

Impacts of Broadband Access

Executive Summary

High-speed internet can increase access to information and digital tools, enabling people to participate in society in a variety of new ways. These activities can have significant downstream impacts on individuals and communities, depending on the particular context and use of internet-enabled functions. A wide body of literature indicates that, in general, higher rates of broadband access are associated with positive socioeconomic, health, and educational outcomes. Recently, the COVID-19 pandemic has brought increased attention to the need for access to reliable high-speed internet in the future in order to ensure individual well-being.

Highlights

- Increased broadband adoption is associated with higher employment levels, agricultural output, housing values, and business formation.
 - There is mixed evidence regarding the effects of broadband adoption on wages and worker productivity.
- Broadband access reduces time and cost barriers to the use of healthcare resources.
- Students with broadband access at home perform significantly better on a variety of educational assessments compared to their peers without home broadband access.

Limitations

- Broadband access is highly correlated with other factors, such as income and education level, so attributing impacts solely to broadband access is difficult and rare.
- Potential negative consequences of internet use, such as addiction or privacy breaches, have not been widely studied in the context of broadband expansion.

Research Background

Socioeconomic Impacts of Broadband Access

High-speed internet plays a role in many sectors of society, and several studies have sought to quantify the effects of broadband access on social and economic variables. A survey of the literature of broadband adoption effects is provided below. Note that “adoption” indicates actual uptake of broadband services, whereas “availability” indicates only that such service can be purchased in an area. Read more about [broadband availability/adoption](#) and [state-level broadband policies](#) in our previously published Science Notes.

Employment & Wages

Most studies demonstrate that broadband adoption positively affects employment. Analysis of the U.S. Census Bureau’s American Community Survey from 2015 to 2019 finds that areas with

high levels of broadband adoption have a significantly **higher labor force participation rate** (i.e., the proportion of people working or seeking work) for workers aged 25-54 in metropolitan areas than metropolitan areas without.¹ Other work finds that labor force participation increases by approximately 2% when broadband is newly deployed to a county.¹

One study finds that **growth in the number of jobs** for non-metropolitan counties with household broadband adoption rates above 60% is approximately 3% higher when compared to similar counties with lower adoption levels. A similar relationship was not found in metropolitan counties, suggesting that these areas have already experienced a large share of the benefits of broadband expansion. Therefore, employment trends may depend on many factors beyond broadband availability.²

These benefits to employment have been attributed to growth in “knowledge-intensive” services (e.g., consulting, engineering, research & development, computer/internet services); data from 2012 indicate that employment benefits from broadband are concentrated most heavily in industries that rely heavily on information technology.²

The literature on impacts to wages and productivity is mixed, and suggests that effects differ according to regional characteristics as well.^{2,3} Some studies find negligible effects of broadband expansion on wages, but other work focused on U.S. Department of Agriculture (USDA) broadband loans indicates that a \$1 per capita increase in loan disbursement results in about a \$1.08 increase in payroll per worker in that area. Most of these wage gains are attributed to salary increases in metropolitan areas.⁴ Other research indicates that nonmetropolitan counties that move from “moderate” (40-60%) to “higher” (over 60%) broadband adoption rates experience a median household income increase of 1.3% over 10 years.²

Overall, these findings indicate that increased broadband adoption facilitates stronger labor markets and potential wage gains, but that these effects are heavily dependent on other socioeconomic factors.

U.S. Census data also indicate that regional poverty rates are negatively correlated with both broadband adoption and home computer ownership rates.¹ Broadband access is highly correlated with other factors, such as income and education level, so attributing impacts solely to broadband access is difficult and rare.

Agriculture

The prevalence of and reliance on high-speed internet in agriculture-related businesses has increased substantially over the past decade. Uses of broadband in an agricultural context include remote monitoring of crops and soil, irrigation control, machinery updates, and market, information, and banking access.⁵ “Precision agriculture” technologies and techniques (which generally involve using real-time, location-specific data to inform farm operations) continue to advance, so broadband-enabled functions may continue to grow in importance as markets adapt to these developments. To date, however, few studies have quantified the impact of broadband adoption on agricultural outputs.

