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# Evaluation of USDA's Broadband Loan Program: Impacts on broadband provision<sup>☆</sup>

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## ABSTRACT

Since 2002 the USDA's Broadband Loan Program has directed more than \$1.8 billion in subsidized loans to help expand broadband access in under-served rural communities. Program eligibility criteria included having a population of 20,000 or fewer, having no prior access to broadband, and providing a minimum matching contribution of 15% by recipients of the loan. Loans were extended mainly to small telecommunications services firms at varying (subsidized) interest rates. We evaluate on the effectiveness of the Loan Program in increasing broadband availability in target locations. Specifically, we analyze whether loan receipt increases the number of broadband providers in a particular location, using various count panel methods. Our analysis is conducted at the ZIP code level over the period 1999–2008; it uses broadband provider data from the FCC's Form 477, and loan data from the Rural Utility Service (the implementing agency for the Broadband Loan Program). Results indicate that ZIP codes receiving broadband loans did in fact experience modest, statistically significant increases in the number of broadband providers vis-à-vis non-recipient locations; that average marginal effects on treated ZIP codes were approximately 0.092 additional broadband providers annually; and that these benefits accrued more towards rural locations than urban locations, in conformance with the intent of the program.

## 1. Introduction

Broadband technology delivers enhanced information and communications services at rapid transmission rates to end users. Previous research suggests that profit maximizing broadband providers tend to first serve areas with higher expected profit—via higher revenues and/or low costs (Czernich, Falck, Kretschmer, & Woessmann, 2011; Whitacre & Mills, 2007; Whitacre, 2010). Consequently, and similar to other emerging communications technologies, broadband diffusion has followed an S-shaped diffusion path over time and spatially so that the rate of availability and uptake in a particular geographic area has been found to diminish with the density of business and households within that area (Attewell, 1992; Geroski, 2000).

Expanding access to high-speed broadband internet, particularly to relatively under-served rural areas, has been a pillar of federal rural development policy for a span of time approaching two decades. Beginning in December 2000, Congress authorized various broadband loan programs to help expand broadband access in under-served rural communities. Through 2007, the programs had approved more than 70 loans in 40 states, totaling over \$1.22 billion worth of loans across 1263 communities and

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582,000 households (USDA-Rural Development, 2007).

This paper utilizes data on two broadband loan programs administered by the United States Department of Agriculture (USDA) in order to gauge how effectively that public investment was implemented. Kandilov and Renkow (2010) is the only previous academic study to analyze the impacts of the two broadband loan programs. That paper examined whether or not various indicators of local economic performance (employment, payroll, number of establishments) have differed in systematic ways between communities that have participated in the Broadband Loan Program and those that have not. Here we examine a fundamental precursor to economic impacts that may stem from these Broadband Loan Program: whether or not the program produced significant increases in broadband availability—a necessary, but by no means sufficient, condition for the programs producing economic impacts.

To do so, we first use discrete choice methods to determine the factors that drove the disbursement of the broadband loans across the United States from 2002 through 2006. Results indicate that ZIP codes receiving broadband loans did in fact roughly conform to the programs' target populations: Statistically significant increases in the probability of receiving a loan were evident for locations characterized by relatively low initial population densities and levels of service. We then use count panel methods to model expansion of broadband availability—proxied by the number of providers in an area—over time. In particular, we seek to ascertain whether or not there was a detectable causal link between a locality receiving loan program funds and broadband availability within that locality. We identify changes in broadband availability using ZIP code level Federal Communications Commission (FCC) data from December 1999 to June 2008. Results indicate that ZIP codes receiving broadband loans experienced approximately 0.092 additional broadband providers annually and that these increases occurred to a greater degree in more rural areas *vis-à-vis* urban areas. Thus, we find evidence in support of the broadband loan programs having contributed to an increase in broadband availability in target areas.

The paper is laid out as follows. The following two sections briefly describe the USDA broadband loan programs and the data we use to analyze it. Next, we analyze econometrically the factors determining whether or not areas received broadband loans. We then estimate whether or not—and to what extent—receipt of a broadband loan contributed to an increase in the number of broadband providers. Concluding remarks are offered in the paper's final section.

## 2. The USDA Broadband Loan Program

The initial roll-out phase of broadband technologies across North America began around 1996 when Rogers Communications introduced the first cable modem service in Canada (FCC, 2005). The technology became available in the United States shortly thereafter, although the diffusion of broadband technologies was neither instantaneous nor ubiquitous. As seen in Fig. 1, around 2000 there were many areas within the U.S. which lacked access to broadband. After 2008, the only areas in the United States lacking access to broadband technology were extreme rural areas with limited economic activity. The early adopters of broadband across the United States were areas with favorable economic conditions: densely populated metro areas with high levels of median income (Greenstein & Prince, 2006).

A troubling issue at the turn of the millennium centered around the so-called digital divide within the United States in which there existed differences in internet access between rural and urban areas. Early work focused on computer adoption and dial-up connections (Antonelli, 2003; DiMaggio & Hargittai, 2001; Norris, 2001; Parker, 2000; Strover, 2001; Wade, 2002). With the growing ubiquity of personal computers and increasing diffusion of broadband, scholarly interest focused more on rural-urban differences in access to high-speed internet (Grubestic, 2003; LaRose, Gregg, Strover, Straubhaar, & Carpenter, 2007; Malecki, 2003). Rural areas were found to consistently lag urban areas in broadband availability. This “infrastructure inequity” was generally thought to put those rural areas at a competitive disadvantage with respect to economic development in the changing US economy (Grubestic, 2006). It was found to be rooted in the lower rural population densities and hence greater per-unit deployment costs, coupled with the idiosyncrasies of the regulatory and market environment determining the types of telecommunications providers operating in rural places (Wood, 2008).

Growing concern over rural-urban disparities in broadband availability spurred government policies aimed at reducing regional differences in broadband access. In December 2000, Congress authorized a broadband pilot program (“Pilot”) to offer subsidized loans to help expand broadband access in under-served rural communities. Program eligibility criteria included having a population of 20,000 or fewer, having no prior access to broadband, and providing a minimum matching contribution of 15% by recipients of the loan. Loans were extended mainly to small telecommunications services firms at varying (subsidized) interest rates; most participating communities qualified for a “hardship rate” of 4% (Cowan, 2010).

Administered by the United States Department of Agriculture's (USDA) Rural Utilities Service (RUS), the Pilot program was implemented to gauge the effectiveness and feasibility of a larger scale program. In the first year, there were 12 loans disbursed, worth \$100 million. The Agricultural Appropriations Act of 2002 allowed for a second round of funding for 16 loans of \$80 million to complete the total funding of the program. Overall, the Pilot program totaled \$180 million in loans to 98 communities located in 13 states. After the Pilot program, the 2002 Farm Bill established the USDA Rural Development Broadband Program that expanded upon the scope of the Pilot program. By 2007, the program had approved 70 loans in 40 states, totaling over \$1.22 billion serving 1263 communities and 582,000 households (USDA Rural Development, 2007).

Although loans were ostensibly targeted toward rural areas, some of the loans went to more urbanized places located in metropolitan counties. Presumably, these loans reflected to some degree the geographical exigencies of existing broadband infrastructure expanding outward from densely populated urban areas out towards the more rural areas targeted by the program. Data on the timing and location of loan disbursements are available from RUS at the ZIP code level. Table 1 displays the distribution of

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