



# Does broadband internet reduce the unemployment rate? Evidence for Germany



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## ABSTRACT

Broadband internet is widely considered an important determinant of economic growth that has a positive effect on various economic variables. This paper addresses the question whether differences in the availability of broadband internet between German municipalities can explain differences in the unemployment rate. OLS results indicate a negative association between DSL availability and unemployment rates. However, the roll-out of DSL networks is not random. To address concerns of reverse causality and omitted variables, an instrumental variable approach is used, which rests on impediments to the roll-out of DSL networks that stem from the structure of the pre-existing voice-telephony network. The results of the instrumental variable estimations do not confirm the OLS results suggesting that the availability of DSL does not reduce the unemployment rate.

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## 1. Introduction

In 2009, the German government initiated a broadband strategy, which was aimed at providing high-speed internet access to every household. Its goals were to provide nationwide broadband access by the end of 2010 and broadband access with transmission rates of at least 50 mbit/s for 75% of all households by 2014. The government initiated the broadband strategy because it believes that the ubiquitous roll-out of broadband networks is a prerequisite for economic growth and prosperity. It expects broadband networks to be as important for economic and social development as traditional infrastructures like road, railway and electricity networks. It is claimed that especially rural areas will gain from broadband access since it is an important factor to consider when making location decisions for companies and families as well as for jobs and for the

attractiveness of rural areas. Therefore, the broadband strategy aims at providing access to the broadband network in the numerous “white spots”, i.e. areas without broadband access (Bundesministerium für Wirtschaft und Technologie, 2009).

Indeed, previous studies have found a positive effect of Information and Communication Technology (ICT) on productivity and there is also a strong indication that ICT is a General Purpose Technology (Cardona et al., 2013). A study based on a panel of OECD countries finds that the introduction and diffusion of broadband internet had an important impact on growth in GDP per capita (Czernich et al., 2011). Further, studies for the US have found a positive association between broadband internet and employment (Crandall et al., 2007; Gillett et al., 2006). Yet, little is known about the effect of broadband internet on economic development in rural areas.

This paper addresses the question whether differences in the availability of broadband internet between German municipalities can explain differences in the unemployment rate. Two potential channels for such a relation are

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considered. First, broadband internet may increase the economic activity and thus lead to more employment. Existing firms might hire more people or self-employment and entrepreneurship may increase because people seize opportunities that stem from broadband internet.

Second, broadband internet may increase the efficiency of job matching. Today, internet plays an important role in the job search process since it offers new possibilities to search for open positions. Numerous online job boards have been founded where firms can post open positions and applicants their CVs. Both sides can then search these boards by the criteria they are looking for. Compared to traditional job search methods, online searches promise to be more comprehensive, more efficient and more up-to-date and may therefore improve job matching and decrease unemployment.<sup>1</sup>

Using regional data for German municipalities, this paper analyses whether the availability of broadband internet lowered unemployment rates. Data on unemployment rates in the year 2006 is combined with information on DSL availability. DSL is by far the predominant technology for broadband internet in Germany. In 2006, DSL was already available in all larger towns, but not yet as widespread in rural areas. Therefore, in this paper the effect of DSL on unemployment is estimated using variation of DSL availability between rural municipalities. OLS estimates show a negative association between DSL availability and unemployment rates. However, this association cannot be interpreted as a causal effect but may be driven by reverse causality or omitted variables. For example in areas with low unemployment rates, ability to pay and thus demand for DSL may be higher, resulting in a faster roll-out of DSL networks to these areas.

To address such concerns, an instrumental variable approach is used, which rests on impediments to the roll-out of DSL networks that stem from the structure of the pre-existing voice-telephony network. The DSL network is built along the existing network for voice-telephony by upgrading the pre-existing copper-based infrastructure with optical fibre. This process started at the highest aggregation level of the network infrastructure and today the network is typically fibre-based but for the last stretch to the individual dwellings, which are still copper-based. The longer these copper wires, the less bandwidth is feasible via this wire. Therefore, the distance from every municipality to the location of the closest interconnection point to the fibre-based network is calculated and used as an instrumental variable to predict DSL availability in a municipality.

The results of the instrumental variable estimations do not confirm the OLS results. This suggests that broadband internet does not reduce the unemployment rate, i.e. it

does not help those currently registered as unemployed finding a job. However, this does not necessarily mean that broadband internet does not have an impact on the labour market. For example, it may increase efficiency of job matching or increase employment of unemployed persons who are not registered as jobseekers.

The paper is structured as follows. Section 2 gives an overview of the existing literature on internet and unemployment. Section 3 describes the model, data and OLS results. Section 4 describes the instrumental variable approach, shows the results of the estimations and discusses the validity of the instrument. Section 5 gives an interpretation of the results, Section 6 concludes.

## 2. Internet and unemployment – related literature

Autor (2001) describes several ways of how the emergence of internet may affect the labour market. Through its function of enabling inexpensive and quick distribution of information, he expects the internet to have a significant impact on the labour market, which is characterised by imperfect and asymmetric information. First, the internet might change the way in which employers and employees are matched. Additionally to the traditional job advertisements in newspapers, internet job boards have grown and firms now post their job openings on their websites. Reversely, these job boards also allow employers to look for potential employees. The online advertisements have the advantage over traditional advertisements in newspapers of being more up-to-date and easier to search. Therefore, internet job boards should increase the efficiency of job matching via their function of reducing the costs of searching for job openings and acquiring information about employers or employees. Second, Autor points out that employees may deliver their work increasingly online rather than on site. Remote access to machinery, e-mails and documents allows employees to perform their task from different locations. Third, labour demand may depend less on local market conditions, but production may be divided into tasks that are done where labour supply conditions are favourable. The coordination of the different tasks could be achieved via information and communication technologies. Thus, Autor concludes that the possibilities arising from the diffusion of internet may have a strong impact on the functioning of the labour market.

The latter two points may lead to an increase in economic activity in areas with broadband internet and thus to more employment. Existing firms might hire more people or self-employment and entrepreneurship may increase because people seize opportunities that stem from broadband internet. The first point in contrast refers to another kind of mechanism, an increase in the efficiency of job matching. Several studies have addressed the question empirically; however, evidence is still ambiguous.

A number of studies for the US find that broadband internet is positively associated with employment. Gillett et al. (2006) look at the effect of broadband internet in an early stage of broadband diffusion. Using a panel data set for the years 1998 to 2002 segmented by zip code, they find that communities with broadband internet experienced a more rapid growth in employment and in the number of

<sup>1</sup> Job searching via the internet has become increasingly prominent in Germany (Bitkom, 2009). In the third quarter of 2009, online job boards in Germany received 23 million visits; the most frequently visited one, the job board of the Federal Employment Agency, received 7.9 million visits alone. It is also the largest job board with over 640,000 open positions and approximately 3.5 million registered profiles of applicants (Bundesagentur für Arbeit, state of November 2010). Moreover, firms use the internet extensively to fill job vacancies: 94% of the interviewed firms advertise their job openings online (Bitkom, 2009).

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