Southern Rural Development Center

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Broadband Availability vs. Adoption: Which Matters More for Economic Development?

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Introduction

Discussions of the broadband "Digital Divide" are generally broken into two categories: (1) *availability* – having a company offer broadband service in a specific location, and (2) *adoption* – signing up for and maintaining monthly broadband service. Availability is seen as an infrastructure supply issue, while adoption is framed in terms of consumer demand (which includes ability to pay and perceived benefits of the technology). This issue brief delves into the recent literature on which of these two components seems to matter more for local economic development, which is often cited as a rationale for broadband investment. Recent federal and state broadband policies have subsidized both components; but an open question is which should be prioritized to have the largest impact on local economies.

This brief summarizes the growing body of research on the economic impacts of broadband. It utilizes academic studies that have looked specifically at U.S. data since 2012 (Tables 1 and 2 in the appendix), and emphasizes those studies that considered both availability and adoption in their analysis.

Summary Focus and Findings

Many academic articles have explored the relationship between broadband and economic development in the United States. Looking at research published since 2012, we find that studies focusing on broadband *availability* find impacts on local employment and entrepreneurship- but mostly use outdated speed thresholds. Other studies show that broadband *adoption* is closely linked to household- and farm-level outcomes. When both elements are considered simultaneously, adoption seems to matter more.

Summary Findings (Full Summary in Appendix Tables 1 and 2)

Availability and Speed Matter for Businesses and Employment

Table 1 demonstrates that broadband availability is an important determinant for employment outcomes and startup activity, in particular. Several studies document higher employment, reduced unemployment rates, or increased numbers of startups in areas with better broadband infrastructure – a finding that holds specifically for rural locations. However, many studies used only a very early definition of broadband (0.2 Mbps) and only one study (Lobo et al., 2020) focused on very high-speed access (1,000 Mbps or more). More work needs to be done, with more recent data, to assess whether ultra high-speed or gigabit networks have economic impacts beyond those where only lower speeds are available.

Adoption is Linked to Household and Farm Outcomes…and Economic Recovery

The studies in Table 2 largely show that broadband adoption is closely linked to household-level outcomes like income growth, poverty levels, and civic engagement. There are also positive associations with firm and employee growth and job productivity, including in the agricultural sector. Several recent studies also make clear that household adoption rates (and use) are positively linked to better recovery from both the Great Recession and the COVID-19-induced recession.

Adoption Seems to Matter More

When studies consider BOTH availability and adoption, adoption seems to matter more. Five of the eleven studies in Table 2 also considered broadband availability as potential determinants on different economic metrics. Strikingly, four of these five showed that *only* broadband adoption was linked to the economic outcome of interest. Gallardo et al. (2021) explicitly included 10 different broadband metrics, both availability and adoption-focused, to see which was more closely linked with productivity. Their findings make clear that the adoption measures were better indicators when compared to those assessing simple availability.

Recommendations

Federal, State, and Local Policies Should Include Availability and Adoption Components

The forthcoming federal Broadband Equity, Access, and Deployment (BEAD) program includes roughly $44 billion for availability and $17 billion for adoption. The adoption-oriented funding includes both monthly subsidies for low-income households ($14B) and programs to help people become familiar with the necessary tools ($3B). This is a significant change from prior broadband efforts, which were nearly universally focused on availability. While availability remains important (and is a prerequisite to adoption),

the research discussed here makes clear that demand-side efforts are potentially even more vital. State and local organizations working on broadband issues should be aware that positive economic outcomes are more closely linked to higher rates of adoption and use, and should prioritize efforts to create a larger base of productive broadband users. Future research evaluating the social and economic outcomes of these policies will be important – particularly from an equity perspective since the adoption efforts are largely focused on disadvantaged households.

Data and Methods

A Google Scholar search was conducted using variations of the terms "broadband" and "economic development," with the timeline set from 2012 – present. The year 2012 was chosen due to its proximity to the years that the U.S. started gathering Census block-level broadband availability data (2011) and began asking questions about household Internet subscriptions via the American Community Survey (2013). Relevant studies were limited to those using only U.S. data, and that contained quantitative analysis where an economic development metric was the outcome variable. The authors also drew on their own knowledge of the literature.

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Appendix Table 1. Summary of U.S. Studies on Broadband Availability (BBAV) and Economic Development

