Chapter 5
ICT and Regional Growth in Europe: Lessons and Prospects

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ABSTRACT

Information and Communication Technologies (ICT) have been at the heart of economic changes for more than a decade. ICT producing sectors play an important role, notably by contributing to rapid technological progress and productivity growth. The existence of a widely accepted definition of the ICT sector is the first step towards making comparisons across time and countries possible. International comparisons are made more difficult by the lack of harmonization in the definitions of indicators. Accordingly, there is renewed interest in measuring productive efficiency to determine the degree of inefficiency (if any) and the sources of inefficiency, if it exists. This chapter provides a broad theoretical and empirical review regarding productive efficiency as well as its relationship to productivity enhancement, especially focusing on ICT and FDI investments, comprising two of the most important productivity enhancement means.

INTRODUCTION

Economic growth literature on endogenous economic growth has provided some insights into why countries grow at different rates over long periods of time. In some of these models, the government’s choices of Foreign Direct Investment (FDI) and Information and Communication Technology (ICT) expenditure levels influence rather significantly the long-term growth rates (Barro and Sala-i-Martin, 1992), as well as productivity growth. Productivity is apparently one of the main determining sources of economic growth and there is a huge literature relating productivity with FDI and ICT.

Figure 1 illustrates the business use of broadband, 2010 or latest available year (Percentage of businesses with 10 or more employees).

As far as growth and productivity enhancement are concerned, in the last three decades, significant changes have taken place in the economic environment all over the world. In today’s globalised

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markets new production practices have emerged, trying intensively to find new investment opportunities. These changing conditions have imposed a great number of challenges to national economies, since they seek to find new resources and opportunities to develop their capabilities and obtain a wider variety of organizational mechanisms to increase their growth level. Within this macroeconomic framework, productivity has always played a leading role in raising economic growth and development, by boosting output, improving quality, and saving capital and other resources, allocating resources to more productive uses, especially through FDI and ICT investments, accelerating knowledge creation and dissemination.

**METHODOLOGY AND THE EMPIRICAL MODEL**

In order to examine the effects of ICT and FDI in productivity, we use technical efficiency as a proxy for productivity growth. We consider a panel data stochastic model for inefficiency effects in stochastic production frontier based on the Battese and Coelli (1995) model, providing translog effects. The model has the form of: \( y_i = f(x_i, \beta)TE_i \), where \( \beta \) are the production function parameters and \( TE \) is technical efficiency \( (0 < TE(y_i, x_i) \leq 1) \). In logarithmic form the model becomes:

\[
\ln y_i = \ln f(x_i, \beta) + \ln TE_i = \ln f(x_i, \beta) - u_i.
\]

One of the main objectives of fitting the frontier models is to estimate the inefficiency terms in the stochastic model, \( u_i \) by observation. The parameter \( u_i > 0 \) is a measure of technical inefficiency, thus, \( u_i = -\ln TE_i \approx 1 - TE_i \), where \( TE_i = e^{-u_i} \).

Our model is a stochastic frontier model of one output (value added) and three inputs: Output (in Gross value added, volume indices, 1995 = 100), Labour input (in Labour services, volume indices, 1995 = 100), Capital input (in Capital services, volume indices, 1995 = 100), Time variable to capture the effect of technical progress. In order to analyze the determinants of productive efficiency, we relate the estimated productive efficiency to ICT technology and FDI as explanatory variables: Information and Communication technologies (ICT) capital services relative to total industry capital services (i.e. ICT capital services / total capital services, volume indices, 1995 = 100), Foreign Direct Investments, in constant 1995 prices.

Our analysis is based on estimating efficiencies of selected countries within European Union, during 1980 – 2005, employing the econometric software program LIMDEP 9.0. The countries selected are: Austria, Denmark, Finland, France, Germany, Italy, Netherlands, Spain, and United Kingdom. The data used come from the EU KL-EMS and PENN data base. Table 1 summarises the estimation results of the model.