A 2011 study found that USDA broadband loans provided in the 2000s increased farm profits by 3%. This effect was driven mainly by increased crop sales; livestock operations did not exhibit similar gains, potentially because much animal-production business is contract-driven, and thus benefits less from rapid access to market information.⁶ More recent findings from 2020 suggest a similar effect; every 1% increase in broadband adoption may result in up to a 4% increase in crop yields, particularly for corn and soybeans.^{2,7} These gains are attributed to the use of precision farming techniques and equipment, and better access to real-time market information.²

Finally, preliminary analysis by the Office of Economics and Analytics at the FCC suggests that a 1% increase in low-speed internet (10 Mbps download/1 Mbps upload) adoption in a county is associated with 3.5-6.5% decreases in seed, plant, and fertilizer expenses in that area. However, no additional effect was found for high-speed (25/3) internet.⁷

Housing

There is some research on the effect of broadband availability on housing prices, but causal analysis is difficult since housing values are influenced by many different factors. Several surveys have assessed what discount would be required for a customer to purchase or rent a home without fiber. Respondents generally indicate that they would require a ~3% discount to the purchase price or an 8% monthly discount in rent to occupy an otherwise identical home without broadband access.^{3,8}

Business Formation, Entrepreneurship, and Productivity

A study of new businesses in North Carolina and Iowa found that firms are more likely to locate in rural counties with broadband availability than in those without.³ Broadband access leads to a higher business formation rate across business size in rural areas, and has the largest effect on women-led and remote rural establishments.⁹ A U.S. study found that rural counties with broadband adoption rates between 40 and 60% see the number of businesses located there grow 3% faster than rural counties with less than 40% adoption.¹⁰

Other research suggests that educational attainment levels of the local workforce also influence firms' decisions to form and locate in an area. Specifically, municipalities with broadband and a high proportion of college-educated workers have a 3% higher business formation rate than similar areas without broadband; a study of metropolitan areas in France finds no relationship between broadband availability and business formation in areas with a low-skilled workforce.¹¹

Similarly the effects of broadband on worker and business productivity are also skill-dependent. Broadband availability and adoption are associated with increased productivity of skilled workers (those with college degrees), but potentially allow businesses to replace workers without college educations by introducing options for automation of low-skill tasks.¹¹ Additionally, more productive businesses are more likely to have broadband, but there is no strong evidence that moving from low-speed internet to broadband increases the net productivity of businesses.^{11,12}

Population

An analysis of the 420 most rural counties in the U.S. found that the rural counties with the highest levels of broadband adoption experienced an average 13.5% increase in their millennial population between 2010 and 2016.¹³ These data suggest that internet connectivity is an important factor in attracting and retaining younger workers, who are more likely to work in information technology-related industries.

Health impacts of broadband access

Telehealth utilization has been shown to reduce healthcare costs by decreasing the number of visits to the emergency room and reducing lost income due to travel and missed work.² Across the U.S., rural counties with low broadband adoption use ~30% fewer telemedicine visits than those with high broadband adoption, indicating that broadband is an important factor in achieving those cost savings.

People with broadband are more likely to utilize telehealth services, access a patient portal, view test results, seek medical advice, and read messages from healthcare providers. Importantly, telehealth services such as consultations and follow-ups have been found to be of generally similar quality to in-person services. However, attributing broadband access directly to improved health outcomes (e.g., life expectancy) has been difficult. For more information about broadband and telemedicine, read our previously published [Science Note](#).

Educational Impacts of Broadband Access

Several lines of research indicate that broadband access, particularly at student homes, can impact educational outcomes. Prior to the COVID-19 pandemic, research on educational benefits from broadband focused mostly on cost savings and productivity at schools, but recent work also finds effects on student performance and outcomes.²

Several surveys consistently find that students without home internet access are less likely to participate in all online educational activities outside of school, including checking grades/assignments, locating resources, or communicating with peers/teachers. Students without broadband access also exhibit lower digital literacy, lower grades, and a lower self-reported desire to attend college.¹⁴

Specifically, a study of Michigan K-12 school students found that, regardless of other demographic factors, students who relied on a mobile phone for home internet ranked 5 percentile points lower nationally in reading and writing test scores and 6 percentiles lower in math.¹⁴ A 2008 analysis by the Federal Reserve found that students with home internet access are 6-8% percent more likely to graduate from high school than students without.¹³

Other studies find no appreciable effects of high-speed internet at schools on student achievement, suggesting that computer-assisted instruction is not necessarily superior to traditional curricula.¹⁵ Additionally, the literature on the benefits of online education is mixed

(see our [Science Note](#) on this topic). Similar to effects described above, the impact of broadband expansion on educational outcomes is sometimes difficult to attribute to internet alone, since broadband access is correlated with other factors such as income and education level. However, a wide body of research indicates that increased access to resources of all types improves academic performance and life outcomes (see our [Science Note](#) on opportunity gaps in education for more information).

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