

Analyzing the Korea's growth experience: The application of R&D and human capital based growth models with demography

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Abstract

This study analyzes the growth experience of Korea from a neo-classical growth perspective. Korean annual data for the period 1971–2002 are used to examine the quantitative importance of many key determinants of long-run growth. The investment rate, R&D, education, years of schooling, and financial liberalization policy, the size of government, and the age structure all these human education and capital features exert significant influence on growth. Our findings are also consistent with the view that Korea's high growth is attained by its high degree of adaptability to rapidly changing technology and its ability to exploit new opportunities. The rate of speed of per capita output towards its steady-state output is found to be high.

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1. Introduction

The original Solow growth theory was reported in 1956. Since then, we have seen the emergence of modified and endogenous growth theories (Jones, 1995a; Lucas, 1988; Romer, 1986). New growth theories emphasize the role of human capital and R&D in the process of growth.

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The study by Barro in 1991 and, by Mankiw, Romer, and Weil in 1992 along with many other's empirical studies showed the capability to analyze growth behavior.¹ Almost all the empirical studies used panel data or cross-country regressions. The heterogeneity of countries in the sample with regard to the conditions in economic developments and institutions raises severe problems of econometric methodology and limits to draw firm conclusions on important policy issues.²

This study takes a look at the relevance of neo-classical growth model from an empirical prospective, using Korea as an example. Over the past 4 decades, Korea has been transformed from an underdeveloped agricultural economy to a modern industrialized economy.³ It is misleading to explain this remarkable transformation in terms of the government policy of industrial targeting pursued from the 1960s. Although targeted industrial policy played a leading role, a solid supply of human capital and policies to open the economy and to promote competition made industrial targeting successful.

This study seeks to apply neo-classical models of growth to the Korean growth experience from 1971 to 2002, thereby reducing the limitations of empirical studies which utilize cross-country samples. We utilize neo-classical growth models that incorporate the role of human capital and R&D. We make contributions in following areas. First, by explicitly linking between per worker output and per capita output, younger age dependency ratio and older and inactive dependency ratio enter the specifications for per capita output growth models. Second, we explicitly consider private investment in education and R&D. Third, we examine the effect of globalization on the explanation of growth.

This paper is organized as follows. Section 2 presents econometric specification of economic growth we are interested in applying to Korea. Section 3 presents data sources and descriptions. Section 4 presents the main results of the estimation. Finally, section 5 summarizes and concludes.

2. Econometric specification of growth model

We start with a model of growth that incorporates physical and human capital.⁴ The model contains the essence of the well-known neoclassical growth model of Solow (1956) and a family of endogenous models.

The economy produces aggregate output using a Cobb-Douglas production function $Y_t = F(K_t, H_t) = K_t^\alpha (H_t)^{1-\alpha}$. K_t and H_t are the quantities of physical capital and human capital service inputs with Y_t denoting output during t period. The production function F is assumed to be homogenous degree of one and well behaved. Human capital input is the amount of human capital service supplied by unit of hour worked per worker, A_t , times the man-hours worked by all workers, L_t , and hence, $H_t = A_t L_t$. We assume that the man-hours worked grow at the rate of n per annum. It is written as $\dot{L}_t = nL_t$, where a dot over a variable denotes a derivative with respect to time.

Let us define the output and capital per unit of human capital as $\hat{y}_t = y_t/A_t$, and $\hat{k}_t = k_t/A_t$, and define the output and capital per man-hour as $y_t = Y_t/L_t$, and $k_t = K_t/L_t$, respectively. Then, we can write the production function as $\hat{y}_t = \hat{k}_t^\alpha$, $0 < \alpha < 1$.

¹ However, McCallum (1996) argues that the neoclassical growth model has the difficulty in explaining observed growth.

² See Quah (1996).

³ For discussions on the experience of Korea's development, see Cho (1994), Kim (2005), and Rodrik (1995).

⁴ We follow Jones (2002, chapter 3), and Romer (2001, chapters 1, 3). An extensive explanation of growth models is provided by Barro and Sala-i-Martin (1995).

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