

Rural America's emerging knowledge economy*

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Knowledge has become the new premium fuel for economic growth in the 21st century. Knowledge fuels new ideas and innovations to boost productivity—and creates new products, new firms, new jobs, and new wealth. Some analysts estimate that knowledge-based activity accounts for half of the gross domestic product in western industrialized countries. In the United States, knowledge-based industries are pacing economic growth.

In rural America, as elsewhere, a variety of factors make knowledge-based growth possible: high-skill labor, colleges and universities, vibrant business networks, and infrastructure. Some rural communities are already leveraging these assets to transform their economy. Many other rural places, however, have yet to tap this rich economic potential. This article analyzes rural America's knowledge economy and describes how some rural communities are leveraging these factors to build their own knowledge economy.

What is the knowledge economy?

Knowledge is a new economic fuel driving the U.S. economy. Traditionally, economic growth was based on the physical resources and the products they yielded. Today, knowledge powers the U.S. economy by generating new ideas and innovations that boost productivity and create new products.

Knowledge-based activities emerge from an intangible resource that enables workers to use existing facts and understandings to generate new ideas. These ideas produce innovations that lead to increased productivity, new products and services, and economic growth. In short, knowledge-based growth is derived from people's knowledge or ability to combine education, experience, and ingenuity to power growth. Knowledge is often equated with information because both assets are intangible. Information, however, can be written down or outlined in a patent or process, making it easy to reproduce. Pieces of writing, artwork, music, movies, and datasets are information because they can be reproduced. By contrast, the knowledge used to produce information is harder to codify or summarize on a piece of paper.

Knowledge is also different from information and other resources because it produces spillovers. Spillovers are benefits to people beyond those who possess the knowledge. Like other resources, knowledge gives a direct boost to the economic growth of people, firms, and communities that have higher stocks of knowledge. But knowledge also provides indirect benefits by boosting the knowledge levels of other people, firms, and communities.

The U.S. knowledge economy

The intangible nature of knowledge—the quality that makes it unique—also makes it difficult to measure. How does one measure the ability to combine education, experience, and ingenuity to boost productivity or create new products? While direct measures still do not exist, economists have used a variety of techniques to measure knowledge activity indirectly. One common indirect measure of knowledge-based activity is simply the number of people in occupations that use high levels of knowledge to perform their tasks. The Bureau of Labor Statistics measures the difficulty, complexity, and knowledge of U.S. occupations on an occupational criteria scale. According to this scale, knowledge occupations are defined as management, professional, and technical occupations. According to the measure, knowledge-based activity has paced recent U.S. economic growth. Growth in knowledge occupations rose more than 2 percent annually from 1991 to 2001, compared to 0.6 percent for other occupations. High-knowledge occupations accounted for a third of all occupations in 2000, after accounting for a fourth in 1980.

While knowledge-based activity is pacing U.S. economic growth, not all parts of the country have shared equally in its wealth. Metro areas tend to have larger concentrations than their rural counterparts.

According to the Census Bureau, the knowledge economy accounts for a larger share of metro employment than rural employment. In metro areas, professional, scientific, and healthcare occupations that are filled by people with higher

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education levels account for a larger share of employment than their rural counterparts. In 2000, these high-knowledge occupations accounted for 20.2 percent of employment in metro areas but only 14.8 percent of employment in rural areas (Table 1). Moreover, the educational attainment level of the workers in these occupations was much lower in rural than in metro areas. For example, 63.8 percent of the rural science occupations were filled by people with at least a bachelor's degree, compared to 69 percent of metro science occupations. The gap was even wider in healthcare occupations.

Despite trailing metro areas in capturing knowledge occupations, current rural job growth is being driven by high-skill industries often associated with the knowledge economy. In 2004, producer service industries—professional and business services, financial and information services—paced rural job growth as job rolls expanded almost 4 percent above the previous year. Producer service industries accounted for roughly 13 percent of all rural jobs and tended to employ a larger share of people with higher levels of education. In contrast, jobs in consumer services education, health care, and retail trade—rose just 1.6 percent, with the strongest gains in the higher-skilled education and healthcare industries.

Strategies to build a rural knowledge economy

Some rural places have begun to tap the knowledge economy. Many factors influence the location of high-knowledge occupations, ranging from high-skill labor to the size and remoteness of rural communities.

Because a variety of factors seem critical to knowledge-based activity in rural places, rural leaders use a variety of strategies to strengthen their economies. Obviously, nurturing a high-quality labor force is a major factor in building a knowledge economy. Knowledge-occupations require people with higher skill levels.

