependent counties are removed from analysis.<sup>6</sup> In such case, rural region's share of workers is 0.1 percentage points higher than share of GDP, in 2020.

Aggregate productivity is lower in non-metro AU and non-metro NAU than in Metro counties. That is, non-metro AU and non-metro NAU contain a higher share of the overall workforce (7.1% and 3.8%, respectively) than their share of output (5.9% and 3.3%, respectively). This could point to inefficient use of resources, dominance of labour-intensive sectors, the lack of capital investment, or a combination of those factors.

The relationship between real GDP across geographies has remained relatively consistent over time. A longer term view of GDP level illustrates that the spatial ordering of output remains steady between 2010 and 2020, despite stronger growth in metropolitan counties (Figure 2.2).<sup>7</sup> Metro counties account for the

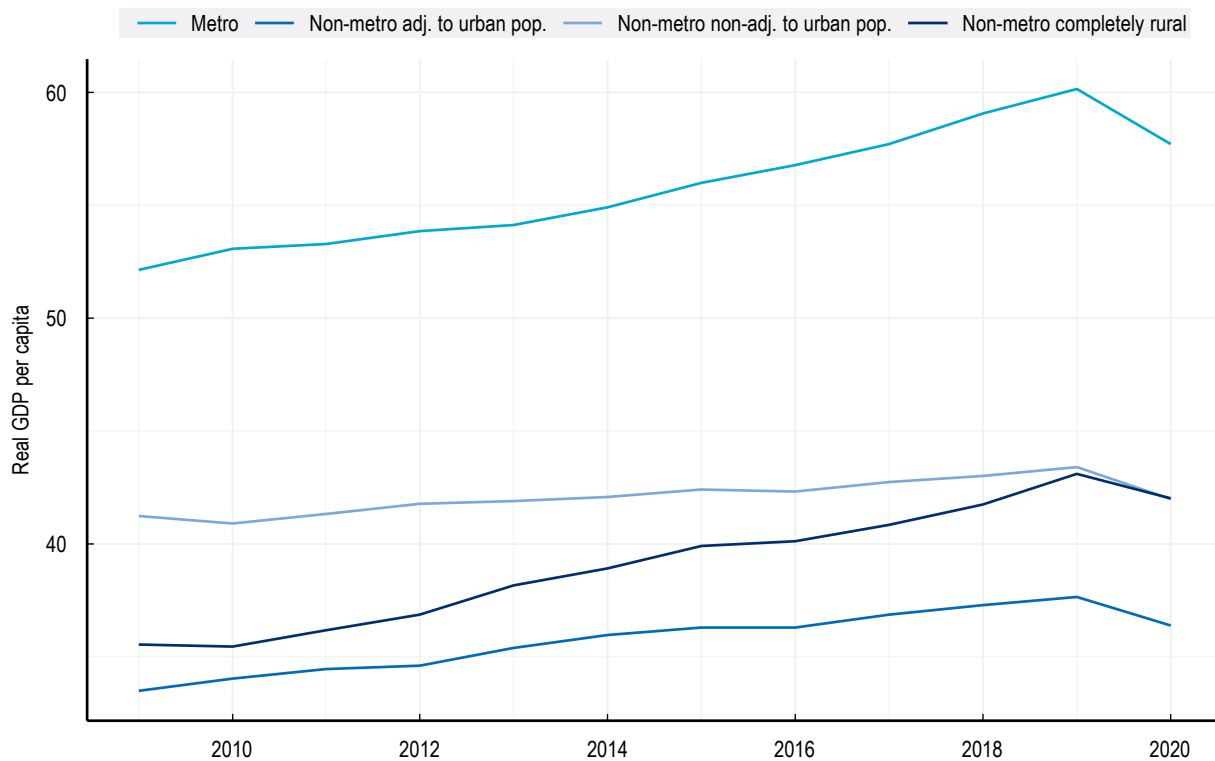
largest share of GDP in levels after having increased 18% from USD 12.7 trillion in 2010 to USD 15 trillion in 2020.<sup>8</sup> Non-metro counties grew by 16% in the same period, although constituting only 1% of metro output in 2020. Non-metro AU grew 7%, totalling 7% of metro output; non-metro NAU grew 3%, totalling 3% of metro output.

Over the 10-year period from 2010 to 2020, metro and rural counties registered the highest yearly growth, yet rural counties were exposed to higher volatility. Excluding the impact of Covid-19, the yearly growth in metropolitan regions climbed steadily, averaging 2.5% per year between 2010 and 2019, while in rural regions it was 2.2% (2.5% if extraction-dependent counties are included) (Figure 2.2, right). non-metro (AU and NAU) counties registered 2.0% and 0.8%, respectively. The increased volatility in non-metropolitan and rural area was evidenced by the 2016 mini-recession, which was caused by a weakening in emerging markets, a drop in commodity prices and a stronger dollar (Irwin, 2018<sub>[11]</sub>).<sup>9</sup> Ultimately, the impact fell on sectors most linked to non-metropolitan and rural areas such as agriculture and manufacturing. non-metro NAU and AU counties' economies contracted in 2016, and rural counties saw near-zero growth, while metro counties were relatively unaffected.

Metropolitan counties bore the brunt of COVID-19, resulting in a year-on-year contraction of 3.4% of GDP. Other regions were also affected: the two non-metropolitan areas contracted by 3.3% and rural areas by 2.9%. Stringent measures at the onset of the pandemic in 2020 came in the form of mandatory business closures and movement restriction, and its geographical impacts on health, economy and well-being are expected to be asymmetrical.<sup>10</sup>

In the decade from 2010 to 2020, rural counties began to catch up to metropolitan areas in terms of per capita GDP. Since 2019, per capita GDP in rural counties has been nearly on par with non-metro NAU counties, although still significantly below that of metro counties. In general, all regions saw a rise in absolute levels of real GDP. Between 2010 and 2020, the increase in real GDP was strongest in metro counties where it grew by 18%. GDP grew in rural counties by 16%; in non-metro AU counties by 7%; and just 3% in non-metro NAU counties (Figure 2.3). Including counties with a high share of jobs in oil and gas extraction inflates GDP per capita, in terms of level and growth, in all Non-metro and Rural areas, but does not alter the converging dynamic between rural counties and non-metro NAU counties. Lastly, COVID-19 halted the upward trend for all types of counties, with metro counties decreasing the most on a per capita basis in 2020.

Figure 2.3. Real GDP per capita, 2010 to 2020

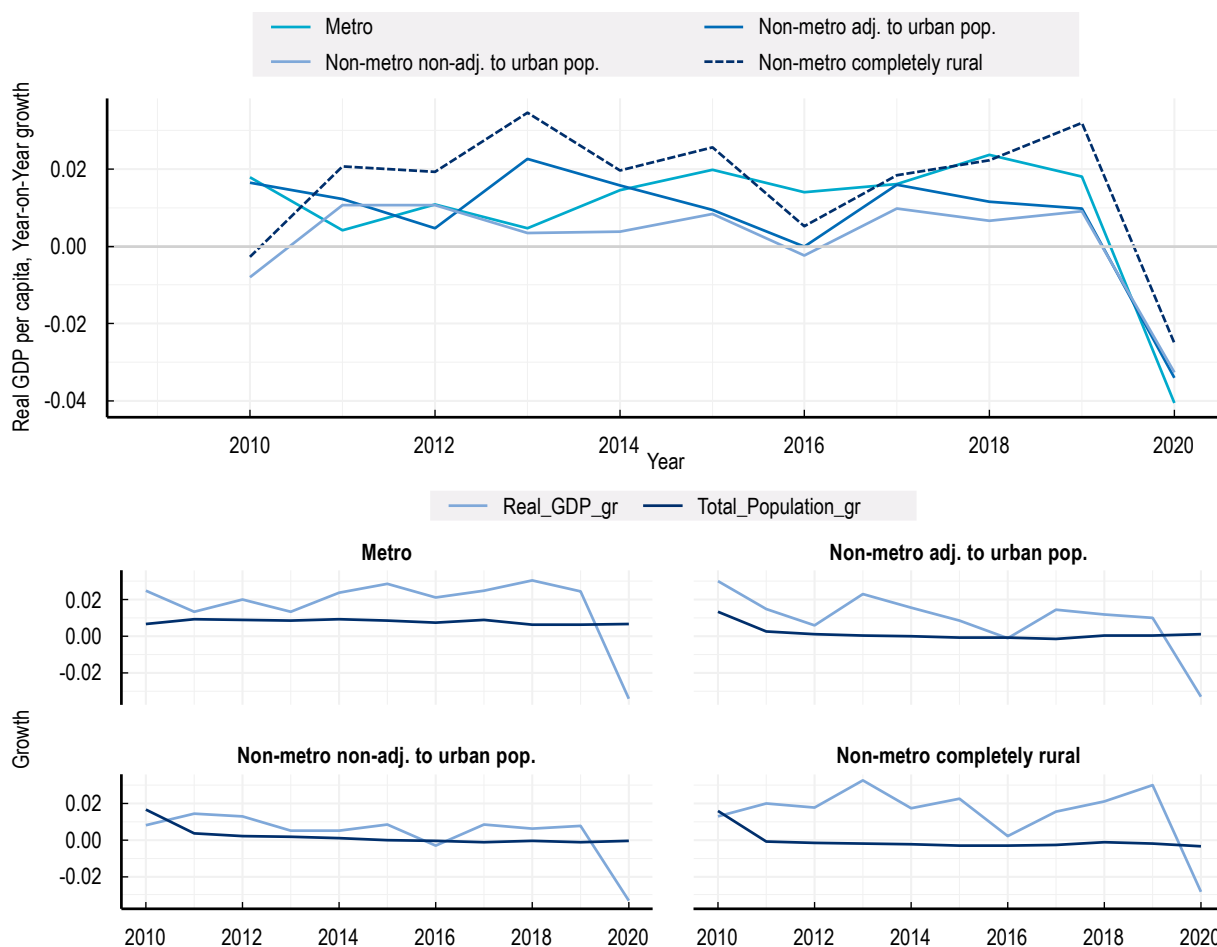


Note: Extraction-dependent counties are excluded from analysis. The four categories refer to metropolitan areas; non-metropolitan areas adjacent to urban populations; non-metropolitan areas non-adjacent to urban populations; non-metropolitan areas that are completely rural. They are further elaborated in Table 2.1.

Source: BEA (2022<sub>[8]</sub>), *Regional Economic Accounts*, <https://www.bea.gov/data/economic-accounts/regional>; U.S. Census Bureau (2022<sub>[7]</sub>), *American Community Survey Data*, <https://www.census.gov/programs-surveys/acs/data.html>.

Rural counties possessed the strongest GDP growth across the decade, taking into consideration changes in population. Between 2010 and 2020, per capita GDP growth averaged 1.5 % per year in rural counties, demonstrating a resilient recovery after the financial crisis. This was followed by metro counties (0.9%), non-metro AU counties (0.8%), and non-metro NAU counties (0.2%) (Figure 2.4, top). Considering the total economy, a mini-recession was observed in 2016 owing to conditions described above, and specifically to decreased private inventory investment and in non-residential fixed investment and slowdowns in personal consumption expenditure, in residential fixed investment, and in state and local government spending (BEA, 2017<sub>[12]</sub>). All regions were affected across the United States, with non-metro NAU even experiencing a temporary, but mild, contraction.

**Figure 2.4. Real GDP per capita growth (top) and its components (bottom), 2010 to 2020**



Note: Extraction-dependent counties are excluded from analysis. The four categories refer to metropolitan areas; non-metropolitan areas adjacent to urban populations; non-metropolitan areas non-adjacent to urban populations; non-metropolitan areas that are completely rural. They are further elaborated in Table 2.1. Bottom figures refer to “real GDP growth” and “total population growth”.

Source: BEA (2022<sup>[8]</sup>), *Regional Economic Accounts*, <https://www.bea.gov/data/economic-accounts/regional>; U.S. Census Bureau (2022<sup>[7]</sup>), *American Community Survey Data*, <https://www.census.gov/programs-surveys/acs/data.html>.

Analysis of the components of per capita GDP reveals that its dynamics are largely driven by changes in output, against a less marked change in population (Figure 2.4, bottom). At the same time, metro counties’ rise in GDP level is accompanied by a concurrent rise in their population, resulting in a nearly perfect correlation (0.98). For rural counties, GDP increased against a declining population, resulting in a clear negative correlation (-0.72). This result gives rise to the interpretation that GDP and population are linked in metro counties, while decoupled for rural counties. The latter might be explained by the fact that isolated rural communities are more self-reliant in terms of sourcing inputs and hiring workers, and have thereby developed economies that are less labour-intensive, stable to population changes, or have invested in sufficient capital stock to be relatively independent. For the remaining non-metro counties, the relationship between GDP and population is positive (0.5 for non-metro AU counties and 0.7 for non-metro NAU counties).

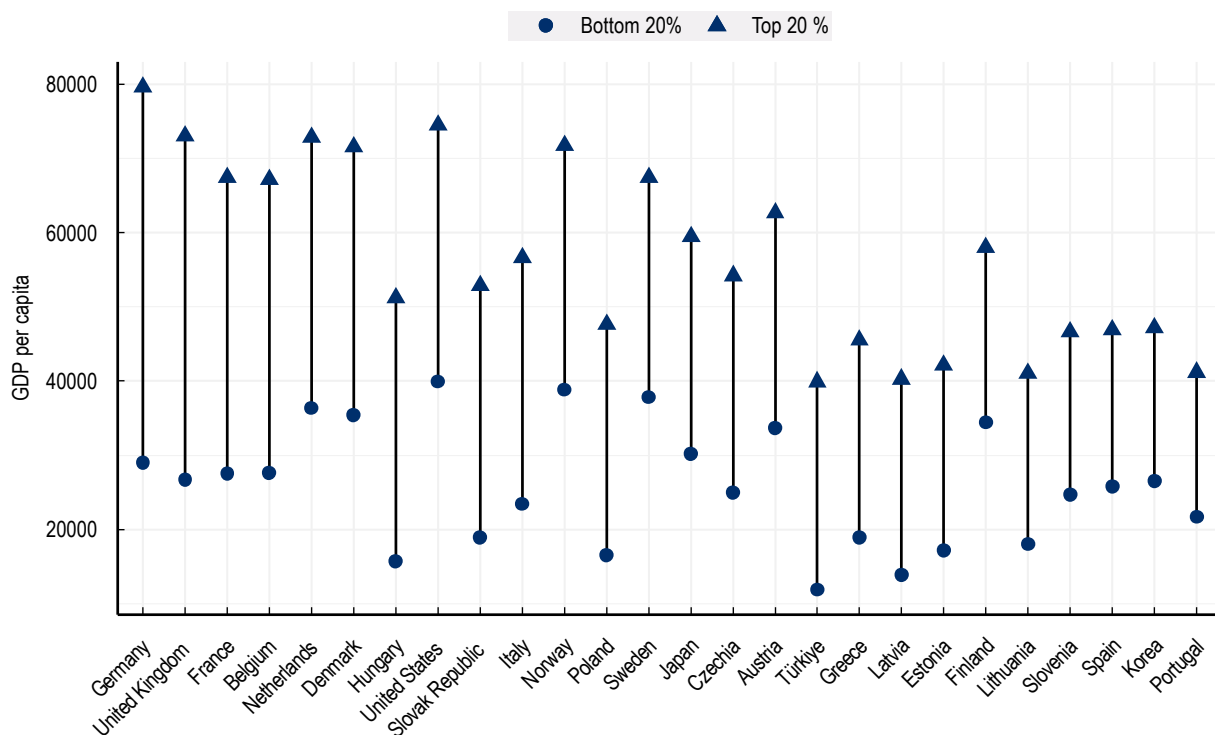
Rural counties witnessed consistent depopulation between 2010 and 2020, averaging a yearly decline of 0.06%. Other regions saw population growth: highest in metro (0.78%), followed by non-metro NAU counties (0.19%), and non-metro AU counties (0.14%).<sup>11</sup> The loss of population mechanically contributes to gains in per capita GDP in rural counties. However, as will be discussed later, there is evidence to

suggest that rural counties are compensating for the lack of workers and a shrinking work force by devising innovative solutions such as upgrading and adopting new technologies, resulting in gains in productivity and ultimately output.

An international comparison reveals that the regional GDP gap in the US is higher than the average, which includes 25 other OECD countries. The GDP gap, as measured by the difference in real GDP per capita between the top 20% and bottom 20% of regions, averaged USD 30 890 across the 26 countries where regional data is available between 2008 and 2020 (Figure 2.5). The US gap stood at USD 34 551, or 12% above the average, larger than 18 countries and smaller than 7 others. Taking the size of GDP into account, the US gap is 62% of its GDP per capita, against an international average of 85%. Of the regions reported to be in the top 20% of GDP, 70% are in metropolitan regions (MR-L and MR-M) and 26% are in rural regions (NMR-R), against 26% and 61% for the bottom 20%. In top-performing rural counties, most are characterised by a strong mining, quarrying, oil and gas extraction sector, as well as retail trade. Caution should be taken in making comparisons of these figures with the rest of the report: the OECD typology focuses on defining administrative regions by their access to cities (Annex Box 2.A.1) and is used here as an exception to facilitate international comparison.

**Figure 2.5. International comparison of geographical gap of GDP per capita, average of 2008-20**

GDP per capita PPP 2015 constant USD, by top and bottom 20% of regions



Note: For international comparison, the classification of all regions used in this analysis is the OECD Typology for Access to Cities, departing from the rest of the report which uses a simplified USDA rural-urban classification. The graph shows the gap between the mean GDP per capita of the top and bottom 20% of the countries' regions as measured by their respective GDP per capita. Top (bottom) refers to top (bottom) 20% regions with the highest (lowest) GDP per capita levels with populations adding up to at least 20% of the national population. The x-axis is ordered by the size of the income gap, a measure of regional disparity. Extraction-dependent regions are included for all countries.

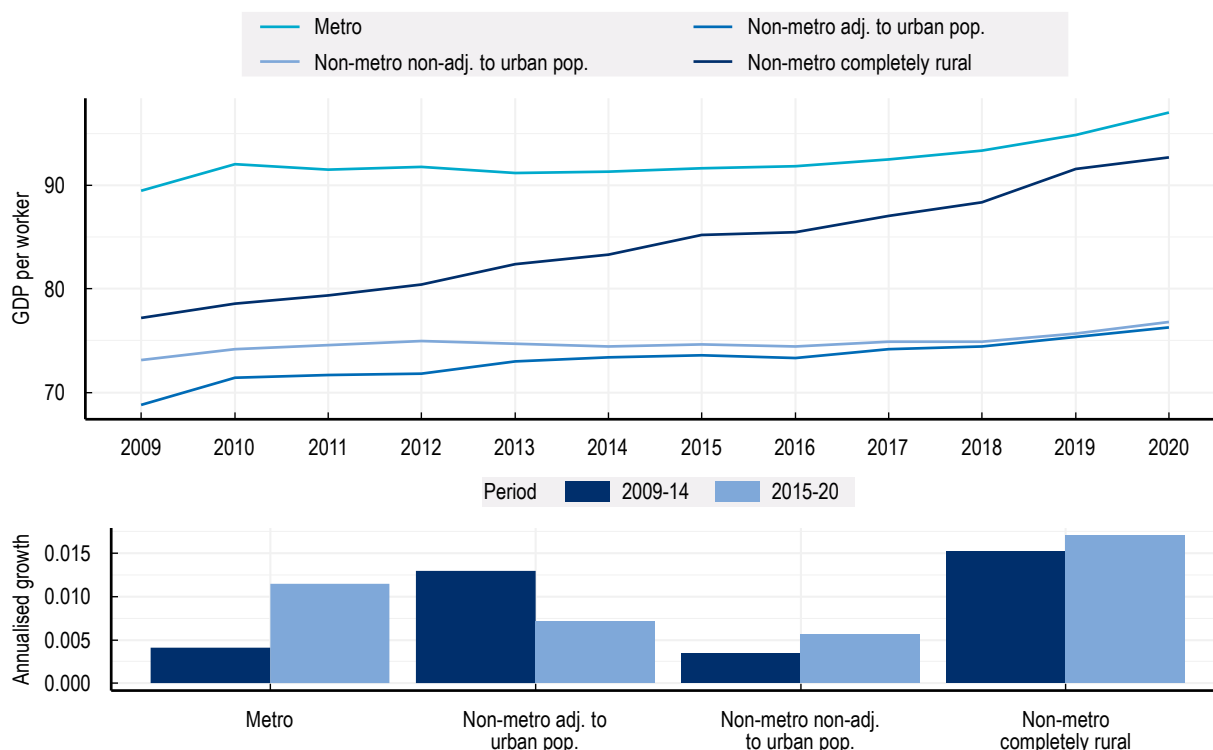
Source: OECD (2023<sup>[13]</sup>), *Regional Indicators*, <https://stats.oecd.org/> (accessed on 15 June 2023).

In terms of labour productivity, metro counties were the most productive between 2010 and 2020, with rural counties quickly converging (Figure 2.6, top). A common explanation for the productivity gap is that metro counties, naturally benefitting from a larger pool of workers and agglomeration (Angel and Blei, 2016<sub>[14]</sub>), have the right preconditions for high productivity. In addition, the composition of sectors is such that many patent-producing firms are located in metro counties. Despite not having these advantages, rural counties nonetheless forged a path of convergence in productivity level similar to that of metro counties. Similarly, Non-metro AU and Non-metro NAU observed a trend of convergence in the decade, with the former catching up, although it remains the least productive type of area. As an aside, we note with interest that had extraction-dependent counties been included, rural areas would have surpassed metro in productivity level in 2018, and would have continued to rise.

The phenomenon of catching up for rural counties is due to its persistently strong growth in the entire period from 2010 to 2020. This group, in the years following the 2008 financial crisis, observed the highest growth among all territories between 2009 and 2014, averaging an annualised rate of 1.5% (Figure 2.6, bottom). This momentum only continued in the second half of the decade, strengthening to 1.7%. On the other hand, metro’s relatively tepid productivity growth is characteristic of the general productivity slowdown seen in OECD economies (Andrews, Criscuolo and Gal, 2016<sub>[15]</sub>) and also in the United States (BLS, 2021<sub>[16]</sub>). Metro counties’ performance eventually gathered pace in the 2015-20 period, increasing its annualised productivity growth from 0.4% to 1.2%.

Non-metro AU’s productivity also caught up to non-metro NAU, although at a slower rate. Non-metro AU productivity had relatively stable growth at 1.3% (annualised) during the 5-year period after the financial crisis, before dulling to 0.7% during 2015-20. Meanwhile, Non-metro NAU performance remained tepid throughout the decade.

**Figure 2.6. Labour productivity (top) and annualised growth (bottom), 2009 to 2020**



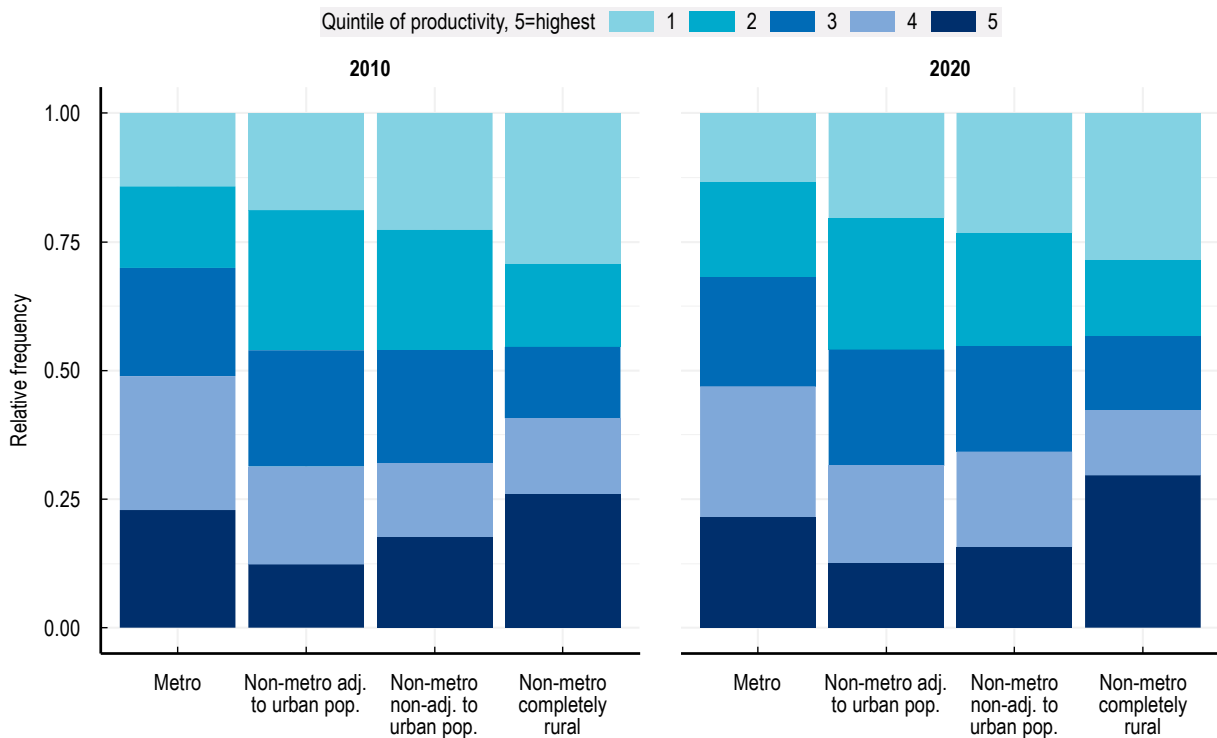
Note: Extraction-dependent counties are excluded from analysis.

Source: BEA (2022<sub>[8]</sub>), *Regional Economic Accounts*, <https://www.bea.gov/data/economic-accounts/regional>.

Rural counties are not homogenous. They tend to either be particularly productive, or particularly unproductive. Rural areas have the largest share of labour-productive (counties in the top quintile, and therefore ranked in the top 20 percent of all counties based on productivity) counties and simultaneously the largest share of labour-unproductive (least productive quintile) counties among all of the different classifications of counties (Figure 2.7, right). Defined as those in the top and bottom quintile of labour productivity across the US, more than a quarter of the highest-performing, and more than a quarter of the lowest-performing, counties were rural in 2020. This dynamic was also observed in 2010, although it is clear that rural counties have progressed in terms of their share of top-productive firms and decreased their share of bottom-productive firms. This result has been adjusted for extractive industries, which are most common in rural regions.

The spatial distribution of labour-productive firms generally remained stable between 2010 and 2020. The share of the most productive counties (quintile 5) increased in rural and non-metro AU counties and decreased elsewhere. That top-productive counties are more often rural than metro could explain the rise in labour-productivity in Figure 2.6, and the increasing share of top-productive firms of non-metro AU counties could explain the catch-up to non-metro NAU counties. We also note that the least productive counties (quintiles 1 and 2) saw a slight increase in metro area between 2010 and 2020.

**Figure 2.7. Distribution of labour-productive counties, 2010 (left) and 2020 (right)**



Note: Extraction-dependent counties are excluded from analysis. This figure first categorises all counties into 5 quintiles of productivity, where the 5<sup>th</sup> quintile reflects the highest level of productivity, and the 1<sup>st</sup> reflects the lowest levels of productivity. It then provides the frequency at which counties are placed into different territorial (geographical) classifications.

Source: BEA (2022<sup>[8]</sup>), *Regional Economic Accounts*, <https://www.bea.gov/data/economic-accounts/regional>.



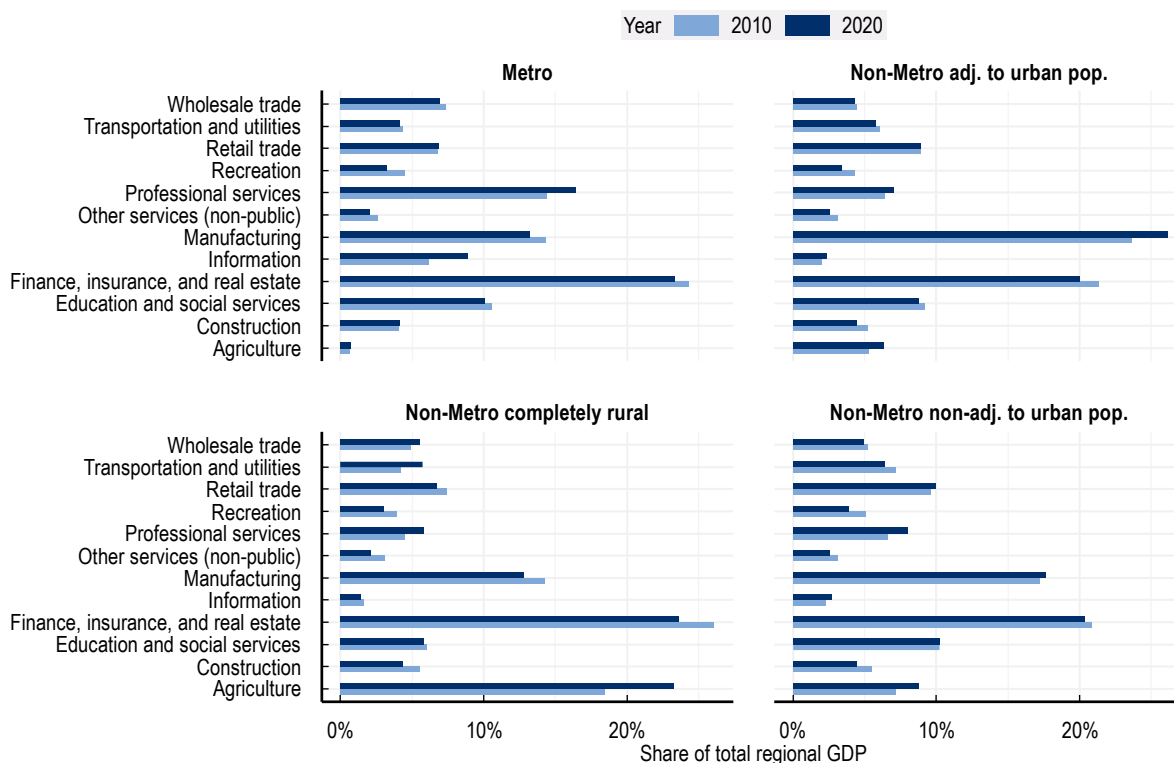
## Sector dynamics across US territories

In 2020, the top three industries contributing to rural counties' private GDP were finance, insurance, and real estate (24%), agriculture (23%), and manufacturing (13%). Agriculture, in particular, saw the highest increase in the economic share between 2010 and 2020, while manufacturing shrunk, in line with the well-documented decline in rural manufacturing (Charles, Hurst and Schwartz, 2019<sup>[17]</sup>). Part of this decline is the relocation of the sector to non-metro AU, which saw an increase between 2010 and 2020 (Figure 2.8).

In metro counties, the top contributing sectors are finance, insurance, real estate (23%), professional services (16%), and manufacturing (13%). These rankings remain unchanged from 2010. In particular, rural counties observe 8 industries which have shrunk since 2010, being offset by a strong 4.8 percentage point increase in agriculture. This analysis excludes government and mining, the latter of which would otherwise occupy 15% of the rural economy in 2010, nearly doubling to 27% in 2020, skewing the result for other sectors.

In metro counties, while remaining a top-contributing industry, finance, insurance and real estate has shrunk by 0.9 percentage point, and manufacturing by 1.1 percentage point in the decade. This was offset by a 2.0 percentage point gain in professional services, and notably information (2.7 percentage point). Non-metro NAU counties and non-metro AU counties observed manufacturing as the predominant industry in 2020, even registering an increase of 2.4 percentage points and 0.4 percentage points, respectively, from 2010. The structure of the economy in all regions appeared stable in the decade from 2010 to 2020, excluding mining.

**Figure 2.8. Share of GDP by industry in 2010 and 2020**

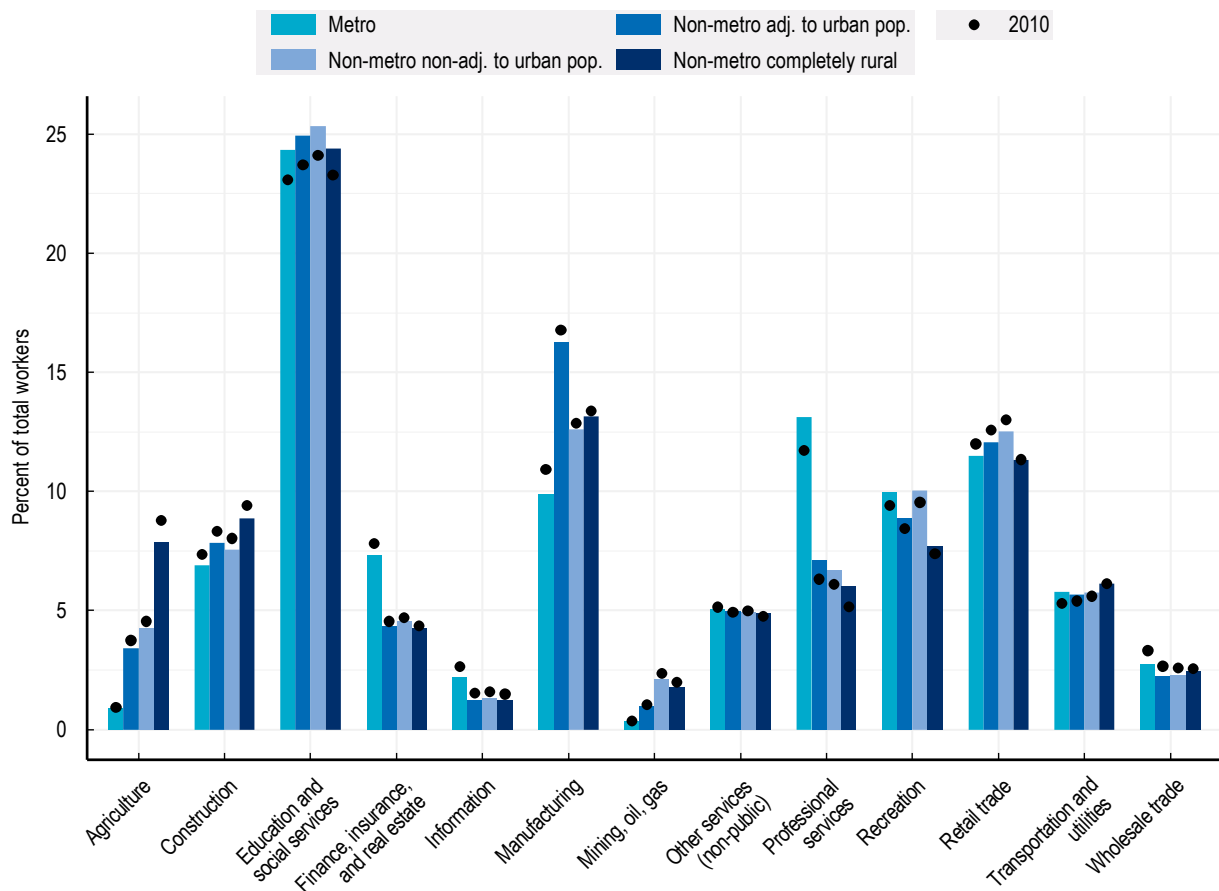


Note: Units are at constant 2012 USD. Only private sector firms are considered. Mining and quarrying are excluded from this analysis. Indeed, calculating total regional GDP would have a distortion effect on other sectors. Industries included farm employment and private non-farm employment, as defined by the Bureau of Economic Analysis. Sectors are abbreviated for brevity; see Annex Box 2.A.1 for details. Counties with no Real GDP data due to confidentiality or lack of availability have been excluded from analysis; as such, underestimation is expected. Source: BEA (2022<sup>[8]</sup>), *Regional Economic Accounts*, <https://www.bea.gov/data/economic-accounts/regional>.

In rural counties, the top employers are in education and social services, manufacturing, and retail trade. Thus, the notion that rural areas are necessarily agrarian does not hold as non-agriculture sectors employ more workers in rural areas. It has to be noted however that agriculture still employs a higher share of rural resident workers than any other region (Figure 2.9). In addition, employment from mining, oil and gas only comprised a small share (less than 5%) in all groupings. In metro counties, the top employer is by far the education and social services sector, followed by professional services (including scientific, management, administrative and waste management), and retail trade.

The ranking of these top sectors has generally been stable when compared to 2010. However, all county groupings increased their employment share in the broad tertiary (service) sector, while moving away from primary and secondary sectors (agriculture, construction, and manufacturing). Across the board, this is most notable in the increase of employment share in education and social services (including health services), professional services, and recreation. Nonetheless, the trend toward services does not account for the fact that manufacturing helps create employment in other non-tradeable sectors (Moretti, 2010<sup>[18]</sup>). In addition, high- and medium-tech manufacturing account for the lion's share of all patents granted in the US (National Science Foundation, 2018<sup>[19]</sup>), indicating the potential that this sector brings to innovation in non-metropolitan and rural areas.

**Figure 2.9. Sources of employment by sector in the United States, 2020 and 2010**



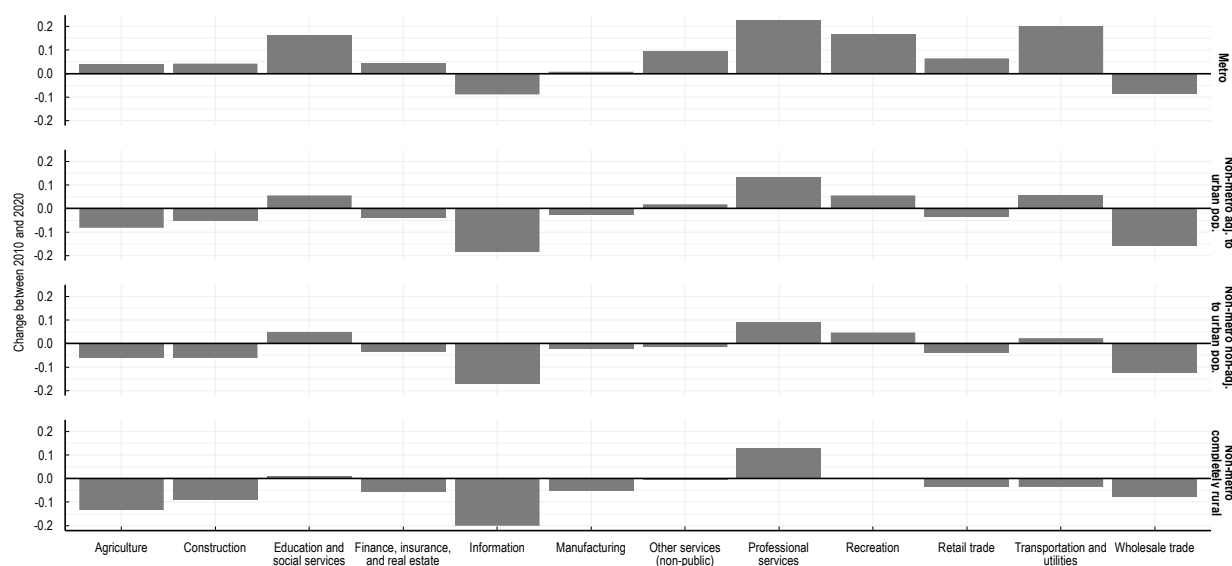
Note: Bars denote 2020 values while black dots denote 2010 values. Extraction-dependent counties are included. Sectors are abbreviated for brevity; see Annex Box 2.A.1 for details. Departing from previous analysis, this analysis is resident-based, rather than employee-based. That is, for a given county, this counts the number of people who work in a specific sector, regardless of the location of employment.

Source: U.S. Census Bureau (2022<sup>[7]</sup>), *American Community Survey Data*, <https://www.census.gov/programs-surveys/acs/data.html>.

Non-metro economies, driven by changes in rural counties, lost 0.2% of its workers between 2010 and 2020 (in absolute terms), averaging a 0.02% decline per year during the decade. This stands in contrast to metro economies which have seen increased workers between 2010 and 2020, growing on average by 1.1% each year. Breaking down the group, rural counties saw declines of 0.4% annually between 2010 and 2020, while non-metro NAU counties averaged losses of 0.04%; non-metro AU counties grew.

By sector, and adjusted for population movement, rural counties lost workers in 9 of the 12 sectors considered in the analysis between 2010 and 2020. Figure 2.10 illustrates employment changes in major sectors between 2010 and 2020. Notably, despite being a top contributor to rural GDP, which increased during the decade, the agricultural workforce declined by 1.5%. This might be due to mechanisation of the sector resulting in less labour-intensive processes, combined with general shortages of farm workers (Wang et al., 2022<sup>[20]</sup>; Hamilton et al., 2022<sup>[21]</sup>). The decrease of workers in the information sector was the most salient in rural counties, but occurred across all territories. Such decline was driven by the telecommunications sub-sector, where larger firms contracted out work to smaller firms, which depressed wages and benefits (known as “fissuring”), and long-term decline in unionisation (Schmitt and Kandra, 2020<sup>[22]</sup>; Weil, 2017<sup>[23]</sup>). Of the three sectors in rural counties which did not decline, only professional services saw substantial growth, at 12.8%, while recreation and education and social services saw negligible change.

**Figure 2.10. Change in number of workers by industry, 2010-20**



Note: Extraction-dependent counties are excluded. The changes have been adjusted for movement in the respective grouping's population between 2010 and 2020. Sectors are abbreviated for brevity; see Annex Box 2.A.1 for details.

Source: U.S. Census Bureau (2022<sup>[7]</sup>), *American Community Survey Data*, <https://www.census.gov/programs-surveys/acs/data.html>.

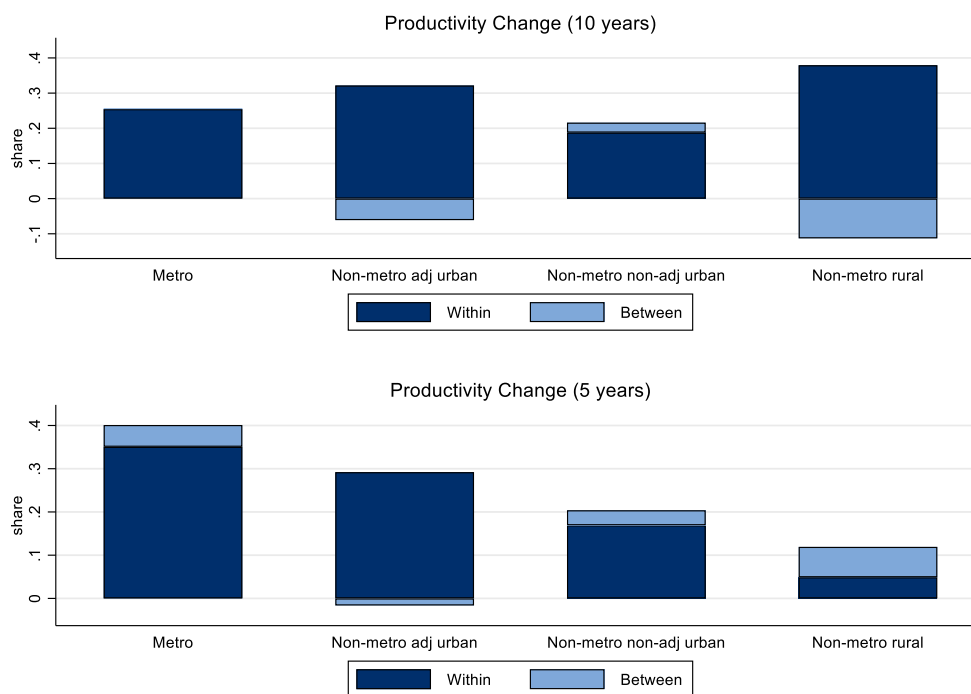
Metro counties added workers in nearly all industries, which provides supporting evidence of the agglomeration of workers in metro counties. Two exceptions were found in information and wholesale trade, which saw job losses. Professional services recorded the highest growth in the decade from 2010 to 2020, at 23%, followed by transportation and utilities (20%), and recreation (17%). Agriculture observed an increase of 4% in metro counties, potentially related to the rise of urban farming or centralisation of farm business activities in urban headquarters.

The employment growth dynamics in all non-metro counties is broadly similar in the shift from primary and secondary sectors to services, although only select service sectors increased. Professional services saw the highest growth across all non-metro counties, as observed also in metro counties. Employment growth also came from recreation, education and social services, and other services (non-public). Increases in workers in these sectors were offset by drops in the remaining sectors, most markedly in information and wholesale trade.

Lastly, this analysis demonstrates that the most substantial driver of productivity change has been the improved use of resources within territories. Notably, approximately 38% of all productivity growth in the United States was due to more efficient use of resources in rural counties over the past 10 years (Figure 2.11, top). Considering all non-metropolitan regions, this was even greater at nearly two-thirds (61%).<sup>12</sup> These types of gains are attributed in part to the capacity of rural regions to absorb innovation and upgrade resources. Investing in the upskilling of workers and firms in non-metropolitan regions will likely continue to contribute positively to aggregate productivity.

### Figure 2.11. Decomposing changes in productivity

County-level aggregations (2010 to 2020 and 2015 to 2020)



Note: There is no entry and exit of firms, as analysis is done based on county level estimates. Oil counties have been excluded. The equation decomposes (breaks) productivity down into “within” components and “between” components. The decomposition takes the following form:

$$\Delta Y_t = \sum_{i=n} \theta_{i,t-k} \Delta y_{i,t} + \sum_{i=n} y_{i,t} \Delta \theta_{i,t}$$

Where  $Y_t$  and  $y_{i,t}$  refer to economy-wide productivity and the productivity for each type of county, and  $\theta_{i,t}$  is the share of employment in the type of county,  $i$ . The first term  $\theta_{i,t-k} \Delta y_{i,t}$  refers to the changes in the contribution of the share of employment *within* each type of county to productivity, while the second component  $y_{i,t} \Delta \theta_{i,t}$ , refers to the change in overall productivity due to the reallocation of resources *between* each type of county. Data used is pooled and averaged by 5-year intervals. The proxies used refer to 2006-10 for 2010 estimates; 2011-15 for 2015 estimates; and 2016-20 for 2020 estimates.

Source: OECD analysis based on BEA (2022<sup>[8]</sup>), *Regional Economic Accounts*, <https://www.bea.gov/data/economic-accounts/regional>; Aggregate Labour Productivity Decomposition following McMillan, M., D. Rodrik and Í. Verduzco-Gallo (2014<sup>[24]</sup>), “Globalization, structural change, and productivity growth, with an update on Africa”, <https://doi.org/10.1016/j.worlddev.2013.10.012>.

However, rural regions also experienced some offsets to these productivity gains due to reallocation of resources between territories. In the context of analysis in this section, offsets were likely, in part, due to workers leaving the territories. Non-metro AU saw a similar, but smaller, dynamic. Rural counties observed a 11% loss of productivity due to resource reallocation, while non-metropolitan AU observed a 6% loss. Surprisingly, non-metropolitan NAU counties made slight gains in productivity at 3% due to reallocation. This last gain was consistent in both 10- and 5-year growth models.

Unfortunately, in the last five years, non-metropolitan counties' contribution to overall growth has been cut by half. Productivity growth has slowed for rural counties and picked up for metropolitan counties totalling 28% on the whole for all non-metropolitan counties (Figure 2.11, bottom).<sup>13</sup> With more gains from reallocation than losses but much lower gains in efficiency, the last five years have been a both positive and negative for non-metropolitan regions.

## Innovation in the United States

The US is a leader of innovations in firm products and processes. It often is measured at the top of rankings in standard innovation statistics such as private R&D expenditures, patent applicants and high firm-growth. In 2020, the United States logged 646 244 patent applications, of which 60%, or 388 900, were granted<sup>14</sup> (USPTO, 2022<sup>[25]</sup>).

However, not much is known about the geography of innovation in rural areas, except for strong performance on overall patent statistics in California and New York, which are states with large populations and a high share of occupations whose innovative outcome may result in patent-filing, or strong R&D investment. As argued previously, when possible, the report adjusts measures of innovation to reflect individual characteristics of people living in different areas. As such, the rest of this section adjusts patents by the occupational structure of geographies as described in Annex 2.B and Dotzel and Wojan (2022<sup>[26]</sup>).<sup>15</sup>

Despite this more nuanced approach, the analysis is still cautious in its interpretation because it overlooks innovation in non-patented products and processes. The occupations considered *inventive* include jobs in the professional scientific, and management, and administrative services sectors; manufacturing sectors; and arts, entertainment, and recreation sectors; and accommodation and food services sectors. These were identified as occupations of inventors most likely to file a patent (Dotzel and Wojan, 2022<sup>[26]</sup>). For example, there are vast differences when looking at the best performing counties in terms of patents and patents per innovative occupations. While the county with the highest number of patents is Santa Clara County (CA), a metro county, the highest intensity, patents per inventive occupation (or occupation that is more likely to patent), is actually found in a rural county, in Barbour County (AL).

The analysis in this section uses data on county level from the American Community Survey 5-year estimates (ACS) (2022<sup>[7]</sup>), the Bureau of Economic Analysis' (BEA) Regional Economic Accounts (2022<sup>[8]</sup>), firm counts from County Business Patterns (CBP); information on patents from the United States Patent and Trademark Office (USPTO); and innovative occupations from Dotzel and Wojan (2022<sup>[26]</sup>). Because the latter is only available for 2015, we display mostly cross-sectional evidence. For ease of interpretation, territorial (geographical) classifications are more frequently grouped into metropolitan and non-metropolitan counties.

### Box 2.1. The relationship between patents, innovation and economic growth

The relationship between patents and economic growth has not been conclusive. Early Schumpeterian models suggest that growth is mainly driven by innovation, which replaces and improves upon previous capital used in production, thereby making companies more productive. Innovation is therefore located at the heart of economic development and facilitates aggregate economic growth (Nelson and Winter, 1982<sup>[27]</sup>). In models of endogenous growth, productivity improvement is traditionally due to spending on research and development, which enhances output (Romer, 1990<sup>[28]</sup>; Romer, 1994<sup>[29]</sup>). The key insight is that knowledge spillovers, because of the long-run non-excludability and non-rivalry of ideas (i.e. patents expire), is one of the primary drivers of growth. Nonetheless, firms are incentivised to generate new ideas since in the short run patent protection endows them the exclusive right to profit from innovation.

Nevertheless, empirically this result has been contested. A strand of the literature using country level data on patents shows a significant impact of patents on growth (Akçomak and ter Weel, 2009<sup>[30]</sup>; Hasan and Tucci, 2010<sup>[31]</sup>). This literature highlights the importance of knowledge creation and corroborates the theory of endogenous growth. However, it has been argued and shown empirically that patents can also have no strong effect on growth (Sweet and Eterovic, 2019<sup>[32]</sup>; Blind, Ramel and Rochell, 2022<sup>[33]</sup>). This argument highlights several weaknesses of patents as a measure of innovation.

First, each sector and even each firm has their specific patenting rules and quality controls. Research shows that patent growth is also associated with subsequent growth of R&D in the medical and optical equipment industry as well as in the electrics and electronics industry. Neither of these effects can be found for both the chemicals and the transport equipment industries (Buerger, Broekel and Coad, 2012<sup>[34]</sup>). Second, not all inventions are innovative. A patent becomes an innovation if it is first “available to potential users” and second “brought into use” (OECD/Eurostat, 2018<sup>[35]</sup>). For instance, about one-third of patents are not utilised and patenting in specific sectors may be viewed as a strategic measure to block competitors (Giuri et al., 2007<sup>[36]</sup>). Therefore, it might be knowledge diffusion rather than knowledge creation which drives productivity growth.

Source: Nelson, R. and S. Winter (1982<sup>[27]</sup>), *An Evolutionary Theory of Economic Change*, Harvard University Press, Cambridge, Mass; Romer, P. (1994<sup>[29]</sup>), “The origins of endogenous growth”, *Journal of Economic Perspectives*, Vol. 8/1, pp. 3-22, <https://doi.org/10.1257/jep.8.1.3>; Romer, P. (1990<sup>[28]</sup>), “Endogenous technological change”, *Journal of Political Economy*, Vol. 98/5, pp. 71-102; Hasan, I. and C. Tucci (2010<sup>[31]</sup>), “The innovation-economic growth nexus: Global evidence”, <https://doi.org/10.1016/j.respol.2010.07.005>; Akçomak, İ. and B. ter Weel (2009<sup>[30]</sup>), “Social capital, innovation and growth: Evidence from Europe”, <https://doi.org/10.1016/j.euroecorev.2008.10.001>; Sweet, C. and D. Eterovic (2019<sup>[32]</sup>), “Do patent rights matter? 40 years of innovation, complexity and productivity”, <https://doi.org/10.1016/j.worlddev.2018.10.009>; Blind, K., F. Ramel and C. Rochell (2022<sup>[33]</sup>), “The influence of standards and patents on long-term economic growth”, <https://doi.org/10.1007/s10961-021-09864-3>; Buerger, M., T. Broekel and A. Coad (2012<sup>[34]</sup>), “Regional dynamics of innovation: Investigating the co-evolution of patents, research and development (R&D), and employment”, <https://doi.org/10.1080/00343404.2010.520693>; OECD/Eurostat (2018<sup>[35]</sup>), *Oslo Manual 2018: Guidelines for Collecting, Reporting and Using Data on Innovation, 4th Edition*, <https://doi.org/10.1787/9789264304604-en>; Giuri, P. et al. (2007<sup>[36]</sup>), “Inventors and invention processes in Europe: Results from the PatVal-EU survey”, <https://doi.org/10.1016/j.respol.2007.07.008>.

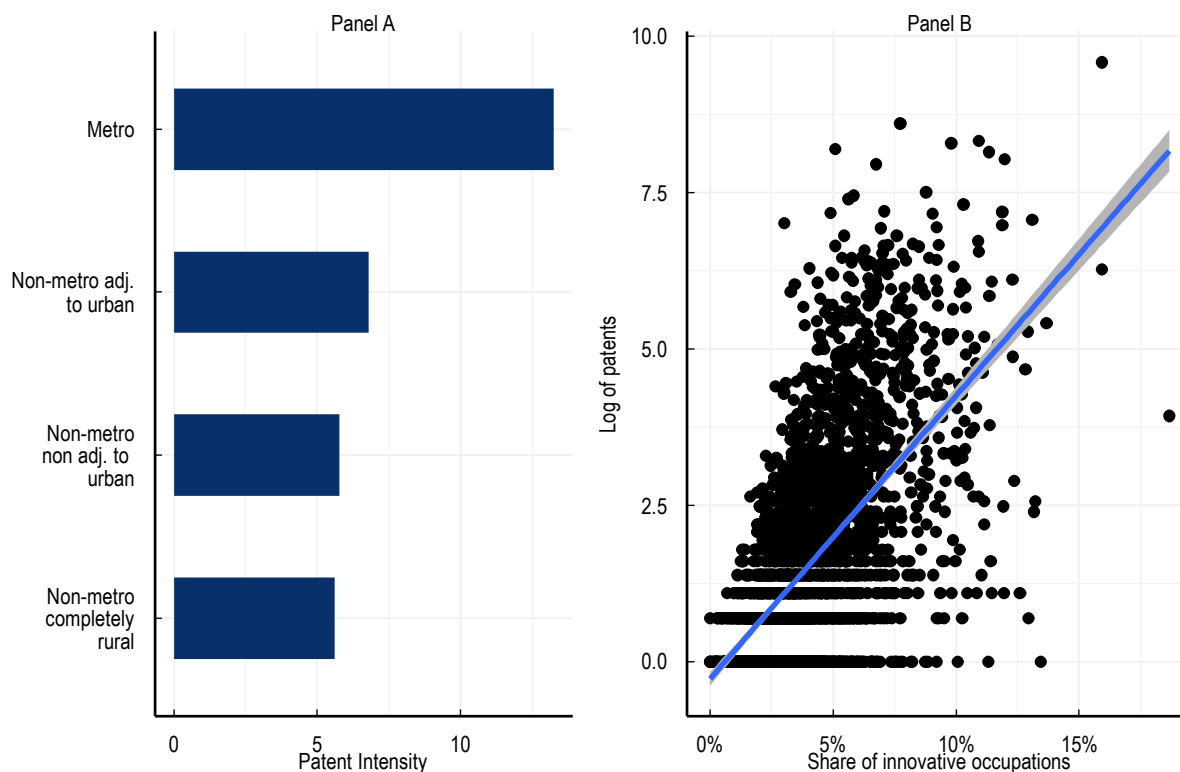
### Individuals as drivers of innovation

Metropolitan counties on average had the highest patent intensity in 2015 (Figure 2.12).<sup>16</sup> There are on average 13.2 patents per 1 000 innovative occupations in metropolitan counties, while this ratio is 5.6 on average in rural counties. This pattern is similar for the share of innovative occupations of the total workforce within counties. Within metro counties’ innovative workforce, over 5% are patent-producing, compared to 3.5% in non-metropolitan AU counties, 2.8% in non-metropolitan NAU counties, and 2.6% in

rural counties.<sup>17</sup> By construction, the number of innovative occupations as a share of the total workforce is strongly correlated with patent output (Figure 2.12, Panel B).

**Figure 2.12. Innovation rates across counties, 2015**

Patent intensity, patents and innovative occupations



Note: Panel A displays the average patent intensity by county classification (Table 2.1). The patent intensity is computed by dividing the number of patents by the number of innovative occupations in a given county. Panel B shows the correlation between the numbers.

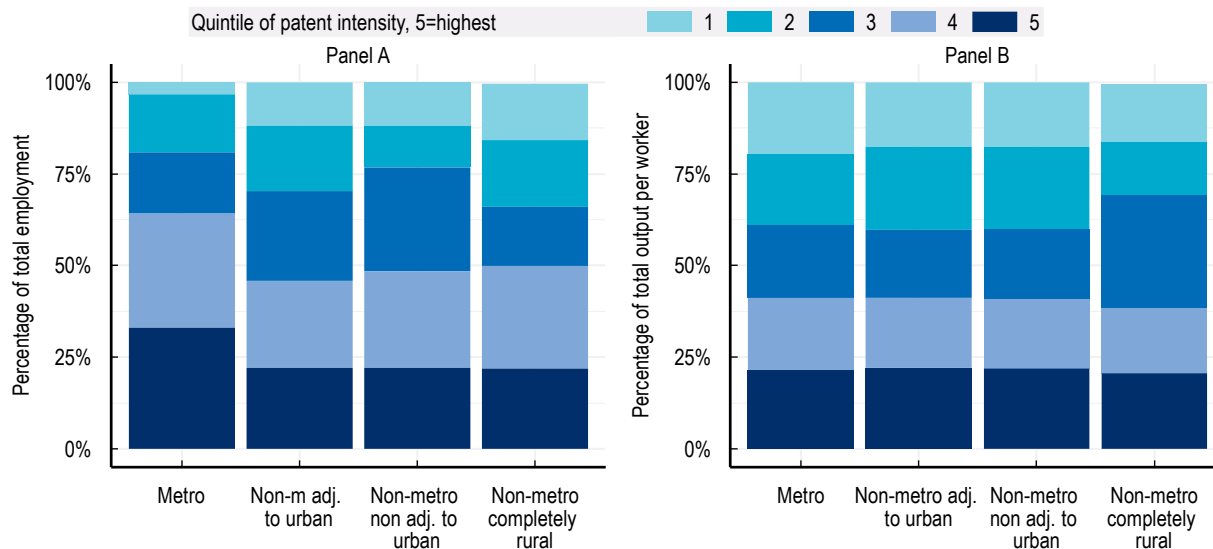
Source: Dotzel, K. and T. Wojan (2022<sup>[26]</sup>), "An occupational approach to analyzing regional invention", <https://ncses.nsf.gov/pubs/ncses22202>; United States Patent and Trademark Office.

Counties with larger shares of inventive workers tend to have high levels of employment, but they do not necessarily have higher productivity (Figure 2.13, Panel A and B).<sup>18</sup> Within metropolitan counties, the highest quintile of counties with high shares of innovative occupations accounts for nearly 75% of all employment (Figure 2.13, Panel A). In contrast, in non-metropolitan AU counties, non-metropolitan NAU counties and rural counties less than 50% of workers are employed in counties with high shares of innovative occupations. In other words, metropolitan counties with more innovative occupations tend to also have the largest share of workers. However, in non-metropolitan counties, innovative occupations are not densely clustered into counties that have a larger labour pool.

The existence of individuals with the proclivity to participate in high-tech (and patentable) innovation does not necessarily align with the productivity outcomes. Output per worker (productivity) is roughly equally distributed among all county classifications, except for completely rural counties where the middle rank of counties based on patent intensity carries a larger share of output per worker. This suggests that innovative occupations are not strongly associated with labour productivity and that some rural counties are managing their resources more effectively, for instance by employing labour in a more productive way.<sup>19</sup>

**Figure 2.13. Employment and productivity across the innovation distribution**

Patent intensity quartiles' contribution to employment and productivity



Note: Quintiles are based on the distribution of innovative occupations within county classification. The colours refer to the quintile whereas the size of the bar indicates the share of the respective quintile of total employment and output per worker for each county class. Patent statistics are available for 2015, and ACS data are based on 2000-15 data.

Source: U.S. Census Bureau (2022<sup>[7]</sup>), *American Community Survey Data*, <https://www.census.gov/programs-surveys/acs/data.html>; BEA (2022<sup>[8]</sup>), *Regional Economic Accounts*, <https://www.bea.gov/data/economic-accounts/regional>; Dotzel, K. and T. Wojan (2022<sup>[26]</sup>), "An occupational approach to analyzing regional invention", <https://nces.nsf.gov/pubs/ncses22202>.

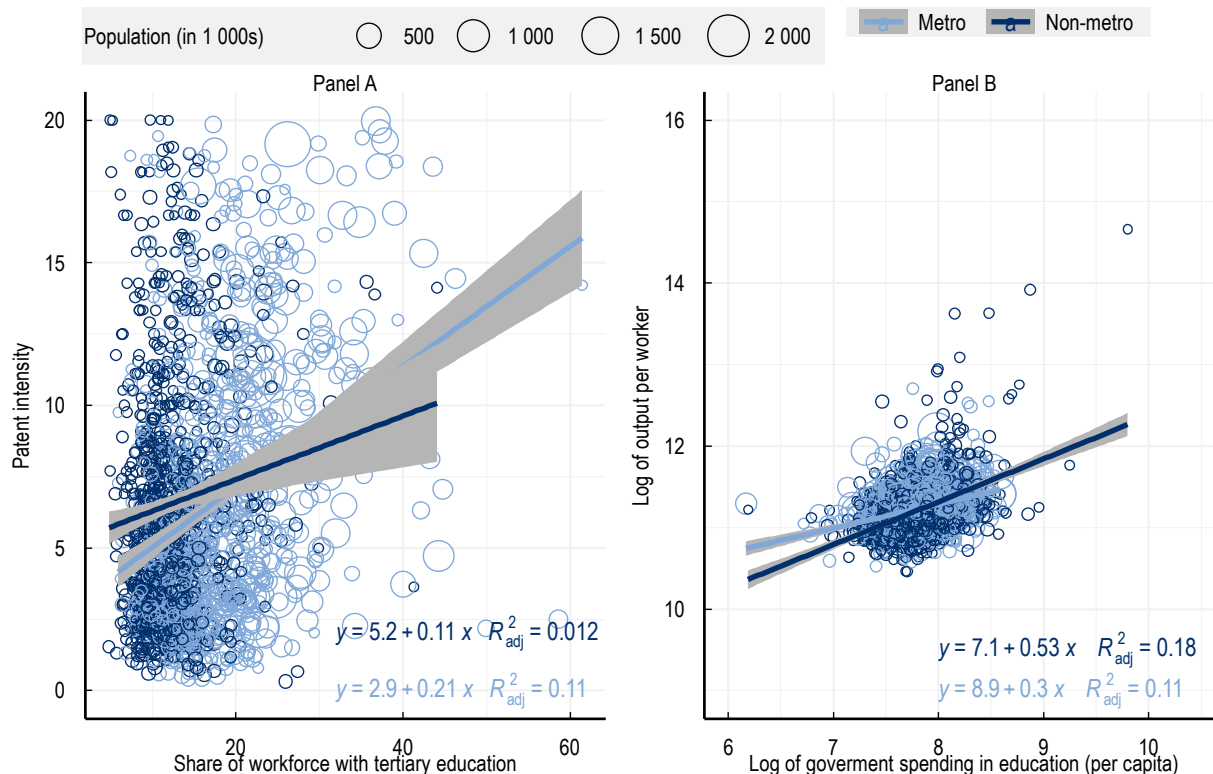
Education is often considered an important determinant of high-tech innovation, but the relationship between higher education and innovation is not exactly the same in metropolitan and non-metropolitan areas. Panel A of Figure 2.14 demonstrates the point. First, the share of those in tertiary education is lower in non-metropolitan areas than in urban areas. Nevertheless, increasing the share of workers with tertiary education leads to an increase in the ratio of the number of patents to innovative occupation for both metro and non-metro counties respectively.<sup>20</sup> Overall, a 1% percentage point increase in the share of the workforce with tertiary education is associated with a 2.1 (2.1 patents per 1 000 relevant occupations) increase in patent intensity in metro and a lower, 1.1 increase in patent intensity in non-metro counties. After the threshold of around 20 percent of the workforce with tertiary education, the total benefit of increasing the share of tertiary education labour force becomes less clear (i.e. estimates become noisy with larger standard errors) and is a lower magnitude for non-metropolitan areas. This finding suggests that increasing the stock of highly educated workers alone in non-metropolitan areas does not have the same impact (despite both being still positive), in non-metropolitan areas, as compared to those in metropolitan areas. The level of education of the labour market is particularly relevant for innovation in non-metropolitan areas that benefit from a higher educated workforce, but it may miss a local focus on the supply of education courses to best fit local markets (see Chapter 4).

