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# Dynamics in a non-scale R&D growth model with human capital: Explaining the Japanese and South Korean development experiences

Chris Papageorgiou<sup>a,\*</sup>, Fidel Perez-Sebastian<sup>b</sup>

<sup>a</sup>*Department of Economics, Louisiana State University, Baton Rouge, LA 70803, USA*

<sup>b</sup>*Dpto. F. del Análisis Económico, Universidad de Alicante, Spain*

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## Abstract

This paper constructs an R&D non-scale growth model that includes endogenous human capital. The goal is to take the model's implications to the data once the complementarity between technology and human capital, commonly found in the empirical literature, is taken into account. Our model suggests that intersectoral labor movements induced by the complementarity between human capital and technology can be a key factor in replicating and explaining development experiences such as those of Japan and South Korea. In particular, it is shown that the adjustment paths of output growth, investment rates, interest rates, and labor shares implied by the proposed model are consistent with empirical evidence.

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\*Corresponding author. Tel.: +1 225 578 3790; fax: +1 225 578 3807.

E-mail address: [cpapa@lsu.edu](mailto:cpapa@lsu.edu) (C. Papageorgiou).

### 1. Introduction

‘Development miracles’ constitute one of the most intriguing phenomena associated with modern economic growth. The stylized facts concerning such fast-growing economies are truly staggering. For example, over the period 1960–1990, Japan and South Korea averaged output growth rates over 5 percent per year. Fig. 1 illustrates the growth experiences of these two miracle countries. Closer observation of Fig. 1 reveals an interesting feature of miraculous experiences: the sharp increase of output per worker was characterized by growth rates that did not peak at the beginning of the convergence process but later on, thus giving way to a hump-shape growth path.

What is even more interesting is that the underlying characteristics of the two East Asian miracle economies are distinctly different. Whereas Japan started its postwar convergence path with high human capital levels, S. Korea started its convergence path with very low human capital levels. In addition, although both nations began with relatively low levels of physical capital, Japan accumulated equipment, machinery, and infrastructure at a much higher rate than S. Korea. Even regarding output growth rates, miraculous experiences show important differences. In Fig. 1, we see that Japanese growth rates were relatively high from the beginning of the convergence process, whereas S. Korean growth rates started low and increased rapidly.

The influential paper by Robert Lucas ‘Making a Miracle’ (*Econometrica*, 1993) concluded that improving our understanding of the mechanics of rapid growth episodes is essential in constructing a successful theory of economic development. Since Lucas (1993), there has been surging interest in theoretical research attempting to explain development miracles, with a number of papers being able to reproduce the average convergence speed exhibited by rapidly growing nations. However, growth models have not in general been able to predict the variable convergence speed needed to generate the observed hump-shaped adjustment path of output growth rate. Nor has the literature paid close attention to the distinct characteristics of miraculous episodes.

In this paper, we propose a model in which the complementarity between human capital and technology adoption is able to replicate and explain development

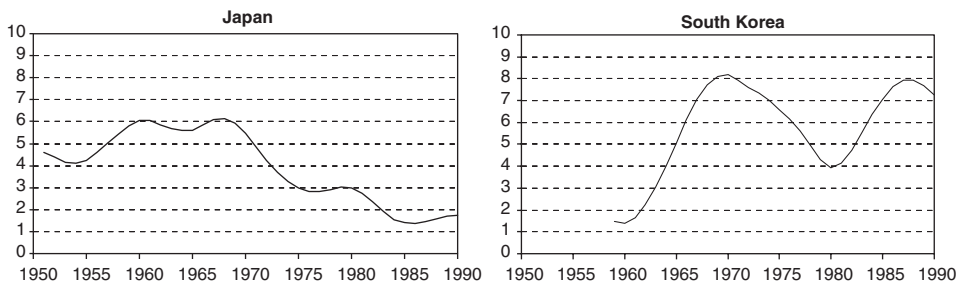


Fig. 1. Output growth rates in Japan and S. Korea.

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