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Convergence in a model with technological diffusion and capital mobility

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Abstract

This paper presents an open-economy model with technological diffusion and adjustment costs for capital investment. For undercapitalized economies, convergence is fast initially, despite the fact that it is slow asymptotically. The recent growth records of some transition countries are consistent with this prediction. © 2002 Elsevier Science B.V. All rights reserved.

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1. Introduction

Numerous empirical studies observe that countries and regions within countries converge to their steady states at a relatively slow rate of 2% per year (see Barro and Sala-i-Martin, 1995, Chapters 11 and 12). Neoclassical growth models (with capital viewed broadly consisting of physical and human components) and models with technological diffusion provide a plausible theoretical rationale for these observations.

An interesting question is whether the observed slow convergence can be used in making predictions for post-communist countries in Central and Eastern Europe.

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Barro and Sala-i-Martin (1991) extrapolate their empirical observations to the case of East Germany. If East Germany's per capita income is initially one half the per capita income of West Germany, the growth rate of per capita income in East Germany should exceed the growth rate in West Germany by only 1.4%. However, as shown by Cohen (1992), the extrapolation of regression results to East Germany may be misleading. Cohen presents a model in which both closed and open economies converge slowly, but if a closed economy turns into an open one, its capital stock is rapidly increased. Thus, convergence may be much more rapid initially for such an economy.

Applying similar reasoning, the present paper develops a model which demonstrates that some post-communist countries in Central and Eastern Europe have a potential for rapid initial convergence, despite the fact that other countries exhibit slow convergence. The model analyzes an open economy with technological diffusion, perfect capital mobility, and adjustment costs for capital investment. Asymptotically, the speed of convergence depends only on the speed of technological diffusion. Thus, convergence is slow asymptotically if the technological transfer is not fast. This may be a relevant explanation for cross-country empirical observations showing the speed of convergence to be approximately 2% per year. The present model allows, however, for faster initial convergence if the initial level of capita is sufficiently low (relative to the initial level of technology). For such undercapitalized economies, initial convergence is driven by capital investment, which is large if adjustment costs are not very great (this is a realistic assumption). During the period of communism (central planning), investment was greatly inefficient. Although we do not have reliable estimates of the physical capital stock in post-communist countries, it is widely believed that this capital stock is obsolete. In light of the present model, these economies should converge rapidly unless their technological parameters (including government policies) are low. It is plausible that the technological parameters are not very low in fast-reforming countries in Central and Eastern Europe (these countries belong to the European Union candidates). The recent behavior of some of these countries (mainly Poland and Slovakia) is consistent with the prediction of rapid initial convergence, especially if one takes into account that their steady states are below the US level, and that the measured rates of growth of real output are significantly underestimated in these countries.

2. The model

Consider a small open economy that faces the world real interest rate, r . Let the economy consist of a large number of firms. Let the production of firm i be Cobb–Douglas:

$$Y_i = K_i^\alpha (AL_i)^{1-\alpha} \quad (1)$$

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