Despite mixed findings on innovation, investing in the workforce is still clearly positive for non-metropolitan and metropolitan counties alike. For both metropolitan and non-metropolitan counties, there is a positive relationship between government spending in education per capita and productivity. However, the effects of government spending are marginally more positive in non-metropolitan areas. Increasing governmental spending on education by 1% in non-metropolitan areas is associated with an increase productivity by 0.5%, as compared to a 0.3% increase in metro counties.



**Figure 2.14. Education and innovation**

Tertiary education on patent intensity, education spending on productivity



Note: Patent intensity is computed by dividing the number of patents by the number of innovative occupations in a given county. The workforce with tertiary education has been denominated by total workforce. Government spending on education has been denominated by total population. Outliers in patent intensity have been excluded in all graphs. Observations are from 2015.

Source: U.S. Census Bureau (2022<sup>[7]</sup>). *American Community Survey Data*. <https://www.census.gov/programs-surveys/acs/data.html>; BEA (2022<sup>[8]</sup>), *Regional Economic Accounts*, <https://www.bea.gov/data/economic-accounts/regional>; Dotzel, K. and T. Wojan (2022<sup>[26]</sup>), "An occupational approach to analyzing regional invention", <https://nces.nsf.gov/pubs/nces22202>.

### ***Firm-based innovation: Competition, higher education and research institutions***

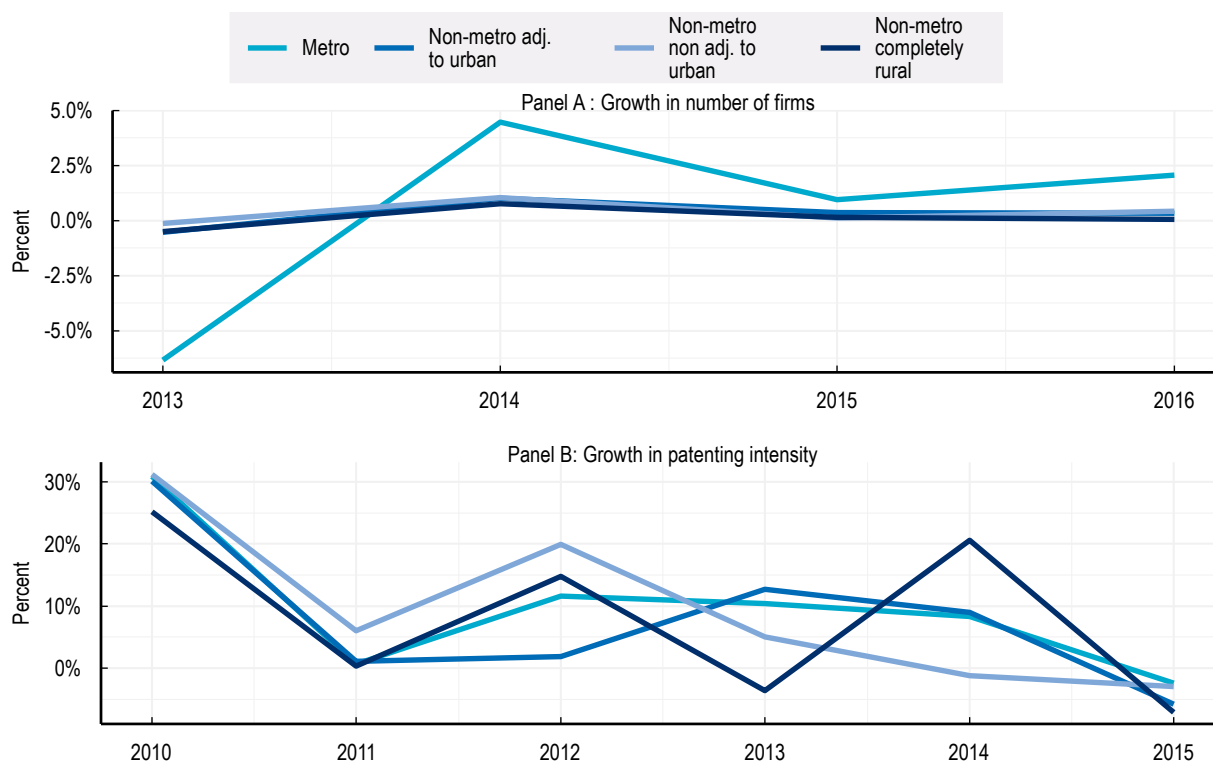
If individuals are drivers of innovation, firms are the mechanisms through which they instrumentalise their ideas. Framework policies regulating firm activities related to competition, finance and human capital are important factors for encouraging innovation (Aghion et al., 2001<sup>[37]</sup>; Andersson et al., 2009<sup>[38]</sup>; Grossman and Helpman, 1990<sup>[39]</sup>). In many cases, the establishment of a new firm implies finding a new product or process that can bring new opportunities to the firm itself or the market it serves. Therefore, more firm activity may both be driving innovation directly, and indirectly through competition, spillovers or simply more specialised services.

There is a strong potential for innovation through encouraging new entrepreneurship. In OECD countries, there is ample evidence suggesting that start-up entrepreneurs tend to be innovative. A portion of start-ups are also highly productive (Freshwater et al., 2019<sup>[40]</sup>; Hall, 2011<sup>[41]</sup>; OECD, 2013<sup>[42]</sup>; 2019<sup>[43]</sup>). Higher start-up rates and creative destruction (firm churning, or firm birth and death rates) are often an indicator of healthy, evolving and innovative economies (2017<sup>[44]</sup>). Moreover, young firms such as start-ups undertake riskier innovation activities that may yield greater performance benefits or greater losses (Coad, Segarra and Teruel, 2016<sup>[45]</sup>; Breschi, Lassébie and Menon, 2018<sup>[46]</sup>).

At the aggregate level, the growth in number of firms in non-metro counties is low, while there is a strongly positive growth for metropolitan firms after 2014 (Figure 2.15, top). At the same time, patent growth follows a decreasing trend in non-metropolitan counties and has been stagnating in metropolitan counties since 2010 (Figure 2.15, bottom). This suggests that the relationship between new firm growth and patents is not monotonous (constant), especially across county classifications.

### Figure 2.15. Growth rate of firms and patent intensity

Growth rate number of firms (Panel A) and patenting intensity (Panel B)



Note: Growth rate of aggregate firms and patents by county classification. Panel A shows the growth rate of the number of firms by county class. Panel B shows the growth rate of patents by county class.

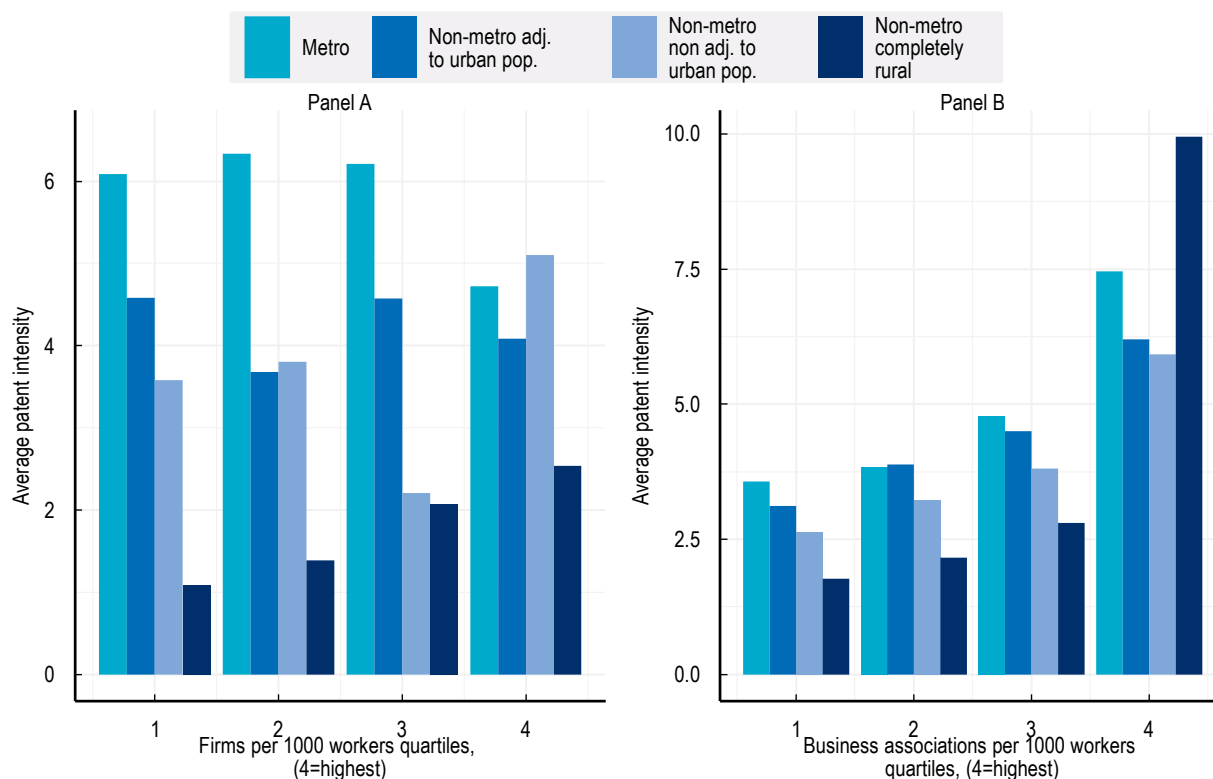
Source: *County Business Patterns Data*, <https://www.census.gov/programs-surveys/cbp/data.html>; United States Patent and Trademark Office; Dotzel, K. and T. Wojan (2022<sup>[26]</sup>), "An occupational approach to analyzing regional invention", <https://nces.nsf.gov/pubs/nces22202>.

Competition is often considered good for innovation and growth, yet imperfect competition can create unfair advantages. In rural counties, more firm activities are associated with higher patent intensity. The more firms there are per thousand workers, the higher the patent intensity. In other words, an increase in firm density is positively correlated with patent intensity (Figure 2.16, Panel A).<sup>21</sup> The top 25 percentile of rural counties with the highest clustering of firms average 2.6 patents per thousand inventive workers. This number drops by half in the counties with the least firms per thousand workers in rural counties. For metro

counties this relationship is the opposite. There are approximately 1.5 fewer patents per inventive worker in the counties with the highest firm intensity as compared to counties with the lowest levels of firm intensity. While those metro counties in the first, second and third quartile of the firm distribution have rather similar patent intensities, those with the highest number of firms per 1 000 workers have a lower patent intensity. Assuming that industrial composition of firms remains constant across regions, this might indicate that there is a level of saturation of firm intensity associated with patent intensity in metro counties, but not in rural counties.

**Figure 2.16. Firms, business associations and patent intensity**

Geographical quartiles on firm intensity on average patent intensity



Note: Counties have been ranked by their position and the distribution of firms per 1 000 workers across the US. The bars indicate the average patent intensity by county class within their respective quartile. The analysis is based on data on number of business associations and patents in 2015.

Source: U.S. Census Bureau (2022<sup>[7]</sup>), *American Community Survey Data*, <https://www.census.gov/programs-surveys/acs/data.html>; U.S. Census Bureau (2021<sup>[47]</sup>) *County Business Patterns Data*, <https://www.census.gov/programs-surveys/cbp/data.html>; United States Patent and Trademark Office; Dotzel, K. and T. Wojan (2022<sup>[26]</sup>), "An occupational approach to analyzing regional invention", <https://nces.nsf.gov/pubs/nces22202>.

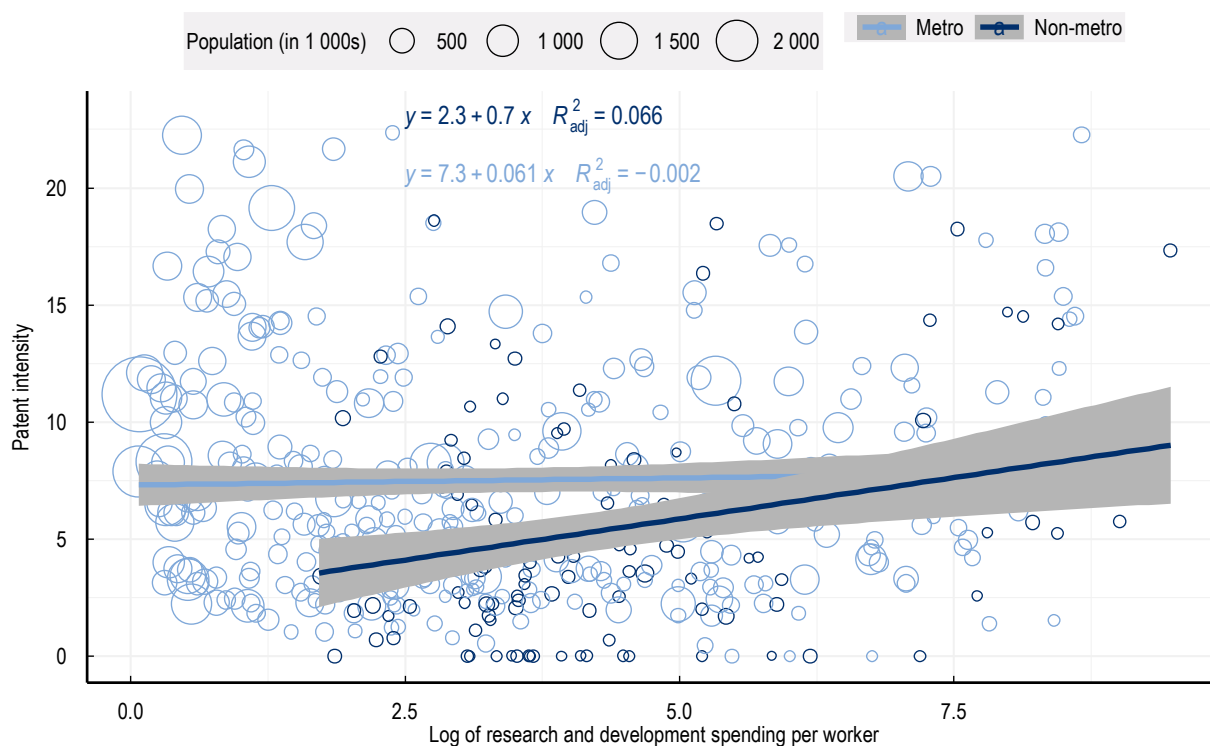
Higher firm intensity might be accompanied by higher spill-over effects, especially in rural counties. Either more firms attract more productive and educated workers or there are general knowledge spill-overs reducing the costs to innovate. In high tech sectors clustered in metro counties a high level of existing firms and patent thickets might hamper more innovation (Hall, von Graevenitz and Helmers, 2020<sup>[48]</sup>; Delgado, Porter and Stern, 2014<sup>[2]</sup>). If competition is high and markets are rather saturated, the willingness to innovate might be reduced since after a certain level, competition decreases potential profits. Moreover, the adverse relationship between firm intensity and innovation across rural and metro counties could be due to different types and cost structures of inventions. Differing characteristics of firms and industries across county classes (see Figure 2.8) and difficulties in access to legal services for filing patent procedures might explain this pattern further (Buerger, Broekel and Coad, 2012<sup>[34]</sup>).

In addition to firm competition, access to business networks such as business associations can help transfer knowledge between firms, and therefore contribute to an enabling environment for innovation. These associations tend to help navigate barriers to entering markets and support the private sector's dialogue with government. Business associations are positively associated with innovation across all county classifications, and even more so for rural counties (Figure 2.16, Panel B).

Business associations perform a wide range of tasks (collective bargaining, self-regulation, representation, and lobbying) usually managing the relations between states and firms. Thus, they can play a crucial role in improving access to external knowledge, building mutually beneficial relationships, and commercialising the internal knowledge. They can directly support innovation in businesses in particular where policymaking impacts funding of R&D, technological development and innovation (Koschatzky et al., 2014<sup>[49]</sup>). Moreover, business associations facilitate the transmission of knowledge for its members. For example, in the automotive industry in Portugal it has been shown that business associations have played an important role in the transfer of knowledge and technology between project stakeholders (Carvalho and Moreira, 2015<sup>[50]</sup>).

Firm-based innovation is also often associated with spending on Research and Development (R&D). However, the effect of spending in research and development on patent intensity also differs between metro and non-metro counties (Figure 2.17). While the effect of R&D on patent intensity is positive in non-metro counties, there is a zero correlation in metro counties. For every 1% increase in R&D spending, the patent intensity increases by 0.7 units in non-metro counties while it is close to zero, and more spurious in metro counties.<sup>22</sup> This might reflect the fact that R&D spending in non-metro counties faces less saturation compared to what is observed in other OECD countries (OECD, 2022<sup>[6]</sup>). Research expenditure can be more effective in places when the cost of innovating is lower, in particular when levels of R&D spending are at a lower, implying lower entry, barriers and marketing costs. However, rural counties with positive patent intensities and no R&D spending do in fact exist. This points to the fact that innovation in some rural counties may not be as connected to R&D spending as those in metropolitan counties and suggests the assertion that knowledge diffusion is a driver of innovation in non-metropolitan regions. In this case, rural innovation is simply less dependent on the direct effects of R&D.

**Figure 2.17. Research and development spending and patent intensity**



Note: The patent intensity is computed by dividing the number of patents by the number of innovative occupations in a given county. All other variables have been denominated by total employment. Counties with no patents and outliers in patent intensity have been excluded in all graphs.

Source: U.S. Census Bureau (2022<sup>[7]</sup>), *American Community Survey Data*, <https://www.census.gov/programs-surveys/acs/data.html>; BEA (2022<sup>[8]</sup>), *Regional Economic Accounts*, <https://www.bea.gov/data/economic-accounts/regional>; United States Patent and Trademark Office; Dotzel, K. and T. Wojan (2022<sup>[26]</sup>), "An occupational approach to analyzing regional invention", <https://nces.nsf.gov/pubs/nces22202>.

## Promoting equitable opportunities for innovation

Innovation is both the predecessor of growth and employment and of job loss and structural change. It happens in different ways. Innovation can create opportunities, but also exacerbate pre-existing inequalities. For example, wage inequality among top earners is associated with innovation (Aghion et al., 2018<sup>[51]</sup>). However, in the United States, growth in aggregate income by top earners is continuing to create inequalities. Among top income earners, white people have continued to increase incomes, while Black top income earners have not seen incomes progress as rapidly (Rinz and Voorheis, 2023<sup>[52]</sup>).

While some level of inequality is useful for innovation, too much inequality can hinder equitable access to opportunities and reinforce pre-existing barriers, leading to a fall in dynamism in the economy. While competitive forces may be driving top income growth through innovation, the average income earner may not experience the same benefits to innovation. Other kinds of innovation can also lead to a reduction in wage inequality over time (social mobility), in particular when it comes from new entrants (start-up entrepreneurs) to the market (Aghion et al., 2018<sup>[51]</sup>). Taking into consideration how innovation and entrepreneurship policies can promote equitable opportunities is often a target for policymakers focused on regional development or those operating in districts or states with a large constituency in rural areas, and can help address worsening geographical divides.

Diversity and interactions between individuals enable innovation (Crescenzi, Nathan and Rodríguez-Pose, 2016<sup>[11]</sup>). Social and professional networks are an important mechanism with which to diffuse knowledge. Networks with new ideas and opportunities develop as individuals from different backgrounds exchange ideas and resources. Diversity in management has been found to be an economic asset. It also generates social benefits: some studies find evidence of a “diversity bonus” for innovation in firms that had more diversity in management, providing better access to international markets, and encouraging entrepreneurship (Nathan and Lee, 2013<sup>[53]</sup>).

Diversity in all forms can foster the creation of new ideas and solutions, while reinforcing equity (Nathan and Lee, 2013<sup>[53]</sup>). However, traditional economics do not often directly take into consideration the diversity of rural challenges related to intersectionality between demographic and geographical diversity to promote inclusive opportunities (Henry-Nickie and Seo, 2022<sup>[54]</sup>). One point of strength in the United States is active measures to encourage diversity in the workforce, including in terms of minorities. For example, the EDA has investment priorities based on equity in grant-making, which includes traditionally underserved populations, including but not limited to women, Black, Latino, Indigenous and Native American persons, Asian Americans and Pacific Islanders, or critically, geographies that have a systematic lack of equitable access such as those on Tribal lands, or those that are classified as Persistent Poverty Counties (EDA, n.d.<sup>[55]</sup>).

While research is still scarce on ethnic diversity, studies on diversity in workplaces suggest more innovative group outcomes (Van der Vegt and Janssen, 2003<sup>[56]</sup>; Goodman, 2013<sup>[57]</sup>). However, US-born minorities, such as Asian, African, Hispanic and Native Americans, account for 32% of the native-born population, but just 8% of US-born innovators. African Americans comprise 13% of the native-born population, yet only 0.5% of US-born innovators according to the Information, Technology and Innovation Foundation (Nager et al., 2016<sup>[58]</sup>). For rural communities with relatively smaller populations, national minorities can become local majorities creating additional different challenges on activating diversity and accessing resources for innovation and entrepreneurship.<sup>23</sup> In some cases, historical discrimination in some areas has persisted over time, thus stifling opportunities for growth and well-being.

### ***Innovation, inequalities and demographic change***

Innovation is driven by people and skills. Promoting access to skills and skills diversity is therefore a primary concern for many regional and rural governments looking to encourage innovation. As in other OECD countries, rural regions are faced with an aging workforce, challenges to engage with youth, and often increasing discrimination in the workforce related to gender, race and or migration status (OECD, 2019<sup>[59]</sup>). Efforts to promote equity in access to opportunities through innovation and entrepreneurship programmes should take into consideration the demographics of non-metropolitan regions in addressing these challenges. Given the importance of promoting innovation and entrepreneurship through a well-being approach, this sub-section explores trends on inequality, demographics and population change for innovation.

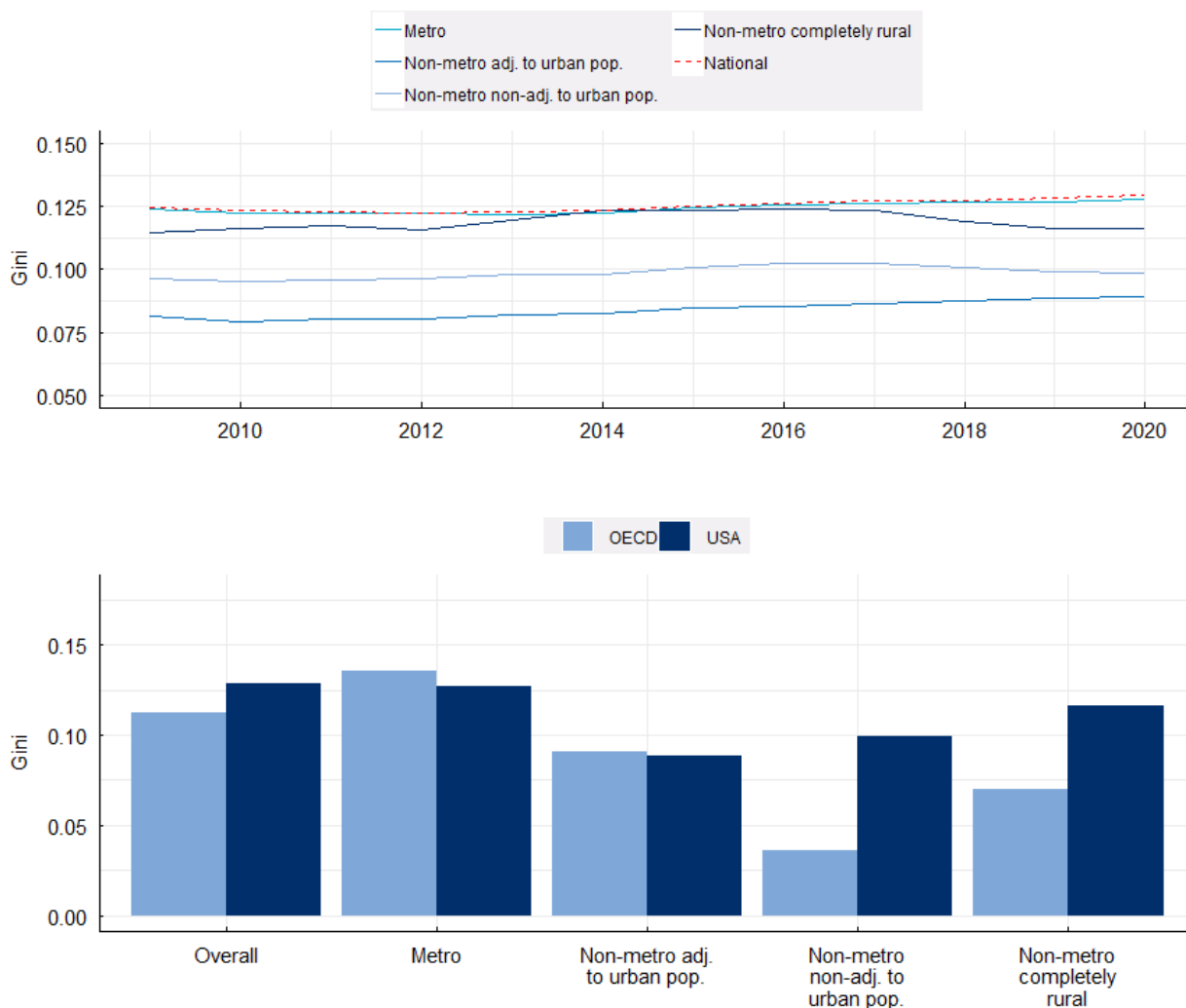
#### *Trends in inequalities*

Comparing the United States to 18 OECD countries<sup>24</sup> where disposable household income is available at the TL3 level, we find that overall inequality was higher in the US in 2019, at 0.13, compared to the OECD average of 0.11 (Figure 2.18, right). In metro and non-metro AU regions,<sup>25</sup> we observe lower inequality in the US as compared to OECD countries. However, in non-metro NAU regions and rural regions, inequality is starkly higher in the US than in OECD countries, with non-metro NAU regions surpassing the OECD average by over 2.5 fold. However, such analysis aggregates county level variations within regions.

Based on more disaggregate data, in the United States today, the highest level of household income inequality among wage earners is found in metropolitan and completely rural counties (Figure 2.18, left). However, notably, in the last five years (2015 to 2020) inequality in rural counties has fallen, while it

continued to grow in metropolitan counties. Between 2010 and 2020, the rise in income inequality as measured by the Gini coefficient<sup>26</sup> (Figure 2.18, left) is also accompanied by the rise in real GDP per capita in most counties (Figure 2.3). In general, overall inequality (dotted red line), driven by metro counties, showed an upward trend.

**Figure 2.18. Gini coefficient on county household income, 2009 to 2020 (left), and international comparison, 2019 (right)**



Note: Extraction-dependent counties are excluded from analysis. On the right, the OECD averages are for 2019 and include the following countries: Czechia, Germany, Denmark, Estonia, Hungary, Ireland, Israel, Iceland, Japan, Korea, Lithuania, Latvia, Norway, New Zealand, Sweden, Slovenia, Slovak Republic, the United Kingdom. Disposable household income on the US at the county level originated from the 5-Year American Community Survey while that of others, at the OECD TL3 level, originated from the OECD Regional Statistics Database. Date in both graphs is based on TL3 regions and classified into the OECD's typology of small administrative regions (TL3) based on accessibility to metropolitan areas. The category labels are adapted from the OECD's typology based on access to cities to similar labelling of the RUCC typologies for ease of interpretation and comparability with other figures. Non-metro adjacent to urban population category refers to the OECD's non-metropolitan regions with access to a metropolitan areas (NMR-M) category. Non-metro non-adjacent to urban population category refers to the OECD's non-metropolitan regions with access to a small- and medium-sized city (NMR-S) category. Non-metropolitan completely rural category refers to the OECD's non-metropolitan remote regions (NMR-R) category.

Source: U.S. Census Bureau (2022<sup>[7]</sup>), *American Community Survey Data*, <https://www.census.gov/programs-surveys/acs/data.html>; OECD (2022<sup>[60]</sup>), Regional Statistics, <https://www.oecd.org/regional/regional-statistics/>.

There have been broad improvements in reducing inequality in rural counties from 2009 to 2020. In contrast, to the trend in metro counties, rural counties exhibited more varied development over the decade, with elevated levels of inequality between 2014 and 2016, but a decline shortly thereafter. Such decline in rural inequality is also marked by more equality for the middle class. The median rural household income approached the mean (the median-to-mean ratio of income was 0.99 in 2020, up from 0.98 in previous years); this phenomenon was not observed in metro households. This dynamic, in view of rising per capita GDP, suggests broad-based improvement in rural counties across the decade even if inequalities are still high. This trend is observed against the context of general worker loss and falling levels of firm and patent creation.<sup>27</sup>

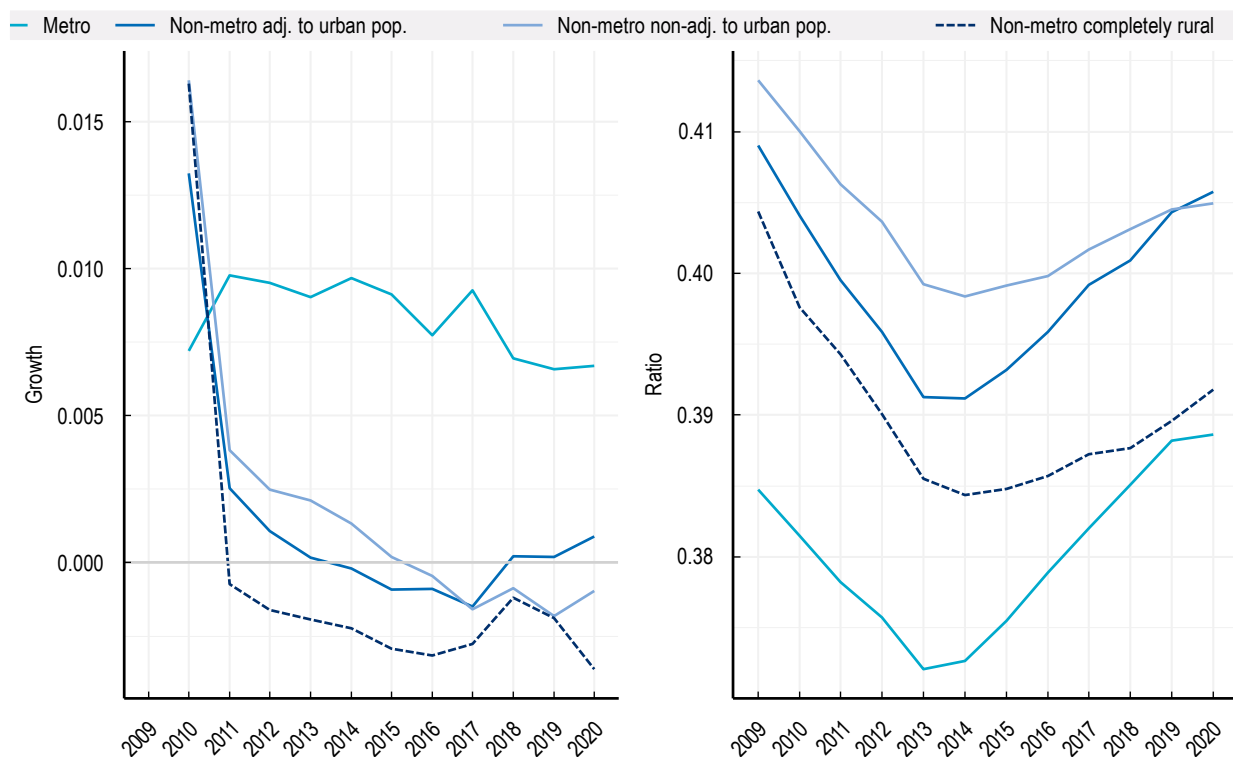
### *Trends in population and demography*

#### **Population and employment**

Population movement and demographic change can substantially impact well-being in rural regions, underpinning the size of a region's workforce is its population. For the first time in history, rural America observed a decade-long population loss during the 2011-20 period (Johnson, 2022<sup>[61]</sup>), with a net decline totalling 100 777 persons, or -0.2%, between 2011 and 2020. See Figure 2.19 (left) for the year-to-year population growth during the period. Non-metro AU and Non-metro AU saw similar losses, although at a relatively slower rate. Metro regions experienced sustained growth.

The loss of inhabitants in different geographies has serious implications for innovation and entrepreneurship. For one, it diminishes the tax base due to a lower workforce relative to population (Figure 2.19, right), leading to lower revenue for the local government, and lower local capacity for delivering critical services for entrepreneurs and innovators. Second, population is often a key metric in determining the size of federal funding. All this implies that lower density areas in general have fewer specialists, more difficulty in attracting people with the right skills, higher infrastructure costs and a smaller population to draw potential users from in order to provide services at scale, leading to higher per-person cost. The provision of government services, essential in remote regions, is affected too, since a smaller user base forces facilities to close and consequently require residents to travel long distances to access services such as health facilities and schools (OECD/EC-JRC, 2021<sup>[62]</sup>).



**Figure 2.19. Population growth (left) and worker share of the population (right), 2010-20**

Source: U.S. Census Bureau (2022<sup>[7]</sup>), *American Community Survey Data*, <https://www.census.gov/programs-surveys/acs/data.html>.

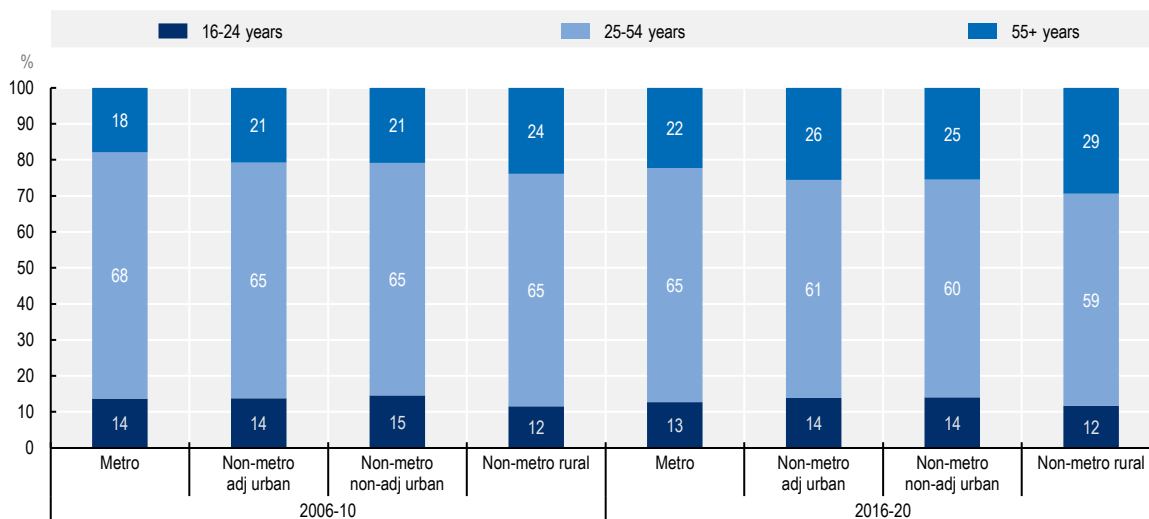
There has been a long-running trend of declining labour participation (Kalleberg and Von Wachter, 2017<sup>[63]</sup>; Perez-Arce and Prados, 2021<sup>[64]</sup>). This was particularly pronounced in the aftermath of the 2008 financial crisis resulting in the trough in Figure 2.19 (right). Despite this trend, metro counties recovered and exceeded its pre-crisis worker level (as a share of the population), while non-metro AU counties recovered somewhat. By contrast, non-adjacent counties such as rural and non-metro NAU counties' number of workers remained depressed. In rural counties, this was due to a decelerated loss of workers between 25 and 54 from 2013 onward.

### Aging workers

The workforce in non-metropolitan counties is aging (Figure 2.20), in the United States and across OECD countries. Close to one-quarter of the population in non-metropolitan rural areas was over the age of 55 from 2006-10, while in the period of 2016-20, close to 29% of the population was over the age of 55. While the share of working age individuals below 24 remained the same in the two periods, the aging trend was primarily due to a loss of prime aged workers (25-54 years of age). While the workforce in the United States is aging as a whole, it is more pronounced in non-metropolitan regions and compounded by a lower share of primary workers. This trend is expected to continue (Martinez-Fernandez et al., 2012<sup>[65]</sup>), further aggravating pre-existing challenges in regional innovation. The aging trend of the non-metropolitan workforce would suggest a heightened need for life-long learning and upskilling programmes for non-metropolitan regions (OECD, 2021<sup>[66]</sup>; OECD, 2022<sup>[67]</sup>).

**Figure 2.20. Age-based demographic change**

Share of workers, by age group based on county (2006-10; 2016-20)



Note: Data are aggregated from county-level number of workers by age group.

Source: U.S. Census Bureau (2022<sup>[7]</sup>), *American Community Survey Data*, <https://www.census.gov/programs-surveys/acs/data.html>.

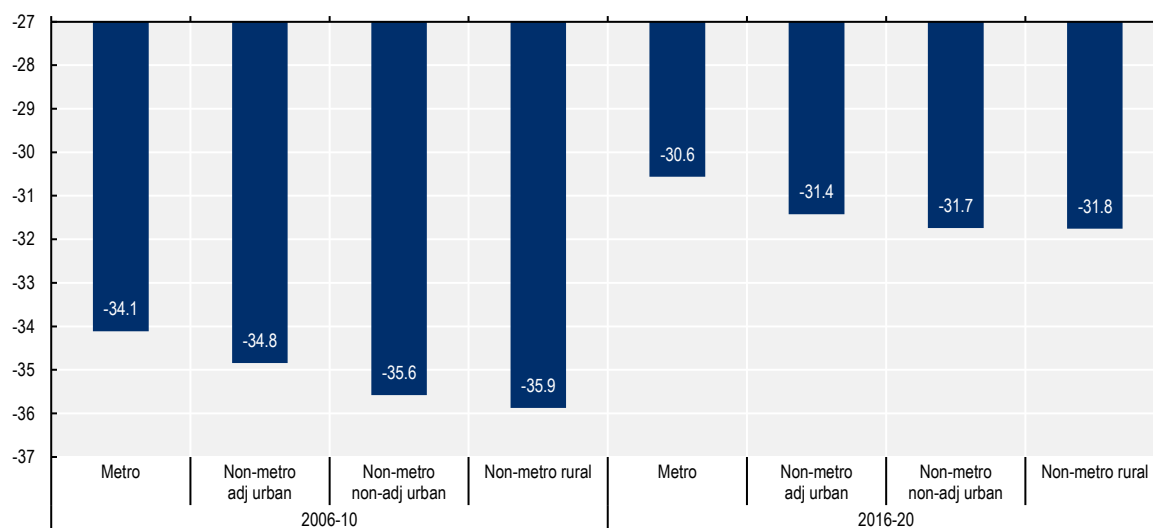
### Gender diversity

Promoting gender diversity can inject new skills and opportunity into rural regions. Several studies have shown that gender diversity contributes positively to innovation and productivity (Gallego and Gutiérrez, 2018<sup>[68]</sup>; Reagans and Zuckerman, 2001<sup>[69]</sup>; Trax, Brunow and Suedekum, 2015<sup>[70]</sup>; Østergaard, Timmermans and Kristinsson, 2011<sup>[71]</sup>).<sup>28</sup> In the United States, the Bureau of Labour Statistics found that 57.4% of women participated in the labour force, as compared to 69.2% of men, in 2019. However, this was still below its peak of 60% in 1999. Women also tended to cluster in educational and health services, financial services and hospitality, but were under-represented in key sectors of the non-metropolitan economy, such as the manufacturing and agricultural sectors (BLS, 2021<sup>[72]</sup>).

Challenges in equal pay and equal opportunities for employment and entrepreneurship are still prevalent in the United States and OECD countries (OECD, 2023<sup>[73]</sup>). Between 2016 and 2020, men were on average paid 31% more than women. While the gap is still substantial, it has decreased from close to 35% a decade earlier (between 2006 to 2010). This has mirrored improvements in the pay gap for women in several OECD countries (OECD, 2021<sup>[74]</sup>). A more recent finding, which focused only on full-time workers, found that while the average pay gap in OECD countries in 2021 was 12%, it remained higher than average in the US, at 17% (OECD, 2023<sup>[75]</sup>).<sup>29</sup> Over the past half century, women have improved education attainment and become more active in higher paid occupations and sectors (BLS, 2021<sup>[72]</sup>; Blau and Kahn, 1994<sup>[76]</sup>; Fitzenberger, 2005<sup>[77]</sup>; Goos, Manning and Salomons, 2014<sup>[78]</sup>; Oostendorp, 2009<sup>[79]</sup>). However, the further away counties are from metropolitan regions, the more likely women are to continue to have stronger disparity with men's wages (Figure 2.21). This finding has also been observed in many OECD countries (Murillo Huertas, Ramos and Simon, 2016<sup>[80]</sup>). Ensuring that innovation brings new activities to regions can create better opportunities and relieve monopsony power for women in small labour markets.

**Figure 2.21. Gender wage gap**

Average wage gap for women as a percentage of men's earnings



Note: Difference between median earnings of men and women relative to median earnings of men, weighted by population.

Source: U.S. Census Bureau (2022<sup>[7]</sup>), *American Community Survey Data*, <https://www.census.gov/programs-surveys/acs/data.html>.

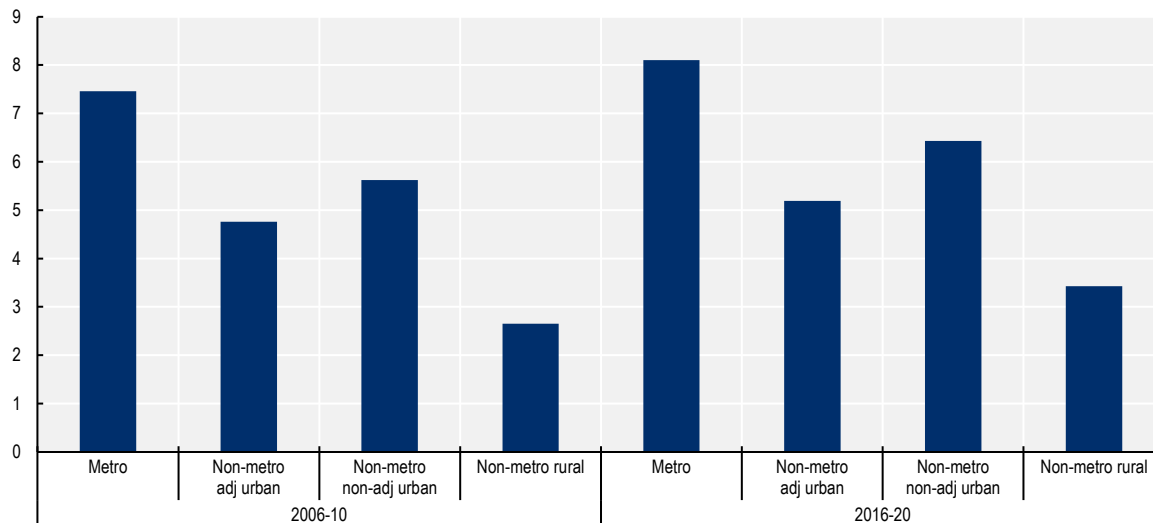
### Foreign-born workers

Migration is positively associated with innovation, entrepreneurship and firm performance across regions (OECD, 2022<sup>[81]</sup>; Kerr, 2018<sup>[82]</sup>; Guichard, Özgüzel and Kleine-Rueschkamp, forthcoming<sup>[83]</sup>). This is especially the case in federal countries like Switzerland and the United States (Beerli et al., 2021<sup>[84]</sup>; Breschi, 2016<sup>[85]</sup>; Hanson, Kerr and Turner, 2018<sup>[86]</sup>) — despite evidence of local labour market friction (OECD, 2022<sup>[81]</sup>). In the United States and other OECD countries like Canada, migration policies are actively being used to promote innovation (such as H1B visas in the US and the Canadian talent-based visa programme).

There is an increasing share of foreign workers on average across all United States counties (Figure 2.22). In part, if these are young foreign workers, it can offset the aging demographic in rural regions. However, in most rural counties, the share of foreign-born workers is much lower than other counties. It is also likely that metropolitan regions, which have a larger share of Higher Education and Research and Development (HERD) institutions, may be disproportionately benefiting from the innovative talents of high-skilled foreign-born workers, whereas the economic structure of rural counties, with a higher share of agriculture and manufacturing, may be more likely to experience higher demand for foreign-born workers with low skill levels or highly specialised skills.

## Figure 2.22. Share of foreign-born workers

Number of foreign-born workers as a share of total workers (2006-10; 2016-20)



Note: Number of foreign-born workers are aggregated over territories then divided by total workers.

Source: U.S. Census Bureau (2022<sup>[7]</sup>), *American Community Survey Data*, <https://www.census.gov/programs-surveys/acs/data.html>.

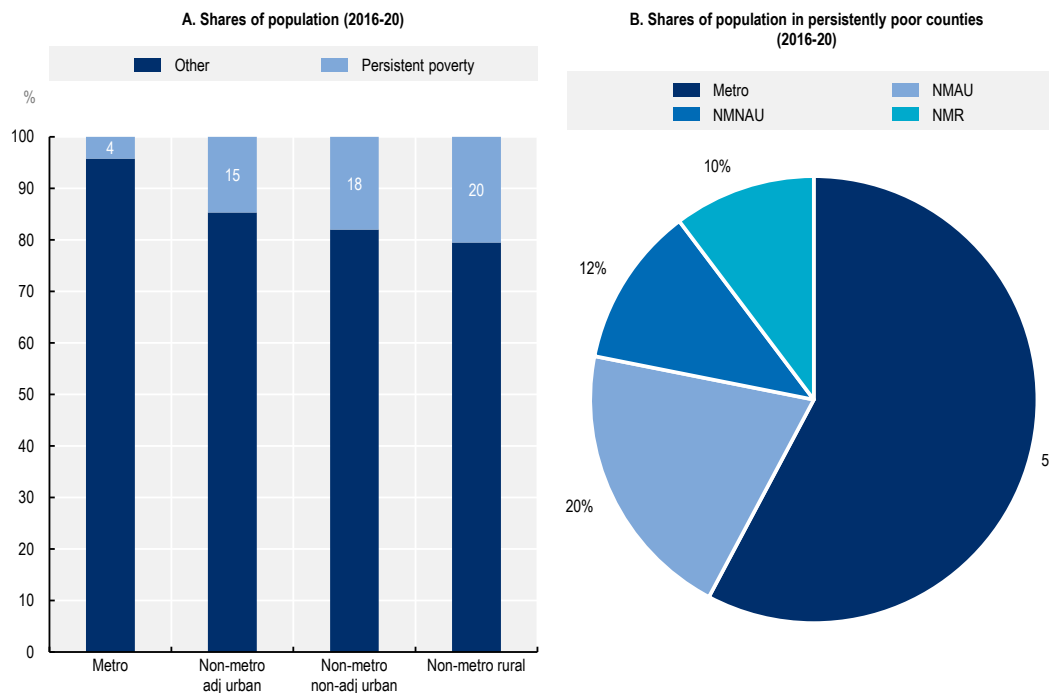
### Persistently poor counties

Promoting equity in access to opportunities for persistently poor across all places is a priority for the US administration. Under the EDA's Equity investment priority, the question of reaching places that are persistently poor is a priority. Congressional guidance finds that a county is experiencing persistent poverty if poverty rates are currently at or above 20% and have been that high for the past 30 years. Using this definition, specific counties are designated as persistent poverty counties (PPCs). EDA's equity investment priority finds that investment in PPCs is one way to meet the requirement of providing service to "underserved geographies." Congress requires that EDA allocate at least 10% of its Public Works and Build-to-Scale appropriations to fund projects in PPCs (GAO, 2021<sup>[87]</sup>).

The share of counties that are considered persistently poor is five times higher in rural counties than metropolitan counties. While there are more persistently poor counties in metropolitan areas, 20% of counties in rural regions are considered persistently poor as compared to only 4% of metropolitan counties (Figure 2.23). The larger share of PPCs in metropolitan areas likely reflects the higher numbers of metropolitan counties (Table 2.1).

## Figure 2.23. Shares of the population in persistently poor counties

Shares of the population living in counties classified as persistently poor

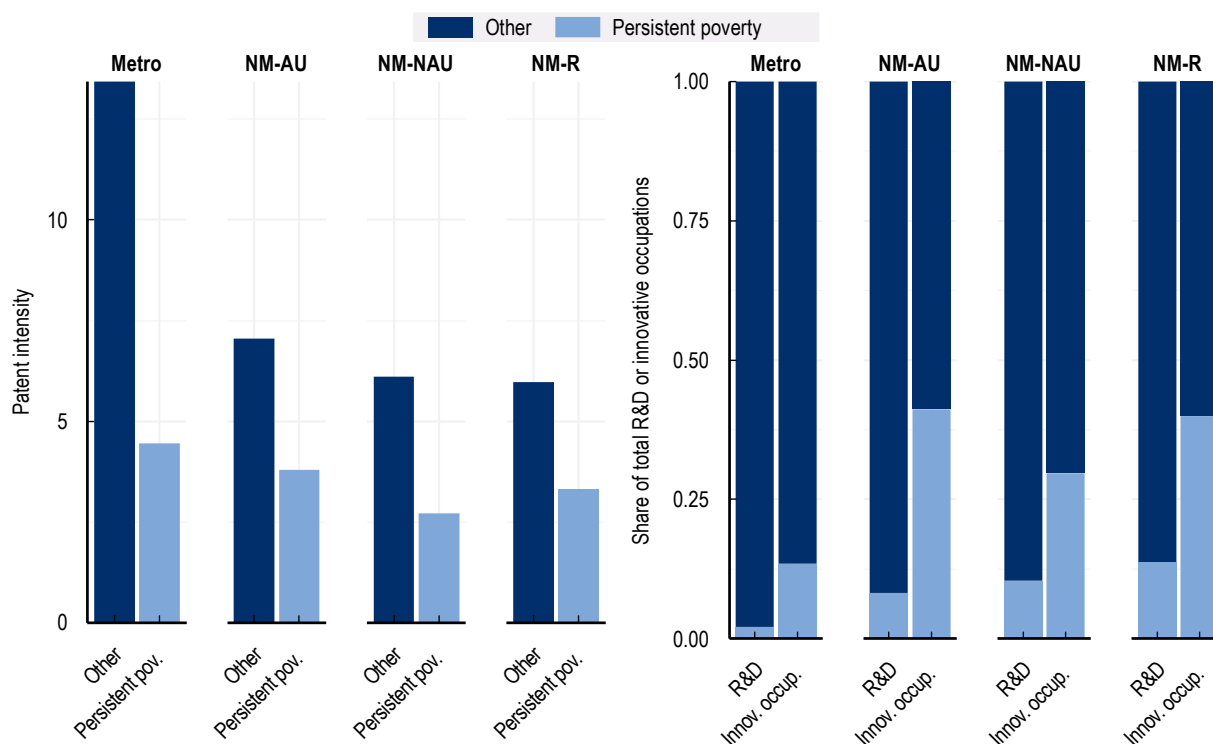


Note: Persistent poverty status is a county classification code used by the Economic Development Administration (EDA, 2021<sup>[88]</sup>). According to a congressional requirement, a county (or a county-level equivalent) is experiencing Persistent Poverty if their most recent poverty rate estimate, within the margin of error, equates to 20%, while also evidencing poverty rates of at least 20% in the 1990 and 2000 decennial censuses (i.e. 20% or greater poverty over the last 30 years). Specifically, for designation as a Persistent Poverty County (PPC), the county's poverty rate must be 20% or greater (within the plus/minus range of the margin of error) of their most recent poverty estimates according to the U.S. Census Bureau's Small Area Income and Poverty Estimates (SAIPE) dataset (<https://www.census.gov/programs-surveys/saippe.html>). The EDA uses the most recent SAIPE dataset (released December of every year, at which time the PPC list for that FY is updated). Metro refers to the counties classified as "Metropolitan." NM-AU refers to the counties classified as "Non-metropolitan, adjacent to urban population." NM-NAU refers to counties classified as "Non-metropolitan, non-adjacent to urban population." NM-R refers to counties classified as "Non-metropolitan, completely rural."

Source: U.S. Census Bureau (2022<sup>[7]</sup>), *American Community Survey Data*, <https://www.census.gov/programs-surveys/acs/data.html>.

Persistent poverty is associated with lower innovation outcomes across all types of counties. There is a strong difference in innovation outcomes across all counties, reinforcing the importance of socio-economic conditions to support innovation (Figure 2.24). Metropolitan counties tend to have high patenting intensity when they are not categorised as a persistently poor county; otherwise, their patenting intensity levels remain similar to those in persistently poor areas in non-metropolitan counties. Outcomes are similar for R&D investment across classification of counties, by persistent poverty status. The largest shares of investment in R&D are in counties that are not categorised as being in persistent poverty. Both patenting intensity and R&D investment are strongly associated with counties that do not face persistent poverty.

If benefits from innovation (for example, rents and wages) are reinvested in the community, innovation should be associated with a reduction in persistent poverty. However, as observed previously, some of the most innovative counties are not always the counties with the highest level of productivity suggesting that benefits of innovation may not always be local in nature. At the same time, a deep and entrenched lack of access to opportunities may also be causing a lower level of innovation. The fact that firms in counties may not be participating in R&D and patenting activities could be aggravating opportunities for persistently poor areas and directly contributing to sustaining people in high poverty levels over time.

**Figure 2.24. Persistent poverty and innovation**

Note: Persistent poverty status is a county classification based on poverty statistics over the past 30 years (EDA, 2021<sup>[88]</sup>). Metro refers to the counties classified as “Metropolitan.” NM-AU refers to the counties classified as “Non-metropolitan, adjacent to urban population.” NM-NAU refers to counties classified as “Non-metropolitan, non-adjacent to urban population.” NM-R refers to counties classified as “Non-metropolitan, completely rural.” The x-axis labels on the right hand side refer to shares of total research and development funding, and shares of total innovative occupations.

Source: U.S. Census Bureau (2022<sup>[7]</sup>), *American Community Survey Data*, <https://www.census.gov/programs-surveys/acs/data.html>; BEA (2022<sup>[8]</sup>), *Regional Economic Accounts*, <https://www.bea.gov/data/economic-accounts/regional>; United States Patent and Trademark Office; Dotzel, K. and T. Wojan (2022<sup>[26]</sup>), “An occupational approach to analyzing regional invention”, <https://nces.nsf.gov/pubs/nces22202>.

Although the capacity for individuals to participate in high-tech innovation may be lower in non-metropolitan areas that are considered to be persistently poor, the relatively higher shares of innovative occupations as compared to R&D investment and relatively low levels of patent intensity in persistently poor areas suggest that the skills (in occupations) needed for high-tech innovation is still salient in non-metropolitan areas, despite the lack of innovation inputs (R&D investment) and outputs (patent intensity). It is important to recognise that in many non-metropolitan counties, there may be opportunities for innovative activities that are not being harnessed because of the lack of access to traditional innovation inputs and mechanisms to turn innovations into measurable outputs.

### ***Innovation outcomes for non-metropolitan counties***

In the next sub-sections, the regression and decomposition analyses reveal differences between counties focusing on differences between regions and their drivers. In this section, the regression analysis is a simple linear model that accounts for direct effects without controlling for interaction effects. In the following section, a full decomposition model estimates differences between metropolitan and non-metropolitan regions, including interaction effects.

There is a persistent and significant penalty for non-metropolitan regions in high-tech innovation. Column 2 of Table 2.2, demonstrates that belonging to a non-metropolitan county is associated with 1.34 fewer

patents per 1 000 relevant workers as compared to metropolitan counties. In counties non-adjacent to urban counties, this impact is larger at 1.84 fewer patents per 1 000 relevant workers. However, completely rural counties are different than other types of counties. There is no statistically significant connection between being located in completely rural counties and patenting intensity. This seems to reinforce the fact that it is important to consider whether the indicator itself may be relevant to understanding innovation in remote rural counties.

The state contexts matter substantially for whether counties are likely to have high patent intensity. In Column 1 of Table 2.2, if we relax the effect of the state, we observe that there is no statistically significant difference between metropolitan and non-metropolitan counties. This suggests that state-level regulations are particularly important for determining high-tech innovation. In federal countries, like the United States, the role of the individual state is substantial in outcomes for individuals and firms. As described in the previous section much of the high-tech patenting activity is clustered on the coasts and in a few counties such as Santa Clarita and Los Angeles, both in California. Understanding how states with high patenting intensity operate can provide more evidence for states who may be looking to promote high patenting intensity, as one of the forms of innovation.

Despite the penalty on patent intensity, the penalty on productivity for non-metropolitan areas adjacent to metropolitan counties is non-existent, and relatively small in other types of counties. It is only when we account for state-level factors that there is a 3.4% decrease in productivity associated with non-metropolitan counties. This is the case even when we control for sectoral, education and territorial (geographical) characteristics.<sup>30</sup> In other words, state-level context impacts whether different geographies are disadvantaged when it comes to productivity. Without taking into consideration state-effects, there is no statistically significant difference between productivity in metropolitan counties and those in remote rural and non-metropolitan counties that are adjacent to metropolitan counties. The difference in outcomes as compared to metropolitan areas seem to suggest that counties close to urban areas may benefit from similar conditions as those in metropolitan areas no matter the state. This finding reinforces the importance of state-level conditions and functional areas that incorporate network effects when designing place-based policies for regional and rural innovation.

Lastly, while productivity as an indicator of innovation absorption suggests rural regions are benefiting from innovation absorption and innovating in different ways than metropolitan regions, there is still a penalty with regard to employment growth (Columns 3 and 4 of Table 2.2). The drop becomes more substantial in regions further away from urban areas, despite controlling from factors such as density and sector intensity. These findings can be impacted by policies on a state-level for non-metropolitan counties. In line with the findings from the macro-economic analysis in the first section, the loss in jobs is occurring in many different non-metropolitan counties, even though productivity and innovation absorption remain relatively high.

**Table 2.2. Innovation outside of metropolitan areas**

Territorial (geographical) impacts in county-level linear regressions (2006-10, 2011-15, 2016-20)

| Metro and non-metro counties (RUCC, 2 categories) |                  |           |                  |           |                           |          |
|---|------------------|-----------|------------------|-----------|---------------------------|----------|
|   | (1)              | (2)       | (3)              | (4)       | (5)                       | (6)      |
|   | Patent intensity |           | Employment (log) |           | Labour productivity (log) |          |
| Non-metro   | -0.376           | -1.341**  | -0.022***        | -0.775*** | -0.010                    | -0.034** |
|   | [0.646]          | [0.565]   | [0.005]          | [0.036]   | [0.017]                   | [0.016]  |
| Rural-urban county continuum (RUCC, 4 categories) |                  |           |                  |           |                           |          |
|   | (1)              | (2)       | (3)              | (4)       | (5)                       | (6)      |
|   | Patent intensity |           | Employment (log) |           | Labour productivity (log) |          |
| Adjacent to urban                                 | -0.368           | -1.491*** | -0.020***        | -0.473*** | 0.007                     | -0.028   |
|   | [0.616]          | [0.566]   | [0.005]          | [0.038]   | [0.018]                   | [0.018]  |
| Non-adjacent to urban                             | -0.752           | -1.839*** | -0.024***        | -0.859*** | -0.038*                   | -0.040** |
|   | [0.810]          | [0.652]   | [0.006]          | [0.040]   | [0.022]                   | [0.019]  |
| Rural   | 1.428            | -0.048    | -0.038***        | -1.378*** | -0.042                    | -0.041*  |
|   | [1.211]          | [1.021]   | [0.008]          | [0.048]   | [0.029]                   | [0.024]  |
| Observations                                      | 5 876            | 5 876     | 6 274            | 6 274     | 6 171                     | 6 171    |
| Time FE   | Yes              | Yes       | Yes              | Yes       | Yes                       | Yes      |
| Sector controls                                   | Yes              | Yes       | Yes              | Yes       | Yes                       | Yes      |
| State demean                                      | No               | Yes       | No               | Yes       | No                        | Yes      |
| Cluster   | County           | County    | County           | County    | County                    | County   |

Note: Patent intensity refers to patents per inventive occupation in thousands of workers in relevant occupations. Employment growth refers to log changes. Productivity is estimated as output (GDP) per worker. Because of confidentiality purposes, data used in this analysis is pooled across 5 years. There are three time periods in this regression, 2006-10, 2011-15 and 2016-20. All growth estimates are based on differences between each time period. All regression models are linear OLS regressions. All time-variant control variables are lagged from the previous year to reduce endogeneity. Other controls (including unreported controls) consist of year fixed effects, spending on Research and Development (log), the number of higher education and R&D institutions (log), the number of financial and bank service institutions (log) education shares, foreign born shares, migrant shares, oil county indicator, percentage of households with broadband, percentage of households with computers, average household income (logs), Gini index on household income, road length (log), density (log), share of migrants, total population, median age, work force age group shares, gender wage gap, median housing costs for owners as a percentage of income, median housing costs for renters as a percentage of income, and sector controls. Robust standard errors are in brackets. Errors are clustered on the county level. The second columns of each regression refer to regressions on variables that have been demeaned from state level averages. Statistical significance is defined as one of the following \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

Source: U.S. Census Bureau (2022<sup>[7]</sup>), *American Community Survey Data*, <https://www.census.gov/programs-surveys/acs/data.html>; BEA (2022<sup>[8]</sup>), *Regional Economic Accounts*, <https://www.bea.gov/data/economic-accounts/regional>.

