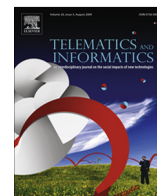


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## Access to broadband Internet and labour force outcomes: A case study of the Western Downs Region, Queensland

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### ABSTRACT

This paper examines the causal effect of household access to broadband Internet on individuals' labour market outcomes in an Australian rural and regional context. This study uses the survey data of 391 households randomly selected from the Western Downs Region of Queensland, Australia, and employs the propensity score matching technique to make causal inferences. This study also controls selection bias issues – an aspect which has been overlooked in previous studies. This study found that the causal effect of household access to broadband Internet on individuals' labour force outcomes is not statistically significant. This finding can add value to our knowledge of the causal relationship between broadband access and labour force participation. As the rollout of a high-speed broadband network in rural and regional Australia is currently underway, the finding can be considered a benchmark for subsequent assessment of the effects of such infrastructure development on socio-economic outcomes.

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## 1. Introduction

The development and deployment of broadband Internet services (hereafter 'broadband') facilitate the flow of information in the digitally connected world. The term 'broadband' commonly refers to high-speed Internet access via a variety of networks, including cable, fibre, wireless and satellite, all of which are faster than analogue dial-up by a huge magnitude. Although broadband refers to high-speed transmission, around the world the threshold varies greatly as does the time involved, especially where the speed/bandwidth is concerned. Broadband in Australia is defined as a minimum download speed equal to or greater than 265 kilobits per second (kbps) and minimum upload speed of 64 kbps (NBN, 2016a). In terms of speed, this is different to what many other developed nations have adopted. For instance, in 2015 the US Federal Communications Commission updated broadband benchmark speeds for the USA to 25 megabits per second (Mbps) for downloads and 3 Mbps for uploads (FCC, 2015). Broadband speed varies a great deal depending on a range of factors, including congestion, location, local conditions, hardware and software, and network traffic. Currently in Australia the National Broadband Network (NBN) is offering five speed tiers – the basic NBN tier is 12 Mbps and the top has download speeds of 100 Mbps and 40 Mbps upload over fibre (NBN, 2016b).

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Broadband services are now as important as conventional infrastructure such as the road, railway and electricity networks. It is important for rural and regional communities when making decisions regarding lifestyle choices and location for business. The Internet in general, and high-speed broadband in particular, has increased the speed of information flow in the labour market, essentially reducing frictional or search unemployment. It has also significantly reduced the direct cost of searching and recruiting for job seekers and employers, respectively. A significant number of studies have assessed the benefits of broadband on communities and economies (e.g., Kuhn and Skuterud, 2004; Kuhn and Mansour, 2013; Koutroumpis, 2009; Roller and Waverman, 2001; Shideler et al., 2007). Broadband is a communication technology, and access to this network creates various opportunities and channels that enhance communications between potential employees and employers (Autor, 2001). Evidence suggests that the penetration of broadband increases the probability of employment and labour market participation; for instance, Crandall et al. (2007) found that an increase of three million lines (i.e., a 1% increase in access to broadband) was associated with nearly 300,000 more jobs in the US economy. Using the Ordinary Least Squares estimation, Czernich (2014) found a negative association between availability of broadband via DSL and unemployment rates in German municipalities, however, an instrument variable approach failed to establish any causal relationship.

Studies on the effects of broadband on employment outcomes have been based on the assumption that individuals' selection of broadband is exogenous in the modelling of this causal relationship. However, theories support the notion that the selection of broadband might be endogenous. For instance, Venkatesh and Brown (2001) confirmed that the adoption of technology in households is associated with an individual's age, income, marital status and the age structure of children in the household. Beard et al. (2012) found that the selection of technology is a matter of choice for users. The desirability of adopting technology varies from person to person, and the variation depends upon the relative advantages of the technology, compatibility, complexity, ease of learning and observability (Rogers, 1995). In line with this argument, access to broadband can also be considered endogenous in the modelling of households' labour market status. Literature provides evidence of a statistically significant association between access to broadband and employment opportunities (Atasoy, 2013; Czernich, 2014). However, none of these studies show any causal relationship between these two variables, because in order to make causal inference, random selection of subjects and their random allocation to treatment and control groups are essential. These methodical issues have been ignored in previous studies. Furthermore, none of the studies on the effects of broadband on the labour market have examined this issue in a rural and regional context.

The main objective of this study is to provide estimates of the causal effect of household access to broadband on labour supply in rural and regional contexts. This study uses primary survey data on the adoption and use of broadband in households in the Western Downs Region (WDR) of Queensland, Australia. In this study, applying the propensity score matching (PSM) technique, we assess the causal relationship between broadband access and employment status. Lane et al. (2016) showed that despite significant improvements in telecommunication infrastructure services, the network capacity in rural and regional Australia remains a major concern. Therefore, research on the influence of broadband on labour market status in Australian rural and regional contexts is significant.

The results will provide potentially useful insights for policymakers. Australia is currently implementing the NBN, which is the biggest and arguably the most important infrastructure project building an accessible, superfast broadband network across the country. The NBN promises social and economic benefits to be delivered as equitably as possible across Australia, particularly for rural and regional households and businesses. The findings of this study will help policymakers understand the potential benefits of the ongoing investment in rural and regional areas.

The remainder of the paper is organised as follows: Section 2 presents the literature review; Sections 3 and 4 present the data and the empirical research strategies, respectively; Section 5 discusses the results; and Section 6 concludes the paper.

## 2. Research evidence

The main mechanisms through which access to and use of broadband services contribute to labour market participation are searching and applying for jobs online. Job searching is a process of information gathering: some traditional job-searching options are informal referrals from friends and relatives, media advertisements and public employment offices (Weber and Mahringer, 2008). However, newly developed mechanisms such as social networking and social media can provide employment-related information more quickly and to a wider audience than other means in this information age.

Several studies have assessed the effects of broadband network deployment and its penetration on macroeconomic outcomes, including employment and gross domestic product growth (Katz et al., 2010; Atasoy, 2013). Some more recent literature have explored the effects on local business and entrepreneurship development. For instance, scholars are increasingly focusing on the effects of high-speed broadband on issues of regional development (Grubetic and Mack, 2015), on business innovation and entrepreneurship development (Alam and Adeyinka, 2016; Tranos and Mack, 2016) and on knowledge-intensive firms' differential performances (Mack and Rey, 2014) or firm-level productivity (Haller and Lyons, 2015).

From a theoretical perspective, broadband lowers the transaction costs of initial employment for both employers and employees, and thus raises overall output and productivity. Katz et al. (2010) studied the employment and economic impact of network externalities by splitting Germany into two regions – a high *Landkreise* (average broadband penetration rate of

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