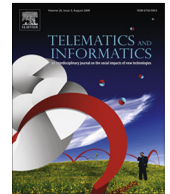




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## Businesses and the need for speed: The impact of broadband speed on business presence



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### ARTICLE INFO

#### Article history:

Received 13 August 2013

Received in revised form 2 December 2013

Accepted 4 December 2013

Available online 16 December 2013

#### Keywords:

Internet

Broadband speed

Economic development

Firm location

### ABSTRACT

Despite the widespread attention devoted to broadband and its anticipated impacts, surprisingly little is known regarding the linkages between broadband provision and establishment location. This is particularly true with respect to broadband speed. Given the understudied nature of this relationship, this study estimates econometric models to examine the linkages between broadband speed and firms using Ohio as a case study. Models results indicate broadband speed is most important to agricultural and rural firms. These findings provide case study support for policy and funding initiatives designed to improve the quality of broadband infrastructure in rural locations.

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### 1. Introduction

Despite the recognition that broadband Internet connections have transformative possibilities for firms, the vast majority of broadband studies have focused on individual adoption and use of the Internet. Research that provides information about the impact of broadband on firms and regional economic growth is crucial given the goals outlined by the Federal Communications Commission (FCC) in the National Broadband Plan (FCC, 2010a). Among the highlighted features of this plan are policy recommendations designed to impact the economic opportunity of places. In this regard, broadband is expected to impact entrepreneurship and small firm growth thereby improving the growth prospects of regional economies.

Two other goals specified in the National Broadband Plan are designed to improve the speeds at which broadband is available to communities. One of these goals is designed to provide at least 100 million households with download speeds of at least 100 megabits per second (mbps) and upload speeds of at least 50 megabits per second (FCC, 2010a). The other goal seeks to ensure that each community has access to 1 gigabit per second broadband service via an anchor institution such as a school, hospital, or government building (FCC, 2010a). Improved access to high-speed broadband is important, because it not only provides for more efficient use of the Internet in terms of faster file uploading and downloading capabilities, but it is also important to ensure that people and firms have the capability of using video-conferencing applications, and other speed dependent Internet applications.

In light of the comparatively understudied impact of broadband on firms and the speed related goals of the National Broadband Plan, this study seeks to answer two questions. Is there a positive association between broadband speed and firm presence? Are there industry-level variations in the association between broadband speed and firm presence? To answer these research questions, spatial econometric models are estimated using industry level information on firms and broadband speed tier information from the Federal Communications Commission (FCC) Form 477 database. This modeling approach is

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important to accounting for spatial effects in the data, a portion of which are related to the manner in which broadband data are reported.

Model results reveal that broadband speed is particularly important for firms in rural locations. This suggests that broadband speed substitutes for the agglomerative benefits of urban locations and enables firms to carry out operations in rural areas. The results also provide case study support for policy and funding initiatives designed to improve the quality of broadband infrastructure in rural locations. This is an important finding for countries with expansive geographic landscapes similar to the United States where issues of infrastructure quality are critical to the competitiveness of businesses and economic vitality of rural communities.

## 2. Impacts of ICTs

While the diffusion of Internet technologies is remarkably similar to prior communications technologies (Perkins and Neumayer, 2011), their potential for economic impacts are perhaps different from previous innovations in communications because they enable the development of new working models and facilitate decentralized information processing (Bloom and Van Reenen, 2007; Czernich et al., 2011). In this respect, advances in Internet-related ICTs are considered particularly important to the economy because of their unprecedented space–time compressing capabilities and their widespread impacts related to their categorization as general-purpose technologies (GPTs) (Harris, 1998; Helpman and Trajtenberg, 1998; Jovanovic and Rousseau, 2005). Innovations in these technologies are recognized as a key feature of the tremendous period of economic growth in the 1990's, and the economic changes wrought by these technologies have received several names over the years including the New Economy and the Knowledge Economy (Cohen et al., 2000; Pohjola, 2002).

### 2.1. Agglomeration economies and the internet

In the early days of Internet availability, the vast potential of this communications medium provoked extreme forecasts about the impact that ICTs, like broadband, would have on firm location. These forecasts ranged from studies that heralded the continued importance of cities (Moss, 1998; Duffy-Deno, 2003; Steinfield, 2004) to those that suggested the ability to communicate remotely would merely loosen the agglomerative ties of firms to cities (Kutay, 1988a,b). Perhaps the most extreme of these forecasts were the prophecies that anticipated the death of distance, the death of cities, and widespread use of the Internet that would allow workers to telecommute from electronic cottages (Negroponte, 1995; Cairncross, 1997). Over a decade after broadband first become publicly available, the hypothesis that broadband has merely loosened the agglomerative benefits of cities appears to be the most accurate of these forecasts. Unraveling how this outcome has impacted firms however is a difficult task because of the heterogeneous distribution of broadband provision (Moss and Townsend, 2000; Stover, 2001; Grubestic and Murray, 2002, 2004) and varied levels of standardization of firms' business processes (Atkinson, 1998; Gaspar and Glaeser, 1998).

In particular, much of the debate about the impact of ICTs on firm location is about the substitutability of ICTs for the daily opportunities for face-to-face contacts offered by central city locations (Forman et al., 2005b). Studies argue that communications via ICTs are a substitute for face-to-face interactions (Moss, 1998; Steinfield, 2004), while other studies suggest that the subtle nuances in face-to-face interactions will reinforce the importance of urban locations (Leamer and Storper, 2001; McCann and Shefer, 2004). Related research finds that the Internet greatly reduces but does not completely eliminate the friction of distance for many activities (Blum and Goldfarb, 2006; Hortascu et al., 2009; Agrawal et al., 2011). For example, Blum and Goldfarb (2006) find that time, transportation, and distribution costs are near zero on the Internet, and that online search costs are also independent of distance. Distance is not completely irrelevant in online transactions however, particularly when tastes and country size are taken into consideration (Blum and Goldfarb, 2006).

Similarly, other studies suggest that “conversational”, routine transactions may be conducted at a distance via the Internet while non-standard, “handshake” interactions require face-to-face interactions (Leamer and Storper, 2001; McCann and Shefer, 2004). Along these same lines, Gaspar and Glaeser (1998) suggest that telecommunications facilitate face-to-face interactions and are a complement rather than a substitute for in-person transactions. Combined, these studies suggest that the complementarities between face-to-face contacts and ICTs in cities are a key reason that central locations will retain their importance for firms trading non-standard information, despite advancements in information technologies (Gaspar and Glaeser, 1998; Pons-Novell and Viladecans-Marsal, 2006).

### 2.2. Establishment adoption and use of the internet

One of the difficulties in unraveling the impact of ICTs on firm presence is determining the extent that ICTs have modified business processes. While the availability of ICTs is an important first step towards use of these technologies, it does not necessarily translate into adoption and use of these technologies. In fact, several variables play into technology adoption decisions of firms including size, industry membership and metropolitan area size. Studies evaluating establishment adoption of ICTs find that firm size plays a key part because of differences between the presence of in-house IT support in large and small firms (Karshenas and Stoneman, 1993; Gibbs and Tanner, 1997; Forman, 2005). Smaller firms are also frequently unaware of

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