Table 1: Rural and Metro Knowledge Occupations, 2000

Worker Occupation Category	Rural (Non-metro)		Metro	
	Share in occupation	% with at least a college degree	Share in occupation	% with at least a college degree
Professional, Misc.	9.9	73.1	11.7	74.6
Science, Engineering, and Computers	2.2	63.8	5.2	69.0
Healthcare Practitioner Professionals	2.7	61.4	3.3	71.2
<i>Total</i>	<i>14.8</i>		<i>20.2</i>	
Management, Business, and Financial	10.9	32.5	12.7	49.6
Technicians	2.4	16.3	2.3	23.2
Sales	10.1	14.6	11.5	25.5
Protective	2.0	14.3	2.0	20.7
Admin Support	13.7	10.9	16.5	16.0
<i>Total</i>	<i>28.3</i>		<i>32.3</i>	
Service	13.2	4.9	11.5	7.7
Installation, Maintenance, and Repair	5.9	4.4	4.8	6.3
Construction and Mining	5.5	4.3	4.4	5.3
Laborers	5.7	3.9	3.8	4.5
Production Operative	10.7	3.8	6.4	6.6
Transportation	5.0	3.5	3.9	5.6
<i>Total</i>	<i>32.8</i>		<i>23.2</i>	

Source: U.S. Census Bureau. Housing and Household Economic Statistics Division. EEO Special Tabulation

Not surprisingly, places with larger concentrations of high-skill labor are more attractive to knowledge-based firms. Moreover, people with high-skill levels are more likely to generate new innovations and start knowledge-based firms. Rural counties with higher concentrations of high-skill labor were found to have higher concentrations of high-knowledge occupations. Tapping institutions of higher education will be crucial if rural communities are going to strengthen their knowledge economies. First, of course, a local educational institution provides the education for a high-skilled labor force. But perhaps just as important, colleges and universities also generate research and development that can lead to new commercial products, new firms, and new jobs. Colleges and universities are a primary generator and distributor of knowledge through their research, teaching, and outreach activities. Many of the economic opportunities emerging in the knowledge economy are being supported by rural institutions that are realigning themselves for the 21st century. Indeed, rural counties with a college or university had higher concentrations of high-knowledge occupations. Many colleges and universities have already brought knowledge to rural communities by educating people and transferring technology and knowledge to firms. Some are serving as catalysts for regional partnerships and business networks. Fort Lewis College in Durango, Colorado, was the catalyst to the success of the San Juan Forum in the Four Corners region of the Southwest. Others serve as a

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broker of services. For example, Oklahoma State University-Okmulgee is helping manufacturers in northeast Oklahoma gain the capacity and certification for Defense Department contracts by helping firms reengineer and reproduce parts for the Defense Department. As a result, Oklahoma vendors have increased their share of contracts at Tinker Air Force Base in Oklahoma City from 3 percent in 1995 to 20 percent in 2002. Leveraging scenic amenities to attract knowledge workers can be a straightforward strategy to build a knowledge economy. Communities in scenic areas have an advantage in attracting knowledge workers by increasing quality-of-life amenities, which are becoming increasingly important in worker location choices. Research finds that scenic rural places have higher levels of economic, population, and income growth. Places with higher natural amenities were also found to have higher levels of high-tech industries, a subset of high-knowledge industries. In a USDA survey, over 70 percent of rural high-knowledge producer-service firm owners indicated that quality-of-life amenities were a major factor in location choice. Natural amenities, especially topography, also appear to have a strong relationship with the concentration of knowledge occupations. Building 21st century infrastructure may be necessary to support knowledge based activity in the future. Infrastructure, such as interstate highways, has traditionally influenced the location of economic activity. Knowledge-based activities, however, are less sensitive to traditional infrastructure. In fact, the share of high knowledge occupations in rural counties does not appear to be significantly related to the presence of an interstate. New forms of infrastructure, however, such as broadband access, may be critical.

