Chapter 60
Technological Innovation and Adoptive Ability: A General Framework

Stilianos Alexiadis
Hellenic Ministry of Rural Development and Foods, Greece & National Kapodistrian University of Athens, Greece

Aikaterini Kokkinou
University of Glasgow, UK

Christos Ladias
University of Central Greece, Greece

ABSTRACT

This chapter develops a model of sustainable regional growth that encapsulates the impact of infrastructure in the adoptive ability of a region. An implication of this model is that convergence towards technologically leading regions is feasible only for regions with sufficient absorptive capacity.

INTRODUCTION

Developments in the theory of economic growth have renewed the interest for the role of innovation, underlining the interaction between the investment in innovative activities, technological change and economic growth. One of these developments has been the contribution of endogenous growth theory by explicitly introducing technology as a production factor, suggesting that there is a three-way complementarity between physical capital, human capital, and technical progress. Innovative capacity is one of the main factors which determine the production level (Fagerberg et al., 1997; Freeman & Soete, 1997) and technological variables are able to explain a significant part of the diverging trends in the economic growth (Fagerberg & Verspagen, 1996) and productivity (Abramovitz, 1986; Fagerberg, 1988a, 1988b, 1994), along with technological change, innovation and technology creation and diffusion.

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In the past three decades, important changes in the pattern of economic growth and productivity have been interpreted as a movement towards knowledge-based economy. Currently, output and employment are expanding fast in high-technology industries, as well as in knowledge-based services. More resources are spent on the production and development of new technologies, in particular on information and communication technology. At the same time, major shifts are taking place in the labour market in particular the increased demand for skilled labour. Globalization and worldwide competition has shifted the comparative advantage of economies towards the factor of knowledge and innovation, where productivity based on the endogenous development capabilities plays a rather important role, as far as growth and competitiveness enhancement are concerned. In the modern knowledge economy, growth depends extensively on the presence or the formation of a network and environment favorable to innovation, which is based on the endogenous development capabilities. Even though the firm-specific factors are important determinants of innovation activity, technological opportunities and favorable entrepreneurial environment have a positive effect on innovation activity, as well. Technological change, innovation and technology creation and diffusion are an important factor to economic progress. Although technological innovation has been acknowledged to be of paramount importance in promoting convergence across regions, nevertheless, the impact of the *adoption* of technology has received less attention. Indeed, Bernard and Jones (1996) claim that empirical studies have over-emphasized the role of capital accumulation in generating convergence at the expense of the diffusion of technology: 'To the extent that the adoption and accumulation of technologies is important for convergence, the empirical convergence literature is misguided' (p. 1037). Although some attempts have been made to capture the impact of technology adoption (e.g. Howitt and Mayer-Foulkes, 2005; De la Fuente, 2000; Fratesi and Senn, 2009; Alexiadis, 2011) nevertheless the existing literature is limited to the extent that it only highlights specific aspects of technology adoption without offering a general model that captures its impacts on regional convergence. It is the purpose of this paper to develop a model capable to provide an appropriate framework to analyse some implications of technology adoption in the process of regional convergence. This effort is organized as follows. The next section outlines a model of optimal growth. The argument that if adoptive abilities differ across regions, then any possibilities for regional convergence are constraint is developed in a subsequent section. Some concluding remarks are provided in the final section.

A MODEL OF OPTIMAL REGIONAL GROWTH

Output in a region i at a time t is produced by a combination of three inputs, i.e. capital ($K_{i,t}$), labour ($L_{i,t}$) and technology ($A_{i,t}$):

$$Y_{i,t} = F(A_{i,t}, K_{i,t}, L_{i,t}) \text{ or } y_{i,t} = f(k_{i,t}),$$

where

$$y_{i,t} = Y_{i,t} \,/\, A_{i,t}L_{i,t} \text{ and } k_{i,t} = K_{i,t} \,/\, A_{i,t}L_{i,t}.$$

Labour force and technology grow exponentially: