

# Introduction

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World and country economic growth is a continuing and major interest to many economists, politicians, policy-makers, media participants, and individuals, as it can impact on the well-being of countries and individuals. However, measuring economic growth is a continuing challenge, particularly with difficult-to-measure factors, such as intangibles, digital and information technology product advances, and productivity, which can impact on growth. In addition, emerging countries such as China and India are taking a greater role in the world economy.

This book serves as a foundational resource for graduate students and researchers worldwide working on growth and productivity and related applications. In addition, policy-makers can use it as a basis to understand how empirical results are produced and to familiarize themselves with empirical analysis and results of experts in this important field.

The chapters in this book demonstrate the significant influence of Dale W. Jorgenson on the research of many economists. Accordingly, this book is dedicated to him with thanks and appreciation for his direct and indirect (through others) contribution to economic research.

The book starts with foundations, three chapters including a discussion of how economic growth is achieved, the evolution of and the

future agenda for national accounts, and the efficiency costs and welfare gains from potential tax reform.

All but one of the next 11 chapters use KLEMS (capital, labor, energy, materials, and services) data, frequently with a KLEMS production model in the analysis.<sup>1</sup> Within these chapters, depending upon the available data and the nature of the analysis, some of the EMS inputs may not be included and others may be added. Chapters cover all Group of 7 (G7) countries (Canada, France, Germany, Italy, Japan, the United Kingdom, and the United States), all Emerging 7 (E7) countries (Brazil, China, India, Indonesia, Mexico, Russia, and Turkey), all EU-12 countries (Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Italy, the Netherlands, Spain, Sweden, and the United Kingdom) plus Australia, Chile, Columbia, Norway, South Korea, and Taiwan, for a total of 28 countries. In 2017, these countries account for three-quarters of gross domestic product (GDP) in the world.<sup>2</sup> The leading chapter in the KLEMS section of this book is a comparison of G7 and E7 countries' economic growth and productivity, where the E7 have been projected to account for a greater share of GDP than G7 countries in the near future. Chapter 5 looks at the possible reasons for the

<sup>1</sup> KLEMS-type production models were popularized by Dale W. Jorgenson. Professor Jorgenson has organized five biennial World KLEMS conferences that have encouraged the construction of and research using KLEMS databases.

<sup>2</sup> As measured in constant 2011 international dollars, purchasing power parity.

slowdown in economic growth in the EU-12 countries compared to the United States. India may soon be the largest country in the world as measured by population. Chapter 6 describes how reforms initiated since the 1990s, aided by increasing participation in global value chains (GVCs), have strengthened the Indian manufacturing sector. Chapter 7 concludes by suggesting that the governments of China, Japan, South Korea, Taiwan, and the United States should encourage investment in R&D in ICT (information and communications technology). Chapter 8 takes an industry perspective to explain China's productivity slowdown. Chapter 9 uses average labor productivity and multifactor productivity over the subperiods 1997 to 2006 and 2006 to 2014 to look at the differences in growth patterns in mainland Norway. In Chapter 10 the progress toward and the nature of KLEMS database construction for Australia and Russia, both resource-rich countries, is described and contrasted. Chapter 11 describes a joint U.S. Bureau of Economic Analysis/U.S. Bureau of Labor Statistics project to create an internally consistent KLEMS prototype data set from 1947 to 2016 using disparate data sources. The prototype estimates reveal that relatively slow input growth in capital and labor services has curtailed US economic growth for the past decade and a half. Chapter 12 provides benchmark estimates of industry-level price differentials between Japan and the United States based on a bilateral price accounting model anchored to the Japan-US input-output tables. Chapter 13 provides empirical evidence on the impact of the skill-biased technical change associated with the introduction of ICT investment on labor demand in Japan and Korea. Chapter 14 measures the knowledge intensity of industries in six American countries and five European countries, concluding that growth in labor and capital knowledge intensity assets is important in industries that are not knowledge intensive. Altogether, these 11

chapters provide an extensive examination of many factors related to economic growth and productivity.

The last set of chapters in the book extend analysis beyond the core economic and growth considerations, from prices and inflation, GVCs, carbon taxes and policy, welfare, to human capital. Looking at Organisation for Economic Co-operation and Development (OECD) countries, Chapter 15 concludes that mismeasurement of digital product prices entering into a consumption deflator results in an overestimate of growth rates of impacted products. Chapter 16 investigates the direct and indirect impact of knowledge capital and innovation on economic growth and productivity in 10 European countries and the United States. For the United States, Chapter 17 outlines the of construction quality-adjusted price indexes for a digital product: smartphones. The interconnected world, specifically through GVCs, is recognized in Chapter 18. It uses a growth accounting framework to analyze sources of growth and productivity in vertically integrated production that crosses borders. The next two chapters both use a multisector general equilibrium model to examine carbon taxes or carbon price policies, but for different countries. Chapter 19 focuses on the United States; Chapter 20 focuses on China. In Chapter 19 it is demonstrated how different accounting methods: top-down versus bottom-up, can have a large effect on the simulated impact of carbon prices. In Chapter 20, a two-stage translog utility function that explicitly accounts for detailed energy expenditures allows for a simulation to determine if a carbon tax can achieve a country's Paris Climate Change targets. GDP is often thought to be a measure of economic welfare. For several US regions, in Chapter 21, the appropriateness of GDP as a proxy for economic welfare is examined. In the concluding chapter of the book, human capital by gender from 1975 to 2012 is examined in an expanded accounting system,

which includes both market and human capital, to look at the trends affecting economic growth and productivity in the United States.

As the managing editor of this book, I was assisted by four associate editors: Carol A. Corrado, Mun S. Ho, Hak K. Pyo, and Bart van Ark. The five editors reviewed the introduction and all but three chapters of the

book. These three chapters were reviewed by Charles Yuji Horioka, Cecilia Jona-Lasinio, or Nicholas Oulton. I thank all of the above and the many authors for their efforts to produce this book, which is dedicated to Dale W. Jorgenson.

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