### **Drivers of high-tech innovation, employment and productivity**

The following section uses data from the American Community Survey (ACS) and the Bureau of Economic Analysis on individual and firm characteristics. While household income, GDP and labour is available on a yearly basis, data from the ACS is often aggregated in 5-year intervals. For regression analysis, we use county level data for three time observations with year groupings of 2006-10, 2011-15, 2016-20. The BEA data is available on a county level on a yearly basis. We match ACS data with the BEA based on the last observable year. The panel is strongly balanced with 9 425 observations, 3 142 counties and three time observations (year groupings). The regression analysis starts with simple linear regressions, with demeaned state effects, and follows through using a decomposition model that compares outcomes for metropolitan and non-metropolitan areas, using the Oaxaca-Blinder model for estimating observable and



unobservable differences in outcomes. It creates a counterfactual exercise that helps us understand whether equal opportunity to the two types of territories (with available observables) can lead to a reduction in disparities. The model is further explained in Annex 2.D.

While we know that there is a penalty in high tech innovation, the findings are less detrimental on innovation absorption as measured by productivity for non-metropolitan regions. How can we understand what are driving these differences so that policies can better provide place-based support?<sup>31</sup>

**Table 2.3. Differences in outcomes between metro and non-metropolitan counties**

Oaxaca-Blinder Decomposition of Patent Intensity, Employment and Productivity, by Metro/Non-Metro counties

|                        | Metro     |         | Non-metro |         | Total difference |         | Explained |         | Unexplained |         |
|------------------------|-----------|---------|-----------|---------|------------------|---------|-----------|---------|-------------|---------|
| (1) Patent intensity   | 9.539***  | [0.732] | 6.860***  | [0.466] | 2.679***         | [0.630] | 0.832     | [0.741] | 1.847*      | [1.012] |
| (2) Employment (log)   | 10.641*** | [0.111] | 8.737***  | [0.092] | 1.904***         | [0.127] | 1.084***  | [0.098] | 0.820***    | [0.163] |
| (3) Productivity (log) | 11.279*** | [0.023] | 11.266*** | [0.044] | 0.012            | [0.033] | -0.028    | [0.038] | 0.041       | [0.025] |

Note: The table above is a summary table for outcomes of the Oaxaca-Blinder decomposition, focusing on the difference between two groups, metro and non-metro. Patent intensity refers to patents per inventive occupation in thousands of workers in relevant occupations. Employment growth refers to log changes. Productivity is estimated as output (GDP) per worker. Because of confidentiality purposes, data used in this analysis is pooled across five years. There are three time periods in this regression, 2006-10, 2011-15 and 2016-20. All growth estimates are based on differences between these time periods. All regression models are linear OLS regressions. All time-variant control variables are lagged from the previous year to reduce endogeneity. Other controls including those unreported consist of year fixed effects, spending on Research and Development (log), the number of higher education and R&D institutions (log), the number of financial and bank service institutions (log) education shares, foreign born shares, migrant shares, oil county indicator, percentage of households with broadband, percentage of households with computers, average household income (logs), Gini index on household income, road length (log), density (log), share of migrants, total population, median age, work force age group shares, gender wage gap, median housing costs for owners as a percentage of income, median housing costs for renters as a percentage of income, and sector controls. Robust standard errors are in brackets. Errors are clustered on the county level. Only state demeaned results are reported. Statistical significance is defined as one of the following \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Source: U.S. Census Bureau (2022<sup>[7]</sup>), *American Community Survey Data*, <https://www.census.gov/programs-surveys/acs/data.html>; BEA (2022<sup>[8]</sup>), *Regional Economic Accounts*, <https://www.bea.gov/data/economic-accounts/regional>.

There are 2.7 more patents per inventive occupation in the United States in metropolitan counties than in non-metropolitan counties and there is close to a two-fold increase in employment growth in metropolitan counties as compared to non-metropolitan counties (Table 2.3). These findings hold despite direct and interaction effects of the sectoral, educational, and socio-economic attributes of counties as described in the note of Table 2.3.<sup>32</sup> Furthermore, as discussed before in the chapter, patent intensities are highly sensitive to the inclusion of state-level effects, meaning that they may highly be contingent on state level regulation and opportunities.

Density and distance are associated with patent intensity, but results are mixed between metropolitan and non-metropolitan counties. For example, less density is associated with patent intensity in metropolitan areas but not non-metropolitan areas (Annex Table 2.E.1).<sup>33</sup> In metropolitan areas, a 10% increase in the density of your county is associated with 1.2 less patents per inventive occupation. This is not the case in non-metropolitan counties, where the relationship is not statistically significant. However, one of the strongest indicators of patent intensity in non-metropolitan regions is physical infrastructure (road length). A 10% increase in road length is associated with 4.4 fewer patents per person (with a relevant occupation) in non-metropolitan counties. The larger the size (road distance) within the county, regardless of the density of the population, the less likely they are to file a patent. In metropolitan counties, the results are not statistically significant. Lastly, a high average household income is positively associated with patent intensity. A 10% increase in average household incomes is associated with 18 more patents per person (in relevant occupations). The magnitude of this variable is large, but likely associated with the occupation of the main household earner.<sup>34</sup>

With equal socio-economic opportunities across territories, there is no statistically significant difference between productivity – our proxy for the capacity to adopt innovation – between counties (row 3 of Table 2.3). This is *the case regardless of the state counties are located in*. The fact that productivity does not follow the same territorial (geographical) trend as patent intensity is substantial. In addition, the decomposition results for patent intensity are sensitive to whether or not we are controlling for the state where counties are located. The fact that this is not the case with productivity suggests that this may be a more comparable statistic to use as a measure of innovation, both because of its statistical features that are applicable across sectors, and because it is less reliant on state-level effects.

What can we say about drivers of productivity in non-metropolitan regions? Some of the standard measures of innovation such as the number of Higher Education and Research and Development (HERD) institutions and R&D spending have no impact on productivity in non-metropolitan regions.

While an increase in the number of HERD institutions is associated with a 1.6% increase in *productivity* in metropolitan regions, it does not drive productivity in non-metropolitan regions (columns 5 and 6 of Annex Table 2.E.1). At the same time, the share of HERD institutions is positively associated with *patent intensity* in metropolitan counties, but negatively associated with patent intensity in non-metropolitan counties. On the other hand, the *share of college educated students* is associated positively with productivity in non-metropolitan counties yet negatively in metropolitan counties. While non-statistically-significant, it seems to suggest that investing in education in non-metropolitan regions is still positively associated with productivity, but not necessarily high-tech innovation (patent intensity) in non-metropolitan areas. Further research on the role of specific types of universities with stronger ties to the rural counties, such as Land Grant Colleges, finds a statistically positive association between universities and ingenuity among engineers (Maloney and Valencia Caicedo, 2022<sup>[89]</sup>). However, other studies find that land grant universities were an important determinant of local-based innovation (Lyons, Miller and Mann, 2018<sup>[90]</sup>).

Critically, the role of building human capital for innovation is important. For example, better management practices are often associated with better outcomes for firms in terms of productivity and employment (Bloom and Van Reenen, 2007<sup>[91]</sup>). Yet, rural entrepreneurs are often likely to start companies without prior training, or access to similar socio-economic resources as those in rural areas (OECD, 2022<sup>[6]</sup>). Many governments try to address this challenge through provision of entrepreneurial courses; however, sometimes programmes to encourage better entrepreneurial skills have no direct effect on innovation outcomes. How programmes for developing human capital are targeted is important, and building on the pre-existing desires and opportunities for entrepreneurs to start a new endeavour during early school years (primary school) is critical (Jardim, Bártolo and Pinho, 2021<sup>[92]</sup>), as is further discussed in Chapter 4. Such programmes when targeted to young individuals had positive impacts on entrepreneurial skills, creativity, self-confidence, power of argument, and construction of social skills in relationships and interpersonal and groups settings.

Increased spending on research and development (R&D) for innovation is associated with a 4.1% decline in jobs in the following year in metropolitan areas, but a 19.4% increase in jobs in the following year for non-metropolitan areas (Annex Table 2.E.1). This finding is similar for in non-metropolitan areas of Switzerland (OECD, 2022<sup>[3]</sup>). R&D investments outside of metropolitan areas are associated with job growth, while they are associated with job retraction in metropolitan regions. This increase in jobs however is not simultaneously associated with productivity in metropolitan regions or non-metropolitan regions.

Finally, a few characteristics that the current model considers will be further developed in the following chapters of the report. This includes access to finance (Chapter 3). In general, there is a positive association between financial institutions, employment growth and productivity in metropolitan counties, but not in non-metropolitan counties. This could imply that financial institutions alone may not be enough to increase access to finance and innovation, in particular when financial markets are not functioning effectively, and when *quick-wins* are favoured over slower innovation (James, Kotak and Tsomocos, 2022<sup>[93]</sup>).

When it comes to broadband (Chapter 4), increasing the percentage of households with access to broadband is positively associated with employment growth in metropolitan counties, but not in non-metropolitan counties. This may suggest that broadband alone, without a focus on quality or affordability may not have the same impact in non-metropolitan counties as it does in metropolitan counties.

Lastly, college-educated populations are positively associated with employment growth in metropolitan areas, but not in non-metropolitan counties. In the context of non-metropolitan counties, this may indicate a difference in the demand for different skilled workers. Anecdotal evidence suggests that rural and non-metropolitan regions may need more support for vocational training and quality education in primary and secondary schools before benefiting from highly educated workers as in metropolitan regions. The subject will be further explored in Chapter 4.

## Annex 2.A. Defining rural geographies

The definition of “rural” adopted for this report is based on the United States Department of Agriculture (USDA)’s classification that distinguishes between rural and urban counties, known as the Rural-Urban Continuum Codes (RUCC). The RUCC is built on the metropolitan and non-metropolitan dichotomy determined by the Office of Management and Budget. USDA then further refined the binary grouping to create a continuum of three metro and six non-metro sub-groups, resulting in a nine-group county classification. While the latest revision occurred in 2013, the classification originally dates back to 1975 at its first release, and is updated every 10 years after the release of the decennial census data.

For non-metropolitan regions, proximity and connectiveness to an urban region is an important predictor of growth (OECD, 2016<sup>[94]</sup>). Because of the importance of connectedness between places for innovation, the analysis in the chapter takes the approach of grouping non-metropolitan counties by adjacency. Taking the functional area approach may encourage networking and linkages across territories. Furthermore, this could have an implication on the scale of interventions (see Chapter 3) and whether territories have access to additional federal resources (CORI, 2022<sup>[95]</sup>).

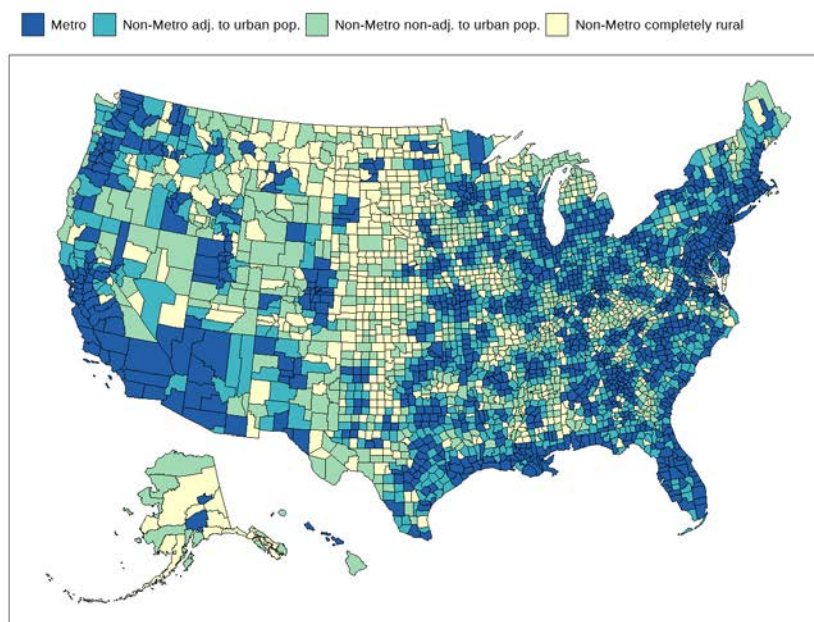
Therefore, the nine original RUCC groupings have been reduced to four: metropolitan counties (MR), non-metropolitan regions adjacent to metropolitan counties (AU), non-metropolitan counties *not* adjacent to metropolitan counties (NAU), and remote non-metropolitan counties (rural).

To explain, this includes namely two combinations based on adjacency of different types of non-metro, non-rural counties. First, it includes the combination of non-metro counties with an urban population of 20 000 or more, that are adjacent to a metro area (RUCC 4), with non-metro counties with an urban population of 2 500 to 19 999, adjacent to a metro area (RUCC 6) to create a simplified category of non-metropolitan adjacent to urban areas (Non-metro AU). Secondly, it includes the combination of non-metro counties with urban population of 20 000 or more, not adjacent to a metro area (RUCC 5), with non-metro counties urban population of 2 500 to 19 999, not adjacent to a metro area (RUCC 7). Finally, it includes the combination of both rural categories that have less than 2 500 urban populations.

As such, the reduced classification, focusing on proximity as a unifying factor, has the goal of shifting emphasis from the size of non-metropolitan regions to their relationship to urban centres. Additionally, it has the advantage of minimising category change due to population movement across the 2010 decade where analysis of this chapter is based. The reclassification is illustrated in Annex Table 2.A.1. This is most notable for non-metropolitan regions, which are interconnected with and shaped by their urban neighbours, while remaining distinct entities in terms of their economic functions, settlement patterns and ways of life. By contrast, in remote rural places there are fewer direct connections with cities so local residents and firms must rely almost exclusively on local providers of goods and services. The reduced classification attempts to capture and account for these dynamics.

## Annex Figure 2.A.1. US counties by simplified USDA Rural-Urban Continuum Classification

County-level classification



Source: Based on USDA (2013<sup>[5]</sup>), *Rural-Urban Continuum Codes*, <https://www.ers.usda.gov/data-products/rural-urban-continuum-codes>.

### Annex Table 2.A.1. Simplified classification of 2013 RUCC by adjacency status

| 2013 RUCC code | 2013 RUCC description  | OECD simplification                        | OECD simplification, in-text short hand |
|----------------|--|--|---|
| 1              | Counties in metro areas of 1 million population or more                            | Metro                                      | Metro                                   |
| 2              | Counties in metro areas of 250 000 to 1 million population                         |  |   |
| 3              | Counties in metro areas of fewer than 250 000 population                           |  |   |
| 4              | Urban population of 20 000 or more, adjacent to a metro area                       | Non-Metro adjacent to urban population     | Non-metro AU                            |
| 6              | Urban population of 2 500 to 19 999, adjacent to a metro area                      | Non-Metro not adjacent to urban population | Non-metro NAU                           |
| 5              | Urban population of 20 000 or more, not adjacent to a metro area                   |  |   |
| 7              | Urban population of 2 500 to 19 999, not adjacent to a metro area                  |  |   |
| 8              | Completely rural or less than 2 500 urban population, adjacent to a metro area     | Non-metro completely rural                 | Rural                                   |
| 9              | Completely rural or less than 2 500 urban population, not adjacent to a metro area |  |   |

Source: Based on USDA (2013<sup>[5]</sup>), *Rural-Urban Continuum Codes*, <https://www.ers.usda.gov/data-products/rural-urban-continuum-codes>.

## Annex Box 2.A.1. Description of OECD classifications for places and US sectors

### OECD classification of rural regions: Defining rural using physical and driving distances within administrative boundaries

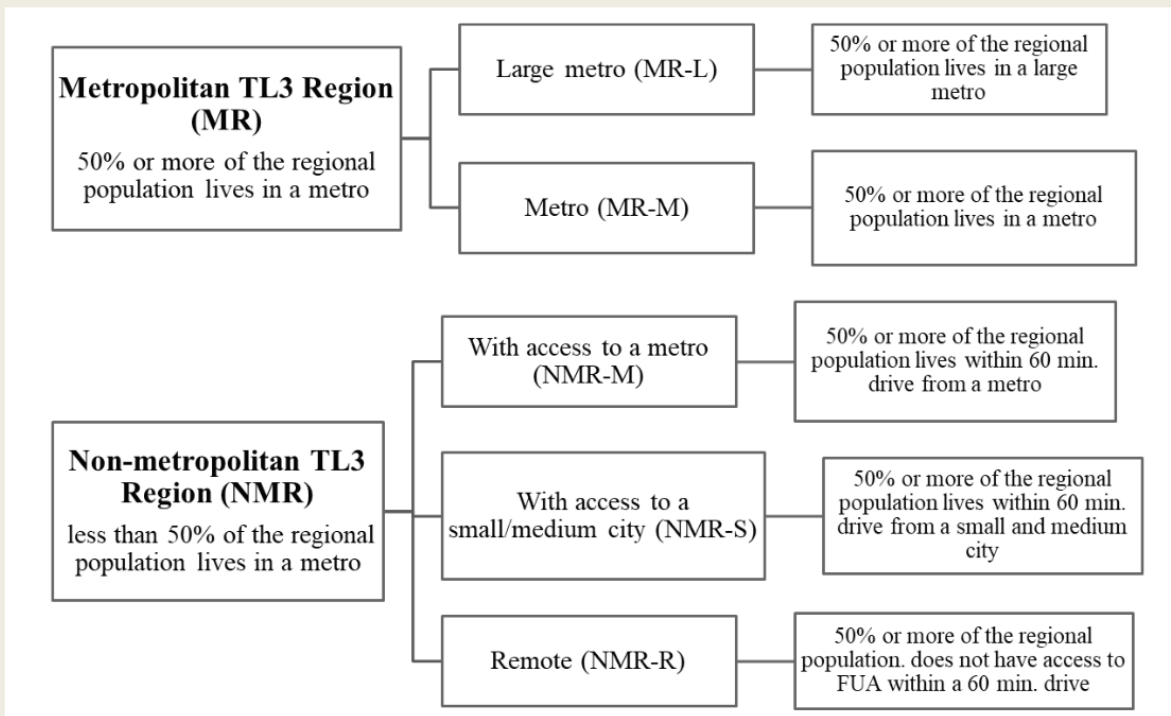
The most recent definitions of rural regions have benefited from a reflection on the combination of physical (“first-nature”) and human (“second-nature”) geographies. Rural regions are defined by economic remoteness, with three distinct features related to the physical distance to major markets, economic connectedness, and sector specialisation. Considering these features, rural regions are physically distant to major markets, with specialisation in niche markets and those linked with natural resources such as agriculture and tourism. The degree of economic connectedness with surrounding areas may vary by relative density, infrastructure availability and complementarities between and within rural regions.

In consultation with OECD national governments, the OECD harmonised a set of guidelines for classifying geographical characteristics across countries that avoid the traditional, and sometimes harmful, rural-urban dichotomy. This unified definition of “rural” provides the basis for analysis across countries within rural economies (OECD, 2020<sup>[96]</sup>). The OECD classified large and small regions within each country, and drew on characteristics of functional urban area within small regions in each country. Each country’s large region, referred to as Territorial Level 2 (TL2), and small region Territorial Level 3 (TL3) are based on administrative zones. In the United States, the Territorial Level 2 (TL2) refers to the 51 states and the District of Columbia, while TL3 refers to 179 economic areas new classification based on functional urban areas (FUA) incorporates density and the driving estimations for the time it takes to access dense metropolitan areas for each TL3 region. To the furthest extent possible, non-metropolitan regions are defined as one of three types of small administrative regions (TL 3) with less than 50% of the regional population living in metropolitan areas.

Non-metropolitan regions are defined as having less than 50% of the population living in a functional urban area with a population larger than 250K. The 3 types of non-metropolitan county include:

- **Non-metropolitan regions with access to a metropolitan region:** These regions have 50% or more of the regional population that lives within a 60-minute drive of a metropolitan area. This is similar in part to towns and suburbs surrounding the distant periphery of major metropolitan centres. An example of such regions includes Tyrolean Oberland in Austria (AT334), Montmagny in Quebec, Canada (CA2418), Jura in France (FRC22), or Nagasaki in Japan (JPJ42). The challenges of such regions often are tied to economies of metropolitan areas, while focusing on industries such as tourism, without some of the infrastructure barriers of less densely populated areas.
- **Non-metropolitan regions with access to small- or medium-sized cities:** These regions are regions with 50% or more of the regional population living within a 60-minute drive from a small- or medium-sized city. Examples of these types of regions include the administrative district of Neufchâteau in Belgium (BE344), San Antonio in Chile (CL056), South Bohemia in the Czech Republic (CZ031), East Lancashire in the United Kingdom (UKD46) or Springfield in Illinois, the United States (US158). These regions have a strong manufacturing base and linkages to neighbouring economies.
- **Non-metropolitan remote regions:** These regions have 50% or more of the regional population without access to a functional urban area within a 60-minute drive. Examples of these types of regions include Capital Region, New South Wales in Australia (AU101), La Côte-de-Gaspé, Quebec in Canada (CA2403), Orkney Islands, Scotland in the United Kingdom (UKM65), and Anchorage, Arkansas in the United States (US008). The schematic breakdown is available in the figure below.

Annex Figure 2.A.2. OECD typology for access to cities



Note: Large metro: functional urban area with a population larger than 1.5 million; Metro: functional urban area with population larger than 250 000; small or medium city: functional urban areas with population smaller or equal to 250 000.

Source: OECD (2020<sup>[96]</sup>), *Rural Well-being: Geography of Opportunities*, <https://doi.org/10.1787/d25cef80-en>; Fadic, M. et al. (2019<sup>[9]</sup>), "Classifying small (TL3) regions based on metropolitan population, low density and remoteness", <https://doi.org/10.1787/b902cc00-en>.

### Sector classifications

The industrial sector classification used in this report follows the one provided by the government agencies where the data originate, which is mainly the North American Industry Classification System. These industrial groupings are used in the American Community Survey from the U.S. Census Bureau and is the basis for sectoral analysis of this chapter. Abbreviations may be used for brevity.

### Extraction dependent counties

Due to supra-national oil and gas price fluctuations and the volatility of output based on global trends rather than firm production processes, the inclusion of oil and gas industries in analysis on drivers of innovation and productivity can be misleading. Because of the outlier effects exerted by counties with a high share of employment in oil and gas extraction, when necessary, such counties are excluded from analysis in this chapter. The list of such counties is obtained from the U.S. Bureau of Labor Statistics (2021<sup>[16]</sup>) based on employment concentration of the oil and gas sector in June 2014. Where of interest, results including these counties are reported separately, or controlled for using a binary indicator.

**Annex Table 2.A.2. Sector classifications**

| NAICS 2017 classification | Industrial sector   | Abbreviation used in the chapter    |
|---------------------------|---|-------------------------------------|
| 11, 21                    | Agriculture, forestry, fishing and hunting, and mining                                    | Agriculture                         |
| 71, 72                    | Arts, entertainment, and recreation, and accommodation and food services                  | Recreation                          |
| 23                        | Construction  | Construction                        |
| 61, 62                    | Educational services, and health care and social assistance                               | Education and social services       |
| 52, 53                    | Finance and insurance, and real estate and rental and leasing                             | Finance, insurance, and real estate |
| 51                        | Information   | Information                         |
| 31-33                     | Manufacturing   | Manufacturing                       |
| 81                        | Other services, except public administration  | Other services (non-public)         |
| 54, 55, 56                | Professional, scientific, and management, and administrative and waste management service | Professional services               |
| 44, 45                    | Retail trade  | Retail trade                        |
| 48, 49, 22                | Transportation and warehousing, and utilities   | Transportation and utilities        |
| 42                        | Wholesale trade   | Wholesale trade                     |

Source: US Census Bureau (n.d.<sup>[97]</sup>), *North American Industry Classification System – NAICS*, <https://www.census.gov/naics/?58967?yearbck=2017>.



## Annex 2.B. Rural proofing innovation

The way we understand and define innovation matters (OECD, 2022<sup>[6]</sup>). The OECD has fostered, since the 1990s, a common approach to measure and report statistics on innovations. This approach is contained in the Oslo Manual, a document produced by the OECD Working Party of National Experts on Science and Technology Indicators (NESTI) that has been adopted by over 80 countries. According to the 4<sup>th</sup> revision of the Oslo Manual, innovation can be defined as “a new or improved product or process (or combination thereof) that differs significantly from the unit’s previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process)” (OECD/Eurostat, 2018<sup>[35]</sup>). The distinction between innovation as an outcome (an innovation) and the activities by which innovations come about (innovation activities) is an important one.

Other major additions to the previous versions include measuring innovation not only from businesses but also other organisations and individuals; updates to improve harmonisation between core definitions and taxation; better accounting of globalisation, digitalisation, and trends in investment in intangible assets; guidance on measuring internal and external factors influencing business innovation; prioritisation of the measurements of government policies on innovation; expansion of methodological guidelines; guidance on the use of innovation data and a new glossary.

Furthermore, the recent revision of the manual now includes definitions specifically for the business sector that target product and process innovations, including management practices, that had not been introduced to the market previously or brought to use by the firm, as well as innovation related activities that include developmental, financial and commercial activities intending to result in an innovation.

The literature on measures of innovation has been largely focused on patent production. This more conventional metric is often better suited for product innovations in large firms that specialise in the manufacturing- or R&D-intensive sectors and depend on heavier capital and resource expenditures. However, a larger share of firms in rural regions are often small, and dedicated to the service or natural resource sectors (Freshwater et al., 2019<sup>[40]</sup>), where innovation is incremental or is characterised by a strong use of social and human capital (Shearmur, Carrincazeaux and Doloreux, 2016<sup>[98]</sup>). Indeed, Mann and Loveridge (2020<sup>[99]</sup>) report that patent applications may be a less useful proxy for innovation by rural firms than for urban firms. Annex 2.C gives an overview of this discussion.

## Annex 2.C. Patentable occupations

The proposal on adjusting innovation indicators for the occupational structure or rural economies comes from discussions within the OECD Expert Advisory Committee for Rural Innovation. During the sessions, several rural academics identified structural problems associated with how innovation is measured in rural areas, and why the bias associated may not be geographically homogenous. To address this, work by Dotzel (2017<sub>[100]</sub>) and Wojan (2021<sub>[101]</sub>) proposes an occupation-driven approach for analysing regional invention. The authors argue that patenting rates should be computed on the subset of workers that might plausibly contribute to patenting. To do this, the authors regress the aggregate number of patents produced in commuting zone during the period 2000-05 on the share of the workforce employed in a selection of detailed census occupations. The authors' commuting zone-level regression includes controls on the patent stock, human capital share (working age population with a bachelor's degree or higher), population density, a natural amenity score, and the wage-rental ratio. They apply the analysis on a core set of occupations (from the U.S. Department of Labor's Employment and Training Administration's O\*NET's database) defined by the National Science Foundation's classification of science, engineering and technical (SET) occupations, along with an iterative random selection of other occupations that may have a strong association with patenting. Ten thousand regressions are estimated with 19 non-SET occupations randomly included in each estimation. The inventive subset inclusion criteria for the non-SET occupations are those occupations associated with coefficients that are positive and significant in at least 75% of their regressions in the metro or non-metro analysis. Of the 300 non-SET occupations included in the analysis, 11 are identified as inventive, that is, consistently associated with positive, significant coefficients.

Annex Table 2.C.1 below provides a list of occupations with a relatively high probability to patent. Furthermore, Annex Figure 2.C.1 and Annex Table 2.C.1 demonstrate the distribution of these occupations as a share of total employed population (patent intensity) across the United States. Adjusting for these shares reduce disparities in patenting intensities between territories.

### Annex Table 2.C.1. Inventive occupations

Occupations with a high (>75%) probability to patent

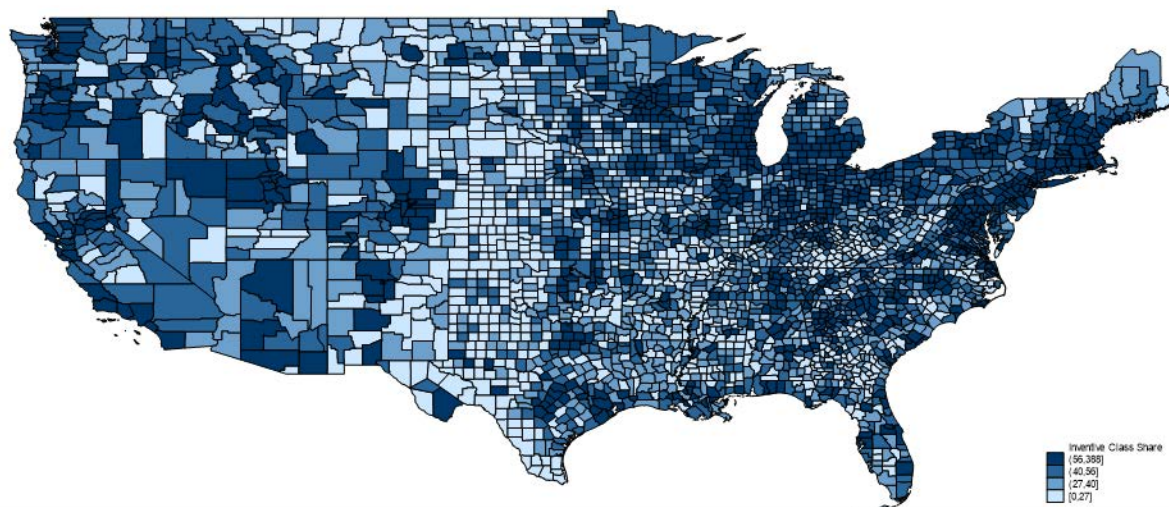
| Census Code(s)   | Occupation  |
|------------------|---|
| 100-176, 190-196 | Science, engineering, and technical (SET) occupations     |
| 005              | Marketing and sales managers                              |
| 030              | Engineering managers                                      |
| 181              | Market and survey researchers                             |
| 263              | Designers   |
| 284              | Technical writers   |
| 772              | Electrical, electronics, and electromechanical assemblers |
| 790              | Computer control programmers and operators                |
| 803              | Machinists  |
| 806              | Model makers and patternmakers, metal and plastic         |
| 813              | Tool and die makers                                       |
| 884              | Semiconductor processors                                  |

Note: Occupations associated with coefficients that are positive and significant in at least 75% of their regressions in the metro or non-metro analysis are characterised as inventive.

Source: Dotzel, K. (2017<sub>[100]</sub>), "Three essays on human capital and innovation in the United States", <http://orcid.org/0000-0002-3363-8751>; Wojan, T. (2021<sub>[101]</sub>), *An Occupational Approach for Analyzing Regional Invention*, <https://nces.nsf.gov/pubs/nces22202>.

## Annex Figure 2.C.1. Inventive occupations in the United States

Shares of inventive occupations on the county level, 2015



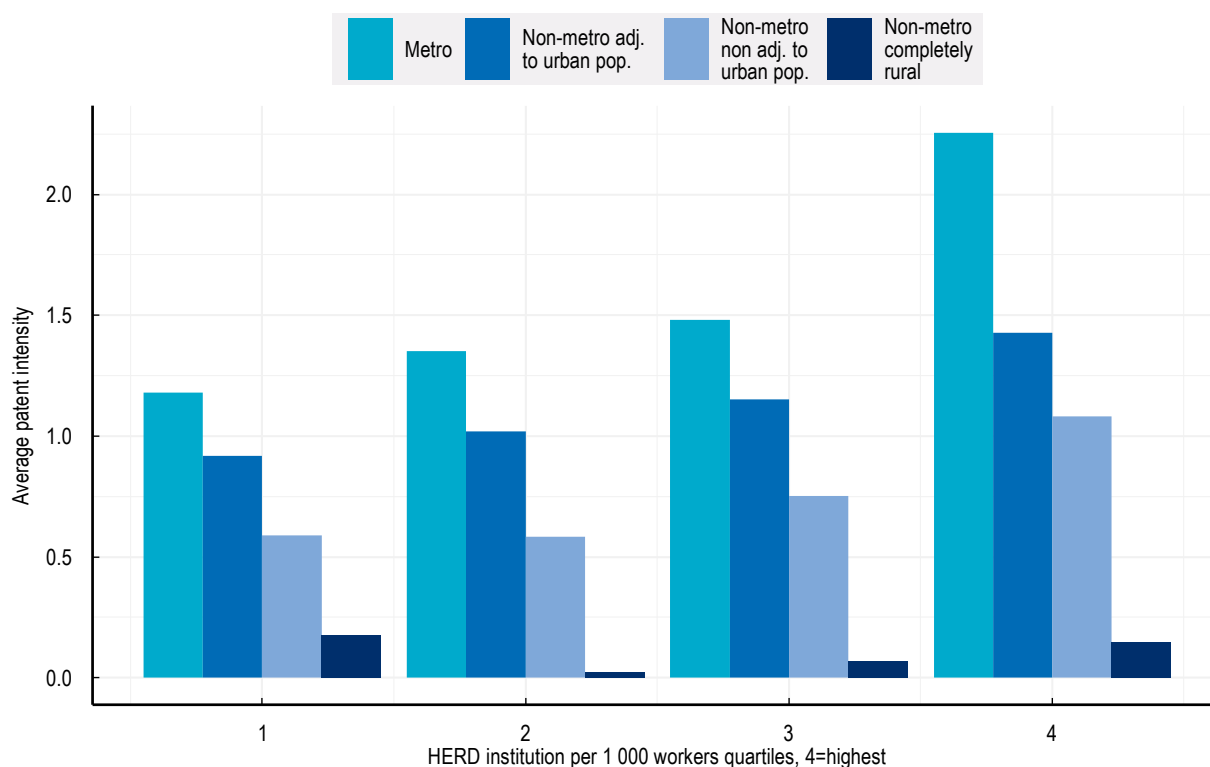
Note: Shares represent the shares of occupations likely to patent as a part of all employed labour defined in Wojan (2021<sup>[101]</sup>).  
Source: US Census Bureau.

## Annex 2.D. Education and patent intensity

While higher education and research and development (HERD) institutions are often associated with high levels of innovation, there seems to be a non-linear correlation with patent intensity across territories. HERD is positively associated with patent intensities in metropolitan regions, but this not as clear in rural counties where the counties with the lowest shares of HERD institutions have the highest average patent intensity (Annex Figure 2.D.1). It suggests that innovation may occur differently in rural counties, and that patent intensity may be tied to other characteristics.

### Annex Figure 2.D.1. HERD and patent intensity

Geographical quartiles on HERD intensity on average patent intensity



Note: Counties have been ranked by their position and the distribution of HERD institutions per 1000 workers across the United States. The bars indicate the average patent intensity by county class within their respective quartile.

Source: U.S. Census Bureau (2022<sup>[7]</sup>), *American Community Survey Data*, <https://www.census.gov/programs-surveys/acs/data.html>; *County Business Patterns Data*, <https://www.census.gov/programs-surveys/cbp/data.html>; United States Patent and Trademark Office; National Science Foundation; Dotzel, K. and T. Wojan (2022<sup>[26]</sup>), "An occupational approach to analyzing regional invention", <https://nces.nsf.gov/pubs/ncses22202> (accessed on 15 July 2022).

## Annex 2.E. Understanding explained and unexplained differences between two groups through a counter-factual exercise: The Oaxaca-Blinder Decomposition

In the early 1970s, Roland Oaxaca and Blinder popularised a framework for decomposing differences between two groups attributed to observables and non-observables. A typical application of the model is the creation of a counter-factual that divides any observed gap between two exclusive sub-groups into components that are observed as characteristics of individuals, and a component that contributes to a difference in the structure of outcome variables (Fortin, Lemieux and Firpo, 2011<sub>[102]</sub>). Since then, the Oaxaca-Blinder decomposition has been one of the most widely used models for understanding what may be attributed to observable and non-observable characteristics between two groups. A simplified version of their model decomposes intergroup differences in two parts. The decomposition aims to understand what part of the differences in the mean outcomes of each group:  $R = E(Y_a) - E(Y_b)$  where Y is expected outcome variables for group A and B.

We can apply a linear estimation form and model assumptions to the differences between both groups and generate the following for our reference groups A and B:

$$R = \bar{Y}_a - \bar{Y}_b = (\bar{X}_A - \bar{X}_B)' \hat{\beta}_B + \bar{X}'_B (\hat{\beta}_A - \hat{\beta}_B) + (\bar{X}_A - \bar{X}_B)' (\hat{\beta}_A - \hat{\beta}_B)$$

which gives us three components. The first component is the difference between observable predictors (“endowments”). The second part is the difference between coefficients (“coefficients effect”). The last component is the interaction effect, which is the difference simultaneously attributed between the two groups. The coefficients effect is the outcome that measures the expected change in group B’s mean outcome if group B had group A’s coefficients. If we applied this to male-female wage gaps, the coefficient effect would measure the mean outcome of women, if women had the same attributes as men. The second and third part of the decomposition are often referred to as the unexplained differences between groups. Most applications of this method have been used to look at differences in gender wage gap, but has also been used for differences between ethnic, union membership and immigrant status in the labour economics literature. It has also been extended to analysis in gaps in test scores, schools and countries. The decomposition has some similar attributes to the programme evaluation literature, as it generates counter-factual interpretation through the assignment of a “treatment” as the unobservable component of the decomposition, but falls short of fully understanding the mechanisms under which discrimination, or unobserved differences, occur (Fortin, Lemieux and Firpo, 2011<sub>[102]</sub>; Jann, 2008<sub>[103]</sub>; Oaxaca, 1973<sub>[104]</sub>).

The results of the exercise applied to metro and non-metro areas are included in the text of this chapter, and the extended results are provided in Annex Table 2.E.1 below.

### Annex Table 2.E.1. Oaxaca-Blinder Decompositions by Classification of counties

County-level linear regressions (2006-10, 2011-15, 2016-20)

|   | (1)              | (2)       | (3)              | (4)       | (5)                | (6)       |
|---|------------------|-----------|------------------|-----------|--------------------|-----------|
|   | Patent intensity |           | Employment (log) |           | Productivity (log) |           |
|   | Metro            | Non-metro | Metro            | Non-metro | Metro              | Non-metro |
| R&D Spending                            | -0.232           | 0.401     | -0.042***        | 0.200***  | -0.003             | 0.009     |
|   | [0.400]          | [0.383]   | [0.013]          | [0.070]   | [0.008]            | [0.013]   |
| Higher Education R&D institutions (log) | 0.171            | -0.714    | 0.005            | -0.236*** | 0.016***           | -0.023    |
|   | [0.401]          | [0.484]   | [0.007]          | [0.088]   | [0.004]            | [0.015]   |
| Secondary Education (share)             | 0.064            | 0.051     | 0.008            | 0.004     | 0.006              | -0.003    |
|   | [0.193]          | [0.140]   | [0.007]          | [0.011]   | [0.006]            | [0.004]   |
| College Education (share)               | 0.297            | -0.403    | 0.098***         | -0.013    | -0.076             | 0.026     |
|   | [0.730]          | [0.552]   | [0.023]          | [0.044]   | [0.049]            | [0.024]   |
| Doctoral Education (share)              | 0.290            | 0.015     | -0.003           | -0.001    | -0.001             | 0.001     |
|   | [0.326]          | [0.211]   | [0.007]          | [0.009]   | [0.003]            | [0.003]   |
| Households with Broadband (%)           | 0.460            | 0.478     | 0.033**          | 0.040     | -0.001             | 0.010     |
|   | [0.714]          | [0.471]   | [0.017]          | [0.029]   | [0.013]            | [0.013]   |
| Financial Inst (log)                    | 0.174            | -0.324    | 0.026*           | -0.064*   | -0.013             | -0.016    |
|   | [0.480]          | [0.377]   | [0.014]          | [0.035]   | [0.014]            | [0.013]   |
| Road Length (log)                       | 0.890            | -0.175    | 0.102**          | 0.074     | 0.107**            | 0.006     |
|   | [1.411]          | [1.162]   | [0.044]          | [0.046]   | [0.049]            | [0.024]   |
| Density, sqm (log)                      | 0.279            | -0.441**  | 0.033***         | -0.026    | 0.039              | -0.025**  |
|   | [0.287]          | [0.223]   | [0.012]          | [0.018]   | [0.025]            | [0.010]   |
| Migrants (%)                            | -0.126**         | -0.048    | 0.004**          | -0.091*** | 0.002              | -0.003    |
|   | [0.061]          | [0.186]   | [0.002]          | [0.034]   | [0.002]            | [0.004]   |
| Household average income (log)          | 0.016            | -0.008    | -0.001           | 0.001     | -0.001             | 0.001     |
|   | [0.015]          | [0.010]   | [0.001]          | [0.001]   | [0.001]            | [0.001]   |
| Gini Indicator                          | -0.154           | 0.024     | -0.014***        | 0.012***  | 0.008              | -0.003*   |
|   | [0.182]          | [0.078]   | [0.005]          | [0.004]   | [0.005]            | [0.002]   |
| Population (log)                        | 0.130            | 0.006     | 0.000            | -0.001    | 0.001              | -0.001    |
|   | [0.098]          | [0.027]   | [0.001]          | [0.002]   | [0.001]            | [0.001]   |
| Young Workforce (16-24, %)              | 1.814***         | 0.296     | -0.158***        | 0.036     | 0.179**            | -0.007    |
|   | [0.666]          | [0.271]   | [0.046]          | [0.026]   | [0.070]            | [0.018]   |
| Prime age Workforce (25-54, %)          | -0.285*          | 0.058     | 0.002            | 0.004*    | -0.004*            | 0.003**   |
|   | [0.154]          | [0.046]   | [0.003]          | [0.002]   | [0.002]            | [0.001]   |
| Median housing costs (own, % inc)       | -3.303           | 0.933     | 1.012***         | -0.008    | -0.248*            | 0.040     |
|   | [2.238]          | [1.623]   | [0.110]          | [0.078]   | [0.149]            | [0.056]   |

|                                    | (1)              | (2)       | (3)              | (4)       | (5)                | (6)       |
|------------------------------------|------------------|-----------|------------------|-----------|--------------------|-----------|
|                                    | Patent intensity |           | Employment (log) |           | Productivity (log) |           |
|                                    | Metro            | Non-metro | Metro            | Non-metro | Metro              | Non-metro |
| Median housing costs (rent, % inc) | -0.906           | -0.458    | 0.014            | -0.031    | 0.060              | -0.019    |
|                                    | [0.710]          | [0.292]   | [0.021]          | [0.024]   | [0.037]            | [0.014]   |
| Observations                       | 2 938            | 2 938     | 3 138            | 3 138     | 3 087              | 3 087     |

Note: The table above is a summary table for outcomes of the Oaxaca-Blinder decomposition, focusing on the difference between two groups, metro and non-metro. Patent intensity refers to patents per inventive occupation in thousands of workers in relevant occupations. Employment growth refers to log changes. Productivity is estimated as output (GDP) per worker. Because of confidentiality purposes, data used in this analysis is pooled across five years. There are three time periods in this regression, 2006-10, 2011-15 and 2016-20. All growth estimates are based on differences between these time periods. All regression models are linear OLS regressions. All time-variant control variables are lagged from the previous year to reduce endogeneity. Other controls (including those that are unreported) consist of year fixed effects, spending on Research and Development (log), the number of higher education and R&D institutions (log), the number of financial and bank service institutions (log) education shares, foreign born shares, migrant shares, oil county indicator, percentage of households with broadband, percentage of households with computers, average household income (logs), Gini index on household income, road length (log), density (log), share of migrants, total population, median age, work force age group shares, gender wage gap, median housing costs for owners as a percentage of income, median housing costs for renters as a percentage of income, and sector controls. Robust standard errors are in brackets. Errors are clustered on the county level. Only state demeaned results are reported. Statistical significance is defined as one of the following \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

Source: U.S. Census Bureau (2022<sup>[7]</sup>), *American Community Survey Data*, <https://www.census.gov/programs-surveys/acs/data.html>; BEA (2022<sup>[8]</sup>), *Regional Economic Accounts*, <https://www.bea.gov/data/economic-accounts/regional>.

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## Notes

<sup>1</sup> See Annex 2.A for further description on comparative regional classifications of metropolitan and non-metropolitan regions (including rural remote regions). See Table 2.1 and Annex 2.A for further description of classifications of counties based on the United States Department for Agriculture’s (USDA) Rural-Urban Continuum Classification.

<sup>2</sup> The definition adopted for “persistently poor” counties is defined by congress and used by departments such as the US Department of Commerce. According to a Congressional requirement, a county (or a county-level equivalent) is experiencing Persistent Poverty if their most recent poverty rate estimate, within the margin of error, equates to 20 percent, while also evidencing poverty rates of at least 20 percent in the 1990 and 2000 decennial censuses (i.e., 20 percent or greater poverty over the last 30 years) (Consolidated Appropriations Act, 2021, P.L. 116-260 (Dec. 27, 2020), Explanatory Statement of the House Committee on Appropriations, 116 Cong. Rec. H7879, 2020, <https://www.congress.gov/116/plaws/publ260/PLAW-116publ260.pdf>)).

<sup>3</sup> In this chapter of the report, the analysis will be based on county level analysis aggregated into categories of counties as identified in Annex Table 2.A.1. The use of the term “areas” is interchangeable with the classification based on counties. When used, the term “region” refers to larger level administrative groups of counties, that are primarily rural or urban.

<sup>4</sup> For Switzerland, the report by Fadic et al. (2019<sup>[9]</sup>) identified Switzerland as one of the countries with a very high level of non-metropolitan population, with 50% of the population living in non-metropolitan areas. However, this is due to the compatibility of territorial (geographical) definitions across countries.

<sup>5</sup> This evidence points to higher relative productivity, assuming that one unit of labour produces one unit of output.

<sup>6</sup> Counties with substantial employment in oil and gas extraction are excluded from all analysis in this chapter, unless stated otherwise. For more information, see the end of Annex Table 2.A.2.

<sup>7</sup> Figure 2.2 (left-hand side) shows this spatial ordering in log levels.

<sup>8</sup> These figures are in 2012 constant USD.

<sup>9</sup> While oil-dependent counties were excluded in this analysis, lower oil prices in 2016 disrupted investments in the sector and would have further contributed to GDP volatility. The shock of this event continued to propagate into 2019 and disproportionately affected non-metro and rural areas, highlighting their exposure to international conditions and precarity to boom-and-bust cycles linked to commodities.

<sup>10</sup> At the time of writing, spatially granular data for 2021 is not yet available. As such, this analysis refrains from extensive commentary on the geographical impact of COVID-19.

<sup>11</sup> This ranking is stable even with extraction-dependent counties accounted for.

<sup>12</sup> When decomposing (breaking down) productivity growth over 10 years between metropolitan and non-metropolitan groupings, metropolitan counties were accountable for 50% of increases in total aggregate productivity because of more efficient use of resources, and a 1% gain due to reallocation of resources within metropolitan counties. On the other hand, non-metropolitan counties saw a greater increase in efficient use of resources at 61%, but a more substantial loss due to reallocation of resources, amounting to a 12% loss.

<sup>13</sup> Decomposing (breaking down) productivity growth over five years between metropolitan and non-metropolitan counties demonstrates that more efficient use of resources in metropolitan counties accounted for 55% of the increase in productivity, but only 28% in non-metropolitan counties. Reallocation of resources accounted for 8% of productivity growth in metropolitan counties, and 9% of productivity growth in non-metropolitan counties.

<sup>14</sup> Figures on patent application and approval include those of domestic and foreign origin. 53% of approved patents were of foreign origin in 2020 (USPTO, 2022<sub>[25]</sub>).

<sup>15</sup> Patents remain a popular indicator of innovation, even if patent thickets in high-tech sectors are increasingly being considered anti-competitive and innovation reducing (Hall, von Graevenitz and Helmers, 2020<sub>[48]</sub>)

<sup>16</sup> This is following the Dotzel and Wojan (2022<sub>[26]</sub>) method and adjusted by the number of inventive occupations.

<sup>17</sup> However, there is a relatively large number of counties that do not produce patents or only have extremely low numbers of patents. In total, 21% of all counties produced only 1-2 patents in 2015 and 37% counties produced none at all. In particular, 49% and 32.5% of the counties with zero patents are rural and metropolitan respectively.

<sup>18</sup> To some extent, this may be further accentuated by local labour multiplier effects that do not necessarily reflect more productivity (Moretti, 2010<sub>[18]</sub>).

<sup>19</sup> This result stresses the point that innovation and growth are less strongly correlated across territories as theories of endogenous growth or Schumpeterian growth models would predict. However, one should note that this section only uses cross-sectional data and does not take the dynamic between patents intensity and productivity into account (Sweet and Eterovic, 2019<sub>[32]</sub>; Blind, Ramel and Rochell, 2022<sub>[33]</sub>).

<sup>20</sup> Results based on linear regression of education shares on patent intensity, including controls, are described further in the last section of this chapter.



<sup>21</sup> This is the case when ranking all US counties by the number of firms into quartiles.

<sup>22</sup> Including a full array of controls demonstrates that R&D spending is negatively associated with patent intensity in metropolitan counties, but positively associated in non-metro counties. Results, however, are not significant when controlling for other sector-related and socio-economic factors. On the other hand, the correlation between R&D spending and employment growth (a proxy for desirable outcomes of innovation) is similar, with a negative relation between R&D and employment growth in metropolitan counties, and a positive correlation in non-metropolitan counties between R&D spending and employment. This result is statistically significant, and similar to trends in other country studies (OECD, 2022<sup>[3]</sup>).

<sup>23</sup> For example, as explored in Chapters 3 and 4 of this report, Pine Bluff, Arkansas, is a minority-majority community with different diversity challenges than those of non-minority-majority areas. It would benefit from targeted support for equitable access to government support and market opportunities.

<sup>24</sup> These include Czechia, Germany, Denmark, Estonia, Hungary, Ireland, Israel, Iceland, Japan, Republic of Korea, Lithuania, Latvia, Norway, New Zealand, Sweden, Slovenia, Slovakia, and United Kingdom.

<sup>25</sup> The names of the categories are adjusted to help readability between the RUCC and the OECD's rural classification systems. Counties are aggregated into small regions which consist of 179 economic areas (TL3) of the US and classified into the OECD's typology (Fadic et al., 2019<sup>[9]</sup>).

<sup>26</sup> The Gini coefficient measures the extent to which the distribution of income among individuals or households within an economy deviates from a perfectly equal distribution. In this context, we use instead the average household income of US counties as the base unit of analysis. A Gini value of zero represents perfect equality in the group and a Gini value of 1, represents perfect inequality. For more information, see <https://stats.oecd.org/glossary/detail.asp?ID=4842>.

<sup>27</sup> It might also suggest the spatial dimension of the polarisation of occupations as discussed in Goos, Manning and Salmons (2014<sup>[78]</sup>), however, further research is needed to validate this observation.

<sup>28</sup> The estimates in this report were obtained from the Current Population Survey (CPS), a national monthly sample survey of approximately 60 000 eligible households that provides a wide range of information on the labour force, employment, and unemployment. The survey is conducted for the U.S. Bureau of Labor Statistics (BLS) by the U.S. Census Bureau, using a scientifically selected national sample with coverage in all 50 states and the District of Columbia.

<sup>29</sup> This is the difference between median earnings of men and women relative to the median earnings of men, for full-time earners, in percentages.

<sup>30</sup> Please refer to the description in Annex Table 2.E.1.

<sup>31</sup> Following Oaxaca (1973<sup>[104]</sup>) and Fortin, et al. (2011<sup>[102]</sup>), we can create a counter-factual exercise that breaks down the aggregate differences between the two types of counties and compare results. Following this method, we built a counter-factual model that, in addition to direct effects of county location, also accounts for interaction effects of simultaneously being in a location and having its attributes. This exercise lets us understand a.) whether differences between metropolitan and non-metropolitan areas can indeed be accounted for by the characteristics we have been able to observe; b.) if the difference in outcomes is driven by these characteristics; and c.) the relative strength of the observable differences between the two. It enables us to understand what we can do to reduce the differences between the two groups. For further

information on the procedure, a description of the Oaxaca-Blinder Decomposition is provided in Annex 2.D on page 56.

<sup>32</sup> Yet, according to the model, there is still quite a bit of unexplained factors impacting outcomes.

<sup>33</sup> According to the meta-analysis by Ahlfeldt and Pietrostefani (2017<sub>[105]</sub>), the correlation between patents and density should be positive. This is the case when observations do not include education shares and are not lagged and state demeaned. Once all three of these concerns are accounted for, density is negatively associated with patents (logs). The case is the same for patent intensity that we use in this paper.

<sup>34</sup> While the total differences between metropolitan and non-metropolitan counties are significant, the unexplained part is still significantly different from 0 in both cases. Except for distance, density and housing measures, the model itself does not capture patenting intensity well. The weakness of the observable characteristics seems to suggest that despite observable geographical and socio-economic characteristics that we cannot identify clearly the drivers of patent intensity or high-tech innovation. While employment growth is somewhat better explained, both outcomes depend on other factors. Nevertheless, productivity as a measure of innovation absorption is better captured by this model. We can therefore make a few more observations.

# **3**

## **Policies and programmes for innovation in rural areas in the United States**

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This chapter aims to shed light on the main policies and programmes targeted specifically for rural innovation. It discusses the scope of the definition of innovation, the main federal institutions in charge of policies and financial initiatives to support entrepreneurs. The chapter uses analysis gathered from desk research, and case study visits to Gallup, New Mexico, Pine Bluff, Arkansas, and Columbiana, Ohio.

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## Key messages

- **To be effective, rural innovation policy must consist of more than providing direct supports to firms or access to capital. A broader rural innovation policy is needed** that encompasses an understanding of innovation systems, territorial linkages and the environment that makes a place attractive to invest and live in. *Product* and *process* innovation must be considered, along with connections to broader rural economic development actions. Innovation in the provision of public and private services is especially important in rural areas because they are relatively underserved compared with their urban counterparts.
- **“Boots-on-the-ground” support for innovation in rural areas can improve awareness and programme uptake.** Support may be targeted to entrepreneurs, local community outreach organisations, non-governmental organisations (NGOs) that work in rural areas and other organisations, as well as to various forms of social enterprise. In addition, supporting innovation by local government agencies to allow more effective provision of core public services enhances the ability of rural places to contribute to national growth. Finally, because each state administers its own programmes to support rural development, opportunities for aligning federal and state efforts have to be built into policy and programme design.
- **Simplifying eligibility criteria can help increase programme uptake.** Currently a number of different spatial units are used to define eligibility for federal programmes, including counties, multi-county regions, and municipalities of differing sizes. This can make it hard for local governments to construct a development strategy when some of the specific programmes they need are not available because they do not meet the selection criteria.
- **In rural America, many local governments serve populations that are too small to have a viable economic development strategy that does not involve collaboration.** EDA’s approach of fostering collaboration within regions could serve as a model for other agencies.
- **Financial intermediaries can help bridge rural “capital access gaps” but they are not widely available.** Increasing support for intermediary financial institutions willing to serve rural areas could make a significant difference. Although most rural communities have a variety of financial intermediaries, they are often focused on consumer or household credit and can be reluctant to fund new businesses. In rural places where incomes and wealth are low, business creation is often blocked by an inability of the enterprise to assemble sufficient equity funds to allow a bank or other lender to provide a loan. In particular, in communities with high rates of poverty and where discrimination has a long history, the problem of access is even greater.

The United States is a major source of global innovation. The key sectors that have fuelled recent economic growth include telecommunications, financial products, biotechnology, advanced manufacturing, computer hardware and software, and pharmaceuticals. Such advances are supported by a strong basic and applied research system, deep pools of investment capital and a large pool of venture capital that funds fledgling entrepreneurs who have new ideas thought to have high potential. As a result of this and high levels of Intellectual Property rights protections, the US leads the world in patent filings and in investments in formal research and development.

There is a pervasive urban bias in innovation studies, with presumptions that innovation is driven by proximity and connectivity of key agents. However, rural areas are also sites of innovation. Innovations that arise *from* rural areas include innovations in agriculture and manufacturing plus cross-sectoral innovations in food processing and tourism. These may be aimed at applications elsewhere, such as the food and consumption preferences of urban dwellers or be linked to global value chains. Additionally, other innovations (those that originate in metropolitan areas but *target* rural areas) are wide ranging and include research, science and technology investments that have widespread application in rural economic activities such as mining, manufacturing and agriculture. Finally, there are innovations that are *universal* in nature, but which strongly impact rural life—from cloud computing and the internet of things to distributed manufacturing.

For example, the United States has long been a leader in agricultural research through direct federal research conducted within the United States Department of Agriculture (USDA), which has a considerable number of specialised research centres across the country. In addition, the USDA supports research conducted by Colleges of Agriculture in all 50 states through a system of formula funding and competitive grants. Since 1919, these Colleges have also engaged in a research dissemination process, called Cooperative Extension, that provides technical assistance to farmers based on research supported by USDA. Farmers also benefit from research conducted by large manufacturing and agrochemical firms that, while urban based, produce machinery, fertilizers, pesticides and new plant and animal genetic material for use in commercial agriculture. Thus, some research that takes place in urban places is specifically targeted for use in rural areas, which has contributed to high levels of productivity exhibited in the sector over the last century. In addition, medical research, renewable energy research and various other significant formal research fields have significant impacts on rural areas. However, most of the formal innovation research conducted in the United States has only weak direct connections to rural people and the rural economy.

This chapter demonstrates that a considerable amount of innovation occurs in rural areas and that much of this innovation makes a significant difference to local communities and the local economy, even though it may not have a large impact beyond the immediate region. By strengthening local firms and improving local communities, these innovations spur businesses and people in rural areas to improve their competitiveness. Rural innovation collectively makes a positive contribution to the national economy while improving local well-being.

## **Policies and programmes that impact rural innovation in the United States**

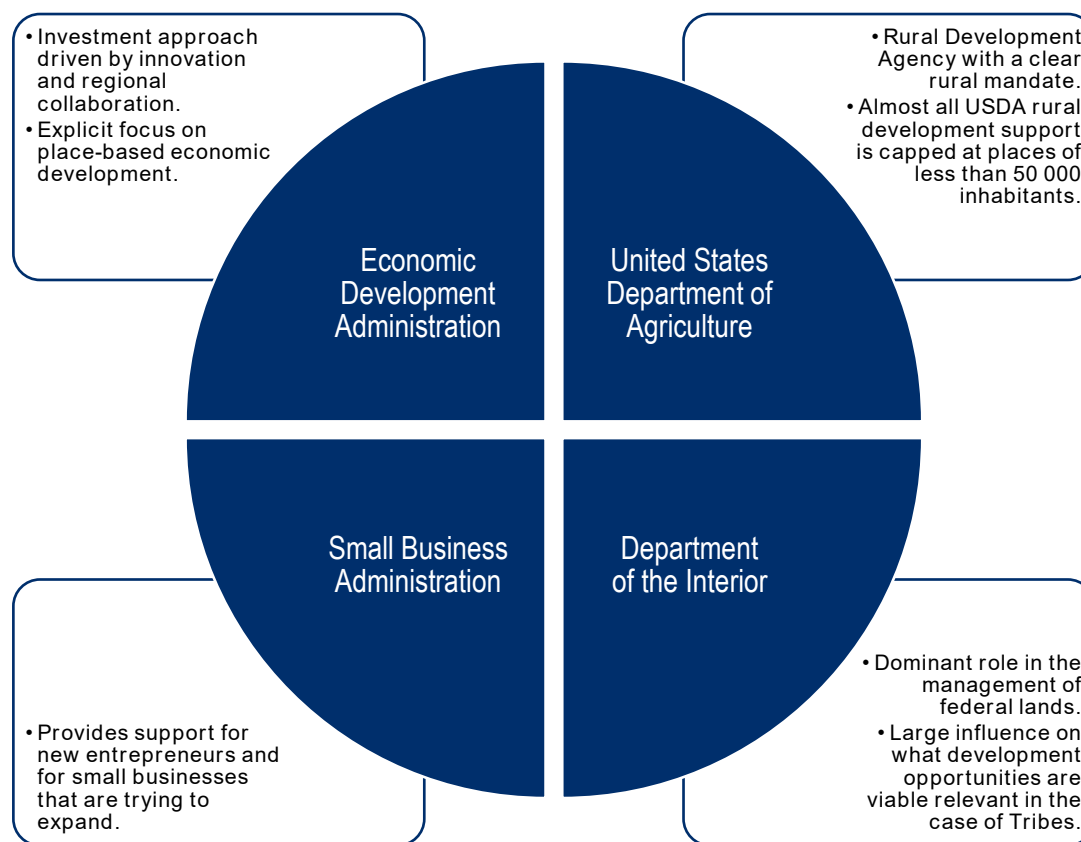
### ***The federal government plays a significant role in fostering rural innovation***

Like many OECD countries, rural policy in the United States has evolved from a focus on the agricultural sector towards a more multi-functional view of rural development. The United States Department of Agriculture (USDA) has a key role in supporting rural innovation alongside the Economic Development Administration (EDA), the Small Business Administration (SBA) and the Department of the Interior (Figure 3.1). Local governments in rural regions are fiscally constrained and typically depend upon

transfers from national or provincial/state governments for a major share of their funding, hence the importance of these agencies.

While each agency has its own areas of programmatic focus, it remains important that resources and interventions are co-ordinated. Failure to do so can detract from the effectiveness of the rural innovation ecosystem. Despite their central roles, the USDA and EDA lack the authority to influence the policies and actions of other Departments. As a result, informal arrangements and/or joint agency memorandums of understanding are commonplace and these tend to drive interdepartmental collaboration. Creating mechanisms to co-ordinate rural policy both within and across governments is a common challenge among OECD countries.

**Figure 3.1. Key federal agencies for rural innovation**



*The USDA has a formal responsibility for the co-ordination of rural policy*

The United States Department of Agriculture (USDA) is a massive department, with 29 agencies and over 100 000 employees operating across 4 500 locations and has long been involved in innovation (Box 3.1 and Box 3.2). The Department provides leadership on food, agriculture, natural resources, rural development and nutrition. Its numerous programmes are authorised and described in the USDA Farm Bill, which encompasses more than 40 programmes that directly address rural development (Box 3.2).

Formal rural policy is mainly defined by the Farm Bill. Its rural development title creates and amends programmes focused on: rural utility systems (i.e., water, waste disposal, electricity, broadband), rural business, and rural housing. These programmes are administered by the USDA Rural Business-Cooperative Service, USDA Rural Utilities Service, and USDA Rural Housing Service.

Individual programmes typically offer some combination of technical assistance, direct loans, loan guarantees or grants. USDA funding and technical support plays a significant role not only in helping innovative rural firms, but also in supporting innovative rural governments and innovative rural organisations deliver better public and quasi-public services in rural America.

The Rural Development Agency within the USDA is central to these efforts – its overarching mission is to run programmes to improve the economy and quality of life in rural America. The core activities and main types of programmes offered through the Rural Development Agency are:

- **Rural Housing Service** – support new construction and renovation of single-family homes and multi-family housing, as well as the construction of community facilities, such as schools, libraries and hospitals.
- **Rural Business Cooperative Service** – provides a variety of financial support to small rural businesses either directly or through lenders to these firms, supports the creation of new rural revolving loans that will lend to rural firms, supports research and adoption of new technology for biofuels or other bio-based chemistry applications and the development of new co-operatives in rural areas.
- **Rural Utilities Service** – provides financing for a range of infrastructure programs including, water and sewage treatment and distribution, improved broadband connectivity, and rural electric and telecom distribution systems.

These programmes are only available in rural communities, where other sources of funds and technical assistance are highly limited. Almost all USDA rural development support is capped at places of less than 50 000 while the majority of programmes are restricted to towns of less than 35 000. USDA funding and technical support can play a major role in helping innovative rural firms, but it plays an essential role in supporting innovative rural governments and innovative rural organisations to deliver better public and quasi-public services in rural America.

### **Box 3.1. The USDA Land Grant system supports rural development**

Since the 19th century, the USDA has conducted agricultural research internally, through national research centres focused on increasing the productivity of American farms. These USDA research stations have provided new crop varieties, identified better cropping methods and improved livestock genetics, and provided other innovative approaches to farming.

The USDA has also supported agricultural research at Land Grant Universities in all 50 states since the 1870s. The scope of the research and dissemination activities undertaken at Land Grant Universities has expanded beyond agriculture to include community and economic development in rural areas, and this effort provides support to both rural firms and rural governments and local actors across a large portion of the country.

