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# Telecommunications Policy

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## Economic growth, telecommunications development and productivity growth of the telecommunications sector: Evidence around the world

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### ABSTRACT

This paper studies the relationships between economic growth, telecommunications development and productivity growth of the telecommunications sector in different countries and regions of the world. In particular, this study assesses the impact of mobile telecommunications on economic growth and telecommunications productivity. The results indicate that there is a bidirectional relationship between real gross domestic product (GDP) and telecommunications development (as measured by teledensity) for European and high-income countries. However, when the impact of mobile telecommunications development on economic growth is measured separately, the bi-directional relationship is no longer restricted to European and high-income countries. This study also finds that countries in the upper-middle income group have achieved a higher average total factor productivity (TFP) growth than other countries. Countries with competition and privatization in telecommunications have achieved a higher TFP growth than those without competition and privatization. The diffusion of mobile telecommunications services is found to be a significant factor that has improved the TFP growth of the telecommunications sector in Central and Eastern Europe (CEE).

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### 1. Introduction

Over the last two decades, the telecommunications sector in many countries has been expanding rapidly. The fast-paced growth of telecommunications services can be explained by a number of factors, such as advancements in telecommunications technology, market liberalization, and privatization. The output of the world's economy has also been growing at a faster rate during the period. In particular, many developing countries and transition economies have experienced rapid growth.

It has been widely recognized that advancement in telecommunications technology is one of the driving forces of globalization and the rapid growth of the world's economy. Developments in satellite, optical fibre, mobile technology, the Internet and the World Wide Web have greatly improved global communications and facilitated the exchange of information between different people in the world. Technological innovations in telecommunications have reduced communications costs and facilitated the globalization of production and markets.

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The main objective of this paper is to study the relationships between economic growth, telecommunications development (in particular mobile telecommunications) and productivity growth in different countries and regions of the world. The study covered in this paper is an extension of the authors' previous regional studies on China (Lam & Shiu, 2008; Shiu & Lam, 2008). A dynamic panel data model is applied to measure the causal relationship between economic growth and telecommunications development in different countries and regions. The non-parametric data envelopment analysis (DEA) approach is used to construct the Malmquist Index to measure the total factor productivity (TFP) growth in telecommunications and to identify the sources of TFP growth. The sample in this study covers more than 100 countries. The countries are divided into different sub-groups based on the region and the per capita income. The paper examines whether there are any significant differences in telecommunications development and TFP growth among countries in different regions and at different income levels.

Since the early 1990s, there have been a number of studies which measured the causal relationship between economic growth and telecommunications development. There have also been numerous studies which measured telecommunications productivity in different countries and regions. Few of them, however, considered the situations of telecommunications development and productivity growth after 1998. In many countries, telecommunications reform began in 1998 or later. In addition, over the past decade, many countries have also seen explosive growth in mobile telecommunications. The diffusion of mobile telecommunications services has not only facilitated market competition, but also attracted a lot of private investment (both domestic and foreign investment) into the telecommunications sector (see Gruber, 2001; Gruber & Verboven, 2001). The results of previous studies do not capture the impact of telecommunications reform or mobile communications on economic growth and telecommunications productivity. This study is intended to fill the gap by providing a separate assessment of the impact of mobile telecommunications on economic growth and telecommunications productivity.

Besides, the sample sizes of many previous studies were also relatively small, and they were often restricted to countries in certain regions (e.g. Asia, Africa, or Eastern Europe) or at similar stages of development (e.g. developing countries or member countries of the Organization for Economic Co-operation and Development (OECD)). In the current study, the sample size is larger, and it covers more than 100 countries throughout the world. Hence, the results of this analysis are more comprehensive and provide better information about the relationship between economic growth, telecommunications development and productivity growth in different countries and regions of the world.

The structure of this paper is organized as follows: Section 2 reviews previous studies on the relationships between economic growth, telecommunications development and productivity growth. Section 3 describes the data and methodology used in this paper. Section 4 reports the empirical findings, and Section 5 provides conclusions and policy implications based on those findings.

## 2. Literature review

### 2.1. *Economic growth and telecommunications development*

Although telecommunications development has been found to be one of the factors that affect economic growth, its contribution has varied between countries at different stages of development.

The studies conducted by Cronin, Parker, Colleran, and Gold (1991, 1993) and Cronin, Colleran, Herbert, and Lewitzky (1993) were the earliest attempts to use causality tests to investigate the causal relationship between economic growth and telecommunications development. They discovered a two-way (bidirectional) relationship between economic growth and telecommunications infrastructure in the United States. Röller and Waverman (1996, 2001) examined the impact of investment in telecommunications infrastructure on the gross domestic product (GDP) of 21 OECD countries and 14 developing or newly-industrialized non-OECD countries between 1970 and 1990 and found that the impact might not be linear: it was greater in OECD countries than it was in non-OECD countries and in countries that had reached "critical mass", that was, the number of main telephone lines exceeded 40 per 100 persons.

A causality analysis carried out by Madden and Savage (1998) confirmed a bidirectional relationship between economic growth and telecommunications investment in countries in Central and Eastern Europe (CEE). A study conducted by Dutta (2001), however, found that the evidence for causality that ran from telecommunications infrastructure to economic activity was stronger than that for causality in the opposite direction. This pattern held for all of the 15 industrialized and 15 developing countries being studied.

The results of Chakraborty and Nandi's (2003) study indicated a bidirectional relationship between teledensity and GDP in both the short run and the long run in 12 developing countries in Asia. When these countries were divided into two groups with a high and low degree of privatization, respectively, the causality was bidirectional only for those countries in the former group. For those with a low degree of privatization, the causality ran from teledensity to GDP. Cieslik and Kaniewski's study (2004) confirmed a positive and statistically significant causal relationship between telecommunications infrastructure and income at the regional level in Poland and found that the causality ran from the former to the latter.

The study by Yoo and Kwak (2004) found a bidirectional relationship between economic growth and information technology investment in South Korea over the period 1965–1998. A more recent study carried out by Wolde-Rufael (2007) also found a bidirectional relationship between the two in the United States over the period 1947–1996. Karner and

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