

Readings on Broadband and the Economy

Broadband continues to be an important economic driver, researchers say – but the story is getting more complicated.

A BBC Staff Report

Over the two decades since broadband internet access started to become available, researchers have asked whether it contributed in a positive way to economic activity. During that time, many studies have confirmed broadband's impact on the economy. Following are excerpts from this year's batch of research reports.

As these readings show, the answer seems to be, as Facebook might put it, "It's complicated." To summarize the authors' findings,

- Higher broadband speeds lead to higher GDP, but the effect tapers off at higher income levels.
- Rural firms are more likely to locate where

broadband is available, but it may be too late now for the have-not areas to catch up.

- RUS broadband loans help boost the farm economy, but only in metro-adjacent counties.
- Broadband can boost rural employment, but only in metro-adjacent counties or where workers' skills have been upgraded.
- The economic benefit of the internet can't be measured just in terms of new jobs – it includes the creation of new categories of goods and services.
- As next-generation networks are deployed, even more new types of goods and services will be created.

Broadband Speeds Matter

Impact of Broadband Speed on Economic Outputs: An Empirical Study of OECD Countries, *Economics and Business Review*, 2017

By Chatchai Kongaut / *National Broadcasting and Telecommunications Commission of Thailand* and Erik Bohlin / *Chalmers University of Technology*

This study estimates the relationship between broadband speed and economic outputs. The results show that broadband speed contributes positively to economic outputs, such as GDP. The effects of broadband speed are also greater in countries with lower income. The policy recommendation is therefore that countries should focus on and encourage high-speed

broadband infrastructure and its adoption in their national broadband plans and policies. ...

This study does not aim to quantify the exact effects of broadband speed on GDP. Instead it points out the importance of high-speed broadband, since the causality of high-speed broadband and economic outputs in all the models shows that the results in all models

are consistent and that broadband speed does matter. With regard to whether the relationship between broadband speed and economic output is linear or nonlinear, the results ...

imply that different countries have different impacts of broadband speed on the economic outputs (higher positive impacts on lower-income countries). It is therefore possible that

the relationship of broadband speed on economic output is positive but at a decreasing rate.

<http://bit.ly/2zDjTqg>

Broadband Influences Rural Firms' Location Decisions

Broadband Internet and New Firm Location Decisions in Rural Areas, *American Journal of Agricultural Economics*, January 2017

By Younjun Kim / *Southern Connecticut State University* and Peter F. Orazem / *Iowa State University*

We focus on newly entering firm location decisions that would be the most sensitive to the presence or absence of local high-speed internet service. New firm location decisions are predicated on current local infrastructure, including whether or not broadband service is available, whereas most existing firms in the location entered before broadband was available in any market. ...

We apply our method to data taken from new firm startups in rural areas of Iowa and North Carolina. We choose rural areas because very rapid deployment of broadband eliminated meaningful variation in broadband availability in urban areas. Broadband deployment started in 1998 and spread quickly in urban areas that had the largest customer base[s]. In urban Iowa and North Carolina, 67 percent of ZIP codes had at least one provider within a year. In contrast, broadband deployment was considerably slower in rural areas, with only 35 percent of

rural ZIP codes having service within one year in Iowa and North Carolina.

We find that rural firms are 60 to 101 percent more likely to locate in ZIP codes with broadband availability. The broadband effect on firm entry is larger in rural areas adjacent to a metropolitan area or with larger populations. In a robustness test using ZIP code dummy variables, the effect of broadband on rural firm entry falls to 3 percent. ... [T]his 3 percent estimate can be viewed as a lower-bound estimate of the true broadband effect.

Federal and state governments have invested considerable resources to encourage rural broadband deployment and to reduce the digital divide between urban and rural areas. Our findings support the view that rural firms are more likely to enter a market with broadband availability. However, our findings do not suggest that universal rural broadband deployment will cause the gap in economic growth between urban and rural areas to

close. While broadband availability will increase the likelihood that a firm will locate in a rural area relative to other rural towns lacking broadband, the total number of firms locating in rural towns might not be affected by broadband availability.

Moreover, the complementarity between broadband and agglomeration suggests that broadband is most valuable to the rural places close to urban markets or with higher populations. The uneven deployment of broadband across rural locations has caused recent rural firm entry to concentrate in a small number of towns with service. The resulting agglomeration of firms in these towns may continue to favor firm location in these relatively few locations, even if broadband access were made universal. Future research will need to investigate whether broadband deployment into rural markets increases the total number of rural firm startups.