Both basic and applied innovations in agriculture have been disseminated to farmers through the Cooperative Extension Service that was established in 1916. Funding for the adoption of new technologies by farmers has been supported through direct loan programs of USDA and through the federally sponsored Farm Credit System. In addition, the USDA supports the creation of a wide range of input supply and marketing co-operatives to facilitate farmers access to inputs and improve their prospects for selling farm output in rural areas where competition is limited. The USDA's innovations are not restricted to agriculture. They have also provided: support for rural electrification, installation of telephones, and more recently, expanding access to broadband through the Rural Utility Service.

### Box 3.2. The United States Farm Bill and rural development programmes

Every five years, the United States Congress passes legislation that sets national agriculture, nutrition, conservation, and forestry policy, commonly referred to as the “Farm Bill”. Since 1973, omnibus farm bills have included a rural development title, which has included USDA Rural Development programmes focused on: rural utility systems (i.e., water, waste disposal, electricity, broadband), rural business, and rural housing.

Formal rural policy is mainly defined by the Farm Bill. The rural development title of the farm bill reauthorises, amends, and creates programmes administered by the USDA Rural Development Agency. The rural development title also addresses emerging issues affecting rural communities. These programmes are administered by the USDA Rural Business-Cooperative Service, USDA Rural Utilities Service, and USDA Rural Housing Service. For example, the 2018 farm bill:

- Added a grant component to the Rural Broadband Program.
- Required that at least 50% of households in the proposed service area lack sufficient broadband access, for direct loans.
- Increased the threshold for sufficient broadband access from 4 megabits per second download, 1 megabit per second upload (4/1 mbps) to 25/3 mbps.
- Raised the authorisation of annual appropriations to USD 350 million from fiscal years 2019 to 2023.
- Raised the maximum amount of project financing for the water and waste disposal revolving loan fund from USD 100 000 to USD 200 000 per project.
- Authorised USDA to make grants to entities that provide technical assistance and training to support applications for rural business-co-operative service programmes.
- Established the Rural Innovation Stronger Economy (RISE) programme to create job accelerators to assist distressed rural communities in creating high-wage jobs and accelerating the formation of new businesses.

Most USDA Rural Development programmes rely on discretionary funding, which Congress authorises in farm bills and funds through the annual appropriations process. Notably the definition of eligibility for each programme can vary considerably, which leads to significantly different levels of federal support across rural America. Moreover, while the Farm Bill authorises the existence of programmes, the actual amount of annual funding for each programme is determined separately by the Agricultural Appropriations subcommittees of the House of Representatives and the Senate. This means that the funding level for any given programme is uncertain beyond the current year which can make strategic planning and programme delivery challenging.

Source: CRS (2023<sup>[1]</sup>), “Farm bill primer: What Is the farm bill?”, <https://crsreports.congress.gov/product/pdf/IF/IF12047> (accessed on 24 March 2023).

#### *The EDA is the only agency with an explicit focus on place-based economic development*

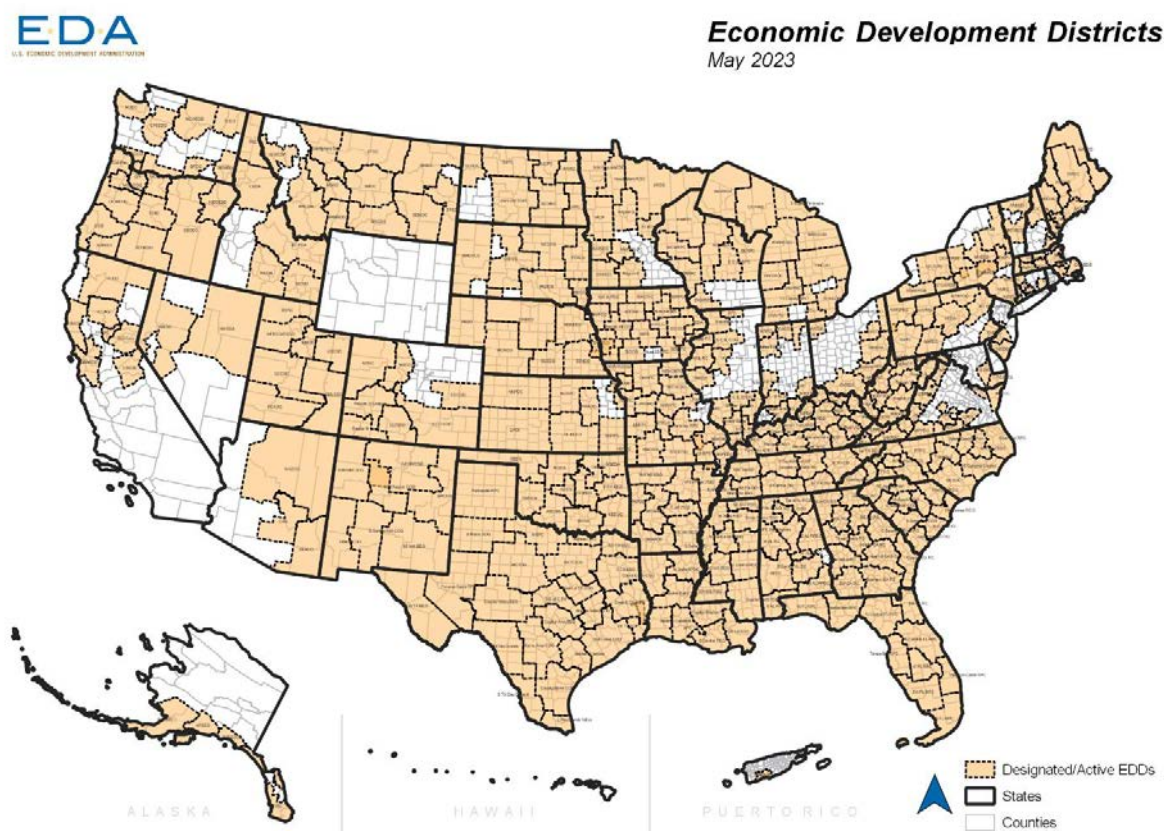
The EDA is a bureau within the US Department of Commerce that promotes innovation and competitiveness in American regions. It works through a planning and investment approach driven by innovation and regional collaboration and focuses on both economic development and disaster recovery (EDA, n.d.<sup>[2]</sup>). It provides support to a large number of primarily county-based<sup>1</sup> regional economic development organisations that tend to be located in rural areas. In this way, the EDA is a strong example



of a federal department that pushes for decentralised development decision making and the use of regional development agencies or bodies (Figure 3.2).

Economic Development Districts (EDDs) are multi-jurisdictional entities, commonly composed of multiple counties and in certain cases even cross-state borders (Figure 3.2). As the figure shows, EDDs cover most of the country but there are many places where they do not exist, not excluding rural counties. Each EDD applicant must contain at least one county that meets EDA's economic distress eligibility criteria, and the group must prepare a Comprehensive Economic Development Strategy (CEDS) that includes all the counties (EDA, n.d.[3]). In developing the CEDS the applicant group is expected to include local politicians, business leaders and other key stakeholder groups from the various counties to ensure that the resulting plan is broad-based and inclusive. The intent is to link counties with a shared economic structure and to encourage them to collaborate on a common development strategy. The EDD is eligible for financial assistance to support infrastructure investments and for funding for business development. Although EDDs cover a large part of the nation, there are considerable gaps in coverage, in part because prosperous areas are not eligible for EDA assistance.

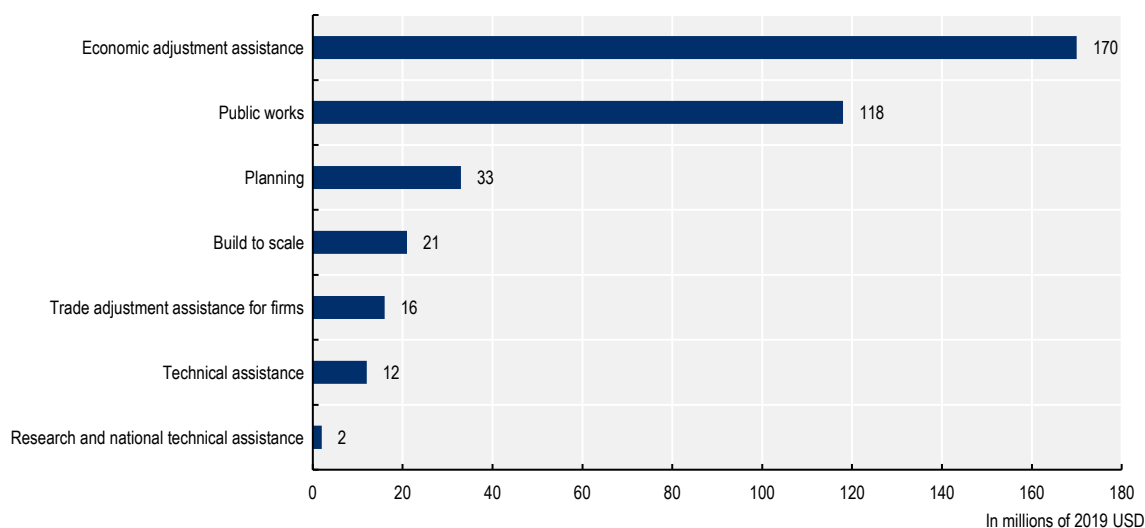
**Figure 3.2. Economic Development Districts**



Source: National Association of Development Organisations and EDA.

EDA's six regional offices cover all U.S. states and territories (including Puerto Rico, Guam, the Islands). This can allow each district to focus on the most appropriate subset of EDA programmes that meet regional needs and develop a delivery approach that connects to client groups. One problem--which the EDA is working to resolve--is when EDDs intersect. If counties are in different EDDs or they are in different EDA districts but see opportunities to co-operate. For instance, the Navajo Nation spans four states which complicates its efforts to work with adjacent counties. In recent years (2011-19), the vast majority of EDA funds have gone to supporting projects within EDDs that address either the loss of employment due to structural change or the need to alleviate poor infrastructure (Figure 3.3) (Theodos et al., 2021<sup>[4]</sup>). However, the EDA is limited by its levels of annual appropriations for regional economic development activities, especially in the crucial areas of planning and innovation. EDA grants are typically used in conjunction with other forms of funding by EDDs or other recipients. This leverage effect is particularly important for certain programmes, such as Public Works, Economic Adjustment, and Build to Scale, where EDA funds are less than 50% of total outlays (Theodos et al., 2021, p. 10<sup>[4]</sup>). As such, the EDA's mission is crucial in supporting a bottom-up contribution of local economies to the larger national economy. In particular, the ability of EDDs to leverage limited EDA funds to carry out their projects suggests that there is broader recognition by other funding sources that these projects are credible investments in community economic development.

**Figure 3.3. Economic Development Administration funding awarded by programme, annual average, 2010-19**



Note: In the figure above, the Technical Assistance category contains the University Center, Local Technical Assistance and National Technical assistance programmes. Build to Scale's annual average covers only 2015-19; the programme did not operate before 2015. Also note that Technical Assistance includes three programs: UCs, Local TA, and National Technical Assistance and Research & Evaluation has two sources of funding.

Source: US Economic Development Administration administrative data and based on Theodos, B. et al. (2021<sup>[4]</sup>), *History and Programmatic Overview of the Economic Development Administration: EDA Programme Evaluation*, p. 5.

Economic Development Representatives are the main contact point at the agency. They work with all potential applicants as well as EDDs. These representatives can also help to identify other federal agencies with relevant programmes and co-ordinate and expand support. While infrastructure improvement is a critical component of an EDD's economic development strategy, over time sound EDD strategies aim to expand their business development activity to increase the size and scope of the local economy. In particular, since 2010, EDA now emphasises its "Build to Scale" programme which encourages EDDs to create innovative ways to restructure their local economy to make it more productive and competitive in a

changed economic environment. In part, this is an extension of an earlier focus on supporting adaptation to structural shocks, but there is an expanded focus on identifying medium- to long-term opportunities that can lead to significant increases in the size and scope of a local economy. Other notable initiatives from the EDA that support the framework conditions for innovation and entrepreneurship are EDA's University Centers that encourage local economic development actors in building a local strategy in tandem with skills training offers.

A recent report by the Urban Institute (2021<sup>[4]</sup>) notes that EDA is primarily a grant-making agency, with more than 80% of its resources used for grants (p. 2<sup>[4]</sup>). These grants are for multiple purposes, with the largest number going towards planning purposes within existing EDDs. One function of EDA is to increase the planning capacity of regions in order to encourage collaboration that can lead to more effective infrastructure investments and greater capacity to expand the regional economy that can benefit all parts of the EDD. The EDA's effectiveness is often challenged by its limited budget and by incentives for individual rural counties to capture as large a share as possible of the benefits from new businesses within their jurisdiction. This tendency for development exclusively within county boundaries is widespread in government programmes that have limited incentives to collaborate. In addition, since county governments are delegated their responsibilities by the 50 state governments, and as some states vary the authority given to counties on the basis of population there may be difficulty among counties in an EDD in implementing some plans. Furthermore, even within counties there can be significant conflicts between the county government and the governments of cities embedded within a county over land use changes, the location of facilities and siting of firms, since these all affect revenue and outlays. This increases the importance of EDA requirements that counties collaborate on their proposals and create a common strategy, because it can lead to a new way of thinking.

*The Department of the Interior manages public lands and upholds Federal trust responsibilities to Indian Tribes and Native Alaskans*

Land is a key asset for economic development and rural innovation. The Department of the Interior plays a dominant role in the management of federal lands, which are particularly important in states west of the Mississippi River where the Department of the Interior sometimes holds the single largest ownership share of land. Through its Bureau of Reclamation, the Department of the Interior also controls most major water development projects in western states. While this may not have a direct connection to innovation, by controlling how land and water are used this department has a large influence on what development opportunities are viable in roughly half of the country. Finally, the Bureau of Indian Affairs is also part of the Department of the Interior and is responsible for managing the relationships between the federal government and Tribal Governments. It holds land in trust for Tribal Governments and either directly provides or funds most public services, such as schools and hospitals that Tribe members utilise. This gives it considerable influence over economic development activity on reservations, most of which are located in rural areas.

*The Small Business Administration provides support for new entrepreneurs and for small businesses seeking to expand*

The SBA works to stimulate all forms of business activity and it has several programmes that support innovation. The most significant is the Small Business Innovation Research (SBIR) programme that provides funding for small for-profit enterprises that wish to commercialise an innovative product, process or service. SBA co-ordinates the programme, but 11 federal agencies participate in funding entities whose interests correspond to the mission of that agency. The SBIR is an example of a situation where Congress has explicitly authorised a number of federal agencies to co-ordinate their funding for small business innovation. The SBIR programme is national in scope but has no explicit rural requirements. As a such, in addition to the Department of Agriculture, larger Departments such as Defence, are likely to have rural applicants, but all participating agencies support some rural innovative firms. In addition, the SBA operates

a parallel programme, the Small Business Technology Transfer (STTR) programme that links a for-profit firm with a non-profit research entity that originated the innovation. The firm becomes the entity to commercialise the concept and both partners are engaged in the development between designing the concept to its implementation. Because this programme has a formal research entity as a partner, it can be more challenging for firms in rural areas that are not close to a comprehensive university to identify a partner.

Other core SBA programmes provide funding and other forms of support to all small businesses, including innovative firms. A state-based network of Small Business Development Centers is located in each state with a district office and multiple sites that are housed at universities and community colleges or other entities with an economic development mission. Each site provides support tailored to the local context and can either directly assist firms or connect them with other local institutions that also offer various types of support. The programme is a key resource for entrepreneurs and existing small businesses because it can provide basic business management advice that is appropriate to various industries and help clients with funding proposals. Because it is organised on a state-by-state basis, the location of sites depends to a great extent on where universities and community colleges are available and whether the state has sufficient capacity to expand the network across its entire territory. The SBA provides loan guarantees for eligible borrowers who can then approach a commercial lender for finance. With the guarantee the lender faces less default risk and may be more willing to make a loan, especially for an innovative activity that is hard to assess.

Another key SBA programme that can support innovation is the network of Small Business Investment Corporations (SBICs) that receive matching funds for the SBA to create pools of funds for equity investments in small businesses. The programme is described in more detail in the finance section of the chapter. Once again, the presence of an SBIC in rural areas hinges on there being some sort of local entity, either a bank or a development corporation, that is willing and eligible to obtain authority for the SBA to start an SBIC.

### ***Different types of support for rural innovation***

Taken together, the different types of support for rural innovation can be categorised as *direct* and *indirect*, with the latter subdivided as “rural business” and “ancillary” support (Figure 3.4). “*Direct support*” refers to the resources and programmes that specifically target “rural innovation”. An example is the Build to Scale programme offered by EDA’s Office of Innovation and Entrepreneurship. This initiative supports rural innovation and scalable start-ups through the Venture Challenge and Capital Challenge (EDA, 2022<sup>[5]</sup>). “*Indirect support*” is comprised of rural business support and ancillary opportunities. Rural business support may not be used to promote innovation directly, but these supports are key to the day-to-day activities to kick-start and maintain rural businesses. The Intermediary Relending Program offered by the USDA Rural Business Service is an example. It makes 1 percent low-interest loans to local lenders that re-lend to businesses to improve economic conditions and create jobs in rural areas (USDA, 2022<sup>[6]</sup>). “*Ancillary support*” programmes include high quality broadband, transportation, and housing that are necessary for businesses to thrive. Given some of the challenges faced by rural communities, “ancillary support” can be just as important as direct and indirect supports. As an example, the Telecommunications Infrastructure Loans & Loan Guarantees offered by the USDA Rural Utilities Service provides financing for the construction, maintenance, improvement and expansion of telephone service and broadband in rural areas (USDA, 2022<sup>[7]</sup>). Table 3.1. shares examples of direct, indirect and ancillary funding and programmes that support rural innovation across the four federal agencies.

Figure 3.4. Rural innovation support

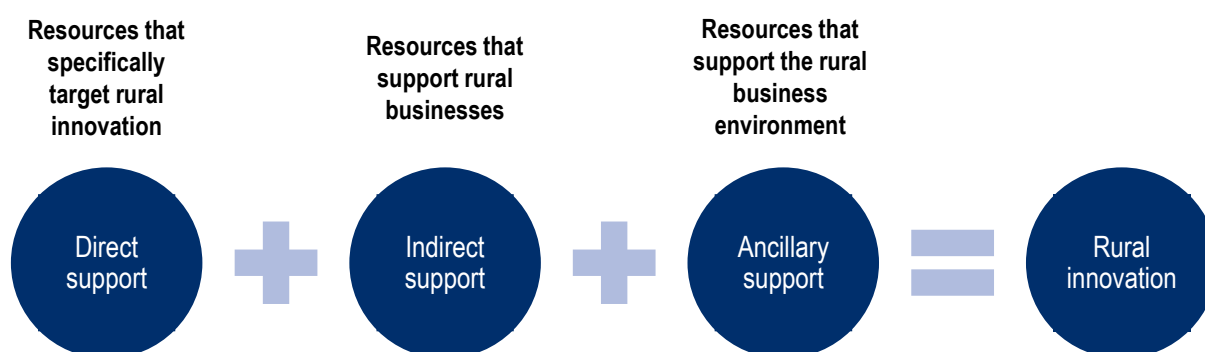


Table 3.1. Different categories of funding and programmes that can support rural innovation

| Direct  | Indirect   | Ancillary  |
|---|--|--|
| EDA: Regional Innovation Strategies (RIS) awards grants that build regional capacity to translate innovations into jobs through the formation, launch, and growth of early-stage seed capital funds (EDA, 2023 <sup>[9]</sup> ).                  | EDA Revolving Loan Fund Program (RLF) provides small business with access to capital (EDA, 2023 <sup>[9]</sup> ).  | USDA: Rural Home Loans (Direct Program helps low- and very-low-income applicants buy housing in eligible rural areas (USDA, 2023 <sup>[10]</sup> ).  |
| SBA: America’s Seed Fund Program – Small Business Innovation Research (SBIR) provides equity-free funding to American small businesses (America’s Seed Fund, 2023 <sup>[11]</sup> ).  | SBA: HUBZone program gives preferential consideration to businesses in underutilised zones (SBA, 2023 <sup>[12]</sup> ).   | USDA: Community Connect Program helps rural communities extend access where broadband service is least likely to be commercially available (USDA, 2023 <sup>[13]</sup> ).  |
| EDA Regional Technology and Innovation Hubs - Planning grants to be awarded to create regional technology hubs focusing on technology development, job creation, and innovation capacity across the United States (EDA, 2023 <sup>[14]</sup> ).   | USDA: OneRD Guarantee Loan Initiative: Business & Industry Loan Guarantees provides loan guarantees to commercial lenders for loans to eligible rural businesses (USDA, 2023 <sup>[15]</sup> ).  | USDA: Water & Waste Disposal Loan & Grant Program provides funding for clean and reliable drinking water systems, sanitary sewage disposal, sanitary solid waste disposal, and storm water drainage to businesses in eligible rural (USDA, 2023 <sup>[16]</sup> ). |
| EDA: Recompete Pilot Program targets investments in innovation and competitiveness with a regional and place-based focus in communities with large prime age (25-54) employment gaps (EDA, 2023 <sup>[17]</sup> ).                                | USDA: Rural Business Development Grants (RBDG) - supports technical assistance, training, and other activities leading to the development or expansion of small and emerging private businesses in rural areas that have fewer than 50 employees and less than \$1 million in gross revenues. (USDA, 2023 <sup>[18]</sup> ). | USDA: Rural Economic Development Loan & Grant Program provides funding for rural projects that will create and retain employment in rural areas (USDA, 2023 <sup>[19]</sup> ).   |
| USDA: Rural Microentrepreneur Assistance Program provides loans and grants to help microenterprises startup and growth along with training and technical assistance to microloan borrowers and micro entrepreneurs (USDA, 2023 <sup>[20]</sup> ). | USDA Socially Disadvantaged Groups Grants provide technical assistance to socially disadvantaged groups. Examples of technical assistance include feasibility studies, business plans, strategic planning, and leadership training (USDA, 2023 <sup>[21]</sup> ).  | USDA: Regional Development Centers link the research and educational outreach capacity of the nation’s public universities with communities, local decision-makers, businesses to help address a wide range of development issues (USDA, 2023 <sup>[22]</sup> ).   |

Source: Various EDA, SBA, and USDA websites.

*A holistic approach to rural innovation is important*

In some mandates, such as those of the EDA, local regional project support is also targeted, without innovativeness being a specific criterion for funding. This means that innovation has to be identified at the local level in the application for direct support. The disadvantage of this approach is that innovation is not inherently privileged as a funding activity, but on the other hand, as long as it can be supported there may be more funds available from larger general-purpose programmes than is the case for pure innovation

support. Additionally, the local applicant may have clearer sense for the role that innovation can play. Maximising the different layers of support would yield more optimal results. However, the case studies conducted for this report reveal the inherent challenges that exist when only some funding streams are/can be engaged, or there are challenges in accessing the resources. The structure of these supports also demonstrate why a holistic approach to rural innovation is important. No matter how much progress is made towards tapping opportunities for startups, if rural infrastructure vulnerabilities and educational challenges are not addressed, progress is limited over the long term. Further, local leaders and citizens are best placed to identify the individual attributes of the rural community and to develop ways to tap into the requisite resources and develop a strategy. This was equally visible in the three case study regions.

Employers and other stakeholders can and should be empowered and incentivised to innovate and introduce change. At the same time, there should be a focus on the infrastructure, skill levels and employability of the workforce. Given the multiple forms and levels of government involved in such initiatives, collaboration is important. For example, the Appalachian Regional Commission (ARC) is a federal-state partnership across 13 states, that invests in rural communities by following a collaborative process. Most federal programmes can fund innovation directly (e.g., direct resources to local firms to invest in innovation and/or their innovative outputs). They can also typically invest in innovative behaviour (e.g., enhancing opportunities, capabilities, and interactions among key actors). This provides a mechanism that can facilitate collaboration across levels of government in ways that improve both programme co-ordination and outcomes and indirect support can also take place through university-firm linkages. Such joint initiatives are one of the strongest drivers of regional innovation across OECD countries. Governments can support these types of linkages through direct supports such as subsidies for joint endeavours or indirect supports such as networking events (see Box 3.3 for examples).

### **Box 3.3. University-firm linkages for regional innovation: Scotland, Sweden, Portugal**

Joint initiatives between universities and firms are one of the strongest drivers of regional innovation across OECD countries. Regions that contain an important share of research universities or laboratories often more easily build connections and generate benefits from spill overs. Governments tend to support these types of linkages through a variety of tools that include subsidies for joint endeavours, networking events, or other kinds of in-kind and programme support.

#### **Interface, Scotland, UK**

In Scotland, Interface is a regional knowledge connection hub that is the prime tool for businesses to connect with universities looking to participate in partnerships for R&D. The hub has eight associated centres specialising in different sectors. Unlike initiatives that focus on finding businesses for academics who wish to explore areas of research and development, Interface is focused on helping to connect businesses to universities and finding matches that can support the firm's research and development competitively. The request for the linkage to occur comes from the initiative of the firm. Once an inquiry from a firm is received, a dedicated staff works to match the firm with a university and find funding opportunities for their endeavours.

#### **Academy for Smart Specialisation, Karlstad University and Region Värmland, Sweden**

The regional government of Värmland, Sweden leverages university-industry ties through its regional development and smart specialisation strategies that now place the initiative within a local university.

As part of a regional smart specialisation strategy, the regional government integrated the Academy for Smart Specialisation, an applied research facility with tailored training programmes and an interdisciplinary platform, into its region's Research and Innovation Strategy for Smart Specialisation 2015-2020. The initiative promotes new specialisation and skills in the forest-based bioeconomy, ICT,

care, industry 4.0 and tourism with an approach reflecting the sustainability, inclusive growth, and well-being goals of the regional development strategy.

While the success of smart specialisation in Värmland is attributed to the institutional “mobilisation” of regional actors, political agencies, and place-based leadership, it also faced several challenges due to changes in regional governance, and lack of funding and business engagement. To address some of these issues, the region of Värmland is now working on mainstreaming the academy within the local higher education institution at Karlstad University.

### **Institute for Systems and Computer Engineering, Technology and Science (INESC TEC), Portugal**

As one of the most influential research centres in Portugal, INESC TEC brings academics and companies together to contribute to the competitiveness of the Portuguese economy, while improving local societal impacts. INESC TEC has 13 R&D centres in five locations around the northern region in Porto, Vila Real and Braga, and focuses on bringing university and academic knowledge to businesses. Presently, its main sites are in the cities of Porto, Braga and Vila Real. The institute has four R&D clusters that include the Power and Energy Cluster; Industry and Innovation Cluster; the Networked Intelligent Systems Cluster; and the Computer Science Cluster. The institute provides management and organisational services, including legal support and human resource management help; business development services through industry partnerships, technology licensing, funding opportunities and international outreach; and technical support including communications and business informatics. In 2017, INESC TEC was composed of 725 researchers and received 33% of funding from international sources.

## **Rural innovation in diverse rural regions: opportunities and challenges**

As part of the analysis of this report, the OECD undertook three case study visits to Gallup, New Mexico, Pine Bluff, Arkansas and Columbiana, Ohio (see Annex 3.A for additional details on the cases). The distinct nature of the three regions provides a window into the challenges of promoting rural innovation when the underlying factors and characteristics are very different. While the cases do not represent the full diversity of rural regions, they do offer important lessons on the development conditions in rural places and the strategies that can improve economic well-being and impact of rural innovation efforts.

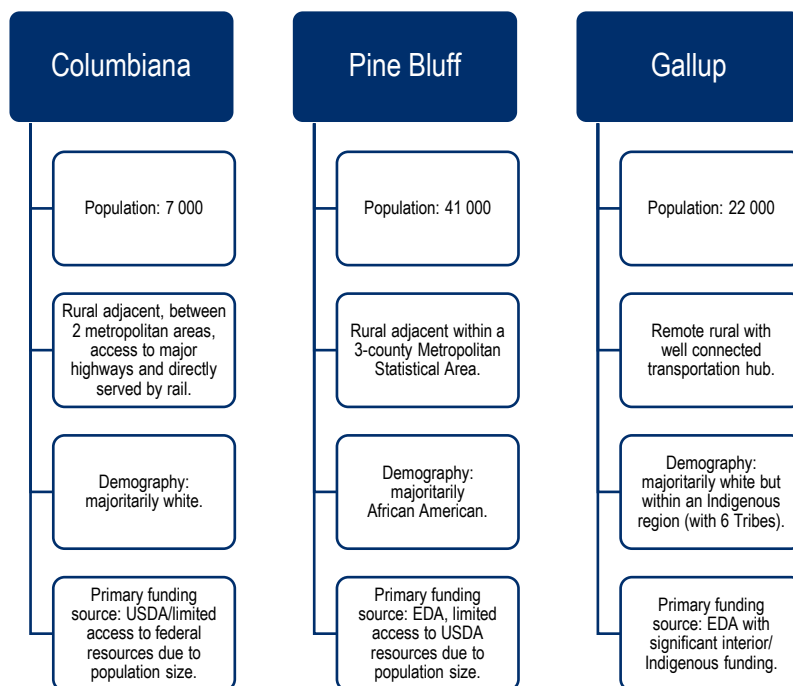
All three cases represent communities that face major development challenges. It is important to recognise that county or city boundaries do not reflect the extent of local labour markets, the local retail trade area or the importance of county governments and state and regional government institutions when it comes to supporting and conditioning local development strategies. In all three cases, the community development strategy has to be seen as incorporating important elements that are managed outside the jurisdiction of the community itself.

Columbiana is the smallest of the three communities with a population of almost 7 000. It is located in Columbiana County in eastern Ohio and is adjacent to both the Canton-Massillon MSA to the west and the Youngstown-Warren-Boardman MSA to the north. The largest nearby city is Youngstown OH (population approximately 60 000), and Columbiana is relatively close to the major cities of Cleveland, OH, and Pittsburgh, PA. The county has the most northern deep-water port on the Ohio River system, which gives it direct access to the Gulf of Mexico via the Ohio and Mississippi rivers.

Pine Bluff is the largest of the three case communities with a population of just over 41 000 in 2020. The city is in Jefferson County in South-Eastern Arkansas, and Jefferson, Cleveland and Lincoln counties form the Pine Bluff MSA with a 2020 population of about 107 000. Jefferson County is one of ten counties in the Southeast Arkansas Economic Development District that is supported by EDA.

The city of Gallup has a population of almost 22 000 and is the county seat of McKinley County, which has a population of just over 71 000. McKinley, San Juan and Cibola counties constitute the Northwest New Mexico Council of Governments, an EDA economic development district. Gallup is a border community to the Navajo Nation, the largest Tribal reservation in the United States, which is also adjacent to the smaller Hopi and Zuni reservations. Notably, a large share of the population of Gallup includes Indigenous people living off-reservation.

**Figure 3.5. Case study areas: Columbiana, Pine Bluff and Gallup key characteristics**



Importantly, all three places are shaped by particular aspects of federal policy. All are part of the system of, or at least in locations covered by, multi-county development districts known as Economic Development Districts (EDDs), supported by the Economic Development Administration, which makes them eligible for forms of support (EDA, n.d.<sup>[3]</sup>). Gallup and Pine Bluff have worked closely with EDA and their EDDs. In addition, Columbiana is located within the area supported by the Appalachian Regional Commission (ARC), which is a joint federal-state economic development partnership that serves historically disadvantaged counties in 13 states. Similarly, Pine Bluff is located in the part of Arkansas served by the Delta Regional Authority, which has comparable goals to the ARC, but far fewer resources. Finally, Gallup is a border community to the Navajo Nation and is significantly influenced by how relationships between the Nation and the US federal government evolve.

### **About the regions – Pine Bluff, Gallup, Columbiana**

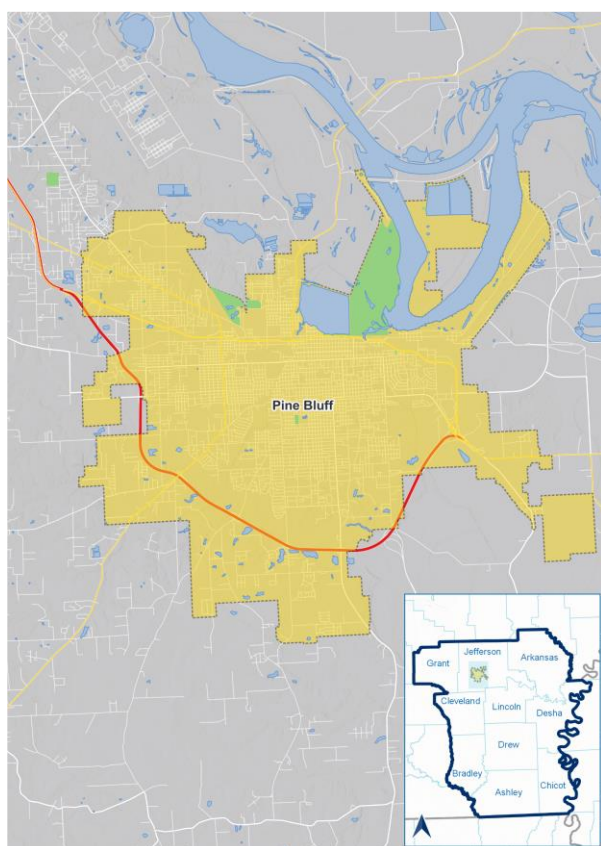
#### *Pine Bluff, Arkansas*

Pine Bluff is part of the Southeast Arkansas Economic Development District, Inc. (SEAEDD), which serves ten counties in Southeast Arkansas: Arkansas, Ashley, Bradley, Chicot, Cleveland, Desha, Drew, Grant, Jefferson and Lincoln (see Figure 3.6). The population in Pine Bluff peaked at 57 400 in 1970 and has declined rapidly since 2000. The city is about an hour away from Little Rock, the state capital. There is no air service to Pine Bluff but a network of federal and state highways connects the city to the larger region



and to the national Interstate Highway System. Pine Bluff has experienced a significant economic decline in the last 30 years as much of its economic base has eroded. While agriculture in the Delta region remains important, it offers far less employment than in the past and farm consolidation has reduced the rural population. Forest products, which once was a formidable industry, has also declined, particularly the local pulp and paper mills. Union Pacific no longer has a service depot in the community and employment at the Pine Bluff Armory has dwindled. Much of Pine Bluff's role as a regional retail and service hub has also disappeared as Little Rock has grown and expanded its retail trade area into communities that used to be served by Pine Bluff. Economic decline has led to accelerating population decline, a falling local tax base, decreasing property values, increases in empty and dilapidated housing and retail establishments, and city infrastructure that is both deteriorating and too large for the current size of the community. With economic decline, human and financial capital have left the community as people with higher skills relocated to growing parts of the state and other parts of the country.

**Figure 3.6. Pine Bluff: Challenges and strengths**



**Challenges:**

- Dysfunctional local school system.
- High rates of poverty, low levels of employment and low workforce skills.
- Numerous commercial buildings in poor condition in the city centre.
- Identifying a new economic function.
- A deteriorating housing stock and falling home values.

**Strengths:**

- Two strong higher education institutions fully engaged with local leaders in efforts to rebuild the local economy.
- Investments in revitalising Pine Bluff from a major regional banking organisation.
- A high degree of racial harmony.
- Strong co-operation between elected officials in city and county governments.
- Widespread recognition that major reinvestment is needed.

Note: Red line refers to a major highway.

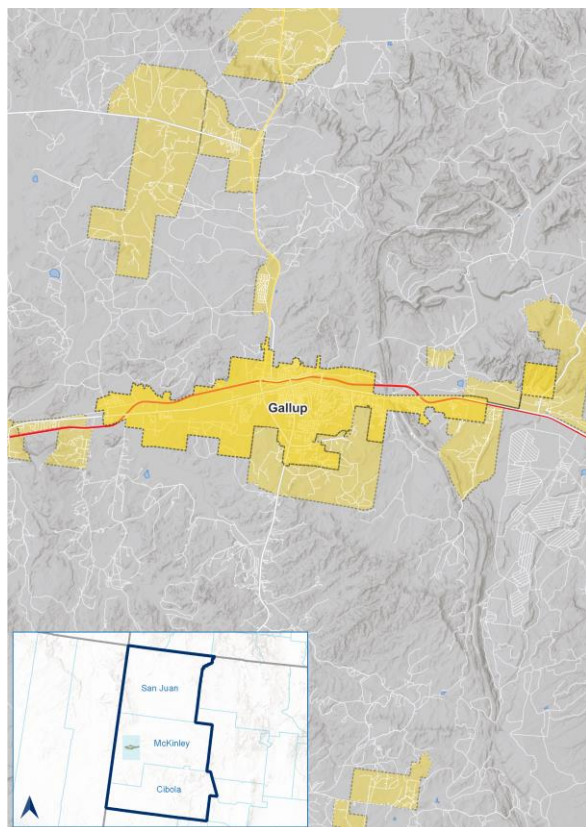
Source: National Association of Development Organizations (NADO).

*Gallup, New Mexico*

Historically, Gallup was started as a railroad town and quickly became a mining community, including coal and uranium mainly with some oil and gas (see Figure 3.7). Over the past decade, closures in coal-fired powerplants, coal mining, and oil refining accelerated, resulting in a reduction in higher paying jobs and the local tax base. A striking feature of the Gallup area is a “checkerboard” pattern of land ownership. When land rights were assigned by the federal government in this part of New Mexico it was on a section-by-section basis. The result is that private land can be adjoined by native land, federal land and/or state

land. Even federal land is allocated to different agencies. The result is a complex pattern of land ownership outside the city boundaries that impedes development of infrastructure and land development. The Gallup retail trade area extends deeply into the Navajo Nation and the city is a hub for both shopping and government services provided to the people living on a number of reservations. Gallup has also been a major market point for Native crafts, particularly silver jewellery and weaving.

**Figure 3.7. Gallup: Challenges and strengths**



Note: Red line refers to a major highway.

Source: National Association of Development Organizations (NADO).

**Challenges:**

- Complex pattern of land ownership.
- Private land adjoined by native land, federal land and state land.
- Federal land is allocated to different agencies.
- Weak relationship with USDA.
- Limited higher education opportunity.
- Necessity to collaborate with local Indigenous communities.

**Strengths:**

- Ideal location for both a maintenance site and for a transshipment hub.
- Major market point for Native crafts.
- Recognises the need for a new economic function.
- Strong relationship with EDA.
- Improved relations with Navajo Nation and other tribes.

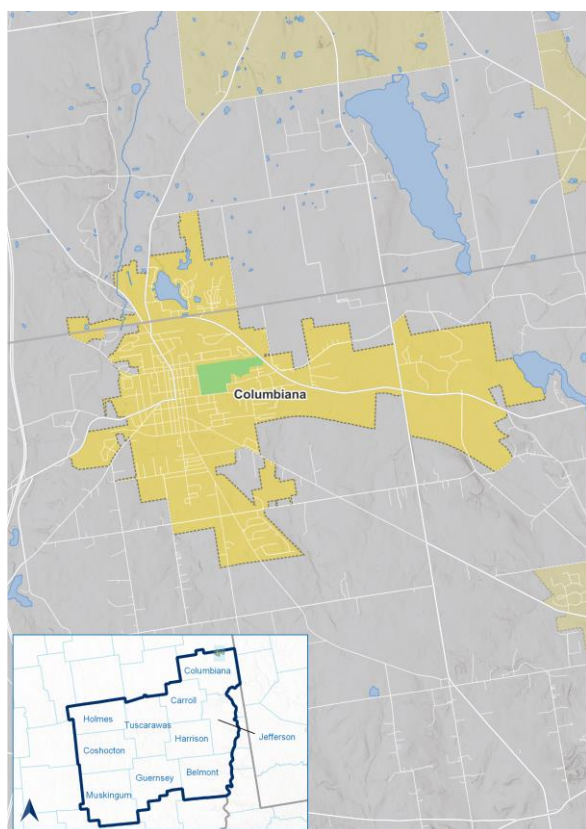
*Columbiana, Ohio*

Columbiana (city) is covered by two separate EDDs: Ohio Mid-Eastern Governments Association (Columbiana County portion) and Eastgate Regional Council of Governments (Mahoning County portion). Neither of those EDDs is based in Columbiana but are instead based in Cambridge and Youngstown respectively. Columbiana is also part of the Eastern Ohio Development Alliance (EODA) which plays a similar role as an EDD. EODA works to stimulate economic development, infrastructure investment, educational advancement, and a better quality of life. Columbiana has good access to major highways and is directly served by rail, although barge access requires truck transport to port facilities in the south-east corner of the county. Both short stay and day-trip tourism is expanding, and the city has started to attract new residents from the Pittsburgh MSA as houses become more expensive there and possibilities for hybrid work increase. On the other hand, with a population of under 7 000 and close proximity to the larger communities of Boardman, East Liverpool and Salem, Columbiana does not have a strong retail sector. For example, the closest Walmart or Home Depot is in Salem. This means that a large share of retail sales leak out of the community. Similarly, while there are several urgent treatment centres in Columbiana, the

closest hospitals are in Salem and Boardman. Rural communities of similar size in relatively densely-populated regions face a similar situation, but it does limit some sources of economic growth.

The study visits revealed strengths in all three regions. A clear advantage of Columbiana is a strong K-12 school system that has a city school district. Strong local support for schools, both financially and in terms of community engagement, has resulted in better school performance than for proximate peer districts. The lower cost of housing and good local schools is a draw for households. In addition, the city is investing in improving its visual attractiveness through a Main Street revitalisation programme and by creating better parks and recreation facilities. The city is fortunate in having received a large tract of land from the estate of Harvey Firestone to establish a multi-purpose park near one of the new housing developments.

**Figure 3.8. Columbiana: Challenges and strengths**



**Challenges:**

- Weak internal retail sector.
- Proximity to hospitals.
- Development of the core labour force.
- Build bridges beyond physical boundaries.
- Limited opportunity to collaborate with adjacent governments that have comparable capability.
- Too small to reach next stage of growth alone.

**Strengths:**

- Strong K-12 school system.
- Innovative local government initiatives.
- Diversified economy with strong local firms.
- Sufficient “free capital” for flexible investments.
- High level of community engagement with the K-12 system.
- Strong partnership with local developers.
- Innovative local regulations to encourage change.
- Local theatre as a point of cohesion.
- Makes strong use of USDA funds.

Source: National Association of Development Organizations (NADO).

Pine Bluff has several key strengths that are being mobilised as part of a major redevelopment effort. These include: two strong higher education institutions, the University of Arkansas at Pine Bluff (UAPB) and Southeast Arkansas College (SEARK), that are fully engaged with local leaders in efforts to rebuild the local economy. Simmons Bank, a major regional banking organisation, is the only large commercial business in the city’s core and has made a number of large investments in revitalising Pine Bluff. While part of this support can be explained by the bank fulfilling its Community Reinvestment Act (CRA) obligations, the level of support goes well beyond the amount CRA would require.

Gallup is roughly an 11-hour drive from the ports of Los Angeles and Long Beach. After 11 hours of driving, commercial trucks are required to stop for a rest period, which makes Gallup an ideal location for both a maintenance site and a transshipment hub. With a logistics hub, there is potential to attract light manufacturing firms, which would add another dimension to the city’s economic base.

### ***Innovation as part of rural community economic development***

All three communities are dealing with economic decline that has transformed rural places that were once prosperous into ones facing a much-diminished economic role that led to reduced employment and lower earned income. The magnitude of the shock varies considerably by community, as has their ability to respond in a proactive way. Recognising that the past could not be restored was not easy, but it may have motivated the search for new roles and ways to support them. As a result of the search, there was clear evidence of innovation. Innovation took place in existing businesses that looked for new products and production processes. It was evident in the efforts of individuals who became new entrepreneurs as a way to improve their own livelihood. Moreover, the process has clearly improved well-being in each community. It was also evident at local government levels where new core economic functions for the community were identified to replace the prior one which is now defunct. Most importantly, innovation was evident in the creation of both new local associations that formed to help support economic revitalisation and in new partnerships among groups who agreed to collaborate on introducing new activities or in delivering services in a new and innovative ways, such as the partnership between the Navajo Nation and the City of Gallup to develop a new hospital to serve the entire community.

#### *Prominent role for developers and the private sector*

In all three cases, efforts to restore economic vitality have been supported by a private sector partner, but once again the level of support varies significantly from place to place. Similarly, the role of local government, in particular the surrounding county, in the development strategy varies considerably. Columbiana adopted a city manager form of government which is unusual in smaller cities where the common form is to have a mayor and a city council that share administrative responsibilities. A clear benefit to having a long-tenured city manager is their ability to master grant applications. They also know which entities can be approached for a particular source of funding. They can follow through both in implementation and on reporting results to the grant provider. Many small rural communities must rely entirely on grant programmes for financial support because their fiscal capacity is so small that it is all spent on required current outlays. With no internal investment funds they face two challenges. The first is they can only obtain funds to invest in projects that grant makers are currently prepared to fund, which limits their activity. Second, since most rural places are in this situation, competition for these funds is intense and many applicants do not receive funding. Conversely, because Columbiana has unencumbered funds it can apply for “cost-shared” programmes, which have fewer applicants. Moreover, they are also preferred by many grant providers since they both leverage the grant provider’s money and have inherently lower risk because the applicant also has invested money into the endeavour. This has given the city the opportunity to make both more investments and a broader range of investment than is common in rural America.

In many communities, relationships between local government and developers are problematic. In Columbiana, there is a strong partnership between the local government and the private developer who is building housing and retail development on the old Firestone Farm. This major development is creating a new retail and recreational complex as well as new housing. A crucial element in Gallup's development vision is a long-term development agreement with Gallup Land Partners. Gallup lacks access to sufficient land to develop its own facilities, and as a small city with a limited budget it could not afford the capital outlays for development even if it had the land. By partnering with a major land development company Gallup can achieve its ambition and the company can more readily convert raw land into something more valuable than it could if it were to try to do it without the support of the local government. Importantly, the Greater Gallup Economic Development Corporation (GGEDC), which is charged with economic development for the area, acted as an intermediary in developing and implementing the relationship. The Go Forward Pine Bluff (GFPB) development approach is the central part of efforts to revitalise the community. It can be seen as an innovative response to a systemic redevelopment challenge, and while it

has yet to demonstrate its success it already provides useful examples of how to undertake a comprehensive approach to renewal.

#### *Major differences in what can be accomplished due to size authority and fiscal capacity*

Because the population of the three places differs, as does the authority and fiscal capacity granted to cities by their respective state governments, there are major differences in what each place can accomplish internally. As an example, despite all three places seeing improved educational attainment as a central part of their development strategy, the range of local education institutions in the respective communities differs considerably, as does the ability of each community to influence how it operates. Public schools in and around Pine Bluff are no longer providing adequate education to students. Conditions within Pine Bluff deteriorated to the point that the State of Arkansas assumed control of the school system. By contrast, in Columbiana, both public officials and business leaders are engaged with the local schools, including the primary school (elementary schools) in an effort to create an environment where students see Columbiana as a place where they might like to live as adults and to provide students with a sense of what employment opportunities are available locally. In Gallup, the mission of Navajo Technical University is to provide an opportunity for Tribal youth to gain a university degree in a STEM-related discipline. The Center for Advanced Manufacturing was created to provide a more specific and job-focused experience for students in additive metal manufacturing. Because there is varying experience in manufacturing on the Navajo Nation it was felt that the best opportunity for success would be in a new field where leading regions have yet to emerge.

#### *Role of the federal government varied across the three cases*

The role of the federal government was also clear. Federal agencies, particularly EDA, SBA and USDA, have provided multiple forms of support in all three cases. While funding for multiple projects over multiple years is the most obvious form of support, it is not the only one. In all three places, federal agencies also provided important technical support and were generally able to find ways to facilitate co-ordination of their respective financial and planning support in order to magnify its impact. Federal support for the creation of new community governance capacities both in government and in civil society, while harder to assess, were also clearly instrumental in bringing about change. In all three communities, but especially Gallup, the challenges inherent in intergovernmental co-ordination were apparent. While federal officials with local responsibility were able to develop informal ways to collaborate, their capacity to do larger things was limited by the need to get “head office” approval. This was particularly apparent in Gallup where Tribal government has a distinct relationship with the federal government through the Bureau of Indian Affairs, which is largely unconnected to other federal departments and agencies.

#### *High level of local government innovation*

A striking feature of the three places was the high level of innovation by local governments and by civil society. Local governments are challenged to innovate because they face problems in providing the services the population desires in a conventional way, or because a novel source of revenue may be the only way they can increase their budget. Similarly, volunteers self-organise to provide services that are not available from firms or government, but which improve quality of life for the entire community. These non-traditional innovations can help create an environment where firms also innovate because they see creative solutions being developed around them and because the quality of the community is improving. This, in turn, may stimulate a sense that the returns on firm innovation may be better than in the past.

Some of the innovations described in the case studies, whether made by firms, governments or organisations are novel in the sense that they are uncommon enough to be classified as innovative in any context. Gallup’s fully integrated development partnership with the private developer, Gallup Land Partners (GLP) (see Box 3.4) is a major innovation in how a city can form a public private partnership to carry out a

large-scale community redevelopment programme. GLP provides land and financial resources the City could not obtain, while the city provides legal and regulatory support, access to federal and state funding and public facilities that complement GLP's investments.

Pine Bluff's entrepreneurial coaching programme, which focuses on encouraging female-owned home-based business startups, is combined with a programme to provide exposure to computers to their young children in a common facility, or in Columbiana, Humtown Product's ongoing partnership with Youngstown State University to develop new applications for additive manufacturing using 3-D sand printers are also examples of novel and innovative approaches. Note that an expansive definition of innovation is being applied which is consistent with the current OECD understanding of the term. Other innovations, while perhaps not as novel, are still uncommon in the rural contexts in which they are applied. Near Gallup, Sacred Winds Communication is leveraging fixed-wireless broadband on the Navajo Nation to connect widely dispersed settlements, which is a novel way to apply a well-known but little-used technology that suits the specific situation. The City of Columbiana has forgone property tax on new homes for 15 years as a way to stimulate development and attract new residents. In Pine Bluff, the Go Forward Pine Bluff model shows how to develop a community engagement process driven by civil society that can mobilise a large share of the population to identify a new development strategy that received a high level of support from the electorate when placed on the ballot. This latter group of examples is important because it demonstrates an ability to find a new solution to an ongoing problem, which is the hallmark of user innovation.

### **Box 3.4. Redevelopment approach – Gallup, New Mexico**

Gallup Land Partners (GLP) was created in 2013 to manage the development of a roughly 26 000-acre parcel of land that is located north of the city of Gallup. This parcel is unique because it consists mainly of contiguous section blocks and was previously owned by a coal mining company and is adjacent to both the BNSF mainline and I-40. GLP has three operating subsidiaries Gallup Energy Logistics Park (GELP), GLP Homes and GLP Commercial, and has developed a master plan for the property that involves a combination of transport related infrastructure, residential development and commercial development.

Several things are unique about GLP's activity. The first is the scale of the investment in a small rural community like Gallup. The second is the integration of residential, commercial and industrial components and all the related infrastructure. The third is the high degree of integration of GLPs activity with the city of Gallup's development objectives. By partnering over an extended period of time, GLP and the city are able to better achieve both entities' objectives. GLP provides land and financial resources the City could not obtain, while the city provides legal and regulatory support, access to federal and state funding and public facilities that complement GLP's investments.

GLP's development plan is connected to Gallup's ambition to be a logistics hub. A new 2 500-acre industrial park designed as a logistics hub has been created that includes a 11 000-foot rail loop that connects to the BNSF mainline with 365 acres certified by BNSF as "rail served and shovel ready". The industrial park is already being used for loading and off-loading trains and additional rail lines are being considered. In 2022, a new four -lane road built with GLP and city -supported funds connected the industrial park to major roads in Gallup. The road was intentionally designed to be used for testing autonomous commercial vehicles with the intent of marketing Gallup as a test site for driverless commercial trucks. The city and GLP also recently constructed a new recreation area, The High Desert Trail System, that is partially located on GLP land that expands the number of bike and hiking trails in the community. While new housing development has not started on the land north of the city, GLP Homes is involved in housing developments in other parts of Gallup.

### *Strong commitment to enhancing workforce skills*

To be successfully implemented, innovation generally leads to new workforce skill requirements. It is important to highlight that in all three places there is a strong local commitment to enhancing workforce skills through efforts to improve the local education system, particularly by better connecting it to local employers' skill needs. In Pine Bluff, Southeast Arkansas College has partnered with People Source, a public benefit corporation that provides training and staffing services for private companies. People Source will locate on the college campus and is expected to employ about 250 people, some of whom will be students enrolled at the college. In Columbiana, local firms are engaging with students before they get to high school to identify high-paying opportunities in skilled trades, and the high school offers an entrepreneurship class that engages students with a firm or government agency that has a problem requiring an innovative solution. The students then devise their own solution to the challenge and present it to the firm or agency. In the Gallup area, the Navajo Technical University has a programme to train technicians to work on machinery used in additive manufacturing. The programme is linked to several research-intensive universities outside the region conducting advanced research on additive manufacturing and students at Navajo Tech work with these researchers to develop cutting-edge technical skills that can allow them to get jobs as research technicians.

Finally, other actions have been successfully implemented in the past, such as: improving the appearance of Main Street, strengthening co-operation between city and county governments, constructing a generic incubator building or building cash reserves to allow applications for “matching grants” instead of 100% donations. Less common is the ability to assemble a coherent package of these good practices and to sustain it over time. While it is perhaps a stretch to describe places that do this as innovative, it is also true that good government and good governance practices in rural areas can be atypical. In many successful rural communities, it is this combination of a few novel or atypical innovative actions combined with a package of standard good practices that leads to a successful rural economic development initiative. Some form of national support for innovation played a significant role in many cases. Even though there is no comprehensive support system for innovation in the United States, the large number of individual programmes provided by a range of federal agencies creates an environment where individual firms, organisations and governments can construct a package of support that enables them to achieve their goals. In a sense, this process is also a form of innovation driven by resourcefulness.

## **Maximising opportunities and mitigating challenges to rural innovation**

### ***Integrating geographic constraints into rural policy***

Public policy is largely shaped around administrative units – nations, states and provinces, and at the lowest level, counties, townships and other units of local government. This is almost a necessary consequence of policy being the prerogative of government, with specific layers of government having certain capabilities and resources and local governments deriving their powers from higher level governments. But administrative units, especially at the local level, may not correspond to how a particular local economy function. A useful way to think of a local economy is as a local labour market. However, this is how the Office of Management and Budget defines metropolitan areas in the United States by using county level worker commuting patterns to construct multi-county functional economic areas.

Nevertheless, the idea of local labour markets is rarely adopted in thinking about rural economic development. While counties are the basic building block for federal rural development activity, a single county may not be the best unit for economic development policy. In some cases, a rural county in the United States can contain multiple functional economic regions, especially in counties that are geographically vast and where population densities are low. Conversely, rural counties east of the Mississippi river can be too small to be a functional economic unit and multi-county aggregations make

more sense as economic building blocks. EDA's Economic Development Districts (EDDs) best reflect this idea because they are multi-county aggregations that are seen as a better way to first construct a set of shared infrastructure and then to collaborate on economic development. This provides benefits to all members of the EDD. For example, although a factory will locate in only one county in the EDD, surrounding counties can gain from increased employment opportunities for their residents at the factory, since no individual county has an adequate labour force to meet the firm's needs.

However, in geographically large counties with dispersed populations, as in New Mexico, EDDs may also have to work at a sub-county level, because the potential economic linkages take place in a smaller geographic setting. Gallup provides a useful example in this regard. The development of the city hinges on collaborating with other entities, including adjacent tribal governments that have a different form of local government, but the three-county EDD that Gallup is part of is too big to correspond to its functional economic area. Conversely, the administrative area of the city of Columbiana, Ohio spans two counties, which requires it to co-operate with both of them.

Importantly, the appropriate geography for rural economic development may not correspond to the best geography for providing public and private services. In the case of public service delivery there is always a crucial trade-off between having larger entities that can capture potential economies of scale to reduce unit service costs and recognising that a large service territory results in significant travel costs from where people live to the facility. In some cases, government may incur a portion of these costs, as in the case for ambulance services or school buses, and this may lead to a balancing of costs. In other cases, travel costs are mainly born by users, as is the case for non-emergency health care or accessing local government offices. In this latter instance it may be more likely that government will recognise the benefits of a larger unit with a bigger service area but tend to downplay the adverse consequences for users.

Unfortunately, this suggests that there is no best single unit of geography for all forms of rural development. Because rural areas encompass a mix of "for-profit" firms, various local governments and a variety of non-profit organisations that play a large role in both the economy and in civil society, a correspondingly large number of overlapping but non-congruent spatial service areas will occur. Fortunately, many rural societies recognise this complexity as part of their way of life and can bridge the gaps between different elements of their life. This is facilitated by each community being relatively small, so people know where to go for a particular good or service. Where problems arise is at higher policy levels when government wants to adopt consistent geographic boundaries and approaches to ensure that all recipients are treated identically.

For example, USDA is often criticised because it does not have a consistent eligibility population for its rural development programmes. However, some programmes may be more appropriately focused only on smaller pockets of the population, while others are justifiably appropriate for larger places. It is this type of flexibility across programmes that is necessary to allow a more appropriate policy response to rural development challenges.

## ***Co-ordinating to support rural innovation and ensure equity***

### *Co-ordinating to consider all the factors needed to support rural innovation*

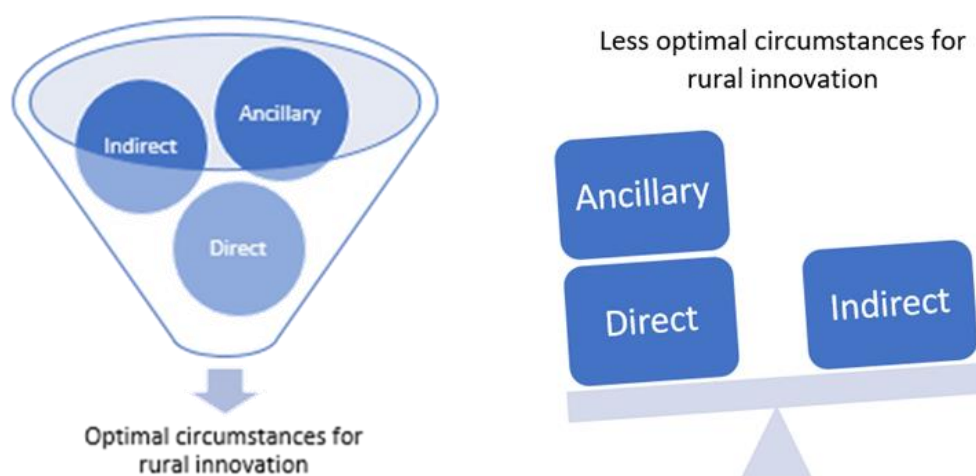
Each case study region has showcased more than just business innovation. Identifying new sources of economic activity to jumpstart economic growth and improve the well-being of the community was the core aim for all. Arguably, a higher degree of co-ordination is needed in this circumstance because achieving the goal depends on all the variables working together at the local level. For example, a decision made by one agency could have consequences not just for the community but for the programmes of other agencies, which obviously makes co-ordination imperative. Also programmes that may not seem to be directly significant for innovation in a rural community may have indirect impact on the effectiveness of programmes that directly affect rural innovation. Further, in rural areas co-ordination is often challenged



by limited local capacity and/or the fact that decision-making by government takes place far from any rural place in structures where conditions and needs of that rural place are unknown. In Pine Bluff, it is more challenging to encourage and build an entrepreneurship culture when the public educational system consistently underperforms. Likewise, it was much more difficult in Gallup to build and galvanize new businesses when land is cumbersome to access for development. Of course, there are workarounds, and this is evident in the role land developers played in Gallup.

Figure 3.9 suggests that co-ordination has to go beyond simply linking the programmes that obviously impact innovation in a rural community if the full benefits of government support is to be achieved. In other words, no matter how much progress is made towards tapping direct or indirect opportunities, if ancillary factors are not addressed, they could render any form of progress shallow. The optimal path to increase rural innovation is based upon local strategies that are grounded in local competences and assets. But it is crucial to recognise that these strategies have to be grounded in an understanding of the external environment in which the rural region is embedded. The discussions in the case study regions underscore the importance of exploiting rural innovation opportunities in a manner that also addresses ancillary factors. A place-based lens on the nature of interventions and how they connect to broader strategic visions of community and economic development is important.

**Figure 3.9. Improving co-ordination for rural innovation**



The United States is a federal country with three levels of decentralised government authorities that include the national, state, and municipal governments. When tribal lands are considered there is a distinct fourth level with limited formal ties to the other three. As with all federal OECD governments, a high level of decentralisation allows for better tailored responses to local markets. However, decentralisation of itself is not enough, as evidenced by the case studies. The ability to make full use of the direct, indirect, and ancillary support streams requires knowledge of what is available, how it can be used, and the ability to access the resources. There are a multitude of tools to help. It may be centralised through the treasury, or central budget offices, through whole-of-government priorities, joint mandates (Peters, 2018<sup>[23]</sup>) or through a central co-ordination unit for vertical co-ordination or decentralised non-hierarchical systems (Bakvis and Brown, 2010<sup>[24]</sup>). Standing commissions and intergovernmental consultation boards are other frequently observed co-ordination mechanisms. These mechanisms can consider the scale of intervention, the frequent duplication and overlapping in competences, a lack of human and technical capacities, unfunded mandates, territorial disparities, and increased competition for resources. One recent example was setup by the Biden-Harris Administration, the Rural Partners Network is an alliance of federal agencies and civic partners working to expand rural prosperity through job creation, infrastructure development and community improvement. The networks brings “boots-to-the-ground” by designating community liaisons to

work to simplify access to information for rural communities. They are established as a collaboration of 27 agencies and the White House in an effort to improve access to government resources, staffing and tools, build awareness of rural issues and focus on building rural strategies. It is currently going through the second pilot programme in 14 counties and 10 states.

### *Co-ordinating to ensure equity for marginalised populations in rural innovation*

Innovation is typically understood as a way to increase productivity which strengthens both the innovative firm and regional competitiveness, or as a method to introduce new goods and services to a market, as discussed in Chapter 2. In both cases, while innovative firms benefit, so does society collectively, but there can also be losers. This is best understood in Schumpeter's notion of innovation as a process of creative destruction, where incumbent firms and their workers are displaced by new innovations (Caballero, 2008<sup>[25]</sup>). In the three case studies, current pressure to innovate was in part created by the loss of an earlier economic specialisation – fossil energy in Gallup; timber processing and cotton production in Pine Bluff; and a decline of the traditional steel casting industry in Columbiana. In Columbiana, traditional skills in pattern making have been repurposed in new ways by introducing modern additive manufacturing. In Gallup a new economic function – intermodal logistics is being created. In Pine Bluff a new economic function that can provide a new source of employment has yet to be determined. While Columbiana is furthest along in the process of redefining its economic role, even there it is clear that there will be both fewer firms, new workforce skills and less direct employment involved in the new production regime.

