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Book review

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Robert J. Barro and Xavier Sala-i-Martin, *Economic Growth* (McGraw-Hill, 1995), 539 pp

The last decade has seen a revived and vigorous interest in the study of economic growth, on which research had nearly stopped between the late 1960s and the early 1980s, mainly because macroeconomists turned their interests and works towards investigating short-run fluctuations. The works pioneered by Romer (1986) rekindled interest in studying long-run economic growth and led to the acknowledgement that long-run economic growth is to some extent more important than short-run fluctuations. Today, the research on economic growth, also known as endogenous growth theory, is central to the study of macroeconomics.

Although there have been voluminous works and findings in this line of research since the mid-1980s, both theoretical as well as empirical, there is, however, no advanced textbook in economic growth except the one by Grossman and Helpman (1991). The book by Robert J. Barro and Xavier Sala-i-Martin contributes in adding one good and useful textbook to the literature. The book by Grossman and Helpman focuses on innovation and international trade, whereas the book by Barro and Sala-i-Martin covers issues that are comprehensive. This book is comprehensive because it surveys and scrutinizes in detail most of the significant analysis and findings in theoretical as well as empirical research on economic growth.

This book includes an introduction, 12 chapters and an appendix. In the Introduction, Barro and Sala-i-Martin point out the importance of economic growth, lay out a number of empirical regularities concerning the economic growth process, and provide a brief description of modern growth theory. Chapters 1–3 deal with the neoclassical growth models, from Solow–Swan models, to Ramsey–Cass–Koopmans models, and to open versions and extensions of these two kinds of models. Chapters 4–8 cover models of endogenous

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growth in which the former two chapters explore models of constant returns to reproducible inputs, while the remaining chapters investigate models of horizontal and vertical technological innovation, technological diffusion and leapfrogging. Chapter 9 allows for migration and fertility choice in Solow and Ramsey models. Chapters 10–12 are the empirical part of this book. Chapter 10 discusses the availability of the data sets. Chapters 11 and 12 contain the empirical investigation for which chapter 11 reports the empirical analysis of regional data sets, whereas chapter 12 presents the empirical findings of a cross section of countries. The appendix discusses the major mathematical instruments employed in this book, mainly consisting of differential equations and static and dynamic optimization.

A key emphasis in this book is the issue of convergence. In the theoretical chapters, the speed of convergence, if there exists one, is calculated in almost every model. In the empirical chapters, the convergence hypothesis, defined as a negative correlation between the initial income and the average rate of economic growth with or without isolating the effects of other factors of economic growth, is tested in terms of regional data sets in which preferences and technology parameters are thought to be similar, as well as cross-country data sets in which additional regressors are augmented to control for the variations in preference and technology parameters. This hypothesis is one of the most controversial hypotheses in the last decade. As is well known, a production function that is constant returns to scale in labor and capital, such as the human capital-augmented neoclassical production function, implies that the correlation between the initial income and the average rate of economic growth is negative, whereas an increasing returns to scale production function of the sorts studied by Romer (1986, 1990) suggests that the relation is positive. The debate of the convergence hypothesis is de facto the debate about which model is able to provide a valuable framework for empirical analysis. This book is silent on this debate. A recent article by Mankiw (1995) and a discussion by Romer represent the two sides of this debate.

Transitional dynamics is another key emphasis in this book. In both one-sector and two-sector models, mathematical derivation and phase diagrams are employed to illustrate the dynamics. The exploration of transitional dynamics serves purposes of two sorts. On the one hand, it demonstrates how the key variables under concern alter and move in the transition toward a steady state. On the other hand, it complements and supports the authors' emphasis on the convergence hypothesis. In the study of transitional dynamics, one issue that is important is the possibility of multiple equilibria. This issue has been analyzed by Benhabib and Perli (1994) and others. This book, however, does not explore the development and implications for the findings of multiple equilibria, although it does take notice of the class of models in a note. One of the authors' arguments for this omission is that the amount of spillover required to generate this multiplicity seems to be unrealistically large. This argument is, however, not

quite legitimate from the theoretical and numerical point of view. Indeed, available evidence cannot exclude the hypothesis of indeterminacy as one of the explanations for the observed dynamics. Moreover, there exist other mechanisms in addition to spillover that are possible to generate multiplicity. Models of growth with multiple equilibria suggest a potential explanation for discrepancies in income levels across countries which stand as an alternative to theories that rely solely on variations in fundamentals, such as neoclassical models, or in initial conditions, such as the models by Romer (1986, 1990).

One issue that is important but also neglected in this book concerns the association between international trade and economic growth. The authors do extend the Solow and Ramsey models in an open context. They do not conduct this extension, however, to highlight the relationship between international trade and economic growth. An open trading regime has been argued to enable countries, especially developing countries, to raise their productivity via increasing the number of specialized inputs, and accumulating useful knowledge such as production engineering, information about production patterns, production scheduling, sale promotion and after-sale services in remote locations. The importance of an open trading regime to economic growth is now a convergent point even for economists of both free-market proponents (e.g., World Bank, 1993) and government-intervention proponents (e.g., Amsden, 1989).

Nevertheless, this book is a very useful and valuable textbook. It is detailed, well organized and clear. It provides lucid treatment of not only theoretical models, but also empirical works. It is essential to have a textbook that scrutinizes most theoretical and empirical results and findings on economic growth and this book serves very well for the purpose. For students and researchers, who are not familiar with the recent literature and development of economic growth and would like to get familiar with the literature, this is an excellent book to start with. As noted earlier, however, some issues that are important are not included in this book. Moreover, since the inquiry of economic growth is now a vivid field of research, many new results and findings will come out quickly after the publication of this book. It follows that this book will need update in a few years.

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