Broadband allows knowledge workers to tap knowledge, information, and markets in other parts of the world. In 1999, only about 18,000 zip code areas had broadband access with only 3,023 areas served by more than three carriers. By 2003, access had reached more than 27,000 zip code areas with more than 13,000 areas served by more than three carriers. Because broadband has only recently begun to emerge in rural places, research identifying the contribution of broadband access to economic

growth is limited, and most success stories remain as anecdotes. One illuminating success story is from rural, western Maryland. To stimulate economic activity, Garrett County, Maryland, in cooperation with Garrett County Community College, helped supply high speed access to the region's businesses and individuals through the Garrett Rural Information Cooperative.¹ Many businesses have chosen to locate in Garrett County because of the telecommunications capabilities in the county. Currently, the co-op is working on an information incubator to house up to 20 start-up firms on the community college campus. Building partnerships to overcome size and remoteness may be the primary key to sustaining rural knowledge-based activity. Knowledge-based activity is associated with larger economies that provide more knowledge resources. The size of rural places is understandably an important factor in the rural knowledge economy. Rural places with larger economies offer more potential for personal and firm interactions. These interactions can reduce the search costs for businesses seeking knowledge and information in two ways. First, larger economies have more firms, allowing for easier communication and greater potential for knowledge spillovers. Clusters of firms in knowledge-rich locations foster more innovations among firms. Of course, knowledge breeds knowledge. Rural counties in regions with an established cluster of knowledge activity had higher concentrations of knowledge occupations. Second, larger and more diverse economies result in larger knowledge pools that improve knowledge transfer and reduce the cost of knowledge acquisition. In general, the size of rural places limits the interactions needed for the sharing of knowledge. However, rural communities with larger and more diverse economies should provide larger pools of knowledge and be more supportive of knowledge based activity. In fact, rural counties with a town of greater than 10,000 people have a higher share of knowledge occupations than other counties. Even if the county did not contain a large town, the share of high knowledge occupations was higher in counties with higher population densities. The remoteness of rural places is often thought to limit the ability of rural people to obtain knowledge that exists in other communities. Rural businesses in remote locations must

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overcome a larger distance to tap into knowledge pools. Advanced communications technologies, such as the Internet, however, may reduce the impact of remoteness on rural knowledge-based growth. For example, in response to a USDA survey, the owner of a computer programming firm relocated to Akron, Colorado (pop. 1,174), because the information highway made location irrelevant. In fact, remoteness was found to be less of a challenge in stimulating knowledge based activity than other factors. After controlling for other factors, counties adjacent to a metro area did not have higher shares of high-knowledge occupations than other counties. Partnership is one way rural communities and businesses can pool knowledge resources to further overcome the limitations of size and remoteness. Regional partnerships can expand both the resource pool and market potential to support knowledge based activity. Therefore, rural communities may want to think regionally. By building partnerships with neighboring places and forming networks, rural communities can capture some of the spillovers that produce growth in a knowledge economy. In Maddock, North Dakota, the Maddock Economic Development Council (MEDC) formed the Maddock Business and Technology Center in 1999 to create new businesses and high paying jobs. The MEDC created a high-growth business incubator that provides training classes, business services, and computer access for the community. The MEDC has fostered new knowledge-based activity by incubating a satellite imagery company, a multimedia firm, an Internet woman's magazine, and a call center. MEDC also embarked on a telemedicine project to improve the delivery of rural health services. Informal partnerships can also create success at the firm level. Further west in Dickinson, North Dakota, a \$600 investment in 1995 was turned into a million dollar company that develops and distributes preschool curricula. Originating as a daycare center, Funshine Express has emerged as a knowledge company shipping over 1,500 preschool kits a month.² The company's growth was fostered by participating in manufacturing roundtables and regional economic

development programs. These networks provided valuable business advice, financial support, and technology transfers.

Conclusions

Knowledge is the new fuel powering economic growth in the 21st century. By spurring new ideas and innovations, knowledge boosts productivity and creates new products, new firms, new jobs, and new opportunities. However, few rural places have tapped this economic potential. Many are asking where to start. A variety of factors may be related to knowledge-based growth. Larger rural communities tend to have higher concentrations of high-knowledge occupations because they provide greater opportunities for personal and firm interaction and the sharing of knowledge. These rural communities tend to have larger pools of labor and existing businesses. Communities with a college or university also had high concentrations of knowledge occupations. Natural amenities also appear to be attractive to knowledge workers. As a result, rural leaders are using a variety of new strategies to strengthen their own knowledge economy. Some are tapping institutions of higher education for innovations to jump-start their knowledge economy. Others are leveraging local amenities to attract knowledge workers. In some rural communities, building new infrastructures may be crucial to a future knowledge economy.

¹The Garrett County Community College and additional community college case studies are published in "Cultivating Successful Rural Economies: Benchmark Practices at Community and Technical Colleges," produced by Regional Technology Strategies, Inc. and available at www.rtsinc.org.
²Funshine Express was highlighted as the Entrepreneur of the Month by the Center for Rural Entrepreneurship. A detailed case study is available at www.ruraleship.org.

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