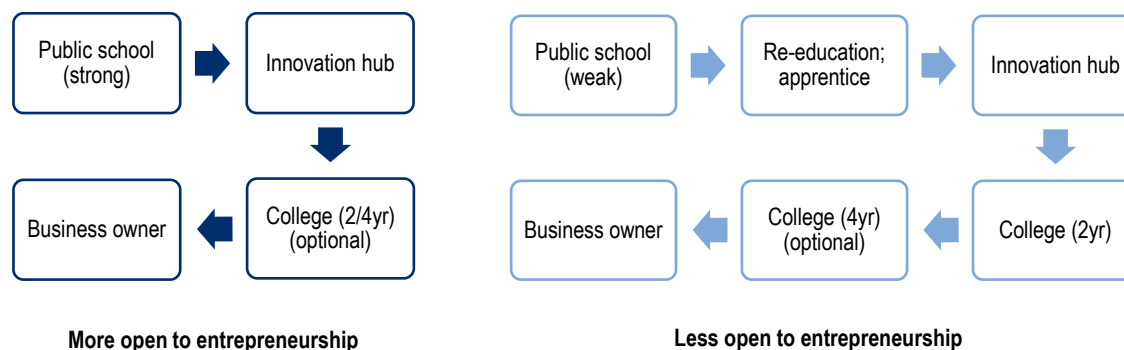
Restoring economic vitality to rural areas can be challenging when places are systematically disadvantaged and populations within regions face disproportionate barriers associated with living in entrenched poverty or systematic discrimination. Thus, even when innovation leads to new economic opportunity, only some people in the community may benefit. In rural communities where employment opportunities that provide stable jobs with a living wage are limited and some groups are trapped in persistent poverty, even a rapid transition to a new economic function driven by innovation may not improve conditions for most community members. This is certainly relevant in the case of Pine Bluff where they are seeking to foster entrepreneurial activity that can take advantage of local resources. This suggests that only focusing on supporting firm level innovation is insufficient to ensure broad based community development. Moreover, even where firms try to innovate to be successful, they need a supportive environment that provides a range of workforce skills, access to necessary inputs, sound infrastructure and strong financial institutions.

In rural areas it is often necessary to undertake crucial social innovations to spark interest in becoming an entrepreneur (Figure 3.10). A strong public school system provides essential support, especially if it incorporates entrepreneurial experiences in the curriculum, as seen in Columbiana. However, where people have limited relationships with individuals who are small business owners it can be hard for them to imagine themselves as entrepreneurs. And, in communities located in regions where there is persistent poverty the problem is further compounded by limited opportunities for work of any type that can reinforce a belief that opportunity does not exist here.

In places like Pine Bluff where economic and social decay have weakened core institutions like the schools and social cohesion, it is essential to first find ways to provide better public services to support nascent entrepreneurs. In Gallup, finding new ways to connect the development needs and aspirations of both the Indigenous and non-Indigenous communities has improved prospects for introducing new economic opportunities that benefit more local people. Conversely, in Columbiana, the small size of the community, its strong local schools and the high visibility of successful family-owned businesses create a supportive environment for new entrepreneurs. In all three communities, implementing innovative new economic functions requires—as a bare minimum—developing a new set of skills in the local labour force, which in turn requires the community to develop new innovative ways of improving schools and of developing new workforce training methods. Successful implementation requires the rebuilding of civic trust and improving

local governance to better fit changing social, policy and economic conditions. In short, innovation in both government and civil society is necessary to support conventional firm-based innovation.

**Figure 3.10. Degrees of openness to entrepreneurship**



Education institutions can contribute to improved human capital formation in rural areas by widening access to higher education, better matching labour force skills to employer needs, attracting new people with particular skills to the region, and by generally upgrading the skills of the local population (OECD, 2014<sup>[26]</sup>). But Pine Bluff faces two challenges. The first reflects the fact that the local labour market is geographically larger than would ideally be the case, which leads to high commuting costs for workers that can be an impediment to participation, while additionally much of the current workforce has limited experience with entrepreneurship and does not see self-employment as a viable option. The second challenge is the difficulty of improving this situation. Improving the education system would allow workers to be more productive and command higher wages, which in turn would reduce the negative impact of high commuting costs on labour force participation. Increasing awareness of entrepreneurial possibilities can also be addressed through school programmes, such as Junior Achievement, that expose students to business opportunities, and entrepreneurship classes, such as the one offered in Columbiana. The absence of this support is due in large part to a public education system that has underperformed for years, and in many respects still continues to do so. For example, in 2018 the Pine Bluff School District was placed under state control due to fiscal distress with five schools categorised as failing (NADG, 2018<sup>[27]</sup>). While there are training facilities such as colleges, technical schools and other institutions where skills can be acquired, arguably more support is needed when the public school is failing to provide the basic foundation of learning.

Inclusivity is a multi-dimensional challenge for the delivery of all forms of government support mechanisms. As such, some federal programmes make deliberate efforts to address equity challenges. EDA has taken many steps towards integrating diversity and equity in their programme delivery. They span from focusing on populations and geographies that have traditionally been underserved (e.g., minorities, rural areas, tribal lands and areas mired in poverty, as defined in Chapter 2) and specific programmes to address equity head on. Congress requires that EDA use 10% of its Public Works and Build to Scale appropriations to fund investments in priority areas that have been identified as persistently poor, meaning counties that have a poverty rate of at least 20% for the last 30 years (United States Congress, 2020<sup>[28]</sup>). The requirement, also known as the 10-20-30 rule, streamlines a focus on providing fair and impartial opportunities by ensuring support is reaching systematically disadvantaged areas across all investment opportunities. USDA has engaged in a comprehensive review of its policies, processes, and programmes to determine how it can advance equity throughout the Department. Along with this review, the Department has taken meaningful steps to advance equity considerations in their programmes. For example, the Rural Development Agency prioritises applications that can receive priority points if their projects are located in socially vulnerable communities, which are defined as communities that score at 0.75 or above on the Social Vulnerability Index (developed by the Centers for Disease Control and Prevention).

However, funding requirements alone do not address some of the core challenges in persistently poor areas, where access to the basic building blocks of a thriving community may be lacking and local economic development organisations and community organisations may benefit from capacity building opportunities. To respond to this, in 2022, as part of the funds received from the Coronavirus Aid, Relief, and Economic Security (CARES) Act, EDA granted USD 5.5 million to the *New Growth Innovation Network (NGIN)* to design and launch a new initiative, *Equity Impact Investments* (EDA, n.d.<sup>[3]</sup>) that will deliver three-year, capacity-building programmes to 120 organisations. NGIN, an independent non-profit organisation that supports economic development practitioners in advancing inclusive economic growth and closing structural opportunity gaps (in partnership with the Local Initiatives Support Corporation (LISC) and the International Economic Development Council (IEDC)) are creating a programme focused on development and delivery of training and toolkits that disseminate knowledge of economic development best practices in serving underrepresented populations. The programme has already reached 60 community-based organisations and 60 economic development organisations that serve underrepresented populations.

Similarly, having recognised the need to do more, the USDA established the *Equity Action Plan* in light of an executive order to advance racial equity and underserved communities. The action plan outlines a strategy to advance equity by:

- Partnering with trusted technical assistance providers to expand access for underserved communities.
- Reducing barriers that prevent underserved producers from accessing USDA farm programmes.
- Expand equitable assistance to USDA nutrition programmes.
- Increase the share of overall USDA infrastructure investments that benefit underserved rural and Tribal communities.
- Increase fair and equitable opportunities for small, disadvantaged businesses (SDBs).
- Uphold federal trust and treaty responsibilities to Indian Tribes.
- Institutionalise civil rights and equity as part of the DNA and culture of USDA.

### Box 3.5. Programmes and initiatives for Equity in Entrepreneurship support services in Canada

Most of the Government of Canada's departments and agencies have a mandate to support diverse and inclusive economic growth across the country. The Canadian constitution has an *equalization clause* which requires the Government of Canada to provide financial assistance to provinces with weak levels of per capita fiscal capacity relative to the average for all provinces. Provinces with low fiscal capacity due to economic weakness are seen to be unable to provide citizens in their jurisdiction with appropriate levels of public services. As a result, access to basic public services among the provinces of Canada is relatively uniform, although major gaps exist between rural and urban regions in all provinces. But improving public service delivery does little to increase economic capacity and major gaps in earnings and employment continue to exist both among provinces and between rural and urban regions.

In addition to this, there are targeted initiatives and departments and agencies that invest in and prioritise projects that are led by and benefit underrepresented groups. A few examples of this include projects that prioritise supporting women, Black and Indigenous entrepreneurs as well as language minority communities. Lastly, supporting an inclusive recovery was a key pillar of the government's COVID-19 relief and recovery programming.

The Canadian **Department for Innovation, Science and Economic Development (ISED)** estimates that by ensuring the full and equal participation of women in the economy, Canada could add up to CAD 150 billion in gross domestic product (GDP). With only 17% of Canadian small and medium sized

businesses owned by women, the government of Canada developed a Women Entrepreneurship Strategy with CAD 6 billion in investments and commitments to encourage access to finance, talent, networks and expertise. It includes an Inclusive Women Venture Capital Initiative, a Women Entrepreneurship Loan Fund, an Ecosystem Fund and the Women Entrepreneurship Knowledge Hub. Other similar programmes exist in the form of a Women Entrepreneur programme administered by Farm Credit Canada, a Women in Technology Venture Fund, a Women Entrepreneurs programme administered by the Business Development Bank of Canada and a Women in Trade programme administered by Export Development Canada.

Regional development agencies (RDAs) in Canada, such as ACOA, FedDev Ontario, PrairiesCan, PacifiCan and provinces provide specific support, consulting and advisory services to women. They deliver two aspects of the WES:

- The Women's Entrepreneurship Loan Fund helps ensure that more women entrepreneurs have the tools and financing they need to succeed. The program provides loans of up to \$50,000 to women entrepreneurs, particularly for start-ups, underrepresented groups, and sole proprietorships which may experience more difficulty in accessing financing.
- The WES Ecosystem Fund, a National and Regional fund, is a four-year programme that runs until March 2023. Notably, the fund:
  - Provides non-repayable contributions to non-profit partners that deliver business services and support programming to women entrepreneurs.
  - Includes an additional top-up to support women entrepreneurs to navigate the COVID-19 crisis.

Through WES, the RDAs seek to increase the number of businesses owned and managed by women and strengthen capacity within the entrepreneurship ecosystem while closing gaps in service for women entrepreneurs.

The Women's Enterprise Initiative is an example of a distinct Canadian regional programme that addresses the challenges that women entrepreneurs face. The initiative, in partnership with PrairiesCan and PacifiCan, helps women entrepreneurs start, scale up and grow their businesses. There is a Women's Enterprise Initiative organisation in each of the four Canadian western provinces (Alberta, British Columbia, Manitoba, Saskatchewan). These non-profit organisations provide a variety of unique resources for women entrepreneurs, including business advisory services, training, networking opportunities, loans and referrals to complementary services.

The Black Entrepreneurship Program (BEP) (Government of Canada, 2023<sup>[29]</sup>), a partnership between the Government of Canada's Canadian Department for Innovation, Science and Economic Development (ISED), Black-led business organisations, and financial institutions, provides opportunities targeted towards supporting Black Canadian entrepreneurs. The programme has an investment of up to CAD 265 million over four years, to help Black Canadian business owners and entrepreneurs build and grow their businesses. It has three main components including a Black entrepreneurship loan fund, a National Ecosystem Fund, and a Knowledge Sharing Hub that conducts research on the challenges for Black entrepreneurship in Canada, led by Carleton University's School of Business and Dream Legacy Foundation.

Launched in 2020, the programme includes:

- up to CAD 53 million to develop and implement the new National Ecosystem Fund. The fund helps Black business owners and entrepreneurs access funding and capital, mentorship, financial planning services, and business training.
- up to CAD 33.3 million in support through the new Black Entrepreneurship Loan Fund that provides loans of between CAD 25,000 and CAD 250,000 for Black business owners and

entrepreneurs. The Government of Canada is also partnering with financial institutions, including RBC, BMO Financial Group, Scotiabank, CIBC, National Bank, TD, Vancity, and Alterna Savings, to make up to CAD 128 million available in additional lending support.

- up to CAD 6.5 million to create and sustain a new Black Entrepreneurship Knowledge Hub that will collect data on the state of Black entrepreneurship in Canada and help identify Black entrepreneurs' barriers to success as well as opportunities for growth.

The Economic Development Initiative (Government of Canada, 2023<sup>[30]</sup>) is an initiative under the responsibility of Innovation, Science and Economic Development (ISED) that supports development for official language minority communities. It is a partnership between federal agencies including Atlantic Canada Opportunities Agency (ACOA); Canada Economic Development for Quebec Region (CED); Canadian Northern Economic Development Agency (CanNor); Prairies Economic Development Canada (PrairiesCan); Pacific Economic Development Canada (PacificCan); Federal Economic Development Agency for Southern Ontario (FedDev Ontario); Federal Economic Development Initiative for Northern Ontario (FedNor) as a part of Innovation, Science and Economic Development (ISED). It provides financial support to projects that encourage economic diversification, business development, innovation, partnerships and increased support for small and medium sized enterprises in official language minority communities (OLMCs). Through the EDI, agencies can invest in projects focused on economic development of businesses and communities with diversified linguistic heritages that help develop capacity, expertise and partnerships.

In addition, the Canadian Government has implemented the Aboriginal Entrepreneurship Program (AEP) (Government of Canada, 2023<sup>[31]</sup>) and federally supports the network of Indigenous Financial Institutions (IFIs) (National Aboriginal Capital Corporation Association, 2023<sup>[32]</sup>) to provide access to capital, access to business opportunities, and support services for Indigenous entrepreneurs and business owners in Canada. The Business Development Bank of Canada offers the Indigenous Entrepreneur Loan (Business Development Bank of Canada, 2023<sup>[33]</sup>) to offer financing to grow or scale Indigenous-owned businesses.

Note: Agency for Toxic Substances and Disease Registry. <https://www.atsdr.cdc.gov/placeandhealth/svi/index.html>; United States Department of Agriculture. <https://www.usda.gov/equity-commission>; Government of Canada (2021), *Women's Enterprise Initiative in British Columbia*, <https://www.canada.ca/en/pacific-economic-development/services/support/womens-enterprise.html> (accessed on 19 August 2022); Government of Canada (2021), *Women's Enterprise Initiative in the Prairie Provinces*, <https://www.canada.ca/en/prairies-economic-development/services/support/womens-enterprise.html> (accessed on 19 August 2022); [Black Entrepreneurship Program - Black Entrepreneurship Program \(canada.ca\)](#); [Prime Minister announces support for Black entrepreneurs and business owners | Prime Minister of Canada \(pm.gc.ca\)](#); [Economic Development Initiative \(EDI\) \(canada.ca\)](#).

The USDA Equity Commission, which began work in 2021, is composed of external stakeholders that are reviewing USDA policies and programmes to provide recommendations to the Secretary. The Commission includes a Rural Community Economic Development Subcommittee that provides recommendations on rural development, persistent poverty, and underserved communities (EDA, n.d.<sup>[34]</sup>). Further examples in Box 3.5 elaborate how different government institutions in Canada take different steps towards promoting inclusivity and equitable access through targeted programmes.

In many OECD countries, the use of online platforms have helped facilitate access to information for rural entrepreneurs, social innovators, and community anchor organisations. For example, in Scotland entrepreneurs looking for support can use Business Gateway, an online, one-stop shop for entrepreneurial support, as a point of first entry. The service then directs entrepreneurs to services within their region, or outside of their region if necessary. Regional Development agencies are able to find and trace the beneficiaries across territorial agencies because of the centralised record management system. In Switzerland, a “no-wrong door” policy across cantonal, municipal, and federal agencies helps build in co-ordination, based on demand from entrepreneurs, from the bottom-up (OECD, 2022<sup>[35]</sup>). In some

regions of Canada, a similar “Business Pathfinder Tool” has enabled entrepreneurs to access government services in a user-friendly co-ordinated way (see Box 3.6 for further examples).

### **Box 3.6. Encouraging simplification for the delivery of entrepreneurship and innovation support in rural areas**

Complementing physical presence with online services can allow for easier navigation of business services according to particular needs. This can reduce complexity and help direct people to the ‘right’ offer in their geographic location without having to relocate. In Scotland, UK, for instance, the main regional development agencies, Scottish Enterprise, Highlands & Islands Enterprise and the newest, South of Scotland Enterprise, work with Business Gateway and local authority councils to deliver support to SMEs through a shared national website (Find Business Support, 2023<sup>[36]</sup>). The aim of the initiative is to help SMEs find business support wherever they may be. Behind this website is a Business Support Partnership where all the agencies meet and share information to avoid confusion and duplication. In addition, the Enterprise Agencies and Business Gateway share a customer relationship management (CRM) system for all businesses engaging in the public sector, to give an overview of previous and current engagement.

#### **Business Pathfinder Tools, Canada**

The Canadian federal government has set up a “Business Benefits Finder” (Government of Canada, 2023<sup>[37]</sup>), which aims to provide businesses with a list of tailored supports. The tool is designed on the basis of questions and answers that help filter hundreds of federal, provincial, and territorial programmes. A key objective of the tool was to develop a site that is fun, interactive and as user-friendly as possible, while providing the best results. It also aims to reach people who might not know what they are looking for and equip them with information on what the government can do for them. Importantly, the process does not collect or track individual information. The more questions are answered, the more customised and accurate the results will be. A team of four people work to keep information up-to-date, summarise programmes and create the right tags for the programmes. While the page was largely oriented towards business growth in the beginning, due to the COVID-19 pandemic it was expanded to include resilience to economic shocks. The tool currently provides information on 16 000 programme streams (some programmes have multiple sub-services) and is advertised through a sustained marketing effort.

#### **Community Futures, Canada**

In an effort to address the specific needs of rural entrepreneurs and bring funding for community support and innovation to rural areas, since 1985, the government of Canada has run the Community Futures Program, which is a community-driven economic development initiative designed to assist communities in Canada’s rural areas. It helps them to develop and implement strategies for dealing with a changing economic environment. They are co-ordinated by federal regional development agencies.

This programme works with 267 Community Futures Development Corporations (non-profits) to provide services to entrepreneurs in their local communities including entrepreneurial and innovation support, strategic community planning and socio-economic development. It also provides support for community-based projects, business financing, business plan consultation, business planning and business start-up assistance. It provides access to capital for small and medium-sized businesses and social enterprises.

### **Business Support Simplification, United Kingdom**

The Business Support Simplification Programme (BSSP) was initiated by the Department for Business Enterprise and Regulatory Reform (now the Department for Business, Innovation and Skills) for English regions. It aims to make it easier for companies and entrepreneurs to understand and access government-funded grants, subsidies and advice with which to start and grow their businesses. It was estimated over 3 000 publicly funded business support schemes existed. Businesses reported that they were confused by the number of schemes, which discouraged them from applying. Streamlining helps save them time and money when looking for support. Better targeted schemes have more impact for businesses and provide the public sector with greater value for money from a leaner system. The 3 000 schemes were reduced to 100 or less by 2010 and made available through the nationally sponsored and regionally administered Business Link gateway. With the new UK government in 2010, this process was consolidated into Solutions for Business. The portfolio will contain only 13 products and will no longer be supported by the administrative regions that ceased to exist 31 March 2011 but rather be offered through an Internet portal.

Source: OECD (2012<sup>[38]</sup>), *OECD Reviews of Regional Innovation: Central and Southern Denmark 2012*, <https://doi.org/10.1787/9789264178748-en>; BIS (n.d.<sup>[39]</sup>), *Solutions for Business: Simplified Business Support*, [www.bis.gov.uk/policies/enterprise-and-business-support/solutions-for-business-simplified-business-support](http://www.bis.gov.uk/policies/enterprise-and-business-support/solutions-for-business-simplified-business-support); Find Business Support (n.d.<sup>[40]</sup>), *Homepage*, <https://findbusinesssupport.gov.scot/> (accessed on 15 June 2023); RPN (n.d.<sup>[41]</sup>), *Homepage*, <https://www.rural.gov/> (accessed on 15 June 2023); CFNC (n.d.<sup>[42]</sup>), *Homepage*, <https://communityfuturescanada.ca/> (accessed on 15 June 2023).

## **Improving access to finance**

### *Funding rural development and innovation*

The focus of this section is on non-government financial intermediaries that serve non-farm rural businesses, particularly new small firms or firms seeking to introduce an innovation. Different processes have evolved to support both rural development and rural innovation. These tend to be highly diverse and vary widely both among states and within states, with some places having an effective set of institutions that provide adequate financial resources, and others having very limited capacity. In particular, access to equity finance is a crucial problem in many rural regions, both to support innovation and to fund more traditional economic development functions. In the relative absence of government support, there is a greater reliance on a variety of private sector initiatives, although some of these are able to access limited government support in the form of loan guarantees or infusions of seed money.

Essentially any firm, organisation or local government has four possible sources of funds:

1. Own revenue from its ongoing operations.
2. Equity capital provided by the owners of the business, or the assets of a government or organisation.
3. Debt financing, which provides funds, but creates a liability that must be repaid in the future.
4. Grants, which can be considered to be donations that do not have to be repaid, but that contain restrictions on their use.

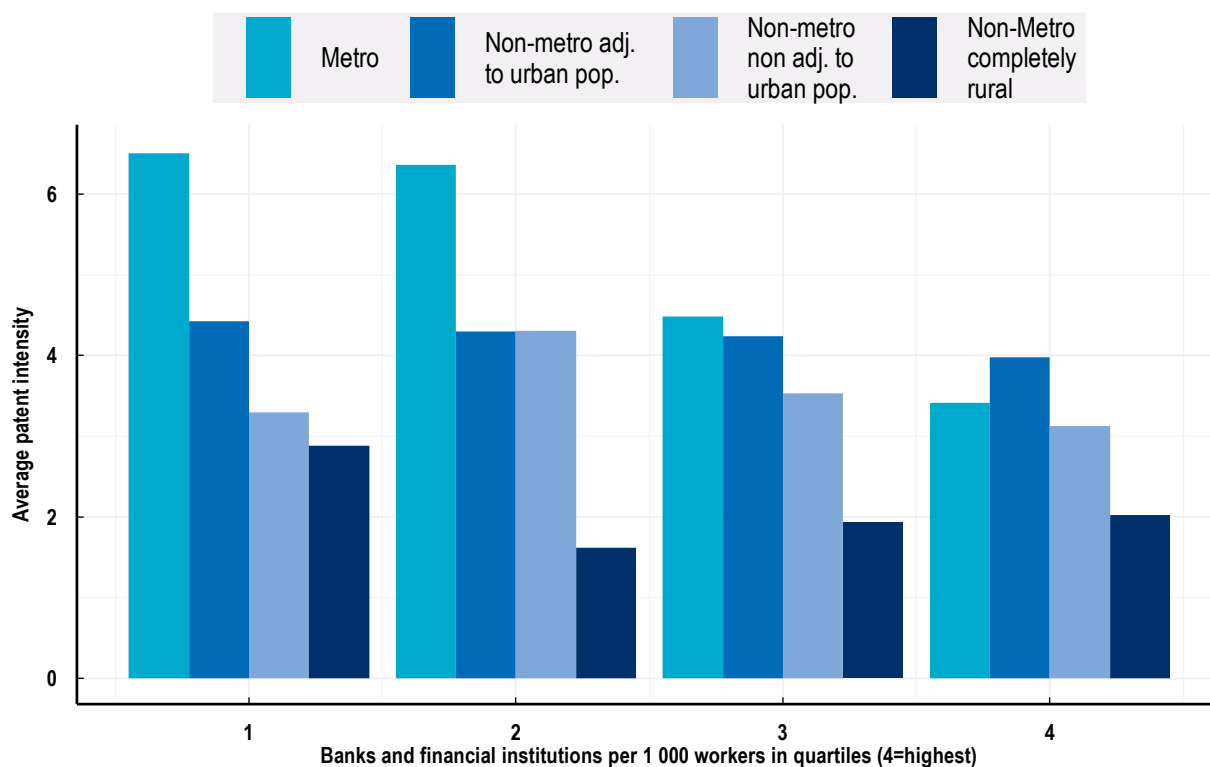


The mix of sources of funds varies considerably both by type of entity and across the range of firms, organisations, and governments. For any entity, adequate access to finance is necessary if it is to carry out its intended function. In particular, if a firm, organisation or government is going to introduce an innovation it almost always requires additional funding to do so.

Access to all forms of financial capital is typically more difficult for firms, organisations and governments in rural counties than in major urban centres. Limited access to finance leads to low innovation performance for rural firms as compared to firms in metropolitan counties (Figure 3.11). Some of these gaps reflect structural differences between urban and rural places that lead to inherent challenges. For example, rural firms are typically small and are unable to access equity capital through a listing on a stock exchange, rural governments have small populations to tax, and rural organisations may not attract the attention of wealthy individuals who can provide philanthropic support. Rural lenders may lack expertise to assess atypical loan requests and there may not be many lenders operating in a rural area, which reduces competition. Typically, this rural disadvantage, however, is fairly small for conventional forms of finance for households, like home mortgages and automobile loans. Similarly, established farms have ready access to finance from commercial banks and specialised lenders like the Farm Credit System and the credit arms of machinery manufacturers, as well as from USDA loan guarantees and other financial instruments. Finally, firms with rural branches (or subsidiaries) of large publicly traded firms receive funding from their urban-based parent, which means they don't need access local sources of finance. Thus, large parts of the rural economy face only slightly more difficulty in accessing finance than do their urban peers.

### Figure 3.11. Banking and financial institutions and patent intensity

Average patents per inventive occupation associated with banks and finance institutions, by quartile and territory



Note: The patent intensity is computed by dividing the number of patents by the number of innovative occupations in a given county. Panel B shows the correlation between the numbers.

Source: Dotzel, K. and T. Wojan (2022<sup>[43]</sup>), "An occupational approach to analyzing regional invention", <https://nces.nsf.gov/pubs/nces22202> (accessed on 15 July 2022); United States Patent and Trademark Office; Bureau of Economic Analysis.

Established non-farm rural businesses are also thought to experience only a slightly larger burden in accessing loans than do their urban peers. However, the funding gap can be high for entrepreneurs wishing to start a new business, especially if that business is innovative and its survival risk cannot be easily assessed. Firms seeking to expand into more distant markets may also face a challenge getting additional funding if they need significant amounts of money that are beyond the ability of their local lenders to provide. Equity finance can be a major challenge for rural firms because there are few potential investors, nor is there the local capacity to help broker and set up such deals. Additionally, rural local governments may have difficulty in qualifying for grant or loan support from national or state governments if they lack the capacity to provide matching funds or even the ability to produce an acceptable application for support. Similarly, rural organisations typically lack the capacity to identify possible sources of funding.

A crucial gap for rural firms, governments and organisations is an inadequate level of financial equity. Without sufficient equity funds, either in the form of cash or assets that can serve as collateral, it is hard to find funding because lenders are concerned that if they are not repaid there will be insufficient money after liquidation to fully reimburse them. Even if a loan is approved for a high debt-to-asset value borrower, it will likely carry higher interest rates or more restrictions on how the money can be used. For grants, fund providers may also be concerned that the grant objectives may not be met if the recipient lacks the capacity to properly administer and utilise the funds. Further, many grants require adequate matching funds for applicants to be eligible, so those places and organisations without adequate equity must compete for a smaller set of grant opportunities. While rural areas in other countries also face these difficulties, they are more challenging in the United States because there is a much lower level of intergovernmental transfer of funds from national and state sources to local governments, and much less funding for rural economic development policies that support firms and organisations.

Innovative specialised financial intermediaries have been established in some parts of rural America to address these particular financing challenges. Often they are rural versions of parallel programmes that exist in marginalised or underserved urban areas. However, fundamental conditions among rural areas differ (e.g., low density and high transportation costs) that can lead to higher costs and lower recovery rates on foreclosed assets. While these intermediaries are generally highly successful, they are not present in most rural areas and many can have difficulty in generating the additional funds to expand their activity. Many of these entities are organised as non-profit corporations and most provide loans at below market rates and/or are willing to accept a lower position in receiving repayment if the business fails. Most also provide some form of supervised lending where borrowers are required to enrol in programmes to improve their managerial and technical capacity and must make regular reports to the lender on their activity. This gives the lender a greater chance to intervene in a timely manner if the business is stressed, which in turn improves the success rates of such lending practices.

#### *Rural non-bank financial intermediaries*

There are also a number of rural non-bank financial intermediaries that may offer favourable terms to rural firms—many of which have an expressly social purpose and non-profit orientation (Table 3.2). Importantly, non-bank financial intermediaries in rural communities tend to have a good sense of the communities and people that they serve and are able to provide targeted services to their clientele but also understand the nature of the local economy and can evaluate the riskiness of projects in different ways. Others non-bank intermediaries such as traditional venture capital (VC) may not be well suited to rural areas because most firms are small with limited growth prospects and are removed geographically from the locations of the core venture capital industry.

**Table 3.2. Rural non-bank financial intermediaries**

|   |  |
|---|--|
| Community Development Banks (CDBs)                  | Provide loans to individuals and firms that cannot qualify for credit under typical terms. However, the loan may also require the borrower to comply with greater oversight or other conditions, which can reduce default risk. CDBs also can house real-estate development arms and operate subsidised housing projects. Other activities may include operating Small Business Investment Corporations that hold equity positions in small businesses and that receive financial support from the Small Business Administration.  |
| Community Development Corporations (CDCs)           | CDCs offer a mix of for-profit and non-profit subsidiaries to address the distinct needs of community members. The for-profit portions of the organisation also generate additional funds for non-profit activities.   |
| Community Development Financial Institution (CDFIs) | CDFIs are US Treasury-certified entities that make loans to qualified individuals, firms or organisations. To qualify, the CDFI applicant must demonstrate a viable business model that serves an underfunded client group. Some CDFIs are established as non-profits to serve a distinct community that has difficulty in obtaining loans. Other CDFIs are founded as for-profit entities but with a distinct social purpose that mitigates their incentive to maximise profits.  |
| Small Business Investment Corporations (SBICs)      | SBICs are private companies that are licensed and regulated by the SBA to provide debt and equity finance to qualified small businesses. SBICs can include free-standing entities or subsidiaries of other firms, such as banks or development organisations. Each SBIC establishes an initial equity pool of investment funds, and this amount is doubled by the SBA. They typically focus on existing profitable businesses that have sufficient cash flow to repay loans.   |
| Local Initiatives Support Corporation (LISC)        | The LISC was established in 1980 as a non-profit foundation to provide grants to deteriorating communities and neighbourhoods seeking to attract private sector financial and technical resources to support their re-development. LISC partners with other funders on housing and business support activity in various communities. While it initially had an urban focus it has expanded into distressed rural areas. Rural LISC was created in 1995 to address the challenges in rural areas. Rural LISC provides capacity building grants, affordable capital, and equity to a network of over 140 rural community-based groups in 44 States and Puerto Rico. To date, they have mobilised \$582.2 million in grants and loans for partner organisations plus additional \$2.17 billion in affiliate financing. Rural LISC strives to bring partners to the table to help them build and leverage resources and develop solutions. One example is Go Forward Pine Bluff, the organisation spearheading the transformation and reimagining of Pine Bluff through targeted projects, grants, and initiatives. In addition to increasing access to capital in rural areas, Rural LISC strives to bring greater attention to “rural areas in distress”, educate public and private decisions makers on rural capital needs, and demonstrate the value of investing in rural areas (Rural LISC, 2022 <sup>[44]</sup> ). LISC funds must be matched dollar for dollar by local funds. In addition, local lenders and businesses must be full participants in the funding proposal and the community must demonstrate that it has the capacity to carry out the proposal. |
| Rural Focused Venture Capital Firms                 | The traditional venture capital (VC) model is not well suited to rural areas because most firms are small with limited growth prospects and are located a great distance from where players in the core venture capital industry tend to be headquartered. There are a few examples of successful rural investment firms that act like traditional VC firms, but generally these firms focus on sectors more common to rural regions such as agricultural innovation or firms involved in technology transfer. Importantly they may have more of a portfolio investment strategy and are not looking for a fast exit after rapid short-term growth. Some rural VCs are subsidiaries of other types of rural non-bank intermediaries described in this list.  |
| Credit Unions and Other Co-operatives               | In some states, credit unions have formed subsidiaries to finance small businesses in the communities they serve. This activity is seen as being compatible with the credit union mission of providing financial support to members as it can improve local employment prospects and help foster a better quality of life. Similarly, other forms of co-operatives, such as rural electric co-operatives or farm supply co-operatives, have also formed a subsidiary to invest in rural businesses that are vital to the ongoing survival of the community in which they operate.  |
| Angel Investors                                     | Angel investors can operate under a wide variety of organisational forms since they are the result of a group of individuals pooling their money to invest in either new or existing businesses. Typically, these firms are interested in making equity investments in firms that are located near the investors’ homes as this increases their ability to assess investment opportunities and monitor firm performance. While angel investors are a form of venture capital, they can be a more patient form and one that does not look for excellent performance quickly. However, they do not accept the types of high-risk opportunities that are the focus of traditional VC funds. Many of these sources of finance can be thought of as having at least a partial social enterprise orientation, or a dual bottom-line, where profit and community benefits are jointly valued. While some provide conventional loans, they typically have a different metric for assessing credit risk than a commercial bank. Most importantly, most of these entities have some way of either providing equity finance or some form of “patient” capital that does not over-burden a firm with too much debt. In addition, these entities generally operate with a fixed pool of funds, which means that they cannot afford to make many bad funding choices. When compared to a government lending or grant programme they are likely to be more conservative, but they have the advantage in most cases of employing people embedded in the community who may already have detailed knowledge of the inherent risks to each investment opportunity.                        |

## Broadening the definition of innovation in OECD rural regions

In rural areas the combination of distance, low population density and limited opportunities to take advantage of economies of scale combined with the large role of natural resources leads to a “low-density economy” (OECD, 2016<sup>[45]</sup>). Such differences create inherent opportunities for trade because comparative advantages differ, and the resulting urban and rural connectivity can create benefits for both urban and rural areas (OECD, 2014<sup>[46]</sup>).

Building economic connectivity across different geographies may reduce disparities and increase opportunities for innovation across urban and rural areas. According to a recent report by the National League of Cities (NLC) and the Rural Community Assistance Partnership (RCAP) (2021<sup>[47]</sup>), these are facilitated by an inclusive innovation ecosystem, access to broadband and digital inclusion, aligning workforce skills with industry needs, and an approach that engages with regional organisations and businesses.

Innovation has played a central role in rural areas of OECD countries since the early stages of the industrial revolution in the 19<sup>th</sup> century. Improvements in agricultural and mining technologies underpinned the rapid growth of manufacturing in urban areas (Mokyr, 2018<sup>[48]</sup>). Over the 20<sup>th</sup> century, continuous innovation allowed ever larger increases in productivity in resource extraction and first stage processing, which in combination with falling transportation costs, has reduced the share of household income spent on food and released large amounts of labour for other occupations, primarily in urban areas. Broadly speaking, two distinct innovation processes can be distinguished. One involves a formal systematic search process that has evolved from the model proposed by Schumpeter to the current, regional innovation systems approach (McCann and Ortega-Argilés, 2016, p. 24<sup>[49]</sup>). Investments in formal R&D often lead to inventions. When implemented, the production gains from these inventions more than cover the underlying costs of developing the innovation, thereby generating a positive rate of return. This process is associated with measurements of innovation that focus on formal R&D outlays and patents developed.

A second process is older and predates the general adoption of the scientific method and the Industrial Revolution (Mokyr, 2018, p. 17<sup>[48]</sup>). Innovation in earlier times relied upon a combination of serendipity, individual intuition, and efforts to remove impediments to improved well-being. This type of innovation can be characterised as “user-innovation” as it stems from an individual being confronted with a problem that is pressing enough to warrant substantial efforts to find a new approach to resolving it (Baldwin and von Hippel, 2011<sup>[50]</sup>). A classic example is James Dyson who invented a new type of vacuum cleaner because he was unhappy with the performance of existing models (Roy, 2016<sup>[51]</sup>). Crucially, both types of innovation continue to take place, albeit at different rates. In particular, Baumol (2010<sup>[52]</sup>) sees the innovative entrepreneur as a useful complement to large-scale innovation systems, with individual entrepreneurs and small firms playing key roles in producing “revolutionary breakthroughs” (Baumol, 2010, p. 30<sup>[52]</sup>). In order to appreciate the extent of innovation in rural areas, a broad definition is required that goes beyond the most common approach of measuring expenditures on research and development activity as the main input and patents registered as the main output.

The broader definition of innovation recognises that many types of new ideas and approaches can improve society. New ways of providing services by governments, new forms of civil society organisation or new activities established by community organisations are all innovations that improve well-being (for examples, see Box 3.7 and case studies in Annex 3.A). This broader notion of innovation also encompasses actions that may not directly add to productivity of the workforce, but they make an improvement in the communities where firms and workers are located. Further, in rural areas many goods and services that are common in urban locations are not readily available from investor-owned firms or local government. As a result, people in rural communities have often self-organised to jointly provide alternative institutions that deliver the services they desire (for examples, see Box 3.7 and case studies in Annex 3.A).

The broader approach is particularly valuable when innovation is seen as a potential source for economic development in rural areas (French, 2021<sup>[53]</sup>; Federal Reserve Bank of St. Louis, 2022<sup>[54]</sup>), instead of only a key factor for explaining national economic growth (Aghion and Howitt, 1990<sup>[55]</sup>). A broader perspective on innovation can include: improvements in management, logistics or labour relations at firms that lead to increased productivity. It can also include similar innovations by both governmental agencies and various for-profit and non-profit firms that provide services or other non-patentable innovations. Clearly such innovations can lead to better quality of life for households and increased productivity for firms and organisations.

### **Box 3.7. Example of Innovation in a broader context**

#### **Ducks Unlimited**

The organisation Ducks Unlimited was founded by a group of duck hunters in the United States in 1937 to improve habitat for waterfowl, mainly on active farmland. The main way it does this is by paying farmers to maintain wetlands on their property, rather than drain them to add to planted land. Hunters support Ducks Unlimited because it improves their hunting experiences and the funds they donate are used to improve habitat, which increases migratory bird populations. Importantly, the initial focus of the programme was in the prairie provinces of Canada where most of the birds shot in the United States are hatched. The innovation that US hunters found was a mechanism to influence the behaviour of farmers in another country who had no direct interest in providing better habitat.

### ***Domains and sources of rural innovation***

Discussions of innovation are commonly restricted to firms in the private sector. Profit-oriented businesses may undertake a search for an innovation if they believe it will enhance their competitive position. Government may support R&D, or even early stage implementation of new inventions where it sees evidence of market failure that limit firm innovation efforts, but the main focus of most innovation analysis remains on entrepreneurs and larger firms (Grossman and Helpman, 1994<sup>[56]</sup>; Nelson and Winter, 1977<sup>[57]</sup>; Shearmur, Carrincazeaux and Doloreux, 2016<sup>[58]</sup>).

In rural areas where markets are small and competition is limited, it may be difficult to find an existing product or service that meets the needs of an individual or firm. Clearly the combination of the Internet, e-commerce and package delivery services has improved market access considerably but has not fully addressed all issues. Further, in rural areas it may be harder to observe non-market solutions developed by peers than in a city where proximity provides better chances to network with someone who has solved a similar problem. This suggests that in rural areas, particularly for those economic activities that are not common in urban areas, such as resource extraction, there may be difficulty in finding external solutions for production problems. This can lead individuals in rural areas to engage in a search for their own solution - user innovation, which in turn can trigger an entrepreneurial action. Thin and incomplete markets have consequences for competition as well as innovation.

Rural areas also face issues arising from more limited government activity. Public services are both more limited and more costly in most rural areas, not only because actual cost of provision is higher but also because local governments lack either the fiscal capacity or the authority to deliver many of the services that are available in large cities. Where conventional means of providing public services are costly, local governments are compelled to explore innovative ways to deliver services in different ways that provide equivalent outcomes (OECD, 2021<sup>[59]</sup>). Moreover, the combination of limited public services and a limited set of services provided by private firms has stimulated local organisations to in rural areas to find ways to

provide innovative ways to fill this gap. This makes the “third sector” a significant source of innovation in rural regions.

Civil society can play a key role in filling gaps by providing private and public services. Social enterprise in the form of co-operatives and other not-for-profit firms has a long tradition of expanding the range of services when investor-owned firms cannot generate a high enough rate of return to justify operating in a small rural community. Similarly, community organisations, such as volunteer fire brigades, provide an alternative way of delivering essential public services in places where a professional fire department is too costly. Thus, when assessing innovation in rural areas it is important to go beyond an examination of the efforts of private firms. Moreover, in those rural places where both local government and civil society are engaged in finding ways to provide a more complete set of foundational services there may also be better opportunities for private firms to undertake innovative actions that increase their competitiveness that leads to enhanced local development.

The OECD (2022<sup>[60]</sup>) explored how different methods of defining and measuring innovation can have an impact on the way we understand innovation in different contexts. Chapter 2 of this report also sets out how we approach innovation through a rural lens, which prioritises the original Oslo definition of innovation, through measurement mechanisms that adjust for the structural components of rural and non-metropolitan areas that differ from urban definitions.

Currently rural innovation can largely be thought of as having one of three distinct origins.

- The first is innovation that originates in rural areas either through formal efforts to identify new products or services or new processes to produce products or services. In these instances, rural innovation is driven by perceived local opportunities for higher income, better productivity, or more efficient public service delivery. This is in line with the traditional Oslo Manual definition of innovation often adopted by national governments (OECD, 2022<sup>[60]</sup>).
- A second source of rural innovation originates in urban areas, but the innovation effort is explicitly intended for use in rural areas. In this case, urban firms produce goods with the primary goal of serving rural customers. For example, the Firestone Tire company was started to produce tires for automobiles, but its founder Harvey Firestone grew up on a farm in Columbiana, Ohio and was aware of the disadvantages of the all-steel tractor wheels in use in the early 20<sup>th</sup> century. He led Firestone’s initiative to develop the first pneumatic rubber tractor tires using his family farm in Columbiana as a test site. The first tires were sold in 1932 and quickly became a major innovation supporting American agriculture.
- The final stream of rural innovation is made up of innovations that were first applied in an urban context but were then transferred to rural areas. For example, the internet was initially developed by the US Department of Defense but was quickly adopted by farmers as a way to obtain better commodity price information (James and Estes, 1996). All three innovation streams provide clear direct benefits to rural firms, households, and communities, while also providing indirect benefits to urban areas in the form of better or cheaper goods and services that are exported from rural locations.

In sum, we can identify the three sources of innovation in rural areas as the following:

1. Formal process of innovation based on local opportunities in rural areas.
2. Innovation developed in urban areas explicitly for rural challenges.
3. Innovation adopted from the urban context.

Of the three streams, the first two clearly lead to rural innovations, while the third stream may be less clearly innovative. If a rural firm or organisation introduces a product or process that was previously adopted in an urban context in exactly the same way that it is used elsewhere then this may be more appropriately characterised as technology transfer and not innovation, even though the approach or

product is novel in the rural region. However, if the technology undergoes significant modification to be successfully applied in a rural context, then at some point the new way of using the technology may be considered to be sufficiently different from its standard use to be considered an innovation. For example, laser gun sights used on guns in rural areas is clearly a form of technology transfer, but when a laser gun sight was first adapted to be used as a guide to allow a saw operator to make a more precise cut when sawing a log into boards, this was a novel application of the technology to a new production process.

In addition, in rural areas it is important to recognise that innovation often occurs outside the traditional focus of formal research efforts to identify new products or processes. These efforts are typically seen as involving research by industry or government to generate a patentable idea. Patentable research is important in rural areas, particularly for research conducted in urban areas with explicit intent for the outcome to be applied in rural areas. This would include agricultural research conducted by national government or universities to improve agricultural productivity or by companies that supply farm equipment or pesticides to farmers. Similarly, mining and forestry machinery is typically patented and provided by large multi-national companies with urban research centres.

First-stage processing of natural resources also largely occurs in rural regions because it involves a weight reducing activity that lowers subsequent transport costs and can often reduce product deterioration in the case of agricultural or fish products. Once again, much of this technology is developed and refined in urban areas, particularly for large scale processing establishments. However, a considerable share originates in rural areas as small-scale local firms develop processing technology to meet their specific needs.

In the United States this involves local co-operatives that provide inputs and marketing services to farms, but rural co-operatives also account for a considerable share of electricity, telephone and now broadband infrastructure in rural regions. These co-operatives were created by local actors when investor-owned firms determined that the cost of providing goods or services did not meet the required profit margins. Because members are both owners and users of co-operatives services, they capture both the revenue that a conventional firm would extract and also recognise the benefits from the consumer surplus that an investor-owned firm or a government entity cannot capture. This makes the total benefit to member-users high enough to justify undertaking an activity that is too costly for investor-owned firms, or even governments. This third-sector activity is a source of significant innovation that, while almost completely local in terms of its impacts, has a significant impact on both the quality of life and, in some instances, on the productive milieu in the community. Additional examples of the innovative nature of community organisations and encouraging experimentation in partnership with the public sector are available in Box 3.8.

Similarly, because local governments in rural areas face the typical challenges of long distances, low population density and an inability to capture scale economies, they often must find innovative ways to provide essential public services. The problems of rural government are typically exacerbated by weak fiscal capacity which limits their available revenue. With limited resources, some core “public services” in rural areas are not provided by government but are the responsibility of volunteers. For example, while in cities fire-fighters are professionals who are directly employed by local governments, in rural areas they are almost always volunteers who receive limited financial support from the government, which is supplemented by donations from residents to cover expenses.

### **Box 3.8. Promoting a culture of experimentation**

#### **Regulatory innovation sandboxes**

In 2016, the first regulatory innovation sandbox allowed experimentation in the fintech<sup>2</sup> industry. According to a recent study, since then 73 fintech sandboxes have been established in 57 countries, with more than half of them being established between 2018 and 2019 (World Bank, 2020<sub>[61]</sub>). An

Innovation Sandbox is a type of regulatory sandbox that encourages innovation, suspending certain regulatory requirements while innovators experiment on whether outcomes of innovations may develop useful innovations that may solve greater issues or prove whether regulations may be needed. Regulators across the globe are using regulatory sandboxes to provide a safe environment for emerging technologies to test regulatory boundaries.

A recent report showed that they tended to serve as a base to test the necessity of regulations, facilitate firm start-up entrepreneurship, and foster new partnerships. A few examples include a Fintech Sandbox in Australia and a Digital Sandbox in the United Kingdom. Additionally, initiatives in the agri-tourism sector of the Jura region of Switzerland fit a similar definition.

### ***Fintech Sandbox in Australia***

The Australian government established an Australian Licensing Exemption Scheme through the Australia Securities and Investment Commission that allowed exceptions for eligible fintech companies on certain products and services for up to 12 months without a license. This allowed firms to begin operating quickly, with low barriers to entry for new fintech companies through lower compliance costs. The firm is required to notify the ASIC of their plans but remains temporarily free to experiment on product and services offered.

### ***Digital Sandboxes in the United Kingdom***

Starting with the beginning of the global COVID-19 pandemic in May 2020, the Financial Conduct Agency in the UK began piloting a “digital sandbox.” The initiative is currently in its initial stages that attempt to provide guided support for firms looking for a digital testing environment with the aim of addressing some of the challenges of the pandemic. The initiative has a specific goal and is administered through a call for applicants who are given the right to participate based on whether their aim is to accomplish one of the targets of the administration. Those targets include preventing fraud, improving the financial resilience of consumers, and improving access to finance for small and medium-sized enterprises (SMEs).

### ***Regulatory exemptions in tourism for the region of Jura, Switzerland***

While not directly marketed as such, two examples of regulatory sandboxes with the specific target of developing the tourism sector are found in the mountainous region of the Jura, in Switzerland. Both initiatives were driven from the bottom-up and included the co-ordination efforts of the regional innovation system agencies. The first one was built in collaboration with TalentisLab, which requested exemption from environmental protection legislation that limited activities associated with eco-tourism. After an application for exemption and a call for proposals, a new initiative to encourage eco-responsible tourism is being put into place that provides housing at various camping areas.

Second, exemptions from visiting publicly protected places while visiting local towns, through an initiative that provides access to a “secret route” (Ville de Porrentruy, 2023<sup>[62]</sup>) to groups of tourists that have acquired digital keys. The community of Porrentruy, alongside the regional innovation system’s agency services, worked on reducing regulations on public access to touristic sites. This has allowed the town of Porrentruy to gain visibility and attractiveness, which is a welcome development given the business slowdown due to COVID-19.

### **Innovation labs**

Another increasingly popular way to encourage innovation that has taken flight are “Living labs,” “Fab labs” and similar initiatives to bring previously inaccessible tools to budding innovators. The Interreg Europe Policy Learning Platform (Interreg Europe, 2021<sup>[63]</sup>) is one of the agencies supporting the increased use of such tools that create a place to learn, experiment and enjoy the process of innovation.



While the different labs vary, they generally provide a mix of services such as the skills, material and advanced tools to participants that can include university-industry collaborations and provide prototyping services for SMEs.

### ***Living Labs, Portugal***

The experience of implementing Living Labs in Portugal dates to the 1990s. Since then, they have been of crucial importance for economic, social and business development of the country. To date, 18 projects have been developed, some of which are part of the European Network of Living Laboratories (ENoLL). There are diverse types - local, sectoral and thematic Living Labs - organised in regional, national, and transnational networks. Sectoral and thematic Living Labs include labs for energy, well-being and health, e-government and digital participation, sustainable environment, mobility, rural and territorial development, and industry and logistics.

The Smart Rural Living Lab (SRLL) was founded at the end of 2007 and is located in Penela in central Portugal. It aims to develop new methods and technologies to identify the weaknesses and strengths of rural areas, find references for sustainable rural development, export the acquired knowledge to other rural areas and collaborate with citizens to promote rural areas. Key local issues are related to aging population and the weak development of the economic fabric. The goal of SRLL is to promote innovation and development in the exploration of innovative technologies, methods, and applications to achieve better integration of rural areas into the global supply chain, create new services/ systems/ products and business opportunities, and promote citizen participation.

SRLL has established itself as a centre for innovation, best practices, and sustainable development of rural areas where the agri-food and forestry sectors are strong. One such problem is a shortage of shepherds to take care of sheep needed to produce Rabaçal, a local cheese (protected designation of origin). In response, a Smart Farm concept called “[FarmReal](#)” was tested (Farmreal, 2023<sup>[64]</sup>). This involves investment in a community herd via crowdfunding and the adoption of individual animals by investors who would then survey their physical activity and milk production digitally via specific sensors. Users become “virtual shepherds” of real goats and can follow the day-to-day life of the adopted goats, monitor their behaviour and socialisation through updated photos and videos, their GPS location, as well as the area and amount of vegetation consumed by the herd.

Source: Smart Rural 21 (n.d.<sup>[65]</sup>), *Penela*, [https://www.smartrural21.eu/villages/penela\\_pt/](https://www.smartrural21.eu/villages/penela_pt/); Farmreal (n.d.<sup>[66]</sup>), *Homepage*, <https://farmreal.pt/en> (accessed on 15 June 2023); Deutscher Bundestag (2018<sup>[67]</sup>), “Reallabore, Living Labs und Citizen Science-Projekte in Europa”, <https://www.bundestag.de/resource/blob/563290/9d6da7676c82fe6777e6df85c7a7d573/wd-8-020-18-pdf-data.pdf>.

### ***Living lab e-Health and Smart Energy Grids, Eindhoven, The Netherlands***

As part of the Brainport Development Cluster, Eindhoven also houses an example of a living lab that focuses on the development of time-limited trial runs for new products and services. Brainport works with local stakeholders, higher education institutes, government and a consortium of private sector parties, to focus on experimenting new solutions to pre-existing issues. Through Living labs, individuals are given a license to test out a new initiative in a short time frame to get feedback as soon as possible, and determine the feasibility, benefits and scalability of such a project. For example, Living Lab eHealth provides elderly people with the opportunity to try out new medical and healthcare services and a Smart Energy Grids project provides new energy solutions for social housing.

### ***The Center for Innovation and Entrepreneurship in CalPoly, United States***

As a service to students, led by students, the California Polytechnical State University creates a space for budding entrepreneurs to use materials involved in developing new products and services in a variety of sectors including but not limited to manufacturing, farming and services. This initiative provides some of the more advanced, and often more expensive tools to experiment with innovative

ideas. Some of the materials available for students to use include vinyl cutting, 3D printing, virtual reality, computer numerical control (CNC) routing and laser cutting resources.

The student-run organisation also offers workshops for learning engineering and artistic skills, as well as small grants that facilitate the development and starting of new student-led projects. Funds for grants are targeted towards bringing ideas from the innovation sandbox to entrepreneurial fruition.

### **Experimenting in the public sector**

The use of “serious games” to support governments and make various options for courses of action visible through systems thinking and futurism has been increasing in the policy arena. This can be a good option to replace conventional brainstorming sessions with sticky notes and drawings on a board.

The European Commission (EC) Joint Research Centre (JRC) has worked with experts in these types of games at the Hawaii Research Center for Future Studies to create the Scenario Exploration System (SES). Participants explore their long-term objectives against scenarios and consider various stakeholders. By creating a realistic journey towards the future, SES generates a safe space to uncover perspectives and thinking, with a view to simulating possible responses linked to issues of interest to the participants.

SES is available under a Creative Commons licence, which allows anyone to freely use and modify the game, as long as they share the results of their adaptation under the same conditions. The OECD and Observatory of Public Sector Innovation has made available detailed instructions and templates to be freely downloadable (Observatory of Public Sector Innovation, 2023<sup>[68]</sup>)

### **Augmented reality in policy making**

Governments are also realising the potential of AR and VR for public good. Similar to gamification, governments and their partners are using technology as tools to unlock new insights.

For example, in the United States, the New York City suburb of New Rochelle was recently named a 2018 Bloomberg Mayor’s Challenge champion city for its pioneering use of AR and VR to engage residents in plans for new buildings and public spaces in the city. Through this innovative project, residents can use AR apps on their smartphones to envision what a new park might look like, employ interactive software to design streets and use VR headsets to review different options for buildings and provide their opinions.

Source: OECD (2021<sup>[69]</sup>), *Embracing Innovation in Government: Global Trends 2020*, <https://trends.oecd-opsi.org/> (accessed on 15 June 2023).

## **Conclusions**

A significant amount of innovation is taking place in many rural areas of the United States, particularly when innovation is defined to include social innovation and innovations in local government practices. However, there appears to be a high degree of variability in both the types and levels of innovation across rural communities.

Firm-level innovation clearly occurs in rural areas and can be disruptive.<sup>3</sup> Most rural innovation, however, is less visible and its impacts are mainly felt in the immediate vicinity of where it is implemented. This is true for firm-based innovation, social innovation and government innovation. Although the benefits can be relatively small they can make a difference in the community where they take place by either making it more competitive or a better place to live. Efforts to identify rural innovation have largely focused on firm-level analysis, which remains the focus for national policy in most countries.<sup>4</sup> When innovation is more

broadly conceived to include new ways of delivering public and private services the scope for rural innovation expands considerably. Innovations by organisations and by local governments are common in rural America. Each of the three case studies demonstrate this type of innovation, even where innovative products and processes were not seen. Since its inception, OECD Rural Policy has promoted a bottom-up, place-based approach to rural development. This reflects the recognition that each rural place faces a unique set of opportunities, resources and constraints, and must find its own solution to reaching its objectives. Essentially this is an argument that rural communities have no other choice than to innovate. It is hardly surprising, therefore, to find examples of social and public innovation in rural communities.

While many rural communities face challenges in improving the skills of the local labour force they can adopt significantly different approaches to resolving them, depending on their circumstances and the skills they need. In Gallup the skill development programme is being directly managed by the Council of Governments, while in Pine Bluff it is driven by the local Community College. In Columbiana, skills development is a more complex process with firms, community leaders and school officials seeking ways to integrate formal education with experiential learning so graduates are better prepared for the mix of available jobs. Further complicating the process is the variability among state governments that set their own policies and priorities for education and workforce training.

In many cases the innovations are in principle transferrable to other places, but there is rarely a mechanism to make this a reality. Few of these innovations are patented and few people visit small towns looking for innovative ideas to emulate. While technology transfer processes exist in the United States, the focus is on larger scale innovations that can have a significant individual impact on relatively large economies.

Because local governments in the United States are highly reliant on property taxes to fund their activity there is intense competition to attract new businesses and new residents that can add new tax revenue. This competition often leads to an unwillingness to co-operate with nearby jurisdictions because of a common belief that helping another community leads to a weaker outcome. In addition, it also leads to communities competing to offer lower taxes as a way to attract new development under the belief that some revenue is better than none, especially if the incoming firms or households result in increased economic activity and second-round local benefits. Even when a specific community tries to collaborate with others it may not find many willing partners. One of the main objectives of EDA is to provide incentives for collaboration. This has clearly been successful in Gallup but less so in Pine Bluff and Columbiana where intergovernmental co-operation is more limited.

All three places relied on the assistance of external actors to support their development effort, even though the underlying vision for development appeared to have been drawn from within each community. These actors included federal agencies, in particular EDA and USDA, but also a number of non-profits that focus on supporting community development. The presence of this support seemed to be instrumental in their successes which raises two questions. The first is the extent to which other communities have access to this type of support, and the second is how might a community without similar support undertake development. In the US system, it is difficult for communities to seek support, which has the advantage of there being a self-selection process that requires a community to first decide it wants to engage in development.

All three places relied on support from an external source of funding that had its own interest in seeing development occur. In essence a public-private partnership was formed with the private party contributing a considerable amount of money and in some cases specific expertise. The infusion of funds provided several benefits. The first was the ability to begin acting quickly, which created local interest. Second the initial infusion of funds bolstered local actors' credibility, which enabled them to gain access to other sources of funds. Third, the partner was able to undertake complementary investments that were co-ordinated with the community efforts.

In all three places it was important to build social cohesion before undertaking significant traditional economic development activity. Many of the initial acts were fairly small but accomplishing them provided

some sense of progress in the community and expanded local support. Actions included storefront remediation on Main Street and improving pedestrian spaces to attract more people downtown and working to increase the amount of retail activity in city centres. None of these concepts are particularly innovative in and of themselves, but in each community they were carried out in a different way.

Finally, while the US government provides a large amount of programme and project funding to rural places, it does not provide a framework for using these funds in a systematic way. This makes it incumbent on each rural community to identify a specific development strategy that it can use to apply for specific project support. It is this situation that leads to the importance of innovation by local government and innovation by civil society in a community. Because each rural community is unique in terms of its development opportunities and the proper sequence for carrying out steps, every place has to have a development approach in the sense that it has to fit their unique situation. However, the US approach can leave some places with a bleak future if they cannot assemble the internal capacity to begin the development process.

However, because many local governments in rural places typically lack adequate capacity to define and implement a development strategy, an industry has developed that supports the community development process. The entities in the process are diverse in nature and include: community development specialists at Land Grant universities, as well as faculty from other higher education entities; a variety of non-profit firms, many of which are funded by philanthropical organisations; and some for-profit consulting firms. In addition, EDA funds EDDs, to provide capacity to local (including rural) communities to assist with development strategies, and University Centers, to provide technical assistance to communities looking to establish and carry out development strategies. When it works well, the result is a development plan that can leverage local resources to attract federal and other forms of support for ongoing economic development projects. In the absence of a leading role by national government, a quasi-market solution has evolved that relies upon private and social enterprise to create institutions that can support those communities that are prepared to engage in the type of bottom-up development process endorsed by the OECD.

Finally, the United States, unlike other OECD countries where multi-year funding for programmes and projects is often available over a pluri-annual funding cycle, only authorises funds for a single period. While funds may be paid out over a number of years the full amount has to be set aside in specific budget period. This makes it more difficult for communities to use federal programmes in a systematic way if they cannot be sure that funds for a particular programme will be in place in the future. In response, a number of non-profit funding entities have developed over time to provide a stable flow of finance to rural communities and rural firms.

## Annex 3.A. Additional descriptions of case study areas

As part of the analysis of this report, the OECD undertook three case study visits to Gallup, New Mexico, Pine Bluff, Arkansas and Columbiana, Ohio. The distinct nature of the three regions provides insight into the challenges of promoting rural innovation when the underlying factors and characteristics are very different. This annex shares details on the three case studies conducted as part of this study.

### Columbiana, Ohio

#### *A former steel town facing population decline*

Historically Columbiana was integrated into the steel industry located along the Mahoning River until the late 1970s. Columbiana specialised in constructing the wooden patterns used to create moulds for casting steel. Unlike much of Northeastern Ohio, which has experienced significant population decline since 1980, Columbiana experienced a slow increase in population. On the other hand, the population of Columbiana County peaked at 113 000 in 1980 and is now about 102 000. While most of Columbiana is located in Columbiana County, a small part in the north of the city is in Mahoning County.

Metal fabrication remains an important part of the local economy and it is supplemented by a growing logistics sector. Both short stay and day-trip tourism is expanding, and the city has started to attract new residents from the Pittsburgh MSA as houses become more expensive there and possibilities for hybrid work increase.

On the other hand, with a population of under 7 000 and close proximity to the larger communities of Boardman, East Liverpool and Salem, Columbiana does not have a strong retail sector. For example, the closest Walmart or Home Depot is in Salem. This means that a large share of retail sales leak out of the community. Similarly, while there are several urgent treatment centres in Columbiana, the closest hospitals are in Salem and Boardman. Rural communities of similar size in relatively densely settled regions face a similar situation, but it does limit some sources of economic growth.

Columbiana adopted a city manager form of government in the 1970s and has only had three city managers since then. City managers are unusual in smaller cities where the common form is a mayor and city council who share administrative responsibilities. Most places are unwilling to delegate that much authority to an employee, nor are communities that rely upon either volunteer or nominally paid elected officials prepared to pay for a professional manager. However, with part-time elected officials there are often major administrative issues and there can be a lack of continuity in decisions. A clear benefit for Columbiana from having a long-tenured city manager is his ability to master grant applications and knowing which entities can be approached for a particular source of funding. While it may be possible to hire consultants to support grant applications, doing so entails a direct financial cost and provides no continuity, and the city manager is able to follow through both in implementation and on reporting results to the grant provider.

Columbiana has adopted a number of public sector behaviours that contribute to its growth capacity. While these exist in some other rural places they are not common. In addition, the combined effect of multiple governance innovations is likely leading to significant synergies and complementarities that contribute to improved development.

### *Collaboration and engagement*

Collaboration in communities is one of the keys to fostering innovation, and it can be fostered by third party facilitators such as civil society/NGOs or community development organisations. In Columbiana, both public officials and business leaders are engaged with the local schools, including the primary school (elementary school), in an effort to create an environment where students see Columbiana as a place where they might like to live, and to provide students with a sense of what employment opportunities are available locally. In response the high school has hired a teacher who teaches classes on entrepreneurship and business skills. Additionally, the city engages with students both to get their input on recreation facilities and to allow them to play a role in how Main Street is to be redeveloped. Efforts by the city government to engage the students and the efforts by the school system to support that engagement have generated reports of students feeling pride and investment in their community, building enthusiasm for reinvesting in and contributing to the community as adults.

### *Key assets and opportunities*

Most small rural communities rely solely on grants for financial support because their fiscal capacity is so small that they must spend it all on current outlays that are mandatory. With no internal investment funds, they face two challenges. The first is they can only obtain funds to invest in projects that grant makers are currently prepared to fund, which limits their activity. Second since most rural places are in this situation, competition for these funds is intense and many applicants do not receive funding. However, Columbiana has made a strong effort to build internal investment capacity over time, which allows it to apply for “cost-shared” programs that have fewer applicants and are also preferred by many grant providers, since they both leverage the grant providers money and have inherently lower risks. This has given the city the opportunity to make both more investments and a broader range of investment than is common in rural America. Further, in many communities, relationships between local government and developers are problematic. In Columbiana, there is strong partnership between the local government and the private developer who is building housing and retail development on the old Firestone Farm. This major development is creating a new retail and recreational complex as well as new housing. The City government has found ways to restructure local regulations to encourage development. Two examples are illustrative. The first was the creation of a local ordinance to allow people to carry alcoholic drinks in public during specified city events. Typically, in Ohio walking and drinking on public property is illegal. This ordinance is used to allow alcohol sales when events are held on Main Street as it is closed to traffic, or in other public venues. Allowing alcohol sales both increases vendor sales and causes more people to participate, which creates a better sense of community. Second the city has pioneered a reduction in local and school taxes for new homes. City taxes are reduced for the first 15 years of occupancy as a mechanism to make home ownership more attractive in Columbiana. Lower property taxes reduce the monthly cost of home ownership, which has attracted more people from higher cost areas near Pittsburgh. While local schools lose some money in the short term, the influx of people has led to more housing being constructed and to higher property values in general.