<http://bit.ly/2zE6bn7>

USDA Broadband Loans Boost the Farm Economy Adjacent to Metro Areas

The Impact of Broadband on U.S. Agriculture: An Evaluation of the USDA Broadband Loan Program, *Applied Economic Perspectives and Policy*, March 2017

By Amy M. G. Kandilov / *RTI International*, Ivan T. Kandilov and Mitch Renkow / *NC State University*, Xiangping Liu, *University of Tennessee*

The broadband loan programs increase access to high-speed internet in recipient communities, which can raise farm sales by increasing both farm output and prices received by producers. Further, high-speed internet may drive

down costs by providing information on cheaper inputs and better management practices, leading to an overall improvement in farm profits. ... We find that the two USDA broadband loan programs have had positive causal

impacts on farm sales, expenditures and profits in a subset of rural counties – those adjacent to metropolitan counties – but not in other types of counties.

<http://bit.ly/2zHPXad>

Worker Skills Are Critical to Obtaining Broadband Economic Development Benefits

Connecting the Dots of Ohio's Broadband Policy, Swank Program in Rural-Urban Policy, The Ohio State University, April 2017

By Mark Rembert, Bo Feng and Mark Partridge / *Ohio State University*

The most recent research suggests that broadband can be an effective economic development tool in some rural areas, specifically more populated, metro-adjacent areas that have a higher share of skilled workers. For areas that do not fall into those categories, the best case for broadband may not be economic development. Efforts to provide access in these areas – especially in areas with low skill levels – might need to be coupled with other economic development efforts aimed at offsetting the potential adverse effect of firms' using information technologies to outsource work or replace workers with technology, such as supporting entrepreneurship and skills development. ...

Considering this evidence within the context of the costs and benefits of broadband expansion, the vast majority of benefits stem from benefits to consumers. Broadband can greatly expand consumer access to products and services at lower prices, resulting in large economic gains. The evidence regarding the economic development benefits of broadband expansion are less assuring. While more populated rural areas adjacent to metros likely have opportunities to spur some economic development through broadband expansion, these gains are likely to come at the expense of smaller, more remote rural areas. The economics literature suggests broadband

expansion into [rural areas with low-skilled workforces] can actually have unintended consequences that reduce employment. This suggests that broadband expansion policies should be coupled with targeted economic development efforts that include entrepreneurial support, internet literacy, and skills development to mitigate the potential losses associated with broadband expansion. Finally, internet job search can significantly reduce the length of unemployment for job seekers, producing additional economic benefits for workers and the state.

<http://bit.ly/2iVDjws>

Is the Internet More Like a Country?

Refreshing Our Understanding of the Internet Economy, Internet Association, March 2017

By Christopher Hooton, Ph.D.

Simply placing the internet sector ... within the current NAICS taxonomy (or other formalized system) produces a deceptively intuitive fit. Researchers can quickly provide comparators that seem appropriately matched: The internet sector contributes approximately 6 percent of the U.S. GDP; it is a top-20 industry within the United States economy (in 2015); it is larger than powerhouse sectors such as construction (3.6 percent in 2012), transportation and warehousing (2.9 percent in 2012), and others. All of these are true, but as several other researchers who have analyzed the internet economy have argued, the estimates are likely conservative, and the comparators are not entirely appropriate.

Perhaps a more useful approach, hinted at by du Rausas et al. (2011), is to consider the internet economy as a unique market (i.e. the same way we would a sovereign nation). They

Goods and services developed via the internet should be considered a unique class.

estimated that in 2009 the internet would have been one of the 10 largest national economies in the world, larger than Canada, Spain, and many other large developed economies, implying a global GDP contribution of over 2.1 percent. And while not entirely applicable, the approach does fit many of the economic activities in the internet. Recent years have seen the development and stabilization of new currencies (bitcoin and other cryptocurrencies), the development and sale of new territory (domains and sites), new production and distribution infrastructure systems (apps and network platforms), new

communities and culture (social networks), and the collection and utilization of new forms of resources and commodities that can be mined and processed into economically useful items (data, APIs and more).

This is not to suggest that the internet should be considered a country, but it does illustrate that the types of goods and services developed via and available through the internet should, at a minimum, be given more attention than they currently receive and ... considered a unique class with a more sophisticated approach of incorporation.