Study	Years Analyzed	Economic Development Outcome	Broadband Metric	Finding	Rural-focused	Causal Tool
Kolko (2012)	1999-2006	Employment Growth; avg pay per employee; employment rate	Zip-code level count of broadband providers (>0.2 Mbps)	BBAV positively impacted employment growth, but not avg. pay per employee or employment rate	No	Yes
Mack and Faggian (2013)	2000-2007	Change in Productivity (earnings)	County-level presence & count of broadband providers (>0.2 Mbps)	Positive benefits of BBAV on earnings are stronger in areas with more educated / skilled workers	No	No
Jayakar and Park (2013)	2008-2011	Unemployment Rates	County-level percentage of households with > 3Mbps	BBAV has a negative association with unemployment rates in 2011, but is not associated with change in unemployment rates between 2008-2011	No	No
Mack and Rey (2014)	2004	"Knowledge-intensive firm" Establishment Counts	Zip-code level count of broadband providers (> 0.2 Mbps)	Broadband providers positively linked to number of knowledge-intensive firms in metro areas	No	No
Kim and Orazem (2017)	1990 - 2002	Firm Location Decisions	Zip-code availability of > 0.2 Mbps	BBAV had positive effect on location decisions of new firms in rural areas in early 2000s	Yes	Yes
Ford (2018)	2013-2015	Jobs, Income, Earnings	County-level % of population with access to 10 Mbps only vs. 25 Mpbs or better	No impact of 25 Mbps vs. 10 Mbps on any outcomes	No	Possibly
Deller and Whitacre (2019)	2016	Rural Housing Values	County-level % population with access to speeds ranging from 0.2 Mbps - 1000 Mbps	Rural housing values positively impacted by broadband speeds, but declining returns after 0.2 Mbps	Yes	Yes

Study	Years Analyzed	Economic Development Outcome	Broadband Metric	Finding	Rural-focused	Causal Tool
Lobo et al. (2020)	2011-2015	Unemployment Rates	County-level availability: % of population with access to < 100 Mbps, 100-1000 Mbps, and >1000 Mbps	Early access to higher-speed broadband is associated with lower unemployment rates, More pronounced impact in rural counties	No	Possibly
Deller et al. (2022)	2014	Rural Business Startup Rates	County-level availability: % of population with access to 10 Mbps - 100 Mpbs (wired) & 10 - 25 Mbps (wireless) as of 2014	Broadband coverage positively associated with number of startups in rural counties, download matters more than upload, mobile coverage also positively associated	Yes	Yes
Conroy and Low (2022)	2000-2007	Rural & Female-led Business Startup Rates	County-level number of broadband providers (>0.2 Mbps)	BBAV positively linked to the number of rural small business and women-owned establishment births	Yes	Yes

Appendix Table 2. Summary of U.S. Studies on Broadband Adoption (BBAD) and Economic Development

Study	Years Analyzed	Economic Development Outcome	Broadband Metric	Finding	Rural-focused	Causal Tool
Whitacre et al. (2014a)	*2001-2010*	*Median Household Income Growth; Poverty Reduction*	*County-level availability and household adoption rates (>60% considered high)*	*Higher rates of adoption associated with higher growth rates in median household income, lower poverty rates; no association with broadband availability*	*Yes*	*Possibly*
Whitacre et al. (2014b)	*2008-2011*	*Firm / Employee Growth*	*County-level availability and household adoption rates (>60% considered high)*	*Higher rates of adoption associated with increases in firms / # jobs between 2008-2011, no association with broadband availability*	*Yes*	*Possibly*
Whitacre and Manlove (2016)	*2011*	*Civic Engagement*	*County-level availability and household adoption rates*	*Only BBAD (not simple access) positively associated with civic engagement level of rural residents*	*Yes*	*No*
Dettling (2017)	2000-2009	Women's Labor Force Participation	Individual household broadband use (any technology other than dial-up, no speeds specified)	Household broadband use leads to increases in labor force participation among married women	No	Yes
Gallardo and Whitacre (2018)	2011-2015	Median Household Income	Percentage working from home (broadband access assumed)	Percentage of residents working from home positively related to income levels, spillovers from telework in neighboring communities exist	No	No
Gallardo et al. (2021)	*2017*	*Productivity (GDP) per job*	*10 distinct broadband metrics, including both availability and adoption-focused*	*BBAD metrics positively associated with job productivity, while those focused on speed or availability were not*	*No*	*No*

Study	Years Analyzed	Economic Development Outcome	Broadband Metric	Finding	Rural-focused	Causal Tool
Zuo (2021)	2010-2016	Employment, labor force participation, unemployment, income	Eligibility / Participation in low-cost broadband program (15/1 Mbps or greater)	Availability of a low-cost broadband program increased employment and earnings of eligible individuals, driven by greater labor force participation	No	Yes
LoPiccalo (2022)	2007-2017	Farm Productivity (corn yields, operating expenses)	Number of 25/3 Mbps connections per 1,000 households in counties with farm activity	Doubling number of 25/3 connections per 1,000 households leads to increases in corn yields and decreases in farm operating expenses	Yes	Yes
Mossberger et al. (2022)	2007-2019	Median Household Income Growth; Recovery from Great Recession	Number of active "ventures" (domain names) per capita (from GoDaddy) - county-level	Density of domain name sites positively related to economic prosperity, income growth, and economic recovery from Great Recession	No	Possibly
Isley and Low (2022)	*2020*	*Employment Rates during COVID-19 pandemic*	*County-level household adoption rates in rural counties*	*Both broadband availability and adoption had positive impacts on county employment rates in April and May 2020*	*Yes*	*Possibly*
Carvalho et al. (2022)	2020	Unemployment Rates during COVID-19 pandemic	County-level household adoption rates	Higher rates of BBAD, combined with the ability to telework, led to greater resiliency (lower increases in unemployment) in the months following COVID-19 outbreak	No	No

Note: Italicized studies included BOTH availability and adoption measures.