Culture has also been a source of community cohesion and attractiveness. The Columbiana Cultural Collective is transforming the Main Street theatre into a community arts hub. The theatre had been rehabilitated about 15 years ago and served as location for amateur theatre productions, concerts and other events but closed with COVID shutdowns. Not only is the theatre a dominant part of the downtown streetscape but it has been vital in bringing people in the community together over multiple decades. The Collective is working on a plan to raise funding over five years to buy the building from a benefactor who purchased it with the intent to sell it to the Collective at a discount from the purchase price. The collective is a good example of an innovative social enterprise that has leveraged private philanthropy to provide a window of opportunity to assemble the funds to ensure the theatre remains a key part of the community and provide additional opportunities for cultural events.

Finally, a clear advantage of Columbiana is a strong K-12 school system. Strong local support for schools, both financially and in terms of community engagement, has resulted in better school performance than for proximate peer districts. The strategy of attracting nearby households is helped by both the lower cost of housing and good local schools. In addition, the city is investing in improving its visual attractiveness through a Main Street revitalisation programme and by creating better parks and recreation facilities. The city is fortunate that it received a large tract of land from the estate of Harvey Firestone to establish a multi-purpose park near one of the new housing developments.

### *Examples of innovative private enterprise*

Typically, innovation is seen as a business opportunity where a new product or process is introduced into the marketplace. Many of the manufacturing firms in Columbiana are adapting to changing conditions, though mainly in incremental ways. However, several are implementing significant innovations that are increasing productivity and their competitiveness.

Humtown Products is a third-generation family firm that has embraced additive manufacturing and radically redesigned its labour relations processes to increase worker engagement and foster team production. The firm is engaged in producing moulds and cores for metal casting using sand as the medium. One part of the company has shifted to using 3-D printers to form the moulds, and now has the most sand printers in the country. The other part of the firm uses more traditional core and mould production processes but has installed monitoring technology on most of its machinery that show individual operators their real-time production rate displayed as an effective hourly wage. As operators increase output without an increase in scrap rates they earn more money. In addition, each operator's performance can be compared to other workers doing the same task. While the base hourly rate remains set by historical performance levels, the current rate is much higher as operators learn from each other and have an incentive to improve productivity. Since machine operator performance is affected by supporting workers, such as forklift drivers and packers, they too are provided with performance bonuses as output increases.

Humtown Products was named the 2020 Manufacturer of the Year by the National Association of Manufacturers in the small to medium-sized enterprise category. They have developed collaborative relationships with the local schools, including the use of gamification to help teach 3rd and 4th grade students problem-solving skills at Crestview Local Schools.

## **Pine Bluff, Arkansas**

### *An industrial and agricultural economy facing population decline*

The population in Pine Bluff peaked at 57 400 in 1970 and has declined rapidly since 2000. The city is about an hour away from Little Rock, the state capital, and is part of the Little Rock Combined Statistical Area. Pine Bluff is served by the Union Pacific Railroad and the Port of Pine Bluff on the Arkansas River provides a connection to the Gulf of Mexico via the Mississippi River. A network of federal and state highways connects the city to the larger region and to the national Interstate Highway System. Currently there is no scheduled air service to Pine Bluff.

Pine Bluff has experienced a significant economic decline in the last 30 years as much of its economic base eroded. While agriculture in the Delta region remains important, it offers far less employment than in the past and farm consolidation has caused a decrease in the rural population. Forest products, which once was a significant industry, has also declined, particularly the local pulp and paper mills. Union Pacific no longer has a service depot in the community and employment at the Pine Bluff Armory has dwindled. Much of Pine Bluff's role as a regional retail and service hub has also disappeared as Little Rock has grown and expanded its retail trade area into communities that used to be served by Pine Bluff. Economic decline has led to accelerating population decline, a falling local tax base, decreasing property values, increases

in empty and dilapidated housing and retail establishments, and city infrastructure that is both deteriorating and too large for the current size of the community. With economic decline human and financial capital has left the community as people with higher skills relocated to growing parts of the state and other parts of the country.

### ***Key assets and opportunities***

Pine Bluff has several key strengths that are being mobilised as part of a major redevelopment effort. These include:

- Two strong higher education institutions, the University of Arkansas at Pine Bluff (UAPB) and Southeast Arkansas College (SEARK), that are fully engaged with local leaders in efforts to rebuild the local economy. UAPB is a four-year school with a historically Black student population and a significant research programme, while SEARK provides a 2-year associate's degree and a broad range of technical education programmes to students.
- Simmons Bank, a major regional banking organisation, was founded in Pine Bluff and has expanded its operations to seven states. Its corporate headquarters remains in Pine Bluff and is the only large commercial business in the city core. Notably, Simmons has made a number of large investments in the revitalisation of Pine Bluff, including large financial commitments from the Simmons Foundation. While part of this support can be explained by the bank fulfilling its Community Reinvestment Act (CRA) obligations, the level of support goes well beyond the amount CRA would require.
- A high degree of racial harmony in the community. About three-quarters of the city population is African American. African Americans hold all of the elected positions in the city and county, with both Black and white community members being engaged in leading community organisations.
- Strong co-operation between elected officials in the city and county governments.
- Widespread recognition across the community that major reinvestment is required for Pine Bluff to survive. While some debate still exists over how this is to be accomplished, there is general support for change.
- Significant progress in removing or renovating commercial buildings in downtown and cleaning up and renovating neighbourhoods.

On the other hand, Pine Bluff faces major challenges, including:

- A dysfunctional local school system that is under the control of the state government because it has performed so poorly in the past.
- High rates of poverty, low levels of employment and a workforce with poor skills, especially those needed for the modern economy.
- A considerable number of large commercial buildings in the city centre that are in poor condition and are unlikely to ever return to their original use. This leaves the question of whether it is better to demolish them or rehabilitate them. In either case there is typically no clear sense of what use is appropriate for the location.
- Identifying a new economic function for the city and county that will support local objectives for better employment opportunities and higher incomes.
- A deteriorating housing stock that leads to falling home values that reduces household wealth.

### ***The Go Forward Pine Bluff (GFPB) development approach***

The Go Forward Pine Bluff (GFPB) development approach is the central part of efforts to revitalise the community. It can be seen as an innovative response to a systemic redevelopment challenge, and while it



has yet to demonstrate its success it already provides useful examples of how to undertake a comprehensive approach to renewal. The effort started in early 2015 when a group of citizens formed to try to develop an initiative to revive the city's downtown, which had been seen as an impediment to attracting new investment in any part of Pine Bluff. Beyond removing urban blight, they identified three underlying problems that were interconnected: inadequate housing, poor workforce skills and a weak education system. Resolving these issues was seen as a necessary precursor to restoring economic growth.

This in turn led the group to try to create community support in early 2016 for a locally supported initiative to identify a community development strategy. The group solicited volunteers who would make a one-year commitment to work for several hours each month on one of four themes – economic development opportunities, education reform, improving quality of life, or improving government and infrastructure. Through 2016, 100 community members, with support provided by the steering committee, developed a draft plan. The result, in the form of 27 key points, was presented at an open community meeting at the end of 2016 and was broadly endorsed by the large number of attendees.

The strong community support at the meeting led to the local business community raising USD 18 million to support the implementation of the plan. With this support in place the city voted in a referendum in 2017 to increase the local sales tax to fund an implementation programme. The vote was 69% in favour and Go Forward Pine Bluff (GFPB) was created to manage the initiative with seven years of funding. Since 2018 various entities have been created or revised by GFPB to carry out specific programme tasks. Currently about 96% of the set of key points identified at the community meeting are in varying stages of progress. COVID slowed progress significantly for two years and now with funding ending in 2025 there is more pressure to complete the tasks.

Four challenges limit the speed of work. The first is that GFPB must rely on the city (and to a lesser extent the county and state) to actually implement many of the recommendations, and government priorities are not always aligned with those of GFPB. Second, private investors who will make the bulk of the investments have been unwilling to commit funds until more progress has been made to ensure their investment is viable. Third, the amount of work involved is difficult for a small paid staff and a limited number of volunteers to carry out. As the end of the funding period approaches, it becomes harder to attract paid workers even as they become more necessary because their job tenure is short. Finally, while GFPB has a strong vision of how the community of Pine Bluff can evolve, it has not clearly identified an economic development strategy that will generate the employment opportunities needed to take advantage of the up-skilling of the workforce and revitalisation of the city.

The set of key points endorsed by the community in 2016 cover a wide range of potential activities. Some must be accomplished before others, some are simpler to implement, and some require other actors, such as city government to carry out. Importantly, some are more innovative than others, but all are necessary. Given the magnitude of the decline over recent decades virtually all the things being done by Go Forward Pine Bluff (GFPB) involve constructing a platform on which economic development can occur. Some of the main elements of this foundation that are being implemented to date are discussed below.

*The Generator.* Simmons Bank provided a downtown building that could be rehabilitated to house a multifunction technology centre that also hosts classes for nascent entrepreneurs. The Generator operates after-school programmes and well as school field trips to expose primary (elementary) school students to computer technology and encourage their interest in developing digital skills. This is especially important in Pine Bluff where schools lack up-to-date technology and many homes cannot afford to provide it. Also, in a community where local entrepreneurs are not visible, the Generator provides support for small cohorts of people who wish to explore becoming an entrepreneur. The focus of the programme is on helping the individual identify a potentially viable business model and helping them assess whether they truly want to commit to being an entrepreneur.

*Downtown Revitalization.* This programme combines a number of fairly standard elements into an integrated approach. Improving the physical appearance of downtown is essential to convince both the local population and potential external investors that a viable future is possible. Crucially, GFPB recognises that the population of the city is likely to continue to shrink and this means that the structure of the city should adjust to conform to its smaller size. In this process, there is an opportunity to reconfigure the form of the city so that it better serves new conditions. In particular, increasing the amount of high-quality affordable housing is seen as a necessary condition to attract both external workers with higher skills as well as firms that can employ them.

Restoration of smaller commercial buildings that are in relatively good condition has occurred and some of these are now operating again. Other small commercial buildings that were in poor condition have been demolished. A streetscape programme has restored and expanded sidewalks. Several large commercial buildings have been purchased and their exteriors have been stabilised while potential new uses are explored. Where uses cannot be identified, the buildings will be removed and the land converted into housing, among other uses.

Crucially the large number of dilapidated buildings in the city centre provides an opportunity for new urban housing in neighbourhoods that span multiple city blocks. New urban core housing will only be viable if there is additional public investment in creating parks and public buildings like libraries, recreation centres and other public services. Since Pine Bluff is also the county seat for Jefferson County it has both city and county facilities, and it already has several major public buildings, including the library and aquatic centre in its downtown. While the high school is currently downtown residents are concerned that it may be relocated to a suburban site where construction costs will be lower but the amenities and accessibility of the city centre will be lost.

*Renovating and Repurposing Suburban Neighbourhoods.* Much of the older suburban housing stock is severely dilapidated. In some blocks most of the housing is in poor condition or abandoned. In other blocks the number of severely dilapidated houses is relatively small. With limited funds for housing redevelopment GFPB is trying to demolish housing on contiguous blocks where conditions are the worst and intervene in blocks where slowing blight will encourage reinvestment. Reducing the amount of poor-quality housing in older suburbs helps to improve the market for new urban housing and can provide opportunities for alternative land uses.

*Preparing the Workforce for a Digital Economy.* While GFPB has no direct influence on the school system it does serve as a forum for community concerns by improving educational outcomes. GFPB also works with the two local institutions of higher education in Pine Bluff: the University of Arkansas - Pine Bluff (UA-PB) and Southeast Arkansas College. Both institutions have expanded programmes that provide technical skills and can increase employment prospects. Both attract a large number of local graduates who are seeking post-secondary education. Retaining these students however hinges on improved prospects for local employment.

In particular, SEARK has recently entered into a partnership with People Source, a public benefit corporation that provides training and staffing services for private companies. People Source will locate on the SEARK campus and is expected to employ about 250 people, some of whom will be students. Because People Source has offices in Arkansas and several adjacent states it has a strong sense of emerging career opportunities and the capacity to help students prepare for those jobs. This will also help SEARK identify areas where it can adjust its curriculum to better match graduates' skills with employers' needs.

*Working beyond the City.* Pine Bluff remains the largest city in southeast Arkansas and its local labour market extends beyond Jefferson County, particularly to the southeast. It is already a regional and higher education centre and its local labour market extends out about 60 miles from the city. With more retail and service providers it has the potential to serve an even larger retail trade area. For this expanded role to be possible, Pine Bluff will have to work with Jefferson's County officials and elected leaders in the ten other counties in the South East Area Economic Development District, and particularly with Cleveland and

Lincoln counties that are part of the Pine Bluff MSA. GFPB has already developed a strong working relationship with Jefferson County.

### *Fostering entrepreneurship*

Currently the rate of entrepreneurship in Pine Bluff is low, particularly in the African-American community, which comprises the bulk of the population. Fostering a higher rate of entrepreneurship is important for several reasons. Most importantly it offers a potential path out of poverty if the business is successful. Second, a larger business community offers a group of potential leaders for the community. Third, a larger number of locally owned businesses expands the range of locally available goods and services in the community. Even if the firms do not offer many jobs, their presence improves the local quality of life.

GFPB has focused on helping women entrepreneurs start their own businesses, including home based businesses. While motivations vary, some women found that self-employment was more amenable to work-life balance in the labour market. This is especially salient in places where access to work-life balance support schemes (such as child-care facilities) are limited. Their potential is also enhanced by the common finding that women now have higher levels of educational attainment than men, which provides them with stronger formal education. GFPB holds classes at the Generator as a training site to help small groups of nascent entrepreneurs get ready to begin an enterprise. Recently UA-PB received approval to host a Small Business Administration-sponsored Small Business Development Center, which will add resources for the next step of actually starting a business.

Importantly, the entrepreneurial classes connect potential entrepreneurs with local lenders. It provides them with direct experience on how to finance their business. Because many of the entrepreneurs are minorities, local banks can use money from their Community Reinvestment Act (CRA) requirements to offset losses associated with startups. This makes it easier for entrepreneurs with limited wealth to get started.

A challenge for new entrepreneurs, particularly those with only limited ties to the financial industry is understanding how financial intermediation works. Similarly, banks often have little incentive to engage with potential borrowers who will require a large investment of time and resources to make only a small loan. GFPB plays the role of an intermediary by only bringing borrowers that it has worked with to bankers and other lenders who see there is a social benefit to the community if they can help a viable business get off the ground. Certainly, the fact that CRA encourages banks to make this type of effort is also useful.

GFPB also engages with other entities that can provide financing for entrepreneurs. This is critical because banks can only provide debt financing that is secured either by the wealth of the entrepreneur or by some other financial intermediary pledging collateral. For example, federal government loan guarantees provided by USDA, SBA or other agencies reduce lender risk exposure and can lead to a greater willingness of a bank to lend. Another type of financial intermediary with a broader local economic development mandate, such as a Community Development Financial Institution (CDFI), or Community Foundation, may also be able to provide funding either as a grant, a subsidised loan or some form of equity investment (Freshwater, 1990).

## **Gallup, New Mexico**

### *A city deeply connected to the Navajo Nation in the midst of energy economy transition*

The city population has been relatively stable over the last few decades, with only limited growth. Notably, a large share of the population are Indigenous people living off-reservation. The Gallup retail trade area extends deeply in the Navajo Nation and the city is a hub for both shopping and government services provided to people on living on the reservation. It has also been a major hub for Native crafts, particularly

silver jewellery and weaving. The city is located on Interstate 40 and is also on the Burlington-Northern Santa Fe east-west mainline from Los Angeles.

Gallup recognises that it must identify new economic functions to replace fossil fuel extraction if it is to prosper. Its role as a service centre for the Navajo Nation and other tribal communities will remain important, as will tourism; but a new function that offers full-time, higher paying jobs is desired. Gallup sees an opportunity in its location on both a major east-west interstate and on the BNSF east-west rail mainline as a way to first develop a strong logistics industry and then leverage that to introduce manufacturing. In addition, the presence of existing rail and road infrastructure, Gallup is roughly an 11-hour drive from the ports of Los Angeles and Long Beach. After 11 hours of driving commercial trucks are required to stop for a rest period, which makes Gallup an ideal location for both a maintenance site and for a transshipment hub. With a logistics hub there is potential to attract light manufacturing firms, which would add another dimension to the city's economic base.

### ***Collaboration and engagement***

Many EDA economic development districts are characterised by only limited interactions among the multi-county entities and local governments. In the case of the Northwest New Mexico Council of Governments there is far greater collaboration and the COG carries out a number of functions that might normally be the direct responsibility of a county. In part this is because the COG is authorised by the state to carry out more functions than economic development and transportation planning. But this authorisation exists because member governments have concluded that it is in their interest to have one entity with specialised knowledge that allows it to be more effective carrying out extra functions. These include environmental planning, water planning, energy efficiency initiatives and obtaining grant funds for a range of technical support activities. The COG has developed a common approach and model to maximise its impact and effectiveness while being able to customise and adapt to capture and deliver on place-based strategies and opportunities.

### ***Key assets and opportunities***

Located within a one-hour drive from Gallup, the Navajo Technical University trains Tribal youth in STEM related disciplines. The Center for Advanced Manufacturing was created to provide more specific and job focused experience for students in additive metal manufacturing. Because there is varying experience in manufacturing on the Navajo Nation it was felt that the best opportunity for success would be in a new field where leading regions have yet to emerge. The programme has invested in creating labs with modern equipment for students to use for training with the objective of creating entry level skilled technicians. In addition, the centre partners with a number of universities and national laboratories to provide internships for its students and research opportunities for their graduate students and post-docs. This two-way flow increases the chances for employment of Native youth and may encourage new start-ups to be developed by individuals coming to the Navajo Nation to conduct their research.

The Greater Gallup Economic Development Corporation (GGEDC) workforce development programme has developed and implemented its own tailored workforce development programme due to local dissatisfaction with the available options. Local employers were unhappy with training programmes, particularly those focused on menial skills. In addition, employers wanted more female workers than were available. The programme starts by requiring participants to get a GED certificate if they don't already have one. The core curriculum is drawn from the National Center for Construction Education and Research (NCCER) curriculum, which is centred on providing students with basic skills before proceeding to a series of modules that are applicable to specific tasks or responsibilities. This allows each student to tailor their studies to a specific occupation and potentially to an employer. Many of the module sequences can be used as an entry point for a formal apprenticeship in skilled trades once students gain more experience.

The Navajo-Gallup water supply project is a long-standing collaboration between the Navajo Nation and the City of Gallup to improve the local supply of water by building an aqueduct from the San Juan River (USBR, n.d.<sup>[70]</sup>). The impetus for the project was a settlement in 2009 on a decades-long legal battle over water rights. The Navajo Nation advocated that it was entitled to an increased share of the water in the river. The settlement made it possible for the Navajo-Gallup Water Supply Project to begin in earnest. Construction of the project is only now underway, due to major problems both in securing funding and in establishing rights of way across land parcels that were held by a large number of owners. Joint work by the city, the Council of Governments and the Navajo Nation slowly overcame these obstacles. This long-term collaboration has created the opportunity for additional co-operation between the Navajo Nation and the city, even though their interests differ at times (USBR, n.d.<sup>[71]</sup>).

There is a proposed joint Indian Health Service and community hospital. Additional medical facilities are needed both by Gallup and the Navajo Nation. The Indian Health Service, a federal agency, has prioritised the construction of an area inpatient hospital that could be built as a healthcare campus to expand services to behavioural health, dialysis, and many other services. The community has also discussed consolidating its community hospital, Veterans Affairs clinic and other health services on this campus, as well as how to attract medical supply and manufacturing firms for additional job creation.

Providing broadband in rural areas is expensive due to large distances and small populations. In the Gallup area, costs are even higher because of fragmented land ownership, which increases the cost of obtaining rights of way for copper or fibre lines. Sacred Wind Communications began serving the Navajo Nation in 2009 using fixed wireless, which is cheaper to install and avoids easement issues. The company has a contract to provide internet access to schools. Under the agreement, the infrastructure can serve as a beach head from which the company can build out additional capacity to serve houses and businesses in close proximity to the school.

A local bike shop in Gallup (the Silver Stallion) was interested in improving health conditions among Tribal youth. They recognised that while it was possible to get grants to buy bikes for distribution on a reservation this would not have much impact. Instead the company worked with a local school to create a bike riding club as part of the physical education programme. In addition, the company connected with school social workers who saw that communal bike riding could help children with social problems. The programme became part of Outride, which is a national organisation that supports this type of school-based cycling programme. The bikes remain at the school and students start by going on shorter supervised rides to gain experience, confidence and interest. Over time some students become interested in competitive bicycle racing and can compete at a local and regional level.

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## Notes

<sup>1</sup> In some cases, such as those in New England, Economic Development Districts (EDDs) are based on towns.

<sup>2</sup> The fintech industry includes firms that provide financial services that have traditionally been offered by banks and financial institutions, through alternative digital platforms and technology.

<sup>3</sup> The best example comes from rural northwestern Arkansas where Sam Walton, Don Tyson and J.B. Hunt lived within 30 miles of each other. Each started a small business in the middle of the 20<sup>th</sup> century that became a national force in its industry and changed how competing firms conducted their operations – WalMart in retail, Tyson in meat-packing and Hunt in trucking. A crucial element of this example is that the innovations these individuals made were largely in the form of changes in management practices. All three firms initially grew in rural areas and steadily revised their operations until they were able to challenge larger incumbent firms based in urban centres. Finally, all three firms continue to have corporate offices in their ‘birthplaces.’ As a result, the surrounding region has become the fastest growing part of Arkansas.

<sup>4</sup> Even the NSBC, which oversampled rural firms, found that patent activity was far lower than in urban areas for firms of similar size; but the survey did find examples of innovative rural firms. Firms in rural areas may not choose to patent or they may produce innovations that are not readily patentable. In the first instance, they may not fear competitors stealing their idea because the market is too small or they are too far from a competitor to be noticed, or the cost of patenting is seen as being prohibitively high relative to its benefits. In the second instance, the innovation may involve a process that is not readily patentable or is a minor adaptation of an existing product to make it more useful.



# **4 Improving broadband connectivity and access to education in the United States**

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This chapter analyses the main challenges and opportunities to improve broadband connectivity as well as accessibility to quality education to foster rural innovation in the United States. The chapter begins with the assessment of the state of connectivity in the United States, identifying key challenges and opportunities to improve broadband connectivity to boost innovation in rural areas. The chapter ends with an assessment and overview of the measures to improve rural education in the United States.

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## Key messages

### Broadband connectivity

- While rural communities across the United States have distinct demographic features and diverse challenges to foster rural innovation, one common denominator is the ambition and need for high-quality broadband services.
- The United States Government has recognised the importance of broadband connectivity for all segments of the population, regardless of where they live, notably through the Infrastructure Investment and Jobs Act (IIJA) of 2021, which allocates USD 65 billion to bridge digital divides by expanding broadband infrastructure and funding digital equity and inclusion programmes.
- As the digital transformation takes hold, the demand for high-quality broadband services has increased in the United States (e.g. Gigabit fixed broadband subscriptions more than quadrupled from 2019 to 2021). While cable remains the predominant broadband access technology, there is a recent and welcomed push to expand fibre deployments in the country, in which fibre grew by 40.3% from 2020-21, compared to an OECD average growth of 18.6%.
- There are persistent and substantial territorial gaps to high-quality broadband access among urban, rural and Tribal Land areas in the United States. In terms of broadband coverage, 20.9% and 22.1% of the rural and Tribal Land population, respectively, lived in areas without coverage of fixed broadband offers at 100 Mbps download speeds in June 2021. Moreover, even if they are covered, they often only have the choice of one provider. Broadband adoption rates reveal even starker contrasts. In terms of experienced speeds, there is a 51-percentage point gap in download broadband speeds experienced by users in urban (metro) compared to rural regions by state.
- To avoid deepening existent digital and economic divides, access to high-quality broadband at affordable prices in rural areas of the United States is paramount. To address this priority, the United States has a myriad of programmes. The impact of such initiatives could be amplified, for example, by measures that reduce broadband deployment costs, where local authorities are key stakeholders. Policies addressing affordability from the consumer side also play a role, e.g. the Affordable Connectivity Program (ACP).
- The implementation of recent broadband funding initiatives highlights that all levels of government acknowledge the importance of addressing connectivity gaps. These programmes also have an important role to play in shaping broadband policies in the United States. For example, the funding rules of one of the main projects from the IIJA sought to boost competition and incentivise investments in “future proof” technologies, which are laudable developments. Close collaboration across agencies and levels of government should increase the impact of such measures.

### Access to education

- In rural communities, education services are more expensive and often suffer from quality concerns. The limited quality and capacity of local governments to deliver education services is rooted in the territorial challenges of the region, whereby lower density makes services less cost efficient and staffing challenges are persistent.
- Strengthening the early (K-12) education system can be a turning point for rural communities. Ensuring access to quality education from an early age can help engage youth to reinvest in their communities.

- Higher education institutions have a role to play in promoting innovation, but the offer of services they provide need to be aligned with the demand in the market and resources available. This includes communities going through demographic and economic transition, and in particular in communities with a strong portion of Indigenous populations.
- Skills shortages are one of the largest challenges that rural communities face and is a problem that often starts from early education. These issues are exacerbated by the fact that communities struggle to recruit teachers and provide them with certification opportunities or well targeted skills training programmes (e.g. vocational training). Investing in vocational education in rural areas should be a priority to enable more diverse training options.
- Finally, encouraging entrepreneurial activities in rural areas is critical for innovation. Providing skills training, guidance and new partnership opportunities to develop those skills can create new opportunities for rural communities.

This chapter focuses on two key framework conditions that are particularly important for rural innovation, which are access to broadband connectivity and access to education. Innovation is a function of human and capital inputs. It is impacted by access to resources that can ensure the smooth functioning of innovation across all geographical locations. Innovation presents itself in a different way in rural towns compared to other geographical areas, as it may also relate to processes rather than products or services, such as finding creative or innovative solutions to more binding constraints than those found in urban counterparts.

Without solid enabling framework conditions, building the opportunities for innovation can be challenging. Access to basic government services is more limited in non-metropolitan and rural counties than in metropolitan counties (OECD, 2021<sup>[1]</sup>). As demographic change takes place, sparsely populated areas face higher costs for service delivery in basic public services such as education and health (OECD/EC-JRC, 2021<sup>[2]</sup>).

## Broadband connectivity to boost rural innovation

Rural areas have a higher proportion of population without access to Internet or with limited digital literacy skills, also known as the digital divide. Barriers to broadband uptake in rural and remote areas are many and varied, including the high cost of serving rural areas coupled with lack of competitive offers. While access and affordability can also be an issue in urban areas, in rural areas where broadband services are available, there is often limited or no choice among Internet Service Providers (ISPs), and rural residents typically have access to a lower-level quality of service than what is available in urban areas (OECD, 2018<sup>[3]</sup>). In an increasingly connected world, this pronounced digital divide between urban and rural areas further hinders the prospects for innovation and development in rural communities (OECD, 2021<sup>[4]</sup>). Bridging connectivity divides, or gaps in access and uptake of high-quality broadband services at affordable prices,<sup>1</sup> is a policy priority for the United States. The different programmes adopted by the government to achieve this goal will be further delineated in the chapter.

### ***Setting the scene: The importance of connectivity for the digital transformation***

Ubiquitous access to high quality broadband services at affordable prices is key for an inclusive digital transformation of the United States. Individuals, businesses, and governments need reliable and widespread broadband services to benefit from the opportunities that the digital age can offer. Broadband infrastructure is the invisible thread across all sectors of the economy. It underpins the use of digital technologies, and it is crucial for an increasingly 'remote economy', where more and more business processes move online, and people increasingly work and learn from home.

The COVID-19 pandemic has further accentuated the essential role of connectivity and increased the demand for high-quality broadband networks. In the space of just one year (2019-20), Internet traffic exchanged at Internet Exchange Points (IXPs) soared by more than 58% on average in the OECD area and grew by 52.3% in the United States (OECD, 2022<sup>[5]</sup>). To place this into context, between December 2019 and March 2020, bandwidth exchanged at IXPs in OECD countries increased by 22.3%, more than four times that of the prior quarter (OECD, 2020<sup>[6]</sup>).

The United States government has recognised the importance of broadband connectivity for all segments of the population, regardless of where they live.<sup>2</sup> To close connectivity divides, broadband infrastructure was set as a fundamental element for the economic recovery package, notably through the Infrastructure Investment and Jobs Act (IIJA), which allocates USD 65 billion to expand broadband infrastructure and stimulate adoption and digital equity programmes. Concerning this piece of legislation, the White House press release states:



*“More than 30 million Americans live in areas where there is no broadband infrastructure that provides minimally acceptable speeds – a particular problem in rural communities throughout the country. [...] The Bipartisan Infrastructure Law will deliver \$65 billion to help ensure that every American has access to reliable high-speed internet through a historic investment in broadband infrastructure deployment.” (The White House, 2021<sup>[7]</sup>)*

Expanding high-quality broadband connectivity in rural areas of the United States can have important positive externalities across economic sectors and help overcome “the tyranny of the distance” of these communities (i.e. the geographical isolation in the form of distance or transport costs to commodities or infrastructure). It allows people in these communities to have remote access to opportunities and services, such as health, education, banking, and government services.

Broadband connectivity is also a necessity to prepare rural economies to embrace the digital transformation and aid them in disaster relief and emergencies, which in turn increases their resilience and productivity. This could contribute to the regional appeal of rural communities, for example by attracting private sector investments or encouraging regional mobility.

Broadband connectivity has an additional, important role to play in rural areas to boost rural innovation for both digital entrepreneurs as well as traditional firms embracing digitalisation. As explored by academic literature, broadband adoption can enhance a firm’s propensity to engage in trade and increase firm scale (Kneller and Timmis, 2016<sup>[8]</sup>). A recent paper found causal evidence<sup>3</sup> of positive effects of universal broadband policies that may lead to economic benefits for firms in rural areas, in particular, in knowledge-intensive sectors, by exploiting geographical discontinuities in broadband availability across the United Kingdom (DeStefano, Kneller and Timmis, 2022<sup>[9]</sup>). Other academic work has investigated the relationship between broadband availability, the use of cloud computing and various types of innovation for firms in the United States (Wojan, 2022<sup>[10]</sup>). Moreover, a working paper from the same author found causal links of the enabling effect of cloud computing on firm innovation in the United States. The results provide concrete evidence of the adverse effects of the geographical digital divide on businesses (Han, Wojan and Goetz, 2023<sup>[11]</sup>).<sup>4</sup> Therefore, measures that seek to improve access to communication networks and services in rural regions are crucial to foster productive opportunities for small and medium-sized businesses.

### *Going “rural” in the United States: Access to broadband to boost rural innovation, a bottom-up perspective*

The National Association of Development Organizations of the United States highlights an often-said quote, “If you’ve seen one rural town, you’ve seen one rural town” (Schwartz, 2012<sup>[12]</sup>). It points to how rural towns are different, for example, in terms of resources, constraints and distinctive solutions to overcome limitations that may lead to innovation. At the same time, rural communities face common challenges, notably distance to markets, services, and lack of density needed for the economic benefits of agglomeration. The rural communities visited for the field research of this project all shared the common plea and eagerness to be connected to high-speed broadband networks.

Broadband networks are perceived as essential infrastructure in rural communities for a myriad of reasons. These reasons range from enabling entrepreneurs to reach international markets while living in a rural community, to becoming attractive for younger generations so that they stay and live in these communities and foster their development, to accessing high-quality remote education and health services, among many others. The following case studies highlight the demand for broadband and existing challenges in rural communities of the United States (Box 4.1).

### Box 4.1. The importance of broadband access to enhance rural innovation in the United States

The three towns visited for the field research of this project present different demographic features (see Annex 4.A for detailed census indicators) and often face diverse challenges to foster rural innovation; however, they shared the common ambition of enhancing broadband connectivity.

#### Gallup, New Mexico

Gallup is an accessible rural town in McKinley County. It is located on the outskirts of Navajo Nation, a Native American reservation, and surrounded by 22 “Pueblos”.<sup>5</sup> According to 2020 census data, Gallup had 21 495 inhabitants in 2021, with 47.7% identifying as American Indian/Alaska Native,<sup>6</sup> 30.6% as Hispanic or Latino, and 18.9% as “white” (not Hispanic or Latino). The percentage of households with a broadband Internet subscription in the 2016-20 period was 68.3%. The annual per capita household income for the same period was USD 21 231 (U.S. Census Bureau, 2022<sub>[13]</sub>).

The geographical placement of Gallup is within a “checkerboard” of different land property rights (e.g. Tribal Trust Land, Navajo Nation land, and “lati” or family land), rendering infrastructure deployment very challenging. Internet Service Providers (ISPs) in Gallup underscore that navigating the access to rights of way and construction permits are the main roadblocks to deploying broadband infrastructure (as well as other utilities). For example, one ISP deploying fibre declared that it took roughly seven years to clear the rights of way process to be able to deploy fibre along the Interstate 40 corridor from Albuquerque to Gallup (i.e. a two-hour drive).

Notwithstanding these challenges, Gallup’s residents seemed determined to expand infrastructure through what they call “Private Public and Tribal” partnerships. The Northwest New Mexico Council of Governments (NWNMCOG) is strongly engaged to promote infrastructure deployment projects, including broadband. In 2013, a large section of private land of 40 sq. miles (103.6 sq. km) became available, and a private entity interested in the economic development of the city (Gallup Land Partners) purchased it with the intent of engaging in a private public partnership (PPP) with local governments. The projects range from building new neighbourhoods, new industrial parks, connected highways, to a hospital.

The town of Gallup also provides basic infrastructure and services to Navajo Nation inhabitants who travel to buy commodities and access basic services. It also hosts the campus of the University of New Mexico, Gallup. Therefore, fostering broadband access in Gallup also has spillover effects onto Tribal Lands.

Concerning Tribal Lands, Navajo Nation is geographically located between three states: New Mexico, Arizona, and Utah. The Navajo Nation Council, which is the legislative branch of the Nation, has 24 district delegates representing 110 Tribal Chapters. At the end of June 2022, the 24th Navajo Nation Council approved legislation to use USD 1 billion of the American Rescue Plan Act (ARPA) funding the nation had received to promote utility infrastructure deployment projects (water and electric lines), housing projects, and broadband infrastructure deployment (Navajo Nation Council, 2022<sub>[14]</sub>).

According to BroadbandNow data, there are five fixed-wired residential Internet Service Providers (ISPs) in Gallup. One ISP, Sacred Wind, is engaged in deploying more fibre in the region. For example, it provides high-speed broadband connections to the Navajo Tech Innovation Center, a business incubator, in a neighbouring town. In terms of broadband coverage, according to the Federal Communications Commission (FCC)’s “Fourteenth Broadband Deployment Report”, at the end of 2019 only 33.5% of McKinley County rural residents lived in areas where 25 Mbps broadband offers were available, compared to 83.5% in urban areas of the county (FCC, 2021<sub>[15]</sub>).<sup>7</sup>

## Pine Bluff, Arkansas

Pine Bluff, in Jefferson County, is in southeast Arkansas, 42 miles (67.6 km) south of the state capital of Little Rock. According to the 2020 census, it had 40 244 inhabitants in 2021, with 76% of the population identifying as black or African American, and 19.1% as “white” (not Hispanic or Latino). The percentage of households with a broadband Internet subscription in the 2016-20 period was 67%, and the per capita annual income (in 2020 dollars) for the same period was USD 19 240 (U.S. Census Bureau, 2022<sup>[13]</sup>). Among the top issues highlighted were challenges to deploy infrastructure, which has led to a lack of Internet access in rural communities.

At present, the residents of Pine Bluff are working hard not only to restore their previous economic prosperity,<sup>8</sup> but also to rebuild the town through an economic development project called “Go Forward Pine Bluff”. The project was designed through a bottom-up approach, where more than 100 citizens volunteered to meet over a year to develop its vision. The plan encompasses four major pillars: economic development (job creation and retention), government and infrastructure, quality of life and education (Go Forward Pine Bluff, 2017<sup>[16]</sup>).

Among different action points, the Go Forward Pine Bluff plan aims to rebuild downtown Pine Bluff to make it a hub for innovation and business and to foster infrastructure deployment. For example, the “Generator”, located in the downtown area, is an innovation hub that houses a co-working space, a collaborative work space (“maker-space”), and access to digital technologies to promote start-ups and entrepreneurs (Go Forward Pine Bluff, 2022<sup>[17]</sup>). Three female entrepreneurs who graduated from this innovation hub, as well as the Executive Director of the Generator, highlighted the importance of high-quality broadband for the community’s economic development, for example, by enabling entrepreneurship and increasing property values. In particular, the entrepreneurs underscored how vital broadband was for the success of their businesses, either to access global markets or to access digital tools, as well as the role broadband plays to attract businesses and people back into the community, as a revitalised community is important for their respective markets.

More broadly, residents of Pine Bluff emphasised the importance of symmetrical download and upload speeds, coverage, and affordability to achieve meaningful broadband connectivity. However, there is still much to accomplish to bridge the connectivity divide in this community. According to BroadbandNow, there are three fixed-wired ISPs offering residential broadband services in Pine Bluff (BroadbandNow, 2022<sup>[18]</sup>). In terms of broadband coverage, data from the FCC reveals that at the end of 2019, only 35.1% of rural residents of Jefferson County lived in areas where 25 Mbps broadband offers were available, compared to 79.3% in urban areas of the county (FCC, 2021<sup>[15]</sup>).<sup>9</sup> At the moment of writing, the FCC was undergoing an overhaul of their broadband map, and therefore, this 2019 figure may overestimate coverage.

Fibre deployment is a top priority for Pine Bluff residents who wish to see their community thrive with entrepreneurs.<sup>10</sup> However, only 4% of Jefferson County residents were connected to fibre in July 2022 (BroadbandNow, 2022<sup>[18]</sup>). This landscape may improve in the future. In July 2020, the Go Forward Pine Bluff (GFPB) organisation embarked on a United States Department of Agriculture (USDA) funded project (Rural Communities Development Initiative grant) to bring to the town high-speed fibre broadband through a multi-stakeholder approach, and seeking to form a public-private partnership with ISPs (Go Forward Pine Bluff, 2020<sup>[19]</sup>; Arkansas Democrat Gazette, 2022<sup>[20]</sup>). However, as of April 2022, GFPB and city officials had not found a partner willing to enter a public-private partnership with the city for high-speed fibre broadband deployment. Regarding business offers (i.e. non-residential broadband), in December 2020, one regional ISP, Ritter Communications, announced a USD 2.8 million investment to cover Pine Bluff business customers with fibre (Ritter Communications, 2020<sup>[21]</sup>). In June 2021, WEHCO media proposed to invest USD 2.1 million to upgrade existing cable infrastructure to achieve

“gigabit speeds” (i.e. higher than 1 000 Mbps) in Pine Bluff (Arkansas Democratic Gazette, 2021<sup>[22]</sup>). This announcement may render it difficult for other ISPs in the market to obtain federal funding for fibre.

### Columbiana, Ohio

Columbiana is a midwestern town located in northeast Ohio with 6 694 inhabitants, out of which 94.1% of the population identify as “white” (non-Hispanic nor Latino). It was the birthplace of the American entrepreneur, Harvey S. Firestone, founder of Firestone Tire and Rubber Company. The percentage of households with a broadband Internet subscription in the 2016-20 period was 87.1% in the 2016-20 period, and the annual per capita income (in 2020 dollars) for the same period was USD 35 621 (U.S. Census Bureau, 2022<sup>[13]</sup>).

Columbiana residents underscored the importance of high-quality broadband networks. However, at the county level, fibre-to-the-home (FTTH) was only available to 2% of residents (BroadbandNow, 2022<sup>[23]</sup>). In terms of broadband coverage, data from the FCC reveals that at the end of 2019, 68.8% of Columbiana County rural residents lived in areas where 25 Mbps broadband offers were available, compared to 97.4% in urban areas of the county (FCC, 2021<sup>[15]</sup>).<sup>11</sup>

Source: Based on interviews with stakeholders in Gallup, New Mexico, Pine Bluff, Arkansas and Columbiana, Ohio; U.S. Census Bureau (2022<sup>[13]</sup>), *QuickFacts: Columbiana City, Ohio; Gallup City, New Mexico; Pine Bluff City, Arkansas*, <https://www.census.gov/quickfacts/fact/table/columbianacityohio,gallupcitynewmexico,pinebluffcityarkansas/HSG495220#HSG495220>; Navajo Nation Council (2022<sup>[14]</sup>), “\$1,070,298,867 Billion in American Rescue Plan Act funding approved for Water Pipelines, Electricity, Housing Construction, and Broadband Internet Projects by the Navajo Nation Council”, [https://www.navajonationcouncil.org/wp-content/uploads/2022/06/0086-22\\_2022.06.30.pdf](https://www.navajonationcouncil.org/wp-content/uploads/2022/06/0086-22_2022.06.30.pdf); FCC (2021<sup>[15]</sup>), *Fourteenth Broadband Deployment Report*, <https://www.fcc.gov/reports-research/reports/broadband-progress-reports/fourteenth-broadband-deployment-report>; Go Forward Pine Bluff (2017<sup>[16]</sup>), *A Strategic Plan and Future Direction for the City of Pine Bluff*, [https://goforwardpinebluff.org/wp-content/uploads/2023/02/GFPB\\_Plan.pdf](https://goforwardpinebluff.org/wp-content/uploads/2023/02/GFPB_Plan.pdf); Go Forward Pine Bluff (2022<sup>[17]</sup>), *The Generator*, <https://goforwardpinebluff.org/the-generator/>; BroadbandNow (2022<sup>[18]</sup>), *Internet Access in Pine Bluff, Arkansas*, <https://broadbandnow.com/Arkansas/Pine-Bluff?zip=71601>; Ritter Communications (2020<sup>[21]</sup>), “Ritter Communications invests \$2.8 million to bring 100 percent high-speed fiber internet and cloud services to Pine Bluff businesses”, <https://www.rittercommunications.com/newsroom/ritter-communications-brings-fiber-to-pine-bluff-businesses>; Go Forward Pine Bluff (2020<sup>[19]</sup>), “Team working to bring together fiber internet to Pine Bluff residents and businesses”, [https://goforwardpinebluff.org/downloads/Pine\\_Bluff\\_RCDI\\_Project\\_Press\\_Release\\_7\\_2020.pdf](https://goforwardpinebluff.org/downloads/Pine_Bluff_RCDI_Project_Press_Release_7_2020.pdf); Arkansas Democrat Gazette (2022<sup>[20]</sup>), “The Generator has been busy, director tells city officials”, <https://www.arkansasonline.com/news/2022/feb/11/council-mayor-hear-go-forward-initiatives/>; Arkansas Democratic Gazette (2021<sup>[22]</sup>), “WEHCO investment sets up Pine Bluff as ‘gig city’”, <https://www.arkansasonline.com/news/2021/jun/25/wehco-investment-sets-up-pb-as-gig-city/?news-arkansas>; BroadbandNow (2022<sup>[23]</sup>), *Internet Access in Columbiana, Ohio*, <https://broadbandnow.com/Ohio/Columbiana?zip=44408>.

## State of broadband connectivity in the United States

### *Broadband subscriptions and performance*

As the digital transformation takes hold, the demand for high-quality broadband services is increasing across the United States. Broadband users have been upgrading to Gigabit fixed broadband offers (i.e. offers with advertised speeds above 1 000 Mbps) in response to the rise of remote activities. In the two years (2019-21) prior and during the pandemic, the share of gigabit offers over total fixed broadband subscriptions<sup>12</sup> in the United States more than quadrupled, passing from 2.1% to 9.8% (i.e. a 369% increase), which compares to a 134% growth across the OECD over the same period (from 4% in 2019 to 9.4% in 2021) (OECD, 2023<sup>[24]</sup>).

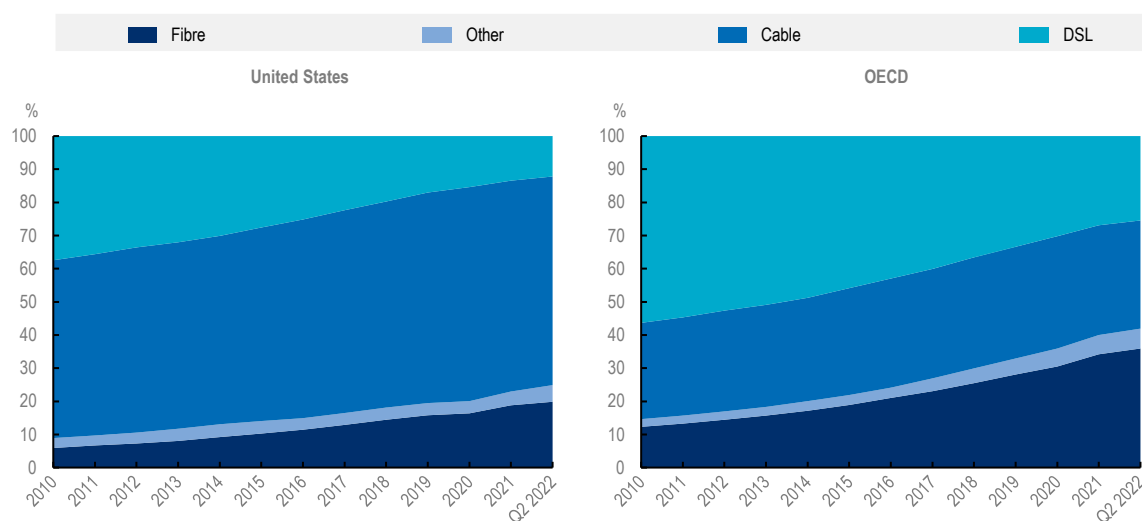
Household broadband data consumption in the United States has also been surging in recent years, in part likely due to the increase in remote activities. According to the OpenVault Broadband Insights (OVBI) report,<sup>13</sup> average monthly broadband data usage of households in the United States at the end of 2021 was 2.6 higher than the 2017 level and grew by 56% compared to Q4 2019 (prior to the pandemic), reaching 536.3 GB Gigabytes (GB) per month (OpenVault, 2022<sup>[25]</sup>). Both the growth in data consumption

and consumers upgrading their fixed broadband offers reflect an increased demand for higher quality and reliable broadband networks, which will likely only grow over the next decade.

To foster connectivity, regardless of whether the last mile access is fixed or mobile broadband, a key element is deploying fibre deeper into networks to unlock the full potential of emerging technologies, such as the Internet of Things (IoT)<sup>14</sup> and artificial intelligence (AI). Fibre is also required for 5G networks as it connects cell sites through what is called “backbone” and “backhaul” connectivity, also referred to as “middle-mile” infrastructure in the United States.<sup>15</sup> That is, fixed and mobile broadband infrastructure are complementary.

The rate of fixed broadband penetration in the United States stood at 38.3 subscriptions per 100 inhabitants in June 2022, slightly higher than the OECD average of 34.7. However, the use of high-speed fibre networks was lower than the OECD average in the United States, as the share of fibre-to-the-home (FTTH) subscriptions over total fixed broadband reached 19.9%, below the OECD average of 35.9%, and well below leading OECD countries, such as Korea (87.3%), Japan (83.9%), Spain (81.2%), Sweden (79.6%) Lithuania (78.6%) (OECD, 2023<sup>[24]</sup>). At present, cable is the predominant broadband technology in the United States, while the share of Digital Subscriber Line/Loop (DSL) copper wired connections is declining (Figure 4.1).

**Figure 4.1. Evolution of fixed broadband access technologies (United States vs. OECD), 2010-22, by subscriptions per 100 inhabitants**



Note: Data for 2022 correspond to June 2022. Fibre subscriptions data includes fibre-to-the-home (FTTH) also known as fibre-to-the-premise (FTTP), and fibre-to-the-building (FTTB); it excludes fibre-to-the-curb (FTTC) and fibre-to-the-node (FTTN). “Other” includes fixed wireless access (FWA), satellite and other technologies.

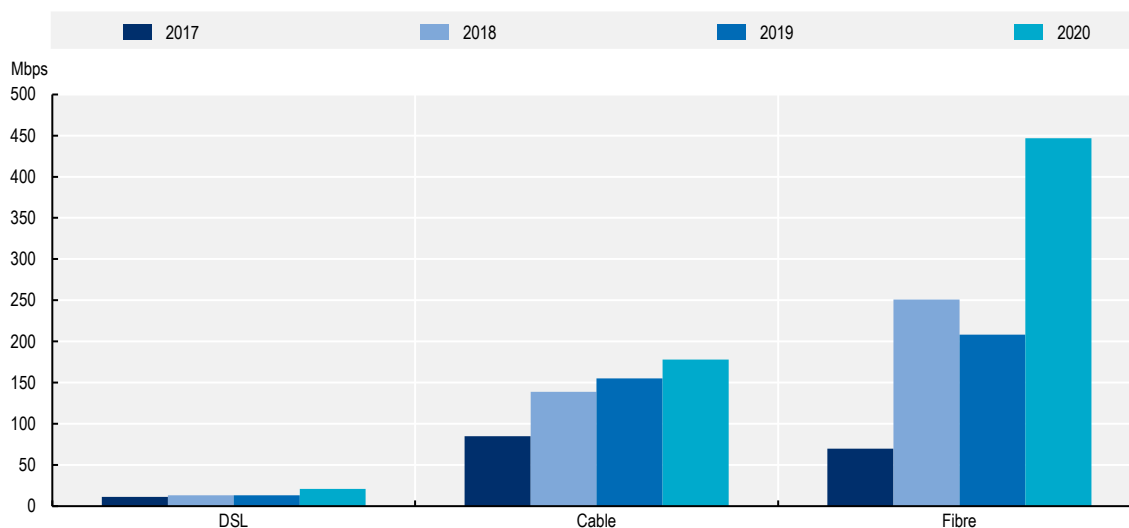
Source: OECD (2023<sup>[24]</sup>), *OECD Broadband Portal (database)*, <https://www.oecd.org/sti/broadband/broadband-statistics/>.

There is a recent push towards more fibre deployment in the United States, likely stemming from an increased demand for higher quality connections. Fibre networks provide symmetrical upload and download speeds, which translates into better support for activities that require upload throughput, such as teleworking or online courses via video conferencing (OECD, 2022<sup>[5]</sup>). Historic funds are being made available to upgrade and expand broadband networks (see section “A window of opportunity: Broadband infrastructure funding in the United States”). From 2020-21, fibre-to-the-home (FTTH) subscriptions grew by 40.3%, compared to an OECD average growth of 18.6% (OECD, 2023<sup>[24]</sup>), although they started from a lower baseline level than the OECD average.

Broadband performance is a key element to gauge the state of connectivity. It is often correlated to the type of access technology pervasive in the market. Advertised fixed broadband download speeds have been increasing in the 2017-20 period, with the highest speeds reported by fibre providers (FCC, 2021<sup>[26]</sup>). Advertised average download speeds in 2020 of copper DSL, cable and fibre fixed ISPs were 20.6 Mbps, 177.9 Mbps and 446.6 Mbps, respectively (Figure 4.2).

Advertised speeds tend to differ from actual speeds experienced by users. According to M-Lab data, the average fixed broadband download speeds experienced in the United States during the period of July 2020 to June 2021 were 92.2 Mbps (M-Lab, 2022<sup>[27]</sup>). Ookla's measure for fixed broadband speeds (average of peak speeds experienced by users) in June 2021 was 195.5 Mbps in the United States (Ookla, 2021<sup>[28]</sup>; OECD, 2022<sup>[5]</sup>). Still, according to both data sources, M-Lab and Ookla, the United States was above the OECD average (i.e. 63.8 Mbps and 136 Mbps, respectively) (OECD, 2022<sup>[5]</sup>).<sup>16</sup>

**Figure 4.2. Advertised fixed broadband download speeds in the United States, by technology**



Note: Weighted average advertised download speeds among fixed broadband ISPs. The median speed of each ISP is weighted by the number of subscribers of that ISP as a fraction of the total number of subscribers across all ISPs (FCC, 2021<sup>[26]</sup>). The y-axis refers to megabit per second (Mbps).

Source: FCC (2021<sup>[29]</sup>), *Measuring Fixed Broadband - Eleventh Report*, <https://www.fcc.gov/reports-research/reports/measuring-broadband-america/measuring-fixed-broadband-eleventh-report>.

Mobile broadband deployment seems to be advancing at pace in the United States. Mobile broadband penetration was 171.6 subscriptions per 100 inhabitants in June 2022 (ranked 3<sup>rd</sup> among OECD countries), compared to an OECD average of 128. Moreover, the United States was one of the first OECD countries to launch 5G commercial services (on 3 April 2019, by Verizon), with the other two mobile carriers launching the same year (i.e. AT&T and T-Mobile). While experienced download speeds in 5G networks in the United States were lower than the OECD average in Q4 2021 (101.7 Mbps vs. 181 Mbps in the OECD area),<sup>17</sup> it was a leading OECD country, after Korea, in terms of 5G availability measured by the percentage of time that the signal is available (i.e. 21.6% vs. an OECD average of 9.1% in Q4 2021) (Opensignal, 2022<sup>[30]</sup>; OECD, 2022<sup>[5]</sup>).<sup>18</sup>

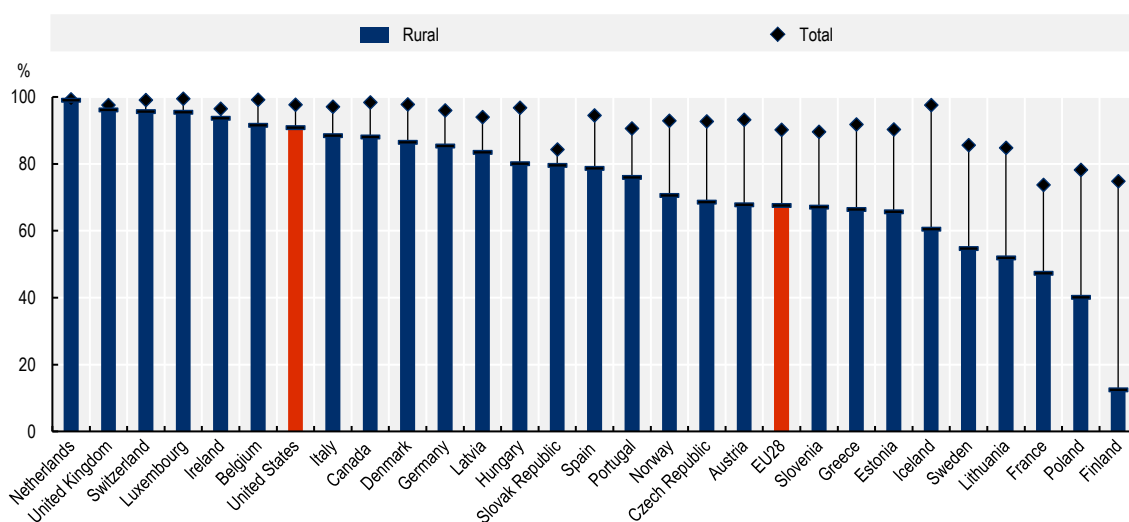
### *Existing territorial connectivity divides*

Being connected *well* means having access to high-quality broadband services at affordable prices. Overall, the main sources of complaints by broadband users in the United States refer to the availability

(36%), billing practices (33%) and speeds of broadband services (13%) (FCC, 2022<sup>[31]</sup>),<sup>19</sup> which point to issues that may be more acute in rural areas. Users in rural areas often face a lack of broadband coverage, have limited or no choice among ISPs (there is often only one ISP providing broadband in their communities), and typically experience lower broadband speeds compared to their urban counterparts.

High-speed broadband coverage in rural areas remains a major challenge for many OECD countries, including the United States. For example, the availability of fixed broadband services in terms of geographical coverage with a minimum speed of 30 Mbps reveals significant gaps between rural and urban households. In Europe, for example, only 67.5% of rural households were located in areas with coverage of fixed broadband with a minimum speed of 30 Mbps, compared to 90.1% of households in overall areas in 2021. In June 2021, in the United States, the availability of 25 Mbps fixed broadband was 90.7% in rural areas, against 97.6% in total (Figure 4.3).

**Figure 4.3. Households in areas where fixed broadband with a contracted speed of 30 Mbps or more is available, 2021**



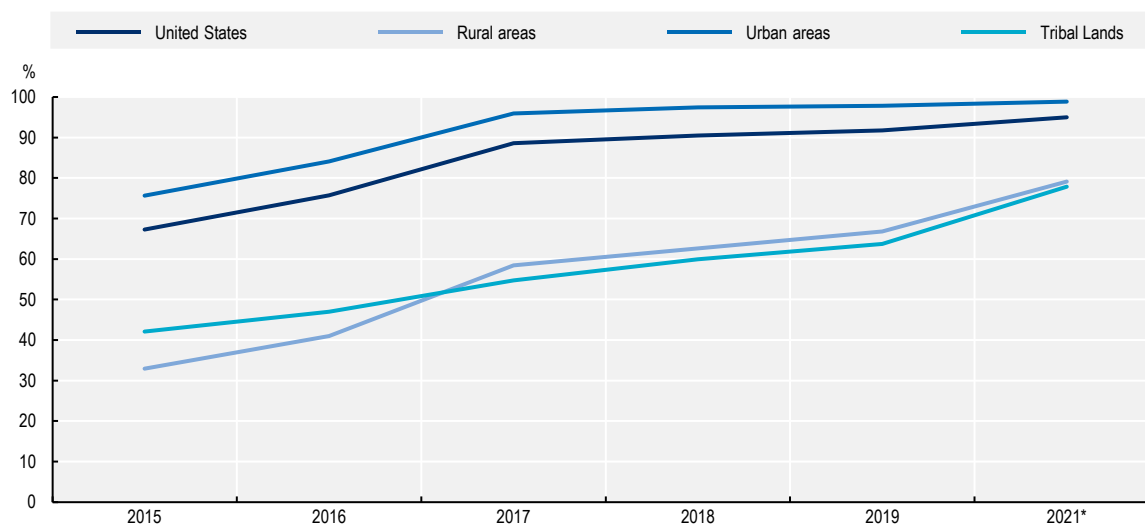
Note: Canada, Iceland, Norway and Switzerland: data are for 2020; the United States: data are for June 2021. *Fixed broadband coverage*: For EU countries, coverage of VDSL, FTTP, and DOCSIS 3.0 capable of delivering at least 30 Mbps download was used; For the United States, coverage of fixed terrestrial broadband capable of delivering 25 Mbps download and 3 Mbps upload services was used (i.e. match the fixed broadband definition used in the European Union, satellite offers are excluded). The United States uses the population coverage approach rather than percentage of households covered. *Rural areas*: For EU countries, rural areas are those with a population density of less than 100 inhabitants per square kilometre. For Canada, rural areas are those with a population density of less than 400 per square kilometre. For the United States, rural areas are those with a population density of less than 1 000 per square mile or 386 people per square kilometre.

Source: OECD calculations based on CRTC (2021<sup>[32]</sup>), *Communications Monitoring Report 2022*, <https://crtc.gc.ca/eng/publications/reports/PolicyMonitoring/ban.htm>; EC (2022<sup>[33]</sup>), *EU Digital Scoreboard - Data Visualisation Tool*, European Commission; FCC (2021<sup>[15]</sup>), *Fourteenth Broadband Deployment Report*, <https://www.fcc.gov/reports-research/reports/broadband-progress-reports/fourteenth-broadband-deployment-report>; FCC (2023<sup>[34]</sup>), *Area Summary: Fixed Broadband Deployment Data (map dataset)*, [https://broadbandmap.fcc.gov/#/area-summary?version=dec2020&type=county&qeoid=39029&tech=acfosw&speed=100\\_10&vlat=40.80890148289103&vlon=-80.75536588457368&vzoom=10.226932829218589](https://broadbandmap.fcc.gov/#/area-summary?version=dec2020&type=county&qeoid=39029&tech=acfosw&speed=100_10&vlat=40.80890148289103&vlon=-80.75536588457368&vzoom=10.226932829218589).

Looking at the different areas of the United States, there are persistent gaps in fixed broadband coverage at 100 Mbps download speeds (and 10 Mbps upload) among urban, rural, and Tribal Land areas. According to the FCC's Fourteenth Broadband Deployment report and the latest public data from the FCC (June 2021), 79.1% and 77.9% of the population in rural areas and Tribal Lands in 2021, respectively, lived in areas where fixed broadband offers at these speeds were available, which compares to 98.9% of the population living in urban areas (Figure 4.4) (FCC, 2021<sup>[15]</sup>; 2023<sup>[34]</sup>).<sup>20</sup> These figures relate to broadband

deployment measured by the reported coverage of ISPs to the FCC, and thus may underestimate the actual coverage gap (see more on the FCC’s current efforts to improve broadband mapping in section on the importance of granular data on broadband availability and quality).<sup>21</sup> Moreover, the urban-rural-Tribal connectivity divide in terms of adoption, measured by the amount of individuals and households actually connected, tends to be more pronounced. According to the FCC’s 2020 “Communications Marketplace Report”, the overall adoption rate of 100 Mbps broadband in 2019 was 50.9% at the national level, 50% in rural areas, and 36.2% on Tribal Lands (FCC, 2020<sup>[35]</sup>). Moreover, according to the NTIA’s Internet Use Survey, 73.3% of urban households had fixed high-speed Internet service at home in 2021, which compares to 58.7% of rural households (NTIA, 2022<sup>[36]</sup>).

**Figure 4.4. Fixed broadband (100 Mbps) population coverage in the United States, by area**



Note: The FCC designates a census block group as rural (or Tribal land) if more than 50% of the population in the census block group resides in census blocks designated as rural (or Tribal land). The definition of fixed broadband includes satellite providers.

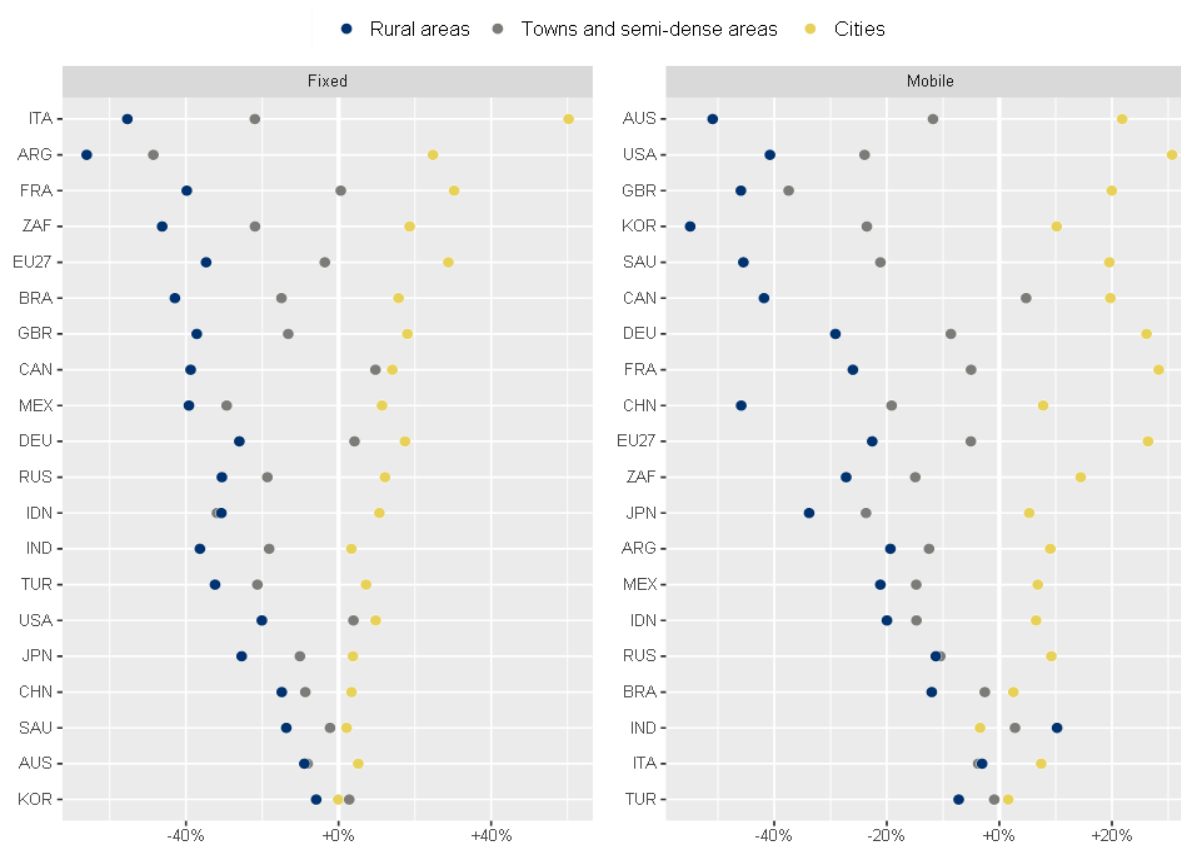
\* Data for 2021 refers to June 2021 using the latest public release of the FCC’s form 477 data.