<http://bit.ly/2jbDcyM>

The Future: GigaApps Will Unlock New Markets

Unlocking GigaWorld Innovation, September 2017

By Gregory Pankert, Ignacio Garcia Alves and Karim Taga / *TIME Practice*, Arthur D. Little

Together, the three families of GigaApps [augmented discovery, virtual telepresence and automated living – all dependent on new advanced networks] will affect most economic sectors. Fundamentally, future GigaApps will generate value by

- Reducing barriers to innovation and time-to-market for small and mid-sized enterprises (SMEs) and small offices and home offices (SoHo), which will be enabled to affordably access online service capabilities [that] currently are available only to larger enterprises or niche businesses. Examples include access to cloud-based advanced analytics (e.g. data mining and online analytical processing to understand customers' habits), and access to shared platforms to reach new markets (e.g. shared physical points of sale where several SMEs are present as hologram projections).
- Increasing productivity through increased automation of tasks, leading to faster manufacturing processes and production, e.g. AR-assisted installation of solar electricity generators or robots autonomously building houses.
- Unlocking new services by enhancing interactions between people and their surroundings via unprecedented experiences, e.g. virtual social interactions and AR guidance for tourism.

We foresee that the industrial manufacturing, engineering, logistics and automotive sectors will benefit most from the three families of GigaApps, accounting for close to 25 percent of total unlocked value, or close to €110 billion in Europe by 2025.

The smart home and entertainment sectors, in addition to retail and e-commerce, come next, accounting for

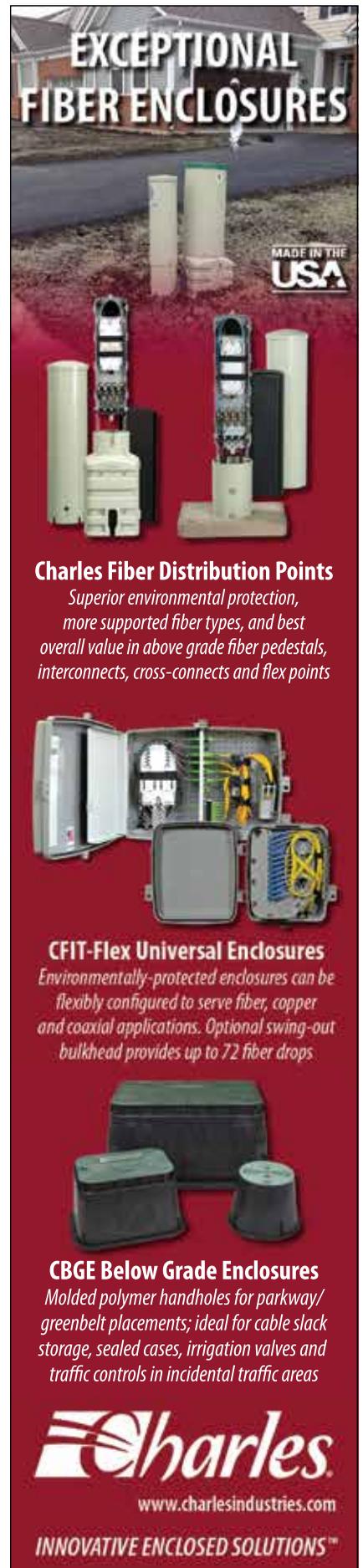
14 percent and 16 percent respectively of the overall GigaWorld market, followed closely by the health care and travel and tourism sectors.

We anticipate that augmented discovery and virtual telepresence services will largely enable use cases in the industrial sector (e.g. collaborative prototyping, drone-controlled warehouse management), the smart home and entertainment sector (e.g. holographic projection of movies or sport events, virtual teleconferencing, AR-assisted do-it-yourself installation of kitchens) and the retail and e-commerce sectors (e.g. virtual sales agent). Automated living-related applications, on the other hand, are expected to be present in all sectors as connected objects and machines are increasingly deployed in all kinds of situations.

By 2025, automated living is expected to profoundly disrupt all industries. Its applications will enable not only human-to-machine interactions but also machine-to-machine. Exploiting a broad variety of already deployed sensors and devices will enable widespread adoption and development of a large number of use cases.

Together, the three families of GigaApps should unlock markets estimated at €450–500 billion per year in Europe by 2025 (and yearly €2.4–2.5 trillion at global level). Augmented discovery and virtual telepresence are forecast to grow at an annual rate of 67 percent and 68 percent respectively while automated living should grow at a pace of 19 percent over the same 2016–2025 period.

<http://bit.ly/2zXisnf>



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