Source: FCC (2021<sup>[15]</sup>), *Fourteenth Broadband Deployment Report*, <https://www.fcc.gov/reports-research/reports/broadband-progress-reports/fourteenth-broadband-deployment-report>, Appendix H: Deployment (Millions) of Fixed Services (includes Satellite) at Different Speed Tiers in the United States (31 December 2019); data for June 2021 from FCC (2023<sup>[34]</sup>), *Area Summary: Fixed Broadband Deployment Data (map dataset)*, <https://broadbandmap.fcc.gov/#/area-summary?version=dec2020&type=county&qeoid=39029&tech>.

Territorial differences in connectivity also translate into user experiences that vary substantially depending on where people live and work, as evidenced by the differences in actual download speeds in cities compared to rural areas (OECD, 2021<sup>[41]</sup>). For the G20, data from self-administered connection speed tests by Ookla for G20 countries show that download speeds over fixed networks in rural areas were on average 31 percentage points below the national average in the last quarter of 2020. Download speeds in cities, on the other hand, were on average 21 percentage points above the national average (OECD, 2021<sup>[41]</sup>). By comparison, in the United States, this territorial difference was less pronounced with rural areas exhibiting speeds on average 20 percentage points below the national average, and cities being situated at roughly 10 percentage points above the national average. Disparities in mobile download speeds were similar to those in fixed broadband speeds across G20 countries, with a 52-percentage point difference on average between rural areas and cities (OECD, 2021<sup>[41]</sup>). The United States, however, had more significant territorial differences, exhibiting an important 72-percentage point gap and the second highest among G20 countries (Figure 4.5).



**Figure 4.5. Gaps estimated as percentage deviation from national averages (Q4 2020) in G20 countries, by degree of urbanisation**

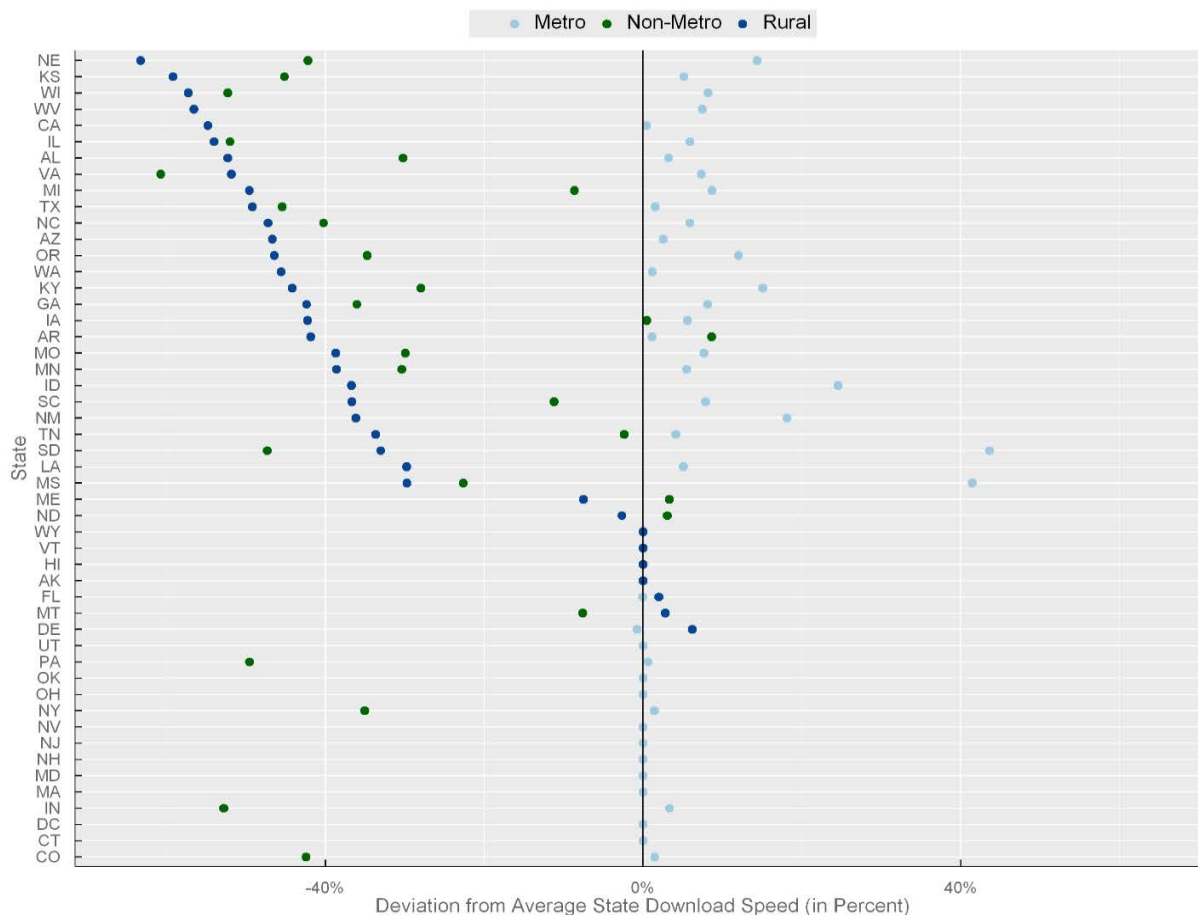


Note: Speedtest data corresponds to Q4 2020. The data for average fixed and mobile broadband download Speedtests reported by Ookla measures the sustained peak throughput achieved by users of the network. Measurements are based on self-administered tests by users, carried over iOS and mobile devices. Aggregation according to the degree of urbanisation was based on GHS Settlement Model (GHS-SMOD) layer grids. The figure presents average peak speed tests, weighted by the number of tests.

Source: OECD calculations based on Speedtest® by Ookla® Global Fixed and Mobile Network Performance Maps. Based on analysis by Ookla of Speedtest Intelligence® data for 2020Q4. Provided by Ookla and accessed 27 January 2021. Ookla trademarks used under license and reprinted with permission.

Using the same source (Ookla), data across the 50 states in the United States shows a clear regional divide in terms of the quality of mobile broadband experienced, as evidenced by the large gaps between urban (metro) and rural areas measured by the mean deviation from the state average in 4G 2020 (Figure 4.6).<sup>22</sup> In the first quarter of 2021, there was a 51-percentage point gap in download broadband speeds experienced by users between urban (metro) and rural regions across states. In Nebraska, South Dakota and Mississippi, the gap was greater than 70 percentage-points. On the other hand, the level of download speeds in these three states was 80.5 Mbps, 88.3 Mbps and 54 Mbps, respectively. According to Ookla data, the level of download speeds in states varied widely, from 42.6 Mbps (Wyoming) to 132.6 Mbps (Utah) in Q1 2021.

**Figure 4.6. Gaps in download speeds experienced by users in states of the United States, by TL3 (small region) classification, estimated as a percentage deviation from state averages, Q1 2021**



Note: Ookla dataset with a TL3 (small regions) classification (see *OECD Regional database* <http://dx.doi.org/10.1787/region-data-en>).<sup>23</sup> Within small regions, the OECD has three main classifications: “Metropolitan regions”, “Regions near a metropolitan area” and “Regions far from a metropolitan area”. Within the last category, two further sub-categories are included: “Regions close to small/medium city” and “remote regions”. Metro = “Metropolitan region”, a region where at least half of its population lives in a metropolitan area (i.e. a functional urban area of at least 250 000 inhabitants). Non-metro = “Non-metropolitan region with access to small/medium city”, a region where 50% of its population lives within a 60-minute drive of a small- or medium-sized city (functional urban areas with a population of less than 250 000 inhabitants and above 50 000). Rural = “Non-metropolitan remote region”, a region with less than 50% of its population living within a 60-minute drive of a functional urban area. \*Honolulu, Hawaii (HI) is the only small region (TL3) in the dataset classified as rural. Therefore, the “state” average of Hawaii corresponds to the rural area average (Honolulu). For Alaska (AK), a similar case is Anchorage, which is the only TL3 region and is classified as rural. This is a similar issue as concerns the states of Vermont and Wyoming. An additional caveat is that in several US states and the District of Columbia (DC) the dataset presents missing data (NA) for rural regions, when in part, this is because the OECD classification is too aggregated to show territorial diversity in some states including: Colorado (CO), Connecticut (CT), Indiana (IN), Massachusetts (MA), Maryland (MD), New Hampshire (NH), New Jersey (NJ), Nevada (NV), New York (NY), Ohio (OH), Oklahoma (OK), Pennsylvania (PA) and Utah (UT). Source: OECD calculations based on Speedtest® by Ookla® Global Fixed and Mobile Network Performance Maps data for Q1 2021. Provided by Ookla and accessed 7 July 2022. Ookla trademarks used under license and reprinted with permission.

### ***Bridging connectivity divides in the United States***

In light of the broadband coverage and quality gaps across territories, action is needed to ensure ubiquitous, affordable, and high-quality connectivity in the United States. *Affordability* and *high-quality* broadband services usually derive from competition in communication markets and investment in networks.

Overarching policies that foster competition, promote investment and ease infrastructure deployment are important tools to spur the expansion of high-quality communication networks, including in rural and remote areas that are often underserved or completely unserved (OECD, 2021<sup>[41]</sup>). Indeed, the United States recognises the importance of boosting competition and reducing barriers to deployment to bridge digital divides as part of the Telecommunications Act of 1996 (United States Congress, 1996<sup>[37]</sup>). These policies also reduce the need for public investments to areas where business cases are not likely to be viable, and where alternative approaches (e.g. through public-private partnership or public funding) might be required.

Combining market forces with alternative approaches is key to expand connectivity (OECD, 2021<sup>[41]</sup>). As such, the regulatory, legal and institutional framework plays a fundamental role to bridge connectivity divides, in particular for the communication sector that is characterised by high fixed costs and barriers to entry. However, a thorough assessment of the regulatory, legal and institutional framework in the United States with an analysis of the level of competition in communication markets, is beyond the scope of this report on rural innovation. It would require a dedicated country review on Telecommunication Policy and Regulation.<sup>24</sup> Therefore, this section will provide a brief overview of broadband availability in rural areas, as well as good practices taken in OECD countries to promote broadband deployment that could inspire policies and actions in the United States.

### *Promoting competition and incentives to invest in broadband networks*

Experience in OECD countries such as Mexico (OECD, 2017<sup>[38]</sup>)<sup>25</sup> has shown that promoting competition is one of the strongest levers to extend connectivity and increase affordability and quality of communication services, including to underserved populations. Competitive communication markets influence not only investments, but also the affordability of communication services, which is a major obstacle for broadband adoption in the United States.<sup>26</sup>

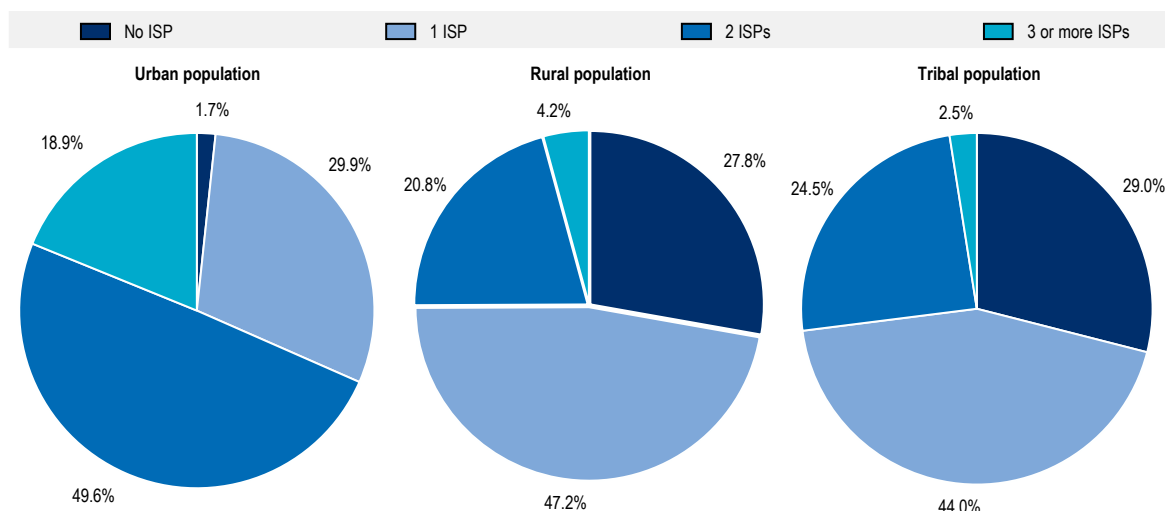
In terms of communication market participants, the mobile market in the United States has four Mobile Network Operators (MNOs). In April 2020, T-Mobile acquired Sprint, bringing down the total of MNOs in the country from four to three. However, the United States imposed remedies on the T-Mobile/Sprint merger as a way to keep the market open for a fourth player (OECD, 2021<sup>[39]</sup>). The main condition imposed by the Department of Justice (DoJ) was for T-Mobile to divest a substantial amount of assets to a company called Dish, so that it could become the fourth wireless carrier (DoJ, 2020<sup>[40]</sup>). Under commitments to the FCC, Dish needed to reach 20% of the population in the United States with 5G by June 2022 and 70% by June 2023. The company reached the first milestone on 14 June 2022 (Dish, 2022<sup>[41]</sup>).

There are seemingly many fixed-wired broadband providers (2 627) in the United States according to BroadbandNow data that relies on FCC's reporting form 477 (BroadbandNow, 2022<sup>[42]</sup>). However, when taking a regional look (TL3 level), on average, there are only four ISPs by small region in the United States, which means that many consumers may find themselves with limited choice of providers. In rural areas, it may be only one DSL copper or satellite broadband provider, and in some instances, no provider at all.

Considering the availability of broadband offers by speed tiers at 100 Mbps download and 10 Mbps upload speeds, people living in rural areas and on Tribal Lands are either not covered at all by any ISP, or only have one ISP offering such services (Figure 4.7). The availability of such offers is important to ensure high-quality connectivity for all. As part of the Notice of Inquiry that starts the FCC's annual evaluation of the state of broadband across the country, a new baseline broadband definition of 100 Mbps download and 20 Mbps upload speeds was proposed in July 2022 (FCC, 2022<sup>[43]</sup>).

To illustrate the lack of provider choice at county level, Table 4.1 shows the percentage of the population living in rural areas where 100 Mbps download speed broadband offers are available in the respective counties of the three communities visited for the field research of this project: Gallup, Pine Bluff and Columbiana.

**Figure 4.7. Percentage of the population living in areas with 100 Mbps download speed fixed broadband offers, by number of providers**



Note: Data are for June 2021 (latest public release of form 477). The definition of fixed broadband includes satellite providers.

Source: FCC (2023<sub>[34]</sub>), *Area Summary: Fixed Broadband Deployment Data (map dataset)*, [https://broadbandmap.fcc.gov/#/area-summary?version=dec2020&type=nation&geoid=0&tech=acfosw&speed=100\\_10](https://broadbandmap.fcc.gov/#/area-summary?version=dec2020&type=nation&geoid=0&tech=acfosw&speed=100_10).

**Table 4.1. Percentage of the population living in rural areas with 100 Mbps download speed fixed broadband offers, by number of providers, in three counties of the United States**

|   | No providers (ISPs) | 1 provider | 2 providers | 3 or more providers |
|---|---------------------|------------|-------------|---------------------|
| McKinley County (Gallup, New Mexico)    | 80.1                | 17.6       | 2.22        | 0                   |
| Jefferson County (Pine Bluff, Arkansas) | 85.4                | 13.5       | 1.13        | 0                   |
| Columbiana County (Columbiana, Ohio)    | 18.7                | 63.4       | 16.7        | 1.2                 |

Note: Data are for June 2021 (latest public release of form 477). The definition of fixed broadband includes satellite providers.

Source: FCC (2023<sub>[34]</sub>), *Area Summary: Fixed Broadband Deployment Data (map dataset)*, [https://broadbandmap.fcc.gov/#/area-summary?version=dec2020&type=nation&geoid=0&tech=acfosw&speed=100\\_10](https://broadbandmap.fcc.gov/#/area-summary?version=dec2020&type=nation&geoid=0&tech=acfosw&speed=100_10).

With the aim of fostering fibre deployment, communication regulators across the OECD are both looking to foster competition while incentivising investments in networks. OECD countries may opt to use pro-competitive wholesale access regulation to promote both retail-based and infrastructure-based competition. Some do it through wholesale fibre access remedies applied only to the dominant operator with geographical segmentation considerations (Spain and Portugal); others apply similar measures to all operators, but regulation depends on the geographical area, such as in France (OECD, 2022<sub>[5]</sub>). For example, Spain has emerged as a connectivity leader in Europe, using a combination of wholesale access regulation that spurs competition and targeted public funds (Box 4.2). In the United States, there are wholesale access regulatory measures imposed on the historical fixed broadband incumbent (e.g. copper unbundling requirements and some unbundling requirements in terms of wholesale fibre).

### Box 4.2. Spain: Pro-competitive wholesale regulation and targeted public funds

In recent years, Spain has emerged as a fibre connectivity leader in Europe, with the country's regulatory environment a key driver of private sector-led investment in fibre networks. Two regulatory measures have been key. First, third party network access obligations on the formerly state-owned incumbent, Telefonica, were capped at 30 Mbps, meaning that new entrants could use Telefonica's network to deliver connectivity only up to those speeds, with Telefonica obligated to sell wholesale access at regulated pricing. Secondly, Telefonica was obligated to allow new entrants to use their ducts to build their own networks.

In 2016, after seven years of the initial phase of regulatory forbearance for fibre deployments, Spain applied fibre wholesale access regulation based on geographical segmentation of competitive versus non-competitive areas (Godlovitch et al., 2019<sup>[44]</sup>). In 2021, the Spanish communication regulator relaxed the imposed obligations by deeming more geographical areas of the country "competitive markets". The result of these measures has been a rapid rollout of "Fibre-to-the-home" (FTTH) connectivity across the country, with fibre as a percentage of total fixed broadband connections growing from 35% in 2016 to 81.2% in June 2022 (ranked 3<sup>rd</sup> in the OECD after Korea and Japan, see the [OECD Broadband Portal](#)).

Public funding outside urban areas complements the supportive regulatory environment. Backed by funding from the European Regional Development Fund, Spain has delivered major programmes to subsidise connectivity investment in rural areas, and in 2021, to expand the next evolution of broadband networks to the whole country:

- Next Generation Broadband Expansion Programme (NGBEP) (2013-20). This programme intended to support private investment, with the aim of extending the deployment of high-speed broadband networks (more than 100 Mbps) to the most remote areas.
- The 300x100 Project. Subsequent to the NGBEP, this project aims for even faster connections, targeting connectivity of at least 300 Mbps to 100% of households nationwide. Up to EUR 525 million (USD 620.6 million)<sup>27</sup> are being distributed to fund projects in rural areas.
- Recovery, Transformation and Resilience Plan (2021-26). In 2021, connectivity and 5G have been identified as the key pillars for Spain's economic recovery plans (OECD, 2022<sup>[5]</sup>). Spain allocated EUR 4.3 billion (USD 5.08 billion)<sup>28</sup> of the European Recovery Funds (Next Generation EU) to expand 5G networks during the period 2020- 2025 (La Moncloa, 2021<sup>[45]</sup>).

Source: Based on OECD (2021<sup>[4]</sup>), *Bridging Digital Divides in G20 Countries*, <https://doi.org/10.1787/35c1d850-en>; OECD (2022<sup>[5]</sup>), "Broadband networks of the future", <https://doi.org/10.1787/755e2d0c-en>; Government of Spain (n.d.<sup>[46]</sup>), *Outreach Programme of Broadband of New Generation (PEBA-NGA) in the Period 2019-2021*, <https://avancedigital.mineco.gob.es/en-us/Participacion/Paginas/Cerradas/PEBA-NGA-2019-2021.aspx>; Godlovitch, I. et al. (2019<sup>[44]</sup>), *Prospective Competition and Deregulation: An Analysis of European Approaches to Regulating Full Fibre for BT*, [https://www.ofcom.org.uk/data/assets/pdf\\_file/0020/145046/b-group-wik-report-annex.pdf](https://www.ofcom.org.uk/data/assets/pdf_file/0020/145046/b-group-wik-report-annex.pdf); La Moncloa (2021<sup>[45]</sup>), "Recovery Plan is most ambitious economic plan in Spain's recent history", says Pedro Sánchez", <https://www.lamoncloa.gob.es/lang/en/presidente/news/Paginas/2021/20210413recovery-plan.aspx>.

#### *The importance of granular data on broadband availability and quality*

Improving the accuracy of broadband data at a granular level is crucial to ensure end-user transparency and increase the effectiveness of broadband policy measures. Broadband maps, for example, can influence the allocation of funds to close connectivity gaps in unserved and underserved areas, such as the case of broadband funds of the Infrastructure Investment and Jobs Act in the United States.

The FCC's efforts to upgrade broadband mapping are commendable. The United States Congress passed the Broadband Deployment Accuracy and Technological Availability (DATA) Act in 2020 instructing the FCC to improve its broadband maps. The FCC launched in February 2021 a "Broadband Data Task Force" with the aim to "lead a cross-agency effort to collect detailed data and develop more precise maps about broadband availability" (FCC, 2021<sup>[47]</sup>). The Head of the FCC reported on the progress of the Task Force's for over 18 months at the end of June 2022, stating that they had opened their system to collect data from over 2 500 broadband providers (FCC, 2022<sup>[48]</sup>). In November 2022, the FCC released a pre-production draft of its new National Broadband Map, where the public will be able to submit challenges to improve its accuracy (FCC, 2022<sup>[49]</sup>).

With the aim of improving transparency for end users, several communication regulators across the OECD, including the United States, are using innovative approaches, such as "crowd-sourcing" techniques and volunteer tests with whiteboxes to measure the quality and coverage of broadband networks (OECD, 2022<sup>[5]</sup>). In 2011, the FCC set up a voluntary quality of service (QoS) measurement programme in collaboration with SamKnows, called "Measuring Broadband America" (FCC, 2021<sup>[26]</sup>).

OECD countries also increasingly make use of government sponsored tools to draw broadband comparisons in terms of both availability and prices, given that affordability is a key concern for consumers. The United States government could consider adding a price dimension to broadband mapping efforts. Consumers need clear, transparent, and readily accessible information on communication services to make informed decisions, and any comprehensive list of broadband metrics developed by policy makers and regulators should therefore include indicators on prices. Access to this information empowers consumers, provides useful insights about the level of competition in the market, and complements other metrics used to assess the sector's overall efficiency and performance (OECD, 2013<sup>[50]</sup>). The OECD has developed a new methodology for bundled communication price baskets, which could be helpful (OECD, 2020<sup>[51]</sup>).

### *Easing infrastructure deployment as key element to boost investment in networks*

#### **The role of local governments to ease broadband network deployment**

Local governments have a key role to play to foster broadband deployment. One important barrier to broadband infrastructure deployment is the lengthy administrative processes to obtain "rights of way".<sup>29</sup> Administrative procedures often require approval from several different public authorities at different levels of government. In rural communities with different land property rights, as seen in the example of Gallup, New Mexico (Box 4.1), the issue is even more acute.

The United States, through the FCC, has carried out efforts to streamline access to rights of way, through the 2018 order "Accelerating Wireless and Wireline Broadband Deployment by Removing Barriers to Infrastructure Investment." The FCC decision determines the amount that municipalities may reasonably charge for small cell deployment given the practicalities and importance of 5G deployment. In offering guidelines for determining this value, the FCC cited the rules of 20 states that limit upfront pole fees to USD 500 for use of an existing pole, USD 1 000 for installation of a new pole, and recurring fees of USD 270 per year (OECD, 2019<sup>[52]</sup>). However, this effort has faced hurdles in some municipalities as this may increase the burden already placed on local governments.

Access to rights of way is an issue present in many OECD countries and can be aggravated depending on the level of autonomy of municipalities, which in some countries, is protected at the Constitutional level (e.g. Sweden). This requires a high degree of collaboration between national, state/regional and local authorities. In Sweden, for example, collaboration to ease broadband deployment is undertaken through the Broadband Forum, which brings together all three levels of government (OECD, 2018<sup>[53]</sup>). Some OECD countries issue a code of "Good Practices" in an effort to streamline access to rights of way, and others monitor how municipalities adhere to the national communication law (e.g. Spain). Colombia publishes an

index of municipalities measuring the degree that capital cities “ease infrastructure deployment” to provide incentives for municipal authorities to reduce barriers for network rollout (CRC, 2022<sup>[54]</sup>; OECD, 2022<sup>[55]</sup>).

To further ease infrastructure deployment, the United States could also build on existing efforts to reduce the administrative burden and costs associated with broadband deployment at the local level. Enhancing the collaboration among national, state, and local authorities, for example through a task force established by the National Telecommunications and Information Administration (NTIA) and the FCC that includes representatives from local and state authorities, could help in this regard. The latter could leverage existing programmes by the NTIA, such as the State Broadband Leaders Network (SBLN), to streamline access to rights of way. The SBLN is a network of practitioners working on state broadband initiatives and provides a platform to strengthen collaboration among states, local authorities, and federal agencies (NTIA, n.d.<sup>[56]</sup>).

### **Making information available for operators to increase deployment efficiency**

Increased access to information and public assets also plays a crucial role in broadband deployment since it is time-consuming to determine where to build towers and then buy or lease that property. To ease this process, the United States could consider increasing transparency and access to information of public assets, as other countries have done.

For example, in Mexico, the National Telecommunication Infrastructure Information system (*Sistema Nacional de Información de Infraestructura*, SNII), approved and issued by the Mexican communication regulator (*Instituto Federal de Telecomunicaciones*, IFT), includes useful information on rights of way geared at allowing licensed communications to deploy communication infrastructure on public assets, such as buildings. This inventory reveals the availability and status of public infrastructure that can be leased by operators with the aim to increase efficiency in deploying communication networks, reduce deployment costs, and increase broadband coverage (Gonzalez-Fanfalone et al., 2021<sup>[57]</sup>).

With respect to broadband deployment, several OECD countries have an “infrastructure atlas” available for communication service providers, that allows them to access information on the specific location of backbone and backhaul connectivity as well as other types of wholesale infrastructure (OECD, 2022<sup>[5]</sup>). This enhances transparency for infrastructure-sharing and joint-deployment initiatives that bring deployment costs down. While not all countries have this data available online, France launched in 2017 a map where consumers, providers and general stakeholders can consult fibre infrastructure, both at retail and wholesale level (<https://cartefibre.arcep.fr/>). The United States could assess the costs and benefits of making available such wholesale infrastructure information available to market players.

### *Promoting efficient spectrum management to bridge connectivity divides*

Spectrum is a scarce essential input, in the form of invisible airwaves, that is required to provide mobile broadband connectivity, among other wireless services. Spectrum management has a role in the efforts to close connectivity gaps through mobile connectivity, for example, by imposing build-out requirements in licences or by allowing access to unused spectrum to expand connectivity in underserved areas. Increasingly, several OECD countries view an individual’s right to communication services as being just as important as the right to electricity or fresh water. They consider this right a prerequisite for digital transformation (OECD, 2022<sup>[58]</sup>).

Coverage obligations in spectrum assignment procedures, such as auctions, along with a competitive communication market, have proven to be an effective tool in OECD countries to extend mobile broadband coverage in rural and remote areas (OECD, 2022<sup>[58]</sup>). For example, Brazil deemed extending broadband coverage as the most important policy objective in the 5G auction that concluded in November 2021, as opposed to focusing only on revenue maximisation. The award process included coverage obligations (for the 700 MHz band) in federal highways and investment commitments to increase mobile broadband coverage and fibre backhaul in Brazilian municipalities (Anatel, 2022<sup>[59]</sup>; OECD, 2022<sup>[58]</sup>).

The United States is continually making efforts to promote the efficient use of spectrum and granting access to various entities in the market (OECD, 2022<sup>[58]</sup>). For example, the 2.5 GHz band was licensed to non-profit schools for educational purposes, and in 2020, the FCC established a “Tribe Priority Window” to allow Tribes in rural areas to directly access unassigned 2.5 GHz spectrum to expand broadband in their lands (FCC, 2021<sup>[60]</sup>). Moreover, to increase the participation of a designated subset of entities in spectrum auctions, the United States routinely offers bidding credits to small firms or providers in Tribal Lands, which lowers their final payments by a pre-established amount (FCC, 2022<sup>[61]</sup>). The United States is also promoting spectrum sharing and flexible use licences. More details can be found in the OECD report “Developments in Spectrum Management for Communication Services” (OECD, 2022<sup>[58]</sup>).

### *Community networks and local ISPs connecting rural areas*

Municipal networks are used in several OECD countries to promote fibre deployment in cities, smaller towns, and surrounding regions. These networks are typically high-speed networks that have been fully or partially facilitated, built, operated, or financed by local governments, public bodies, utilities, organisations, or co-operatives that have some type of public involvement (OECD, 2015<sup>[62]</sup>).

Recent OECD work looked at two examples of municipal networks in the United States: Chattanooga, Tennessee and Lafayette, Louisiana (OECD, 2022<sup>[5]</sup>). Chattanooga provides an example of a successful municipal network provided by the Electric Power Board (EPB), which is currently offering advertised speeds of up to 10 Gbps. LUSfiber in Louisiana is a similar case of a municipal network, which has been a utility provider for 120 years. After winning a Supreme Court case in 2009, LUSfiber was able to operate as an ISP in Lafayette, Louisiana (Talbot, Hessekiel and Kehl, 2018<sup>[63]</sup>). Like EPB in Chattanooga, LUSfiber is offering advertised speeds up to 10 Gbps (BroadbandNow, 2021<sup>[64]</sup>).

In addition to municipal networks, community networks are often bottom-up approaches in rural and remote areas that build on local knowledge and initiatives, and can play a complementary role with respect to national service providers in bridging connectivity divides (APC, 2020<sup>[65]</sup>). Institutional framework conditions may be key to fostering bottom-up initiatives that seek to expand connectivity in rural and/or remote areas. For example, in Mexico, the rise of community networks in rural areas has been facilitated by changes ushered in by the 2013 telecommunication reform, whereby social use spectrum licences include community and indigenous networks with non-profit purposes (OECD, 2017<sup>[38]</sup>). In Brazil, the communication regulator (Anatel) explicitly recognised community networks as an option for Internet access in Brazil (Anatel, 2020<sup>[66]</sup>).

Spectrum licensing can be used as a tool to promote wireless local community broadband networks. The spectrum licensing framework in several OECD countries allows to cater to local networks to address rural connectivity needs, including with low-cost licences to extend coverage in rural and remote areas (e.g. Australia, Finland, Japan, Mexico, New Zealand, Sweden, the United Kingdom and the United States) (OECD, 2022<sup>[58]</sup>). In Mexico, social purpose spectrum licences can be used to provide not-for-profit communication services, such as mobile broadband. To date, five social purpose licenses have been granted for the provision of communication services in Mexico. In addition, 467 commercial licences (i.e. for-profit) have been granted through Wireless Internet Service Providers (WISPs), which provide broadband services mainly in rural areas (OECD, 2022<sup>[58]</sup>).

Deployment costs of fibre are much higher in sparsely populated areas than in urban ones. As such, in commercially “unattractive” areas, community networks can help lower fibre deployment costs given their knowledge of local conditions. For example, apart from the municipal fibre network, the institutional framework also encourages local communities to form co-operatives to roll out fibre networks, commonly referred to as “village networks”. The “village fibre” approach is based on the premise of community involvement to plan, build and operate local fibre networks in co-operation with municipalities and commercial operators. Compared to commercial broadband projects, village fibre projects can achieve cost savings of some 50% using an innovative handling of permissions as well as excavation and voluntary



work. A further reduction of some 25% is achieved through public funds (state aid), making the connection fee equivalent to that of urban areas (OECD, 2018<sup>[53]</sup>). In the United States, an example of a successful rural fibre co-operative network is the Dakota Carrier Network (Box 4.3).

### Box 4.3. Dakota Carrier Network

North Dakota in the United States is a highly rural and sparsely populated state with a density of just 4.1 persons per square kilometre. Out of the 50 states and territories, North Dakota ranks 49<sup>th</sup> in population density. Despite this, 76.6% of rural residents in North Dakota have access to Gigabit speed connectivity (i.e. more than 1 000 Mbps download with 100 Mbps upload speeds), a level that far exceeded the national average in both rural (19%) and urban (29.3%) areas (as of December 2020) (FCC, 2020<sup>[67]</sup>).

North Dakota's success in bridging rural connectivity divides is largely the result of a consortium of small, independent rural companies and co-operatives that came together in 1996 to purchase the 68 rural exchanges from the incumbent telephone company. In doing so, these small organisations formed the Dakota Carrier Network (DCN), a state-wide umbrella organisation that covers 90% of the state's land area and 85% of its population (Sousa and Herman, 2012<sup>[68]</sup>). The development of the DCN's fibre network received USD 10.8 million in federal funding support through the Broadband Technology Opportunities Programme. The DCN also enhanced e-health in the state by deploying a dedicated 10 Gbps health care network to over 200 hospitals, clinics, and other health care providers to enable telemedicine, tele-radiology, tele-pharmacy, and electronic health information exchange (NTIA<sup>[69]</sup>).

Source: Adapted and updated from OECD (2021<sup>[4]</sup>), *Bridging Digital Divides in G20 Countries*, <https://doi.org/10.1787/35c1d850-en>; FCC (2020<sup>[67]</sup>), *Compare Broadband Availability in Different Areas*, [https://broadbandmap.fcc.gov/#/area-comparison?version=jun2019&tech=acfosw&speed=25\\_3&searchtype=county](https://broadbandmap.fcc.gov/#/area-comparison?version=jun2019&tech=acfosw&speed=25_3&searchtype=county); Sousa, J. and R. Herman (2012<sup>[68]</sup>), *A Co-operative Dilemma: Converting Organizational Form*, [http://base.socioeco.org/docs/co-operative\\_dilemma.pdf](http://base.socioeco.org/docs/co-operative_dilemma.pdf); NTIA (n.d.<sup>[69]</sup>), *BroadbandUSA - North Dakota*, <https://www2.ntia.doc.gov/north-dakota>.

Municipal and community broadband networks add to the gamut of solutions to bridge rural connectivity divides in the United States. However, there are still hurdles for local networks in the United States, as 17 states have legal restrictions that render it difficult for (or ban) local governments wishing to offer broadband services if there are commercial providers already present in the market (BroadbandNow, 2021<sup>[70]</sup>). Efforts to promote an enabling environment for these local networks to flourish could help bridge divides in rural and remote areas. These conditions range from reconsidering outright legal bans in certain states, to promoting access and interconnection to 'middle mile' fibre backhaul and backbone connectivity, as well as some degree of regulatory forbearance (e.g. with respect to reporting obligations).

### ***Towards “digital equity”: Fostering broadband adoption among disadvantaged groups***

Digital divides can vary in terms of geography (e.g. as urban and rural areas), by gender, by age, by skill level, by firm size, and in general, by different vulnerable groups in society. Some aspects of digital divides are, of course, common to most geographical areas such as income disparities or lack of skills. Other aspects of the digital divide are accentuated by differences in geography. The definition of “gap” or “divide” inherently means a comparison; therefore, there is an implicit reference group in mind when assessing them (e.g. rural versus urban areas, small and medium enterprises [SMEs] versus large firms, developed versus emerging economies, etc.) (OECD, 2021<sup>[71]</sup>).

The United States is keen to understand the main actions to take to bridge divides and enhance affordability. For example, in February 2022, the FCC launched a cross-agency effort to “combat digital discrimination”, i.e. to promote equal access to broadband across the country regardless of where people live, their income level, ethnicity, race, religion, or national origin (FCC, 2022<sup>[72]</sup>).

### *Affordability, a key obstacle for broadband adoption by disadvantaged groups*

Affordability is one of the main barriers to broadband uptake by households and business in many OECD countries, including the United States, leading to accentuated digital divides. Affordability can relate to both the cost of broadband service as well as the cost of the terminal device to access the service (e.g. tablet, computer, or smartphone), and this can disproportionately affect low-income households and/or populations living in rural areas. In the United States, 26% of people in households with incomes under USD 25 000 per year had no Internet service subscription at all, which compares to only 9% of adults in high-income households (i.e. annual income above USD 100 000) lacking any type of Internet service (NTIA, 2022<sup>[36]</sup>; NTIA, 2022<sup>[73]</sup>).

In addition to overarching policies that increase competition and investment in broadband markets explored in previous sections that influence the affordability of communication services, some OECD countries have also established assistance and subsidised service programmes targeted to low-income populations (i.e. demand side initiatives) to promote uptake of broadband services. In the United States, the FCC’s Affordable Connectivity Program provides qualifying households with a discount of up to USD 30 per month to afford broadband access, and up to USD 75 per month for eligible households in Tribal Lands (FCC, 2022<sup>[74]</sup>).

As a complementary measure to policies promoting the rollout of residential and business broadband connections, some countries are also implementing public broadband access solutions (e.g. in the form of public Wi-Fi hotspots). For example, in Colombia, the project *Acceso Universal para Zonas Rurales - Centros Digitales* (“Project for Universal Access to Rural Areas - Digital Centers”) aims to provide public Wi-Fi connectivity solutions in 14 750 “Digital Centers” throughout all Colombian departments until 2031 (OECD, 2022<sup>[55]</sup>). However, these hotspots can never substitute for household and business broadband subscriptions, and, in addition, the government faces the challenge of continuing to fund such programmes indefinitely.

Countries may also implement tailored measures to bridge the rural digital divide, such as specific public funding to complement private investment to deploy broadband networks in rural areas. For example, the Government of Canada, through the Investing in Canada Plan launched in 2016, committed over USD 143.5 billion (CAD 180 billion)<sup>30</sup> over 12 years for infrastructure projects, including to increase broadband connectivity in rural and northern areas of the country (Government of Canada, 2018<sup>[75]</sup>). New Zealand has established the Rural Broadband Initiative (Phase II) and the Mobile Black Spot Fund that are delivering improved broadband and mobile services to inhabitants in rural and remote areas. Over USD 304 million (NZD 430 million)<sup>31</sup> in grant funding from the Telecommunications Development Levy has been allocated for the Rural Broadband Initiative in New Zealand to provide improved broadband to target around 10 000 rural households and businesses (Government of New Zealand, 2018<sup>[76]</sup>).

### *Digital literacy and its role in bridging digital divides*

Digital literacy is the set of knowledge, skills, and behaviours that enable people to understand and use digital systems, tools and applications, and to process digital information. These capabilities and aptitudes link with a population’s capacity to be innovative, productive, and creative, and to participate in democracy and the digital economy (OECD, 2018<sup>[3]</sup>).

In the United States, the National Telecommunications and Information Administration (NTIA) has implemented programmes, such as the Sustainable Broadband Adoption programme, to support training activities in rural areas to show the relevance of broadband-based services to rural non-adopters and to encourage people to invest time in digital skills training (OECD, 2018<sup>[3]</sup>). More recently, within the funding allocated to boost broadband deployment and adoption under the auspices of the Infrastructure Investment and Jobs Act (IIJA), the NTIA is administering the Digital Equity Act, which allocates USD 2.75 billion to promote digital inclusion, including the promotion of digital skills and digital literacy (NTIA, 2022<sup>[77]</sup>).

In Colombia, government-led initiatives have fostered the training of community champions to promote the locally based efforts to provide face-to-face assistance to individuals who need help acquiring digital skills (OECD, 2018<sup>[3]</sup>). In Canada, beyond government-led programmes, private initiatives are also seeking to advance digital literacy in remote areas. Pinnguaq, a not-for-profit technology start-up founded in 2012 in Nunavut, a vast but sparsely populated territory in northern Canada, is helping remote indigenous communities to learn computer and coding skills (Pinnguaq, n.d.<sup>[78]</sup>).

### *Connecting small and medium firms*

Persistent digital divides across firm size may translate into a large share of firms not having the same access to opportunities that the digital transformation has to offer, which may result in productivity gaps. Therefore, policy makers try to ensure that all businesses, regardless of their size, can benefit from the digital transformation. In the United States, bridging connectivity divides among small and medium-sized enterprises (SMEs) is particularly relevant and 99.4% were small businesses in 2020 (United States Census Bureau, 2020<sup>[79]</sup>).<sup>32</sup>

Some OECD countries have tailored policies or conducted research on the level of connectivity of specific user groups considered to be lagging, such as SMEs. In the United Kingdom, the communication regulator, Ofcom, carried out quantitative and qualitative research to understand the experiences and attitudes of the market for communication services for SMEs. The research found that SMEs often have Internet services that are not optimal for their business, namely with reference to bandwidth, affordability, upload speeds or use in peak times (Ofcom, 2018<sup>[80]</sup>).

In France, connecting SMEs with fibre networks has been a priority for the communication regulator Arcep since 2016 (Arcep, 2018<sup>[81]</sup>). To promote competition and innovation regarding the provision of broadband services, the French regulator has opted to experiment. It put in place a “regulatory sandbox”, which primarily consisted of a limited regulatory waiver of up to two years for start-ups wishing to test new technologies or offer an innovative service. Arcep has also established dedicated office hours within the largest French incubator space, “Station F”, to inform start-ups on issues related to spectrum or numbering, for example.

### ***A window of opportunity: Broadband infrastructure funding in the United States***

At present, the United States is witnessing a historic inflow of public funds to expand and upgrade broadband infrastructure. This is a unique window of opportunity to bridge connectivity divides by fostering “future-proof” deployments. It may also enhance the choice of broadband providers across the United States, which, in turn, influences affordability conditions. The way these funds will be implemented may help change the connectivity landscape in the United States in the coming decades.

The main source of public funds is the Infrastructure Investment and Jobs Act (IIJA), signed into law in November 2021, which allocates USD 65 billion to expand broadband. Four agencies are leading the efforts of the IIJA: the Department of Commerce's NTIA, the FCC, the Department of the Treasury, and the USDA.

The NTIA will manage around USD 48 billion in the context of the IJJA through four programmes to expand access, affordability and adoption of high-quality broadband services (i.e. the Broadband Equity, Access and Deployment Program [i.e. BEAD] the Digital Equity Act Programs, the Tribal Connectivity Technical Amendments, and the Enabling Middle Mile Infrastructure programme). Out of the four programmes, the largest is the BEAD programme, which provides USD 42.45 billion to be distributed among states, territories, the District of Columbia and Puerto Rico, for projects that support broadband infrastructure deployment and adoption (NTIA, 2022<sup>[82]</sup>). The NTIA launched in May 2022 an initiative called “Internet for all”, grouping three out of the four initiatives of the IJJA managed by them (i.e. the BEAD programme, the Digital Equity Act, and the Middle Mile Infrastructure programme), together with other existing programmes (NTIA, 2022<sup>[83]</sup>). All states and territories confirmed their participation, in adherence with the deadlines, by July 2022 (NTIA, 2022<sup>[84]</sup>).

The NTIA’s newly established Office of Internet Connectivity and Growth is in charge of administering the BEAD funds. Through the BEAD programme, states will receive federal grants for projects to build out broadband access for “unserved” and “underserved” areas where broadband connections exhibit speeds lower than 100 Mbps (NTIA, 2022<sup>[82]</sup>). The NTIA published on 13 May 2022 the Notice of Funding Opportunity (NOFO) for the BEAD programme, which established rules on how to allocate the funds at state level. The NOFO mentions a preference for fibre deployment, makes a distinction between unserved and underserved areas with funding available for both, and includes notions of open access and affordability. In addition, while funding is available for all access technologies, the BEAD rules mention that areas currently covered only by satellite broadband or service based on unlicensed spectrum will be considered unserved (NTIA, 2022<sup>[85]</sup>). BEAD funding will depend on the availability (and approval) of the new broadband coverage maps from the FCC.

It is praiseworthy that the BEAD rules (NTIA’s NOFO of May 2022) include the notion of open access to lower barriers of entry to local markets and promote competition at the retail level. In addition, signalling a preference for fibre is a welcome development given that it is a scalable “future proof” technology allowing for symmetrical speeds, which are increasingly important in a remote economy and may also be more energy efficient than other access technologies (OECD, 2022<sup>[5]</sup>). At the moment of writing, the way states would implement the BEAD rules was still being determined. An important question will be the implementation of notions of affordability, open access obligations and preferences for the deployment of future-proof access technologies, such as fibre, found in the NTIA’s NOFO. The success in the implementation of BEAD funding by states will also depend on the level of engagement with rural communities.

Apart from the BEAD programme, the NTIA will also administer USD 1 billion in funding to enable “middle mile” broadband infrastructure, such as undersea cables and IXPs, to connect access networks (NTIA, 2022<sup>[82]</sup>). In addition, the Digital Equity Act allocates USD 2.75 billion to promote digital inclusion (e.g. promoting Internet adoption, development of digital equity plans, promotion of digital skills and digital literacy), and the Tribal Connectivity Technical Amendments (USD 2 billion), which is a programme to help expand high-speed broadband to Tribal Lands. The latter complements the existing Tribal Broadband Connectivity Program.<sup>33</sup>

In addition to IJJA funds administered by the NTIA, the FCC will manage USD 14.2 billion for the Affordable Connectivity Program, and the USDA will administer USD 2 billion for the Rural Utilities Service programme. The IJJA also includes Private Activity Bonds (amounting to USD 0.6 billion) authorising state and local governments to use private activity bonds for rural broadband deployment (NTIA, 2022<sup>[86]</sup>).

Funds managed by the USDA will also play a role in bridging rural connectivity gaps. To that end, the IJJA provides USD 2 billion for USDA broadband programmes, including USD 1.926 billion for the ReConnect programme that offers loans and grants to help ISPs cover underserved areas of the country, as well as USD 74 million for Rural Broadband Program loans. It also directs USD 5 million of the technical assistance funds to establish and support rural community networks (“rural telecommunications cooperatives”) to offer

broadband service in rural areas. The IIJA calls on the USDA to collaborate with the FCC and NTIA in awarding funding for broadband projects (CRS, 2021<sup>[87]</sup>). The USDA has made two rounds of IIJA funding for ReConnect projects available, where historically underserved communities are exempted from matching the grant funding (USDA, n.d.<sup>[88]</sup>).<sup>34</sup> Moreover, the Consolidated Appropriations Act of 2023 allocates USD 363.5 million for USDA's ReConnect programme that offers loans and grants to help ISPs cover underserved areas of the country. It also allocates USD 35 million for USDA's Community Connect Grant Program to help eligible applicants to provide broadband services in rural, economically-challenged communities. This adds to the budget allocated to the USDA within the IIJA.

In 2021, as part of the recovery package of the COVID-19 pandemic, the American Rescue Plan Act (ARPA) of 2021 allocated USD 7.17 billion, out of USD 1.9 trillion, for broadband connectivity and infrastructure funding (i.e. the Emergency Connectivity Fund [ECF]) administered by the FCC. Moreover, on 25 February 2021, the FCC adopted a Report and Order (R&O) that established the Emergency Broadband Benefit Program, a USD 3.2 billion federal initiative to help lower the cost of high-speed Internet for eligible households during the COVID-19 pandemic. The Emergency Broadband Benefit Program was developed by Congress in the Consolidated Appropriations Act of 2021 (FCC, 2021<sup>[89]</sup>). Other eligible funds to invest in broadband access by states include the Coronavirus State and Local Fiscal Recovery Funds (SLFRF) programme, part of the ARPA in 2021, which allocated USD 350 billion to state, local, and Tribal governments to support their response and recovery from the COVID-19 pandemic. The Consolidated Appropriations Act of 2023 provides additional flexibility for these entities to spend their SLFRF (ARPA) allocations. For instance, the Act allows entities to spend their allocations as part of the matching funds requirement for BEAD projects (i.e. at least 25% of grant matching by states).

In terms of promoting affordability of broadband services, the United States Government says it is engaging with ISPs to ensure low-cost Internet offers (e.g. USD 30 per month or less) to boost adoption among low-income households (NTIA, 2022<sup>[86]</sup>). However, a crucial question is how this will be implemented. If the initiative relies on voluntary and non-binding actions by ISPs, it remains to be seen whether service providers would offer low-cost options with sufficiently high speeds. A second option is to tie the requirement of affordable offers to new public grant conditions. For example, the BEAD rules (NOFO) contain requirements of affordability. However, how this notion is implemented will likely depend on the states receiving the funding. The third option would be for the FCC to impose *ex-ante* rate regulation on broadband providers, for example, if they received any public funding. However, it is unclear whether the FCC could pursue that route within the existing legal framework.<sup>35</sup>

The use of market mechanisms, such as competitive tenders and reverse auctions, is a common tool used across the OECD to allocate scarce public funds to meet policy objectives in geographical areas that are underserved by broadband networks (e.g. Italy, Korea, the United Kingdom and the United States). The Rural Digital Opportunity Fund (RDOF) is an existing measure to bridge connectivity divides in rural and remote areas in the United States. Launched in 2020, the FCC will fund up to USD 20.4 billion over 10 years to finance high-speed broadband networks ("up to Gigabit speeds") in rural and remote areas. The funds will be awarded through a two-phase reverse auction mechanism favouring players both willing to provide faster download speeds and willing to accept the lowest grant money per customer. Phase I of the project, where the auction concluded on 25 November 2020, granted USD 9.23 billion in funding targeting over six million homes and businesses in census blocks completely unserved by voice and broadband with speeds of at least 25 Mbps (i.e. 5 220 833 locations in 49 states and one territory) (FCC, 2022<sup>[90]</sup>). In the past, concerning the RDOF decision, the then-Commissioner and now head of the FCC, underscored the importance of accurate broadband mapping and increasing the baseline definition of broadband speeds.<sup>36</sup>

Apart from the importance of granular data to allocate funds, reverse auctions that consist of broadband coverage “promises” at certain speeds and low deployment cost require a thorough understanding of the bidder’s financial ability to sustain such deployment promises. On July 2022, the FCC proposed fines amounting to USD 4.3 million to the companies defaulting on their RDOF obligations by failing to comply with the deployment deadlines. The FCC estimates that the defaults prevented investments in broadband infrastructure in 129 909 locations across 36 states (FCC, 2022<sup>[91]</sup>).

Another source of funding available for broadband development projects relates to universal service provisions, under the FCC’s remit. In the past, these funds were pivotal for the National Broadband Plan of 2009. One of the main pillars of the Communications Act of 1934 (United States Congress, 1934<sup>[92]</sup>), the sectoral legislation in the United States, amended in 1996, was to foster the universal service of communication services “at just, reasonable and affordable rates”. The Telecommunications Act of 1996 expanded the traditional goal of universal service to include Internet services (United States Congress, 1996<sup>[37]</sup>). As such, communication providers, including ISPs, contribute to the Universal Service Fund (USF). The USF targets four main projects: 1) the Connect America fund to support connectivity in rural areas, 2) the “Lifeline” programme to support low-income consumers including residents of Tribal Lands, 3) the E-Rate programme to support the connectivity of schools and libraries connectivity, and 4) the rural health care programme (FCC, 2022<sup>[93]</sup>).

In addition to the above, the FCC and the NTIA also manage programmes to ensure connectivity of educational institutions. The Emergency Connectivity Fund mainly aims to connect schools, libraries, and eligible consortia by supporting the purchase of tablets, hotspots, and routers, and/or broadband access (FCC, 2022<sup>[94]</sup>). According to the FCC, total commitments up to July 2022 (USD 5.6 billion over 3 application windows) have funded over 11 million connected devices and more than 7 million broadband connections, helping 12.8 million students through the support of around 10 000 schools, 900 libraries, and 100 consortia. The FCC committed additional funding to these 3 ECF windows (USD 266 million) to connect schools and libraries on 13 July 2022 (FCC, 2022<sup>[95]</sup>). The NTIA is promoting broadband connectivity of colleges and universities serving minority populations. In July 2022, the NTIA awarded 5 grants (amounting to USD 10 million) to expand high speed broadband in Historically Black Colleges and Universities (HBCUs), Tribal Colleges and Universities (TCUs), Hispanic Serving Institutions (HSIs), and Minority-Serving Institutions (MSIs) (NTIA, 2022<sup>[96]</sup>).

Given the plethora of existing and programmes and grants to boost broadband connectivity and bridge rural digital divides, there is an opportunity to leverage synergies of ongoing programmes undertaken by the FCC, such as the RDOF and universal service provisions, with existing IJJA grants. Moreover, to ensure the success of such initiatives, collaboration across agencies and at all levels of government, with an emphasis on local engagement, continues to be key.

## Enabling Human Capital Assets for Innovation: Education

A second key framework condition for innovation in rural counties of the United States is access to education. While the role of education is critical in providing equal opportunities, the quality and delivery of educational services is often more limited in rural regions. High costs and resource limitations make it particularly challenging to provide education to all people (OECD/EC-JRC, 2021<sup>[2]</sup>). Because of the decentralised nature of administering education services, and its partial dependency on local taxes, the quality of education is often uneven.

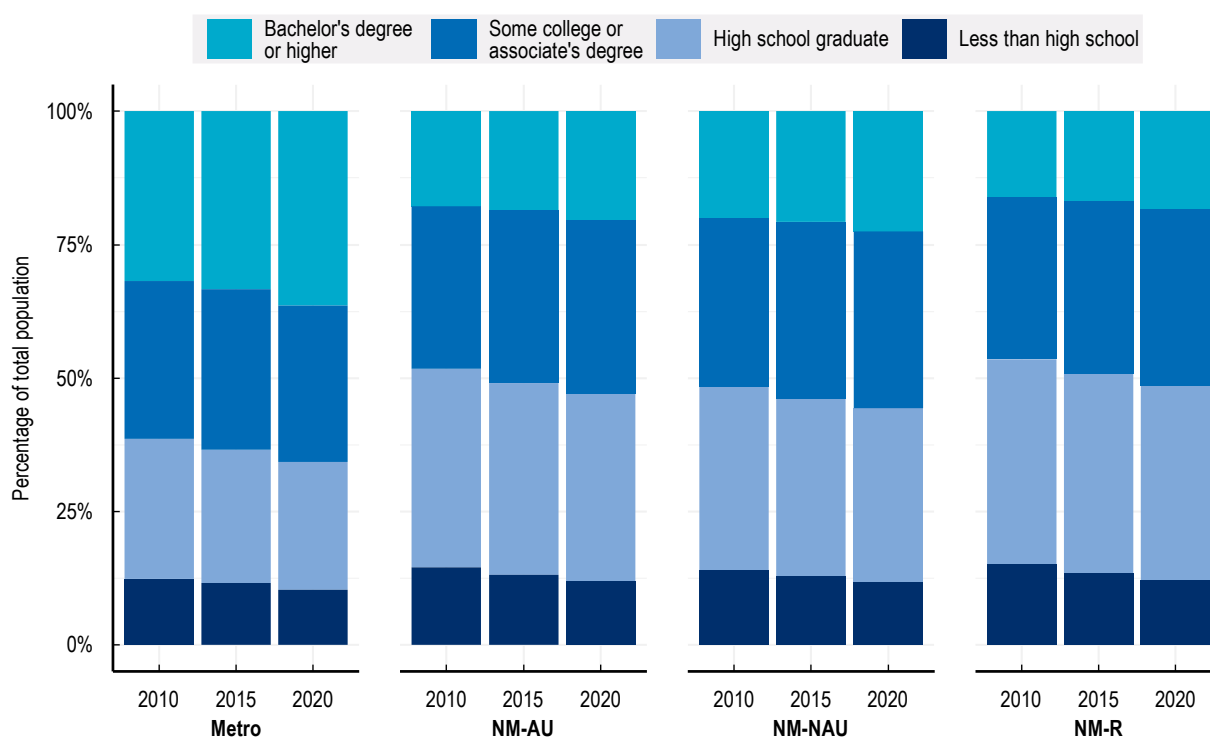
Non-metropolitan counties tend to have lower shares of individuals with at least a bachelor’s degree (Figure 4.8). The share of highly educated workers, which is often associated with innovation, differs in metropolitan and non-metropolitan regions (see Chapter 2). In non-metropolitan regions, higher shares of some college<sup>37</sup> or associate degrees are positively correlated with increased productivities, suggesting that quality college and associate’s education may be relatively more relevant for non-metropolitan regions.

On the other hand, the shares of population with different levels of education are similar across the three types of non-metropolitan counties.

Over time, we have observed a steady rise in shares of those educated with at least a bachelor's degree across all regions and a steady decline of those with less than high-school education. However, the largest share of individuals in non-metropolitan areas are those with high school graduate degrees and this remains relatively constant over time, as Figure 4.8 shows.

Education is more expensive in non-metropolitan counties. The increased costs of delivery are often associated with greater distances for teachers and school staff as well as infrastructure (OECD/EC-JRC, 2021<sup>[2]</sup>). As Figure 4.9 shows, the percentage of government spending on education per capita is concentrated in local government. When local government tax bases are low because of the low population density characteristics of rural and non-metropolitan regions, this can aggravate the challenge.

**Figure 4.8. Educational attainment by type of county, 2010, 2015, 2020**

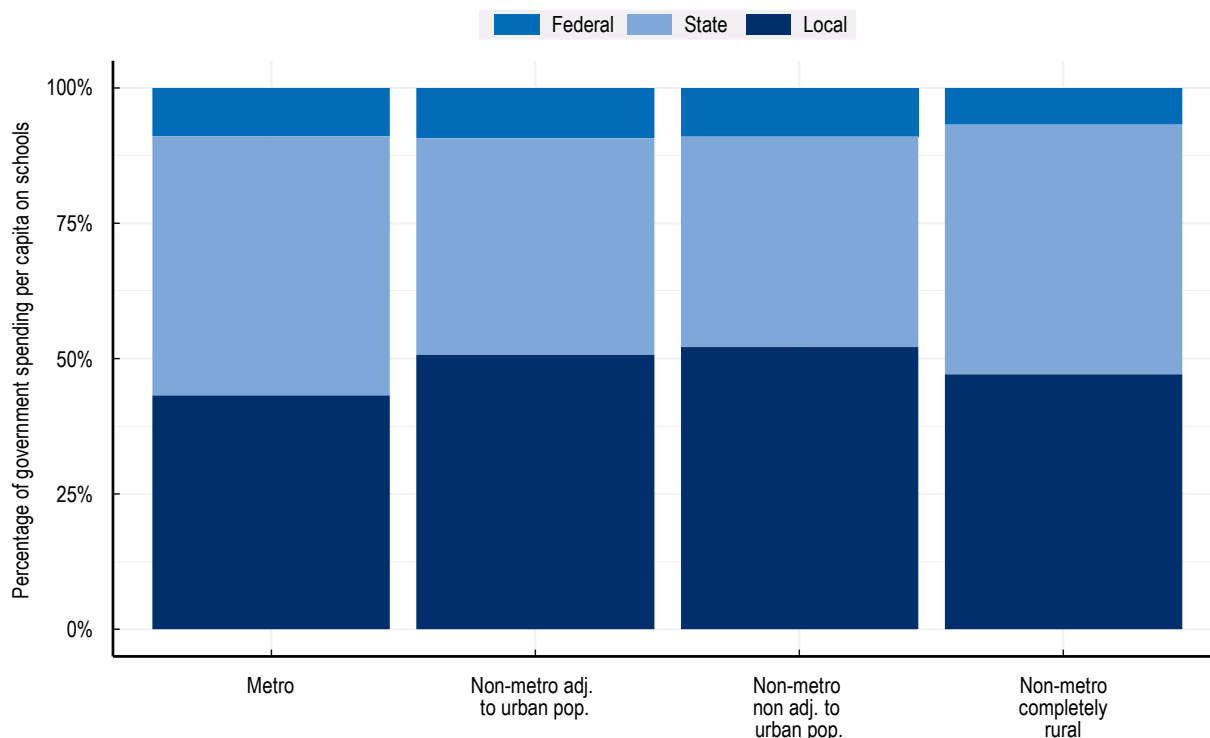


Note: Categories in this figure are described in Chapter 2, and based on the USDA's Rural-Urban Continuum Codes (RUCC). "Metro" refers to metropolitan counties. "NM-AU" refers to non-metropolitan counties adjacent to urban populations. "NM-NAU" refers to non-metropolitan counties that are not adjacent to urban populations. "NM-R" refers to rural non-metropolitan counties.

Source: U.S. Census Bureau (2022<sup>[97]</sup>). *American Community Survey Data*. <https://www.census.gov/programs-surveys/acs/data.html>.

## Figure 4.9. Government spending on education

Educational spending by type and geographical classification, 2017



Note: Spending on education statistics, refer to government (public) spending are from 2017, the last year available. Geographical classifications refer to groupings elaborated in chapter 2, and based on the USDA's Rural-Urban Continuum Codes (RUCC). "Metro" refers to metropolitan counties. "Non-metro adj. to urban pop." refers to non-metropolitan counties adjacent to urban populations. "Non-metro non-adj. to urban pop." refers to non-metropolitan counties that are not adjacent to urban populations. "Non-metro completely rural" refers to rural non-metropolitan counties.

Source: National Center for Education Statistics. (2022<sup>[98]</sup>) *Administrative Data Collections at NCES*. <https://nces.ed.gov/admindata/>. [accessed: January 15, 2022].

### Setting the scene on access to education

The communities that form the basis of this study, Pine Bluff (Arkansas), Columbiana (Ohio) and Gallup (New Mexico), are in different stages of a community revitalisation effort. As part of this process, the local leadership is working to make them more attractive for new businesses, help existing businesses to innovate, and encourage entrepreneurship. Identifying effective mechanisms to support innovation in rural regions is challenging in itself. When this is undertaken as part of a wider community revitalisation effort to help deepen and diversify the local economy and transform it into something more sustainable, it adds a layer of complexity for all involved.

The case study regions have some commonalities and stark differences. Each of the regions have experienced the ebb and flow of growth and decline, limited population growth, areas of disinvestment, and/or a depressed economy. Many of the difficulties these rural areas faced stemmed in part from the loss of an industry or businesses. Of course, small and struggling does not need to be the only narrative. The 2018 *Micro-politan Success Stories from the Heartland*, a report by the Walton Family Foundation, provides a look at several small communities that have been able to rebuild, grow and transform their local economies (Ross DeVol, 2018<sup>[99]</sup>). The report concluded that "small-town America has big-time potential for economic growth" and recognised the ability to "boost the nation's economy" and "bridge the economic



gaps” between the urban and rural areas (Ross DeVol, 2018<sup>[99]</sup>). In addition, it identified a variety of players (e.g., universities and research institutions; community colleges and workforce development; and entrepreneurial awareness support) as key contributing factors to the economic turnaround in the small rural towns studied (see Box 4.4). In the case study communities, we have noticed the following:

- Pine Bluff is a rural town that retained a strong sense of community. However, it has a challenged and underperforming K-12 education infrastructure that impacts the ability of local residents to take full advantage of the strong two-year community college and four-year university in the region. This reality complicates a key priority for Pine Bluff leaders of building the capacity of local residents to own businesses and become entrepreneurs.
- In Columbiana, investment in the town centre and the Main Street Theatre was done to build community as well as drive economic growth, attract new businesses, and create new jobs. Columbiana’s public high school includes a class that provides students with an opportunity to work with industry leaders. Despite good initiatives such as “pop-up shops” and a virtual storefront tool,<sup>38</sup> new businesses in the community could benefit from more training mechanism and streamlined resources to develop “new” entrants. These are potential entrepreneurs with limited resources and no intergenerational family business background or experience.
- Gallup is an economic hub in western New Mexico surrounded by a patchwork of land belonging to the Navajo Nation and private individuals. Rather than simply seeking to attract major employers, the city is trying to take advantage of its key assets, namely its transportation routes, to build new economic opportunities (Williams, Howe and Grey, 2021<sup>[100]</sup>). While Gallup has a 2-year college and 4-year university that offer great opportunities, there was a notable disconnect between local market needs and the training and skills available. The disconnect is such that private sector leaders have stepped in to support the development of a vocational curriculum that matched industry needs to fill the skills gap.

Enhancing human capital to strengthen education, skills and training is important in revitalising communities. Indeed, it was clearly a priority for community leaders in the case study regions. Evolving industry objectives and business needs require school systems to be highly responsive to new patterns of demand and adapt their provision accordingly. To enable local firms to find employees locally and innovate, it is vital that the education infrastructure, K-12, higher education and vocational and training systems, work together.

This section focuses on a few lessons learned from the discussions in the region. The first section looks at the K-12 education system that is providing the necessary foundation for transition to higher education or employment. The second section focuses on the role of higher education in fostering innovation locally. Finally, the third section looks at the ecosystem of education, workforce training and industry, and the fourth addresses entrepreneurial skill building and the capacity of the local population to take advantage of new opportunities and grow their businesses or engage in start-ups.

#### **Box 4.4. Seven Key Attributes That Can Help Spur Economic Growth in Small Towns**

In *Micropolitan Success Stories from the Heartland* the authors measured the performance of 531 small towns in the United States. Based on this list, Pecos, Texas, with a population of approximately 12 000, ranked first. The metric for all 531 areas defined as “micropolitans”, included a young-firm employment ratio ranking (from 2016); per-capita personal income ranking (from 2016); 5-year job growth ranking; 1-year job growth; 5-year average annual income growth; 1-year pay growth; and 5-year personal income growth.

Seven key attributes contributing to their strong economic growth:

1. Universities and Research Institutions.
2. Community Colleges and Workforce Development.
3. Entrepreneurial Awareness, Support, and Access to Early-Stage Risk Capital.
4. Diversified and Thoughtful Strategic Economic Development Planning.
5. Manufacturing, Logistics/Supply Chain, and Foreign Direct Investment.
6. Technology, Professional, Scientific and Technical Services.
7. Quality of Place.

Source: Ross DeVol, S. (2018<sup>[99]</sup>), *Micropolitan Success Stories from the Heartland*, <https://8ce82b94a8c4fdc3ea6d-b1d233e3bc3cb10858bea65ff05e18f2.ssl.cf2.rackcdn.com/d7/f9/00e59918410b83b3a3471533dd44/micropolitan-success-stories-report-print-updated-5.11.2018.pdf>.

### **Strengthening the elementary and secondary education infrastructure**

The main goal of any education system should be that all children and young people achieve their full learning potential. In the United States, 57% of school districts and 32% of public schools are rural, and they educate about 12 million (24%) students (NCES, 2013<sup>[101]</sup>). Family and personal characteristics are often an additional challenge for rural school systems, especially those in persistently poor and low-education areas (Gibbs, 2005<sup>[102]</sup>). The National Center for Education Statistics found that 19% of rural students in remote areas attended high-poverty schools, as did 11% in distant rural areas and 8% in fringe rural areas (NCES, 2013<sup>[101]</sup>).

**Table 4.2. Education related statistics from Gallup, NM, Pine Bluff, AR, and Columbiana, OH**

|                                | Gallup, New Mexico | Pine Bluff, Arkansas | Columbiana, Ohio |
|--------------------------------|--------------------|----------------------|------------------|
| <b>Race and ethnicity:</b>     |                    |                      |                  |
| White                          | 31.5%              | 19.0%                | 95.0%            |
| Black or African American      | 1.4%               | 76.0%                | 2.4%             |
| American Indian                | 47.7%              | 0.3%                 | 0.3%             |
| <b>Citizens 33 and younger</b> |                    |                      |                  |
| Graduate high school           | 84.1%              | 86.2%                | 84%              |
| Bachelor's degree or higher    | 20.1%              | 19.6%                | 14.5%            |
| Median age                     | 30.2               | 34.3                 | 51.6             |
| Persons above 65 years         | 13.3               | 15.2                 | 31.1%            |
| Persons under 18 years         | 31.2%              | 22.8%                | 17.6%            |
| Reading proficiency            | 22%, 44%, 49%      | 12%                  | 86%              |
| Math proficiency               | 4%, 9%, 26%        | 8%                   | 64%              |
| College Readiness Index        | 7.9 – 9.6/100      | 9.7/100              | 14.7/100         |
| Persons in poverty             | 33.7%              | 25.4%                | 12.5%            |

Note: Gallup has 3 public district high schools.

Source: U.S. Census Bureau (2013), *QuickFacts: Columbiana County, Ohio; Pine Bluff City, Arkansas; Gallup City, New Mexico*, <https://www.census.gov/quickfacts/fact/table/columbianacountyohio.pinebluffcityarkansas.gallupcitynewmexico/PST120221>; U.S. News & World Report (n.d.<sup>[104]</sup>), *Columbiana High School*, <https://www.usnews.com/education/best-high-schools/ohio/districts/columbiana-exempted-village/columbiana-high-school-15378>; U.S. News & World Report (n.d.<sup>[105]</sup>), *University of Arkansas Pine Bluff Rankings*, <https://www.usnews.com/best-colleges/university-of-arkansas-pine-bluff-1086/overall-rankings>; U.S. News & World Report (n.d.<sup>[106]</sup>), *High Schools in Gallup-Mckinley City Schools District*, <https://www.usnews.com/education/best-high-schools/new-mexico/districts/gallup-mckinley-city-schools-109891>.

Rural students often deal with a lack of access to quality reading materials and instruction at an early age (especially preschool), a lack of consistent access to medical care, and other factors (Bailey, 2021<sup>[107]</sup>). Some call for more “rural-conscious policies” and more careful attention to the specific needs of rural educators, students, and families (David Arsen, 2021<sup>[108]</sup>). Teacher shortages, student mental health, broadband access, and school funding are all areas of deep concern. Preparing local youth for success with a high-quality public school district is an important component to building a skilled workforce. Localities should pursue a development strategy that incorporates improvements in education.

Basic education is a foundation that inspires young people to stay in school, to train to acquire skills for the labour market, or, for some, to pursue higher education. According to figures from the U.S. News & World Report, in the Pine Bluff School District, only 12% of the high school students tested at or above the proficient level for reading, and 8% tested at or above that level for math (U.S. News & World Report<sup>[109]</sup>). The Pine Bluff State Board of Education has noted that the district had produced a significant imbalance of students with insufficient skillsets, limiting their ability to contribute to the local economy and workforce (Matheson, 2022<sup>[110]</sup>). In Gallup, a look at the three public high schools in the district revealed subpar math proficiency levels of 4%, 9% and 26% and reading at 22%, 44% and 49% respectively (U.S. News & World Report<sup>[106]</sup>).

Teacher recruitment and certification in rural communities is a struggle for school and district leaders. Schools with more experienced teachers tend to have better results in the Programme for International Student Assessment (PISA) science test and a better school climate. However, often the education system in rural communities falls short. The Pine Bluff State Board of Education has noted that students could go through the Pine Bluff K-12 system without interacting with a certified teacher (Matheson, 2022<sup>[110]</sup>). Nonetheless, teacher characteristics are significantly associated with better performance (OECD, 2011<sup>[111]</sup>). An underperforming K-12 education system can have a lasting negative impact on the local labour market and make it more difficult for students to transition to higher education or to join the workforce. Supporting education that drives innovation means helping people in rural communities to explore how existing resources related to the education and skills infrastructure may be strengthened and utilised in more effective and productive ways.

### ***Higher education and innovation***

Higher education institutions play a key role in promoting innovation. Universities and colleges are well placed to build and develop new initiatives through strategies that improve workforce development, knowledge generation and dissemination. The very nature of innovation leads to demands for diverse skills, which underscores the importance of developing and maintaining links with universities.

Nonetheless, fostering innovation is not a straightforward task for universities, particularly in rural regions, where more context-sensitive studies are required (Salomaa, Charles and Bosworth, 2022<sup>[112]</sup>). Programmes that were considered relatively successful for rural populations in the United States, such as Land Grant Colleges, are often overlooked (Lyons, Miller and Mann, 2018<sup>[113]</sup>; Maloney and Valencia Caicedo, 2022<sup>[114]</sup>). The context-specific approach is even more important as these rural institutions navigate questions over their relevance and calls for mergers or closure (Koricich, 2021<sup>[115]</sup>).

The attributes to be innovators or entrepreneurs are not endowed at birth. This knowledge is developed over time and, in large part, through education (OECD/EU, 2018<sup>[116]</sup>). Specifically, innovators need education that increases their ability to effectively use their knowledge and skills with new technologies, products, markets, and business environments. This is where higher education institutions can play an important role as part of a regional innovation support ecosystem.

Given the demographic challenges faced by rural regions, co-ordination between different education institutions is crucial for the establishment of critical mass and the identification of regional strengths. In the education sector, the collaboration between public authorities and the private sector can result in

curricular reforms or changes in teaching practices (OECD, 2016<sup>[117]</sup>). In regions with low levels of educational attainment, the presence of multiple institutions with well-coordinated transfer routes and accreditation allows students of all types to learn or be retrained. The University of Arkansas Pine Bluff (UAPB) is ranked fourth in top Public Schools and 33 out of 125 in Regional Colleges South (U.S. News & World Reports<sup>[105]</sup>). UAPB is the second-oldest public university and the only public historically black institution in Arkansas. It offers an exceptional diversity of programmes. Discussions with UAPB revealed that a large majority of its students were not from the Pine Bluff area. Further, graduates of the university tend to leave the region so there is limited long-term economic benefit to the community.

Universities that are in or serve rural communities have to support local communities to find solutions to local problems. The university is the knowledge provider and source of training tailored to respond to new job opportunities and new industries in the region (Salomaa, Charles and Bosworth, 2022<sup>[112]</sup>). Rural public education institutions, notably, must have attributes that contribute to such overarching objectives (McClure et al.<sup>[118]</sup>). They include the following:

1. sustain local economies and fuel community development.
2. provide college-educated workers for high-demand local industries.
3. provide an access point for educational opportunity in rural communities.
4. are underfunded, relative to other public colleges.
5. need financial support to serve their communities.

This requires higher institutions to not just be at the table as local economic development strategies are developed. They also need the ability to act in tandem with local economic development leaders to design training and technical skills curriculum for short-term changes in the labour market. For example, most of the EDA's University Centers play a role in working with local economic development leaders (see Chapter 3). In addition, they should be able to anticipate the skills that will be needed within industries in the long term. For example, consultations with industry representatives and staying current on local labour market needs can contribute to the elaboration of training offers that reflect the structure of regional labour markets (OECD, 2018<sup>[119]</sup>).

### ***Connect the ecosystem of education, workforce, training and industry***

Skill shortages are one of the most important obstacles to innovation in a wide range of industries and countries (Cammeraat, Samek and Squicciarini, 2021<sup>[120]</sup>). A workforce with the right mix of skills and education is an important asset for attracting new industries. Gallup, through the work of the Northwest New Mexico Council of Governments and its partners, has a number of initiatives in the pipeline. These include infrastructure (rail lines; interstate and highways; airports; and broadband fibre); shovel-ready industrial parks (green or brownfield); and water lines (including the Navajo-Gallup Water Supply Project). These projects are designed to galvanize the local economy and increase employment opportunities, among other objectives. However, discussion in the regions highlighted the need for more diverse training options for the local workforce that encourage and enable them to remain in the local community (Jansen, 1988<sup>[121]</sup>).

The OECD Skills Strategy series has consistently shown that acquiring new skills has the power to transform lives and drive economies. Vocational Education and Training is a natural complement to research and graduate degree programs. Changing labour market needs have created pressures for vocational education and training and other sectors to adapt their educational offer (OECD, 2018<sup>[119]</sup>) Vocational training is different from other training forms, as it aims to equip students with practical skills and is associated with practical labour use.

A particularly important role is played by the “open access” principle of most two-year community colleges, which allows anyone to enrol in programs. In addition, “developmental” (remedial) education can be a stepping stone for the high proportion of entrants that lack such skills – typically maths and literacy skills (Kuczera and Field, 2013<sup>[122]</sup>). In Pine Bluff, Southeast Arkansas College (SEARK) provides comprehensive community college education and services, with an emphasis on technical education and workforce development. The college also collaborates with the UAPB to provide workforce training for the existing workforce and to provide basic skills and specialised training for the unemployed. Training addresses the depreciation of human and social capital that can occur during unemployment, as well as the lack of business experience (OECD/EC, 2021<sup>[123]</sup>). It also plays a key role in reducing dropout rates while facilitating the school-to-work transition.

The needs of local firms, in terms of skills and education levels, can be quite diverse. This was visible in Columbiana. For a small city, Columbiana has a diverse group of industries from pattern making, fabrication, stamping facilities, small foundries, polymer extrusion plants, machine shops and powder coating shops, and even welding shops. Many employers require a high school degree; some were willing to train on the job. Understanding the education and skill levels of the local workforce and the skills that potential growth industries need would lead to strategies tailored to different industries. Skills have an impact on the ability of local firms to compete and to exploit the opportunities represented by innovation. This can be more challenging in rural environments where rural high school graduates are less likely than counterparts in urban and suburban areas to go to college. Moreover, training programmes offered by rural institutions of higher education do not tend to be in sync with the needs of local firms.

The challenge of matching local skills current and anticipated demand to the offer of classes for skills development is commonly observed and addressed through a multi-dimensional approach. In some cases, these are addressed through tripartite consultations (between employers, workers and government institutions, including universities) in what are sometimes referred to as skills councils (OECD, 2016<sup>[124]</sup>) and in other examples, such as in the Netherlands, through regional cooperation between municipalities (OECD, 2023<sup>[125]</sup>). In rural areas, such councils may be less feasible because of lack of agglomeration and large universities, however municipal cooperation and tripartite consultations could provide a solution. For example, in the province of Québec had similar challenges of matching local skills demands from employers with local labour supply. In Québec, community colleges (CEGEPs) and their technology transfer centres (CCTTs) were created to combine applied research with industry support and workforce training. They way they address this challenge is by a.) incorporating the objective of service rural communities into the overarching objectives of rural higher education institutions, b.) working with local companies within the region to provide training based on skills needed for innovation and c.) creating a system of incentives, including financial and career promotion, for researchers to innovate with rural companies and communities. Higher education universities such as the University of Quebec at Rimouski are especially designed to connect with territories and the university incentive system for researchers is tied to how well they serve needs of local (and in some cases rural) communities (OECD, forthcoming<sup>[126]</sup>)

The provision of vocational education must meet labour market needs, which requires a diversity of offerings and pathways (OECD, 2018<sup>[127]</sup>). In Pine Bluff, the K-12 system is handicapped by the fact that high school students are not graduating with proficiency. Discussions with SEARK revealed that they offer a wide range of vocational training and skills enrichment courses. For example, at the College Workforce Development Center, students have the opportunity to train or retrain to learn or improve skills, obtain career advancement, transition to a new industry, or train to get industry-based certifications. However, the students from Pine Bluff tend to spend a large portion of their time at the College in remedial courses to catch up on math and literacy skills; hence, they are less able to take advantage of these opportunities.

#### Box 4.5. Center for Career and Technical Education, Gallup, NM

The Center for Career and Technical Education (CCTE) represents a co-operative effort among the Gallup McKinley County Public Schools, Rehoboth Christian School, Zuni Public School District, Wingate High School and UNM-Gallup to offer career and technical education courses that the individual high schools do not offer.

High School juniors and seniors who wish to enrol in courses at the CCTE should see their counsellors. Those selected to attend will be bused to the CCTE for classes in the morning or afternoon, depending on their schedule and CCTE programme of study selection.

Not only can students earn credits toward high school graduation, but they also can, in most programmes, earn between 14 and 18 credit hours per year. After high school graduation, these credits can be applied to a certificate or degree in a college programme at UNM-Gallup.

Source: University of New Mexico/Gallup <sup>(128)</sup>, *Center for Career and Technical Education*, <https://www.gallup.unm.edu/ccte/> (accessed on 25 July 2022).

The OECD Skill Strategy recommends increasing the quality of vocational education programmes (OECD, 2019<sup>[129]</sup>). This should be done by:

1. Providing comprehensive skills-development to enhance employability.
2. Integrating high-quality, work-based learning into all programmes.
3. Ensuring that there are sufficient teachers and trainers, and that they have both good pedagogical skills and up-to-date technical expertise.
4. Providing adequate quality assurance and monitoring of the labour market outcomes of education and training providers.

#### ***Entrepreneurship, the right education and skills***

The growth of entrepreneurial activities in rural areas provides the necessary capital for diversification of the local economy, primarily through the development of the secondary and tertiary sector (Josipović and Molnar, 2018<sup>[130]</sup>). According to the Northwest New Mexico Council of Governments (NWNMCOG), Gallup has significant opportunities to attract new retail, dining, and lodging establishments through a combination of chain business attraction and start-ups (Williams, Howe and Grey, 2021<sup>[100]</sup>). The *New Mexico's Cultural Economy 2014* report from the University of New Mexico's Bureau of Business and Economic Research found that Gallup and McKinley County had the highest percentage of workers engaged in the cultural economy (Mitchell and Joyce, 2014<sup>[131]</sup>). In addition, artisans play a major role in the city of Gallup's economy. The trade in arts and crafts is a substantial part of the underground economy. A good portion of the artists enter the market from home, others sell at fairs and festivals, and 45% of artists sell their goods through traders (Williams, Howe and Grey, 2021<sup>[100]</sup>). Despite these opportunities, NWNMCOG, in their *2020-2025 Comprehensive Economic Development Strategy*, identified the lack of an entrepreneurial culture as a key weakness for local economic development, portrayed as "a relative lack of entrepreneurial knowledge and experience" (Williams, Howe and Grey, 2021<sup>[100]</sup>).

Innovative approaches and new partnerships between local governments and the business community are needed to maximise their potential. Scaling up education and training to enhance entrepreneurial and innovative initiatives locally is a multi-dimensional effort. It cannot happen unless higher education institutions include engagement with business and communities in their core functions. For example, Shimadzu Scientific Instruments (SSI) and Northern Michigan University (NMU) have partnered to

establish the Shimadzu Analytical Core Laboratory for Medicinal Plant Sciences. Through this collaboration, SSI has donated laboratory equipment to support NMU's first-in-the-nation medicinal plant chemistry programme. This rigorous chemistry programme gives students and faculty access to cutting-edge equipment and technology to conduct medicinal plant research (Shimadzu, 2019<sup>[132]</sup>).

The basis of rural entrepreneurship is the combination of locally specific resources aimed at creating value added for entrepreneurs and for the rural economy as a whole (Josipović and Molnar, 2018<sup>[130]</sup>). Columbiana views entrepreneurship training and education as a key element in promoting business start-ups. Discussions in the region revealed efforts to build a vibrant entrepreneurial culture and early-stage entrepreneurial education at the high school. Activities such as “shark tank” style competitions with students and connecting the students to community leaders and industry through projects help to develop a “start-up mindset” among students. Specifically, in the entrepreneurial class at the local high school, students execute projects for businesses. Guided by their teacher they are able to design, develop and execute an idea. These initiatives do not just bolster the skills of the students, they also help instil pride in the community and empower young people. There are also efforts to create a culture to support entrepreneurs by providing awards to businesses.

The OECD Inclusive Entrepreneurship Policy Assessments across the EU found that entrepreneurship education and training are often part of schemes to support the unemployed in business creation (OECD/EC, 2021<sup>[123]</sup>). Additional benefits of this type of policy are more positive self-perceptions and increased self-confidence, especially among disadvantaged groups. The effectiveness of entrepreneurship training can be increased by tailoring content and methods to the particular skills needs of the target groups (EU/OECD<sup>[133]</sup>). In Gallup, through the work of the Navajo Technical University (NTU), Navajo Nation students are being exposed to new technologies and opportunities. The Navajo Nation is one of the largest federally recognised tribes in the United States. However, more than 40% of tribal members live below the poverty line. NTU's Advanced Rural Manufacturing programme is a state-wide collaboration between industry, academia, and government to bolster the Navajo economy with technological innovation. It aims to empower Navajo students and provide them with access to first rate technology and tools. As part of the NTU programme, students learn about advances in the design of technology and related business aspects, such as how products are financed and introduced to the market. The initiative includes “hands-on” K-12 school programming, advanced manufacturing and entrepreneurial training, internships, and technology transfer programming (NTIC<sup>[134]</sup>).

## Annex 4.A. Local population indicators

**Annex Table 4.A.1. Population and economic indicators for three local communities**

|  | Gallup, New Mexico | Pine Bluff, Arkansas | Columbiana, Ohio |
|--|--------------------|----------------------|------------------|
| <b>Population and demographics (age and sex)</b>                               |                    |                      |                  |
| Population estimates, 1 July 2021 (V2021)                                      | 21 495             | 40 244               | 6 694            |
| Persons under 18 years, percent  | 31.2               | 22.8                 | 17.6             |
| Persons 65 years and over, percent   | 13.3               | 15.2                 | 31.1             |
| Female persons, percent  | 51.6               | 52.8                 | 56.1             |
| <b>Population identifying with a certain race and Hispanic origin</b>          |                    |                      |                  |
| White alone, percent   | 31.5               | 19.6                 | 94.6             |
| Black or African American alone, percent (a)                                   | 1.4                | 76.0                 | 0.0              |
| American Indian and Alaska Native alone, percent (a)                           | 47.7               | 0.3                  | 0.0              |
| Asian alone, percent (a)   | 3.2                | 0.9                  | 2.3              |
| Native Hawaiian and other Pacific Islander alone, percent (a)                  | 0.4                | 0.6                  | 0.0              |
| Two or more races, percent   | 6.5                | 1.9                  | 1.6              |
| Hispanic or Latino, percent (b)  | 30.6               | 1.4                  | 2.4              |
| White alone, not Hispanic or Latino, percent                                   | 18.9               | 19.1                 | 94.1             |
| <b>Housing</b>   |                    |                      |                  |
| Owner-occupied housing unit rate, 2016-20, USD                                 | 135 500            | 74 900               | 156 300          |
| <b>Households</b>  |                    |                      |                  |
| Persons per household, 2016-20   | 2.82               | 2.28                 | 2                |
| <b>Computer and Internet use</b>   |                    |                      |                  |
| Households with a computer, percent, 2016-20                                   | 80.2               | 86.5                 | 89.0             |
| Households with a broadband Internet subscription, percent, 2016-20            | 68.3               | 67.0                 | 87.1             |
| <b>Education</b>   |                    |                      |                  |
| High school graduate or higher, percent of persons age 25 years+, 2016-20      | 84.1               | 86.2                 | 96.3             |
| Bachelor's degree or higher, percent of persons age 25 years+, 2016-20         | 20.9               | 19.6                 | 31.1             |
| <b>Health</b>  |                    |                      |                  |
| With a disability, under age 65 years of age, percent, 2016-20                 | 11.3               | 14.4                 | 5.1              |
| Persons without health insurance, under age 65 years, percent                  | 17.9               | 7.2                  | 2.0              |
| <b>Economy</b>   |                    |                      |                  |
| In civilian labour force, total, percent of population age 16 years+, 2016-20  | 52.9               | 52.3                 | 62.4             |
| In civilian labour force, female, percent of population age 16 years+, 2016-20 | 52.2               | 54.2                 | 51.9             |
| Total health care and social assistance receipts/revenue, 2017 (USD thousands) | 397 386            | 372 767              | NA               |



|  | Gallup, New Mexico | Pine Bluff, Arkansas | Columbiana, Ohio |
|--|--------------------|----------------------|------------------|
| Total transportation and warehousing receipts/revenue, 2017 (USD thousands), USD (c) | 40 952             | 38 665               | D                |
| Total retail sales per capita, 2017, USD (c)   | 33 732             | 14 965               | 39 636           |
| <b>Transport costs</b>   |                    |                      |                  |
| Mean travel time to work (minutes), workers age 16 years+, 2016-20                   | 13                 | 17.7                 | 25.3             |
| <b>Income and poverty</b>  |                    |                      |                  |
| Median household income (in 2020 USD), 2016-20                                       | 45 754             | 34 410               | 44 095           |
| Per capita income in past 12 months (in 2020 USD), 2016-20                           | 21 231             | 19 240               | 35 621           |
| Persons in poverty, percent  | 33.7               | 25.4                 | 12.5             |
| <b>Businesses</b>  |                    |                      |                  |
| All employer firms, reference year 2017  | 762                | 725                  | 166              |
| Men-owned employer firms, reference year 2017  | 321                | 378                  | 104              |
| Women-owned employer firms, reference year 2017                                      | 116                | 74                   | 34               |
| Minority-owned employer firms, reference year 2017                                   | 166                | 121                  | S                |
| Nonminority-owned employer firms, reference year 2017                                | 418                | 412                  | 139              |

Note: (a) Includes persons reporting only one race, (c) Economic Census - Puerto Rico data are not comparable to United States Economic Census data, (b) Hispanics may be of any race, so are also included in applicable race categories.

Value Flags: S= Suppressed; does not meet publication standards; NA= Not available; D=Suppressed to avoid disclosure of confidential information.

Source: United States Census Bureau (2022<sup>[135]</sup>), *QuickFacts: Columbiana City, Ohio; Gallup City, New Mexico; Pine Bluff City, Arkansas*, <https://www.census.gov/quickfacts/fact/table/columbianacityohio,gallupcitynewmexico,pinebluffcityarkansas/HSG495220#HSG495220>.

## Columbiana, Ohio

### *A former steel town facing population decline*

Historically Columbiana was integrated into the steel industry located along the Mahoning River until the late 1970s. Columbiana specialised in constructing the wooden patterns used to create moulds for casting steel. Unlike much of Northeastern Ohio, which has experienced significant population decline since 1980, Columbiana experienced a slow increase in population. On the other hand, the population of Columbiana County peaked at 113 000 in 1980 and is now about 102 000. While most of Columbiana is located in Columbiana County, a small part in the north of the city is in Mahoning County.

Metal fabrication remains an important part of the local economy and it is supplemented by a growing logistics sector. Both short stay and day-trip tourism is expanding, and the city has started to attract new residents from the Pittsburgh MSA as houses become more expensive there and possibilities for hybrid work increase.

On the other hand, with a population of under 7 000 and close proximity to the larger communities of Boardman, East Liverpool and Salem, Columbiana does not have a strong retail sector. For example, the closest Walmart or Home Depot is in Salem. This means that a large share of retail sales leak out of the community. Similarly, while there are several urgent treatment centres in Columbiana, the closest hospitals are in Salem and Boardman. Rural communities of similar size in relatively densely settled regions face a similar situation, but it does limit some sources of economic growth.

Columbiana adopted a city manager form of government in the 1970s and has only had three city managers since then. City managers are unusual in smaller cities where the common form is a mayor and city council

who share administrative responsibilities. Most places are unwilling to delegate that much authority to an employee, nor are communities that rely upon either volunteer or nominally paid elected officials prepared to pay for a professional manager. However, with part-time elected officials there are often major administrative issues and there can be a lack of continuity in decisions. A clear benefit for Columbiana from having a long-tenured city manager is his ability to master grant applications and knowing which entities can be approached for a particular source of funding. While it may be possible to hire consultants to support grant applications, doing so entails a direct financial cost and provides no continuity, and the city manager is able to follow through both in implementation and on reporting results to the grant provider.

Columbiana has adopted a number of public sector behaviours that contribute to its growth capacity. While these exist in some other rural places, they are not common. In addition, the combined effect of multiple governance innovations is likely leading to significant synergies and complementarities that contribute to improved development.

### ***Collaboration and engagement***

Collaboration in communities is one of the keys to fostering innovation, and it can be fostered by third party facilitators such as civil society/NGOs or community development organisations. In Columbiana, both public officials and business leaders are engaged with the local schools, including the primary school (elementary school), in an effort to create an environment where students see Columbiana as a place where they might like to live, and to provide students with a sense of what employment opportunities are available locally. In response the high school has hired a teacher who teaches classes on entrepreneurship and business skills. Additionally, the city engages with students both to get their input on recreation facilities and to allow them to play a role in how Main Street is to be redeveloped. Efforts by the city government to engage the students and the efforts by the school system to support that engagement have generated reports of students feeling pride and investment in their community, building enthusiasm for reinvesting in and contributing to the community as adults.

### ***Key assets and opportunities***

Most small rural communities rely solely on grants for financial support because their fiscal capacity is so small that they must spend it all on current outlays that are mandatory. With no internal investment funds, they face two challenges. The first is they can only obtain funds to invest in projects that grant makers are currently prepared to fund, which limits their activity. Second since most rural places are in this situation, competition for these funds is intense and many applicants do not receive funding. However, Columbiana has made a strong effort to build internal investment capacity over time, which allows it to apply for “cost-shared” programs that have fewer applicants and are also preferred by many grant providers, since they both leverage the grant providers money and have inherently lower risks. This has given the city the opportunity to make both more investments and a broader range of investment than is common in rural America. Further, in many communities, relationships between local government and developers are problematic. In Columbiana, there is strong partnership between the local government and the private developer who is building housing and retail development on the old Firestone Farm. This major development is creating a new retail and recreational complex as well as new housing. The City government has found ways to restructure local regulations to encourage development. Two examples are illustrative. The first was the creation of a local ordinance to allow people to carry alcoholic drinks in public during specified city events. Typically, in Ohio walking and drinking on public property is illegal. This ordinance is used to allow alcohol sales when events are held on Main Street as it is closed to traffic, or in other public venues. Allowing alcohol sales both increases vendor sales and causes more people to participate, which creates a better sense of community. Second the city has pioneered a reduction in local and school taxes for new homes. City taxes are reduced for the first 15 years of occupancy as a mechanism to make home ownership more attractive in Columbiana. Lower property taxes reduce the monthly cost of

home ownership, which has attracted more people from higher cost areas near Pittsburgh. While local schools lose some money in the short term, the influx of people has led to more housing being constructed and to higher property values in general.

Culture has also been a source of community cohesion and attractiveness. The Columbiana Cultural Collective is transforming the Main Street theatre into a community arts hub. The theatre had been rehabilitated about 15 years ago and served as location for amateur theatre productions, concerts and other events but closed with COVID shutdowns. Not only is the theatre a dominant part of the downtown streetscape but it has been vital in bringing people in the community together over multiple decades. The Collective is working on a plan to raise funding over five years to buy the building from a benefactor who purchased it with the intent to sell it to the Collective at a discount from the purchase price. The collective is a good example of an innovative social enterprise that has leveraged private philanthropy to provide a window of opportunity to assemble the funds to ensure the theatre remains a key part of the community and provide additional opportunities for cultural events.

Finally, a clear advantage of Columbiana is a strong K-12 school system. Strong local support for schools, both financially and in terms of community engagement, has resulted in better school performance than for proximate peer districts. The strategy of attracting nearby households is helped by both the lower cost of housing and good local schools. In addition, the city is investing in improving its visual attractiveness through a Main Street revitalisation programme and by creating better parks and recreation facilities. The city is fortunate that it received a large tract of land from the estate of Harvey Firestone to establish a multi-purpose park near one of the new housing developments.

### *Examples of innovative private enterprise*

Typically, innovation is seen as a business opportunity where a new product or process is introduced into the marketplace. Many of the manufacturing firms in Columbiana are adapting to changing conditions, though mainly in incremental ways. However, several are implementing significant innovations that are increasing productivity and their competitiveness.

Humtown Products is a third-generation family firm that has embraced additive manufacturing and radically redesigned its labour relations processes to increase worker engagement and foster team production. The firm is engaged in producing moulds and cores for metal casting using sand as the medium. One part of the company has shifted to using 3-D printers to form the moulds, and now has the most sand printers in the country. The other part of the firm uses more traditional core and mould production processes but has installed monitoring technology on most of its machinery that show individual operators their real-time production rate displayed as an effective hourly wage. As operators increase output without an increase in scrap rates they earn more money. In addition, each operator's performance can be compared to other workers doing the same task. While the base hourly rate remains set by historical performance levels, the current rate is much higher as operators learn from each other and have an incentive to improve productivity. Since machine operator performance is affected by supporting workers, such as forklift drivers and packers, they too are provided with performance bonuses as output increases.

Humtown Products was named the 2020 Manufacturer of the Year by the National Association of Manufacturers in the small to medium-sized enterprise category. They have developed collaborative relationships with the local schools, including the use of gamification to help teach 3rd and 4th grade students problem-solving skills at Crestview Local Schools.

## Pine Bluff, Arkansas

### *An industrial and agricultural economy facing population decline*

The population in Pine Bluff peaked at 57 400 in 1970 and has declined rapidly since 2000. The city is about an hour away from Little Rock, the state capital, and is part of the Little Rock Combined Statistical Area. Pine Bluff is served by the Union Pacific Railroad and the Port of Pine Bluff on the Arkansas River provides a connection to the Gulf of Mexico via the Mississippi River. A network of federal and state highways connects the city to the larger region and to the national Interstate Highway System. Currently there is no scheduled air service to Pine Bluff.

Pine Bluff has experienced a significant economic decline in the last 30 years as much of its economic base eroded. While agriculture in the Delta region remains important, it offers far less employment than in the past and farm consolidation has caused a decrease in the rural population. Forest products, which once was a significant industry, has also declined, particularly the local pulp and paper mills. Union Pacific no longer has a service depot in the community and employment at the Pine Bluff Armory has dwindled. Much of Pine Bluff's role as a regional retail and service hub has also disappeared as Little Rock has grown and expanded its retail trade area into communities that used to be served by Pine Bluff. Economic decline has led to accelerating population decline, a falling local tax base, decreasing property values, increases in empty and dilapidated housing and retail establishments, and city infrastructure that is both deteriorating and too large for the current size of the community. With economic decline human and financial capital has left the community as people with higher skills relocated to growing parts of the state and other parts of the country.

### *Key assets and opportunities*

Pine Bluff has several key strengths that are being mobilised as part of a major redevelopment effort. These include:

- Two strong higher education institutions, the University of Arkansas at Pine Bluff (UAPB) and Southeast Arkansas College (SEARK), that are fully engaged with local leaders in efforts to rebuild the local economy. UAPB is a four-year school with a historically Black student population and a significant research programme, while SEARK provides a 2-year associate's degree and a broad range of technical education programmes to students.
- Simmons Bank, a major regional banking organisation, was founded in Pine Bluff and has expanded its operations to seven states. Its corporate headquarters remains in Pine Bluff and is the only large commercial business in the city core. Notably, Simmons has made a number of large investments in the revitalisation of Pine Bluff, including large financial commitments from the Simmons Foundation. While part of this support can be explained by the bank fulfilling its Community Reinvestment Act (CRA) obligations, the level of support goes well beyond the amount CRA would require.
- A high degree of racial harmony in the community. About three-quarters of the city population is African American. African Americans hold all of the elected positions in the city and county, with both Black and white community members being engaged in leading community organisations.
- Strong co-operation between elected officials in the city and county governments.
- Widespread recognition across the community that major reinvestment is required for Pine Bluff to survive. While some debate still exists over how this is to be accomplished, there is general support for change.
- Significant progress in removing or renovating commercial buildings in downtown and cleaning up and renovating neighbourhoods.

On the other hand, Pine Bluff faces major challenges, including:

- A dysfunctional local school system that is under the control of the state government because it has performed so poorly in the past.
- High rates of poverty, low levels of employment and a workforce with poor skills, especially those needed for the modern economy.
- A considerable number of large commercial buildings in the city centre that are in poor condition and are unlikely to ever return to their original use. This leaves the question of whether it is better to demolish them or rehabilitate them. In either case there is typically no clear sense of what use is appropriate for the location.
- Identifying a new economic function for the city and county that will support local objectives for better employment opportunities and higher incomes.
- A deteriorating housing stock that leads to falling home values that reduces household wealth.

### *The Go Forward Pine Bluff (GFPB) development approach*

The Go Forward Pine Bluff (GFPB) development approach is the central part of efforts to revitalise the community. It can be seen as an innovative response to a systemic redevelopment challenge, and while it has yet to demonstrate its success it already provides useful examples of how to undertake a comprehensive approach to renewal. The effort started in early 2015 when a group of citizens formed to try to develop an initiative to revive the city's downtown, which had been seen as an impediment to attracting new investment in any part of Pine Bluff. Beyond removing urban blight, they identified three underlying problems that were interconnected: inadequate housing, poor workforce skills and a weak education system. Resolving these issues was seen as a necessary precursor to restoring economic growth.

This in turn led the group to try to create community support in early 2016 for a locally supported initiative to identify a community development strategy. The group solicited volunteers who would make a one-year commitment to work for several hours each month on one of four themes – economic development opportunities, education reform, improving quality of life, or improving government and infrastructure. Through 2016, 100 community members, with support provided by the steering committee, developed a draft plan. The result, in the form of 27 key points, was presented at an open community meeting at the end of 2016 and was broadly endorsed by the large number of attendees.

The strong community support at the meeting led to the local business community raising \$18 million to support the implementation of the plan. With this support in place the city voted in a referendum in 2017 to increase the local sales tax to fund an implementation programme. The vote was 69% in favour and Go Forward Pine Bluff (GFPB) was created to manage the initiative with seven years of funding. Since 2018 various entities have been created or revised by GFPB to carry out specific programme tasks. Currently about 96% of the set of key points identified at the community meeting are in varying stages of progress. COVID slowed progress significantly for two years and now with funding ending in 2025 there is more pressure to complete the tasks.

Four challenges limit the speed of work. The first is that GFPB must rely on the city (and to a lesser extent the county and state) to actually implement many of the recommendations, and government priorities are not always aligned with those of GFPB. Second, private investors who will make the bulk of the investments have been unwilling to commit funds until more progress has been made to ensure their investment is viable. Third, the amount of work involved is difficult for a small paid staff and a limited number of volunteers to carry out. As the end of the funding period approaches, it becomes harder to attract paid workers even as they become more necessary because their job tenure is short. Finally, while GFPB has a strong vision of how the community of Pine Bluff can evolve, it has not clearly identified an economic development

strategy that will generate the employment opportunities needed to take advantage of the up-skilling of the workforce and revitalisation of the city.

The set of key points endorsed by the community in 2016 cover a wide range of potential activities. Some must be accomplished before others, some are simpler to implement, and some require other actors, such as city government to carry out. Importantly, some are more innovative than others, but all are necessary. Given the magnitude of the decline over recent decades virtually all the things being done by Go Forward Pine Bluff (GFPB) involve constructing a platform on which economic development can occur. Some of the main elements of this foundation that are being implemented to date are discussed below.

**The Generator.** Simmons Bank provided a downtown building that could be rehabilitated to house a multifunction technology centre that also hosts classes for nascent entrepreneurs. The Generator operates after-school programmes and well as school field trips to expose primary (elementary) school students to computer technology and encourage their interest in developing digital skills. This is especially important in Pine Bluff where schools lack up-to-date technology and many homes cannot afford to provide it. Also, in a community where local entrepreneurs are not visible, the Generator provides support for small cohorts of people who wish to explore becoming an entrepreneur. The focus of the programme is on helping the individual identify a potentially viable business model and helping them assess whether they truly want to commit to being an entrepreneur.

**Downtown Revitalization.** This programme combines a number of fairly standard elements into an integrated approach. Improving the physical appearance of downtown is essential to convince both the local population and potential external investors that a viable future is possible. Crucially, GFPB recognises that the population of the city is likely to continue to shrink and this means that the structure of the city should adjust to conform to its smaller size. In this process, there is an opportunity to reconfigure the form of the city so that it better serves new conditions. In particular, increasing the amount of high-quality affordable housing is seen as a necessary condition to attract both external workers with higher skills as well as firms that can employ them.

Restoration of smaller commercial buildings that are in relatively good condition has occurred and some of these are now operating again. Other small commercial buildings that were in poor condition have been demolished. A streetscape programme has restored and expanded sidewalks. Several large commercial buildings have been purchased and their exteriors have been stabilised while potential new uses are explored. Where uses cannot be identified, the buildings will be removed and the land converted into housing, among other uses.

Crucially the large number of dilapidated buildings in the city centre provides an opportunity for new urban housing in neighbourhoods that span multiple city blocks. New urban core housing will only be viable if there is additional public investment in creating parks and public buildings like libraries, recreation centres and other public services. Since Pine Bluff is also the county seat for Jefferson County it has both city and county facilities, and it already has several major public buildings, including the library and aquatic centre in its downtown. While the high school is currently downtown residents are concerned that it may be relocated to a suburban site where construction costs will be lower but the amenities and accessibility of the city centre will be lost.

**Renovating and Repurposing Suburban Neighbourhoods.** Much of the older suburban housing stock is severely dilapidated. In some blocks most of the housing is in poor condition or abandoned. In other blocks the number of severely dilapidated houses is relatively small. With limited funds for housing redevelopment GFPB is trying to demolish housing on contiguous blocks where conditions are the worst and intervene in blocks where slowing blight will encourage reinvestment. Reducing the amount of poor-quality housing in older suburbs helps to improve the market for new urban housing and can provide opportunities for alternative land uses.

**Preparing the Workforce for a Digital Economy.** While GFPB has no direct influence on the school system it does serve as a forum for community concerns by improving educational outcomes. GFPB also works with the two local institutions of higher education in Pine Bluff: the University of Arkansas - Pine Bluff (UA-PB) and Southeast Arkansas College. Both institutions have expanded programmes that provide technical skills and can increase employment prospects. Both attract a large number of local graduates who are seeking post-secondary education. Retaining these students however hinges on improved prospects for local employment.

In particular, SEARK has recently entered into a partnership with People Source, a public benefit corporation that provides training and staffing services for private companies. People Source will locate on the SEARK campus and is expected to employ about 250 people, some of whom will be students. Because People Source has offices in Arkansas and several adjacent states it has a strong sense of emerging career opportunities and the capacity to help students prepare for those jobs. This will also help SEARK identify areas where it can adjust its curriculum to better match graduates' skills with employers' needs.

**Working beyond the City.** Pine Bluff remains the largest city in southeast Arkansas and its local labour market extends beyond Jefferson County, particularly to the southeast. It is already a regional and higher education centre and its local labour market extends out about 60 miles from the city. With more retail and service providers it has the potential to serve an even larger retail trade area. For this expanded role to be possible, Pine Bluff will have to work with Jefferson's County officials and elected leaders in the ten other counties in the South East Area Economic Development District, and particularly with Cleveland and Lincoln counties that are part of the Pine Bluff MSA. GFPB has already developed a strong working relationship with Jefferson County.

### ***Fostering entrepreneurship***

Currently the rate of entrepreneurship in Pine Bluff is low, particularly in the African-American community, which comprises the bulk of the population. Fostering a higher rate of entrepreneurship is important for several reasons. Most importantly it offers a potential path out of poverty if the business is successful. Second, a larger business community offers a group of potential leaders for the community. Third, a larger number of locally owned businesses expands the range of locally available goods and services in the community. Even if the firms do not offer many jobs, their presence improves the local quality of life.

GFPB has focused on helping women entrepreneurs start their own businesses, including home based businesses. While motivations vary, some women found that self-employment was more amenable to work-life balance in the labour market. This is especially salient in places where access to work-life balance support schemes (such as child-care facilities) are limited. Their potential is also enhanced by the common finding that women now have higher levels of educational attainment than men, which provides them with stronger formal education. GFPB holds classes at the Generator as a training site to help small groups of nascent entrepreneurs get ready to begin an enterprise. Recently UA-PB received approval to host a Small Business Administration-sponsored Small Business Development Center, which will add resources for the next step of actually starting a business.

Importantly, the entrepreneurial classes connect potential entrepreneurs with local lenders. It provides them with direct experience on how to finance their business. Because many of the entrepreneurs are minorities, local banks can use money from their Community Reinvestment Act (CRA) requirements to offset losses associated with startups. This makes it easier for entrepreneurs with limited wealth to get started.

A challenge for new entrepreneurs, particularly those with only limited ties to the financial industry is understanding how financial intermediation works. Similarly, banks often have little incentive to engage with potential borrowers who will require a large investment of time and resources to make only a small loan. GFPB plays the role of an intermediary by only bringing borrowers that it has worked with to bankers

and other lenders who see there is a social benefit to the community if they can help a viable business get off the ground. Certainly, the fact that CRA encourages banks to make this type of effort is also useful.

GFPB also engages with other entities that can provide financing for entrepreneurs. This is critical because banks can only provide debt financing that is secured either by the wealth of the entrepreneur or by some other financial intermediary pledging collateral. For example, federal government loan guarantees provided by USDA, SBA or other agencies reduce lender risk exposure and can lead to a greater willingness of a bank to lend. Another type of financial intermediary with a broader local economic development mandate, such as a Community Development Financial Institution (CDFI), or Community Foundation, may also be able to provide funding either as a grant, a subsidised loan or some form of equity investment (Freshwater, 1990).

## **Gallup, New Mexico**

### *A city deeply connected to the Navajo Nation in the midst of energy economy transition*

The city population has been relatively stable over the last few decades, with only limited growth. Notably, a large share of the population are Indigenous people living off-reservation. The Gallup retail trade area extends deeply in the Navajo Nation and the city is a hub for both shopping and government services provided to people on living on the reservation. It has also been a major hub for Native crafts, particularly silver jewellery and weaving. The city is located on Interstate 40 and is also on the Burlington-Northern Santa Fe east-west mainline from Los Angeles.

Gallup recognises that it must identify new economic functions to replace fossil fuel extraction if it is to prosper. Its role as a service centre for the Navajo Nation and other tribal communities will remain important, as will tourism; but a new function that offers full-time, higher paying jobs is desired. Gallup sees an opportunity in its location on both a major east-west interstate and on the BNSF east-west rail mainline as a way to first develop a strong logistics industry and then leverage that to introduce manufacturing. In addition, the presence of existing rail and road infrastructure, Gallup is roughly an 11-hour drive from the ports of Los Angeles and Long Beach. After 11 hours of driving commercial trucks are required to stop for a rest period, which makes Gallup an ideal location for both a maintenance site and for a transshipment hub. With a logistics hub there is potential to attract light manufacturing firms, which would add another dimension to the city's economic base.

### *Collaboration and engagement*

Many EDA economic development districts are characterised by only limited interactions among the multi-county entities and local governments. In the case of the Northwest New Mexico Council of Governments there is far greater collaboration and the COG carries out a number of functions that might normally be the direct responsibility of a county. In part this is because the COG is authorised by the state to carry out more functions than economic development and transportation planning. But this authorisation exists because member governments have concluded that it is in their interest to have one entity with specialised knowledge that allows it to be more effective carrying out extra functions. These include environmental planning, water planning, energy efficiency initiatives and obtaining grant funds for a range of technical support activities. The COG has developed a common approach and model to maximise its impact and effectiveness while being able to customise and adapt to capture and deliver on place-based strategies and opportunities.



### *Key assets and opportunities*

Located within a one-hour drive from Gallup, the Navajo Technical University trains Tribal youth in STEM related disciplines. The Center for Advanced Manufacturing was created to provide more specific and job focused experience for students in additive metal manufacturing. Because there is varying experience in manufacturing on the Navajo Nation it was felt that the best opportunity for success would be in a new field where leading regions have yet to emerge. The programme has invested in creating labs with modern equipment for students to use for training with the objective of creating entry level skilled technicians. In addition, the centre partners with a number of universities and national laboratories to provide internships for its students and research opportunities for their graduate students and post-docs. This two-way flow increases the chances for employment of Native youth and may encourage new start-ups to be developed by individuals coming to the Navajo Nation to conduct their research.

The Greater Gallup Economic Development Corporation (GGEDC) workforce development programme has developed and implemented its own tailored workforce development programme due to local dissatisfaction with the available options. Local employers were unhappy with training programmes, particularly those focused on menial skills. In addition, employers wanted more female workers than were available. The programme starts by requiring participants to get a GED certificate if they don't already have one. The core curriculum is drawn from the National Center for Construction Education and Research (NCCER) curriculum, which is centred on providing students with basic skills before proceeding to a series of modules that are applicable to specific tasks or responsibilities. This allows each student to tailor their studies to a specific occupation and potentially to an employer. Many of the module sequences can be used as an entry point for a formal apprenticeship in skilled trades once students gain more experience.

The Navajo-Gallup water supply project is a long-standing collaboration between the Navajo Nation and the City of Gallup to improve the local supply of water by building an aqueduct from the San Juan River (USBR, n.d.<sup>[136]</sup>). The impetus for the project was a settlement in 2009 on a decades-long legal battle over water rights. The Navajo Nation advocated that it was entitled to an increased share of the water in the river. The settlement made it possible for the Navajo-Gallup Water Supply Project to begin in earnest. Construction of the project is only now underway, due to major problems both in securing funding and in establishing rights of way across land parcels that were held by a large number of owners. Joint work by the city, the Council of Governments and the Navajo Nation slowly overcame these obstacles. This long-term collaboration has created the opportunity for additional co-operation between the Navajo Nation and the city, even though their interests differ at times (USBR, n.d.<sup>[137]</sup>).

There is a proposed joint Indian Health Service and community hospital. Additional medical facilities are needed both by Gallup and the Navajo Nation. The Indian Health Service, a federal agency, has prioritised the construction of an area inpatient hospital that could be built as a healthcare campus to expand services to behavioural health, dialysis, and many other services. The community has also discussed consolidating its community hospital, Veterans Affairs clinic and other health services on this campus, as well as how to attract medical supply and manufacturing firms for additional job creation.

Providing broadband in rural areas is expensive due to large distances and small populations. In the Gallup area, costs are even higher because of fragmented land ownership, which increases the cost of obtaining rights of way for copper or fibre lines. Sacred Wind Communications began serving the Navajo Nation in 2009 using fixed wireless, which is cheaper to install and avoids easement issues. The company has a contract to provide internet access to schools. Under the agreement, the infrastructure can serve as a beach head from which the company can build out additional capacity to serve houses and businesses in close proximity to the school.

A local bike shop in Gallup (the Silver Stallion) was interested in improving health conditions among Tribal youth. They recognised that while it was possible to get grants to buy bikes for distribution on a reservation this would not have much impact. Instead, the company worked with a local school to create a bike riding

club as part of the physical education programme. In addition, the company connected with school social workers who saw that communal bike riding could help children with social problems. The programme became part of Outride, which is a national organisation that supports this type of school-based cycling programme. The bikes remain at the school and students start by going on shorter supervised rides to gain experience, confidence and interest. Over time some students become interested in competitive bicycle racing and can compete at a local and regional level.

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## Notes

<sup>1</sup> The term “connectivity divide” is used to refer to gaps in access and uptake of high-quality broadband services at affordable prices in areas with low population densities and for disadvantaged groups compared to the population as a whole (OECD, 2021<sup>[71]</sup>).

<sup>2</sup> The role of communication networks as an accelerator of development has been recognised globally. For example, the task of making the Internet universal and affordable is found in target (Target 9.c) of the Sustainable Development Goals (SDGs) (UN, 2015<sup>[141]</sup>).

<sup>3</sup> The authors use a fuzzy regression discontinuity design as an identification strategy and focus on policies in the United Kingdom (DeStefano, Kneller and Timmis, 2022<sup>[9]</sup>).

<sup>4</sup> The authors estimate propensity score matching and endogenous treatment effect models to control for innovation orientation and find evidence of cloud adoption enables various types of innovation using the 2018 Annual Business Survey of the United States.

<sup>5</sup> Permanent indigenous settlements in the Southwest of the United States thought to be descendants of a prehistoric Native American civilization, also known as Anasazi, that existed from approximately AD 100 to 1600 (Encyclopaedia Britannica, 2020<sup>[142]</sup>).

<sup>6</sup> The National Congress of American Indians presented some caveats concerning the American Indian and Alaska Native (AI/AN) population counts collected and released for the 2020 Decennial Census. Given the challenges presented in 2020 due to the COVID-19 pandemic, as well as several natural disasters, tribal lands without broadband access were unable to respond the 2020 Census, which may lead to measurement errors (NCAI, 2021<sup>[143]</sup>).

<sup>7</sup> See “Appendix E: Deployment of Fixed Terrestrial Fixed 25/3 Mbps and Mobile 4G LTE with a Minimum Advertised Speed of 5/1 Mbps Services By State and County Segmented by Urban and Rural Areas (December 31, 2019)” (FCC, 2021<sup>[15]</sup>).

<sup>8</sup> Pine Bluff enjoys a strategic geographical location connected by interstate and national roads, the Union Pacific Railroad, a regional airport, and seaport in the Arkansas River. Given its location, it is still a foreign trade zone. In the early 1900s, it was an economic prosperous region (e.g. Simmons Bank, a large bank present in several states, was founded in Pine Bluff in 1903).

<sup>9</sup> See “Appendix E: Deployment of Fixed Terrestrial Fixed 25/3 Mbps and Mobile 4G LTE with a Minimum Advertised Speed of 5/1 Mbps Services by State and County Segmented by Urban and Rural Areas (December 31, 2019)” (FCC, 2021<sup>[15]</sup>).

<sup>10</sup> Concerning the demand for high-quality broadband, the Executive Director of the innovation hub stated, *“At the Generator, we know how important fiber internet is to economic development and entrepreneurship. Not only does it enable cutting-edge businesses, but fiber internet makes it more attractive to move to an area; apartments fill faster, and housing values go up. This will help with attracting and growing our skilled workforce, and with our ability to attract tech entrepreneurs to Pine Bluff, grow existing businesses and especially retain entrepreneurs in the community”* (Go Forward Pine Bluff, 2020<sub>[19]</sub>).

<sup>11</sup> See “Appendix E: Deployment of Fixed Terrestrial Fixed 25/3 Mbps and Mobile 4G LTE with a Minimum Advertised Speed of 5/1 Mbps Services By State and County Segmented by Urban and Rural Areas (December 31, 2019)” (FCC, 2021<sub>[15]</sub>).

<sup>12</sup> Access to fixed broadband has the potential to deliver high-speed Internet services. The OECD definition of fixed broadband subscriptions refers to fixed subscriptions to high-speed access to the public Internet (a TCP/IP connection), at downstream speeds equal to, or greater than, 256 Kbps. This includes the sum of DSL subscriptions, Cable subscriptions, Fibre subscriptions, Satellite subscriptions, Terrestrial fixed wireless subscriptions and Other fixed broadband subscriptions (see the OECD’s Broadband Portal section on [Broadband Methodology - OECD](#)). To capture the evolving nature of fixed broadband delivering higher performance, the OECD also has six speed tier categories (i.e. < [lower than] 2 Mbps; ≥ [higher or equal than] 1.5/2Mbps and < 10Mbps; ≥ 10 Mbps and < than 25 Mbps; ≥ 25 Mbps and < 100 Mbps; ≥100 Mbps and < 1 Gbps; ≥ 1 Gbps).

<sup>13</sup> This indicator represents a weighted average of data usage trends for both flat-rate billing and usage-based billing fixed broadband subscribers. OpenVault’s platform captures broadband usage data from millions of residential and commercial subscribers across the United States and Europe, from more than 150 service providers. The data presented here concerns the United States (OpenVault, 2022<sub>[25]</sub>).

<sup>14</sup> The Internet of Things includes all devices and objects whose state can be altered via the Internet, with or without the active involvement of individuals. While connected objects may require the involvement of devices considered part of the “traditional Internet”, this definition excludes laptops tablets and smartphones already accounted for in current OECD broadband metrics (OECD, 2018<sub>[144]</sub>).

<sup>15</sup> Wireless mobile networks have four main elements: the core network (i.e. backbone), the transport network (i.e. backhaul), the radio access network (RAN), and the users’ terminal device. The core connects to the access network through backhaul, and the RAN connects to the users’ terminal device via the air interface (spectrum) (OECD, 2022<sub>[5]</sub>). First (or last mile) networks carry telecommunication data from the customer to an antenna or local switch. Backhaul networks carry the traffic of the first mile networks (DSL, cable, mobile) towards central switching locations and to their final destinations. Backhaul networks can cover a city, a region or a country and are known under different specific names. Historically, the terms used for backhaul have included ‘trunk networks’, inter-local or long distance networks. Other terms such as “middle mile” and “metro”. These terms do not, however, necessarily specify any specific network length or particular technological deployment. What is termed as a metro network in one context, for example, may be considered to be part of a backbone or core network in another (OECD, 2014<sub>[145]</sub>).

<sup>16</sup> Each source has a different methodology, and thus provides a different perspective of the Internet (OECD, 2022<sub>[5]</sub>).

<sup>17</sup> Data collection period: October 2021 to December 2021. Opensignal definition: “5G Download Speed shows the average download speed experienced by Opensignal users across an operator’s 5G network. 5G Download Speed for each operator is calculated in Mbps (Megabits per second).” Opensignal notes

the following: “Opensignal, a mobile analytics company, is the global standard for measuring real- world mobile network experience. Using billions of measurements collected 24/7 from tens of millions of smartphones, Opensignal analyses real-world mobile network experience at the largest scale and frequency in the wireless industry: by operator and country, regionally and worldwide”. For more information please visit the Opensignal website (<http://www.opensignal.com/>).

<sup>18</sup> Data collection period: October 2021 to December 2021. Opensignal definition: “5G Availability shows the proportion of time Opensignal users with a 5G device and a 5G subscription had an active 5G connection”.

<sup>19</sup> Out of 42 870 complaints filed to the FCC in 2021.

<sup>20</sup> See “Appendix H: Deployment (Millions) of Fixed Services (includes Satellite) at Different Speed Tiers in the United States (December 31, 2019)” (FCC, 2021<sub>[15]</sub>).

<sup>21</sup> For example, Commissioner Rosenworcel in her dissenting opinion of the Fourteenth Broadband Deployment report noted: “The FCC relies on information submitted by providers without a system to independently verify the data. Last year, this allowed one company overstate its service coverage by tens of millions of people. This year, one of the country’s largest providers found that it too had overstated its coverage in thousands of areas” (FCC, 2020<sub>[146]</sub>).

<sup>22</sup> The limitations of this dataset should be noted as it presents the caveat of limited to no data points for many states where the OECD Territorial classification is not refined enough to identify rural areas. Please refer to Chapter 2 for further descriptions of each of the territorial classifications used in the report.

<sup>23</sup> Regions within the 38 OECD countries are classified into two territorial levels reflecting the administrative organisation of countries. The 433 OECD large (TL2) regions represent the first administrative tier of subnational government, for example, the Ontario Province in Canada. The 2 296 OECD small (TL3) regions correspond to administrative regions, with the exception of Australia, Canada and the United States. These TL3 regions are contained in a TL2 region, with the exception of the United States for which the Economic Areas cross the States’ borders. For Colombia, Costa Rica, Israel and New Zealand, TL2 and TL3 levels are equivalent. All the regions are defined within national borders (OECD, 2020<sub>[150]</sub>).

<sup>24</sup> The OECD is strongly engaged with governments to address broadband connectivity challenges. Namely, within the Communication Infrastructure and Services Policy (CISP) unit, the OECD has conducted over [20 Telecommunication Policy country reviews](#) in the past two decades. These reviews provide tailored policy recommendations on how to adapt the legal and regulatory framework to increase connectivity and access to high-quality communication services at competitive prices.

<sup>25</sup> One example is Mexico, increased competition since the Telecommunication Reform in 2013 led to a price decline of up to 84% in the mobile broadband market and added 72 million mobile broadband subscriptions from 2013 to 2020, which is the equivalent to slightly more than the combined population of Colombia and Chile. This allowed many people in Mexico – especially from low-income households – to connect to the Internet for the first time (OECD, 2021<sub>[71]</sub>).

<sup>26</sup> The Federal Communications Commission (FCC) is required to report every biennium an analysis of the state of communication market competition. On 16 May 2022, the FCC released a public notice seeking data for the 2022 Communications Marketplace Report (FCC, 2022<sub>[147]</sub>).



- <sup>27</sup> Using the exchange rate of 0.846 EUR/ USD for the year 2021 from <https://stats.oecd.org/>.
- <sup>28</sup> Idem.
- <sup>29</sup> A public right of way permit is usually an agreement between the government and an applicant (OECD, 2008<sup>[148]</sup>). The granting of public rights of way usually requires the active participation of public authorities, often at different levels of government in managing or authorising the civil works needed in constructing ducts or other infrastructure required for networks.
- <sup>30</sup> Using the exchange rate of 1.254 CAD/USD for the year 2021 from OECD.stat.
- <sup>31</sup> Using the exchange rate of 1.414 NZL/USD for the year 2021 from OECD.stat.
- <sup>32</sup> Small businesses (or small and medium enterprises) defined as having less than 300 employees using the “2020 SUSB Annual Data Tables by Establishment Industry”, see <https://www.census.gov/data/tables/2020/econ/susb/2020-susb-annual.html>. The OECD ICT Access and Usage by business database harmonised with Eurostat classifies small firms as those with 10-49 employees and medium firms as those having 50-249 employees.
- <sup>33</sup> The IJJA funding complements existing programmes managed by the NTIA for digital inclusion, such as the [Broadband Infrastructure Program](#) (USD 288 million), and the [Tribal Broadband Connectivity Program](#) (USD 980 million) directed to tribal governments to be used for broadband deployment on tribal lands).
- <sup>34</sup> This category includes Alaska Native Corporations, Tribal Governments, Colonias, Persistent Poverty Areas and Socially Vulnerable Communities (USDA, n.d.<sup>[88]</sup>).
- <sup>35</sup> Broadband was removed from Title II of the 1934 Communications Act (United States Congress, 1934<sup>[92]</sup>) in 2017, whereby broadband providers would be considered “common carriers”. The implications of such move makes it unclear whether the FCC would be able to pursue an *ex- ante* regulation route.
- <sup>36</sup> In her dissenting opinion concerning the RDOF, Commissioner Rosenworcel had said: “We need maps before money and data before deployment” (FCC, 2020<sup>[149]</sup>).
- <sup>37</sup> Colleges refer to traditional 4-year degree programmes.
- <sup>38</sup> One initiatives provided to support new entrepreneurs was through a public-public collaboration between the city and local downtown building owners that created small, pop-up spaces for aspiring entrepreneurs to test their markets and products affordably. The building owner offered one month of free rent to help entrepreneurs get started. It was reported that some of the entrepreneurs have been successful enough to sign leases for downtown spaces.
- Additionally, an initiative that supported budding entrepreneurs in their pre-start-up period was a virtual tool called the “virtual storefront” which allows business owners to imagine what their storefront might be able to look like in context of the street.

**OECD Rural Studies**

# **Enhancing Rural Innovation in the United States**

When it comes to high-tech innovations, the United States leads the path amongst OECD economies. However, in the context of the national record-breaking activities in high tech innovation, there lies distinct and growing geographical disparities. This report dives into strategies for better understanding innovation that occurs in rural places, and places outside major metropolitan areas, often going beyond science and technology. It provides analysis and recommendations to support regional development initiatives aimed at closing the gaps in innovation between rural and urban areas. The report includes a special topic chapter on the role of broadband and education in rural areas, exploring trends and providing policy recommendations to enhance rural innovation through these specific and critical framework conditions.



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