

Measuring Economic Growth and Productivity: Foundations, KLEMS Production Models and Extensions edited by Barbara M. Fraumeni, 536pp, Academic Press, Elsevier (2020), \$125.00 ISBN: 978-0-12-817596-5

Productivity plays a crucial role in driving the potential growth trajectory of an economy. What policies can raise productivity and how it needs to be measured, however, remain debatable in academic and policy discussions. The book “*Measuring Economic Growth and Productivity*” edited by Barbara M. Fraumeni provides a comprehensive perspective on productivity, covering both theory and its related applications. The book is also a tribute to Jorgenson’s contributions to the theory of growth accounting, which command an overwhelming influence on researchers pursuing studies on productivity worldwide. The edited volume brings together contributions from top academicians on extension of KLEMS (Capital, Labour, Energy, Material and Services) production models, that ranges from an analysis of trade productivity linkages, and energy and environmental issues to models of welfare and human capital development. Apart from theoretical underpinnings, the book also provides empirical evidence on patterns of productivity trends in both developed and developing economies.

Twenty-two chapters in the volume are categorised under four different themes, namely: (i) theoretical foundation, (ii) cross country estimates of productivity, (iii) methodological refinements and (iv) extension models. Some broad observations and remarks are presented in the conclusion section.

On the first crucial theme, Edward A. Hudson discusses different approaches to explain economic growth and presents a model where growth is driven by demand for innovative products. The paper draws inspiration from Schumpeter “creative destruction” and emphasises the role of innovation in driving output growth. In another topic, Carol Corrado, Jonathan Haskel, Massimiliano Iommi and Cecelia Jona-Lasinio, develop a theoretical model to derive the relationship between innovation, intangible capital and productivity. Based on data for the European countries and the US, the paper investigates the impact of knowledge capital on productivity to find a positive relationship

between growth in intangible capital and total factor productivity growth in the post Global Financial Crisis (GFC) period.

A total of nine chapters in the book explain different facets of productivity trends around the world. Khuong M.Vu examines the performance of seven largest emerging E7 countries (namely China, India, Indonesia, Brazil, Mexico, Turkey and South Korea) vis-à-vis G7 countries (namely US, Japan, Germany, UK, France, Italy, Canada) on three important parameters – sources of growth, catch up performance, and future growth prospects. It finds that capital accumulation exceeded total factor productivity contribution in both G7 and E7 economies. Further, the E7 economies outperformed G7 countries due to their higher productivity growth as well as greater capital deepening and contributed to about 60 percent of world growth during 2010 to 2017. As compared to the E7, the G7 group accounted for about 20 percent of world growth during the same period. In another chapter Matilde Mas, Andre Hofman and Eva Benages compare the knowledge intensity of industries across American, European and Latin American nations based on measurement of human and physical capital services. They find that developed nations have a higher share of knowledge based gross value added, but the growth in knowledge intensity is fastest in less developed nations, indicating a certain process of gradual convergence.

Among studies on European nations, the chapter by Gang Liu, finds that the slowdown in productivity growth between 1997 to 2014 in Norway originated from declining productivity growth in distribution, finance and business service sectors. Robert Inklaar, Kirsten Jager, Mary O. Mahony and Bart Van Ark highlight that productivity slowdown in the EU region started well before the GFC in 2005. In the European economies, the industries that had benefitted the most from global value chain integration and offshoring activities during 1995 to 2005, experienced larger declines in productivity growth in the subsequent decade, suggesting that the slowdown in global trade was an important factor in depressing productivity growth.

Among studies on the Asian economies, Chi Yuan Liang and Ruel-He-Jheng find that TFP gap in Information and Communication Technology (ICT) industries between the US and the Asian countries became wider during 1995 to 2010. Lower R&D expenses and lower number of patents had led to lower TFP growth in Korea, Taiwan and China as compared with the US. In a comparative

study between Japan and Korea, Kyoji Fukao, Tsutomu Miyagawa, Hak Kil Pyo, Keunhee Rhee and Miho Takizawa emphasise increase in investment in ICT that led to an increased demand for middle and low skilled labour in Japan, whereas in Korea the demand for skilled workers increased with the rise in ICT investment. To understand the productive trends of the two giant economies of Asia- i.e., India and China, two separate chapters are devoted in this edited volume. Harry X.Wu, finds that TFP growth slowdown in China began during mid 2000s, following its entry in WTO and increased state intervention to protect strategic industries. The paper finds protection of strategic industries crowded-out private investments and made Chinese industries less capable to adjust to structural shocks of GFC. In contrast to productivity decline in China, for India, K.L.Krishna, Bishwanath Goldar, Deb Kusum Das, Suresh Chand Aggarwal, Abdul A Erumban and Pilu Chandra Das finds TFP growth improved during 2000s, with higher equipment share in total capital stock and greater engagement in backward linkages in GVCs helping Indian industries to enhance their productivity performance.

Four exclusive chapters in the book discuss the statistical refinements brought about by the National Statistical agencies in strengthening developing productivity accounts. For instance, J. Steven Landefeld describes the interactions between growth theory and the development of US National accounts. It presents how the US National account systems has improved beyond GDP measurement and included supplementary accounts that capture distribution of income, production accounts of energy, natural resources enabling better assessment of economic welfare. On a related issue, Chapter by Lucy P Eldridge, Corby Garner, Thomas F. Howells, Brain C. Moyer, Mathew Russell, John D. Samuels, Erich H. Strassner and David B. Wasshausen discuss the joint research work by two institutions namely the US Bureau of Economic Analysis (BEA) and the Bureau of Labour Statistics (BLS) in developing industry level production accounts for the US for the time period 1947 to 2016. Ilya Voskoboynikov, Derek Burnell and Thai Nguyen report in another chapter the development and progress of KLEMS framework in two resource rich countries - Australia and Russia. It highlights the role of the Australian Bureau of Statistics (ABS) in developing Gross Output based KLEMS data in Australia. For Russia it mentions the recent methodological developments in the KLEMS framework and records that the contribution of the National Research University of Higher School of Economics and University of Groningen.

Nine other chapters in the book look beyond the traditional growth decomposition debate and aim at linking productivity theories with trade, inflation, climate change and economic welfare. Richard J. Goettle, Mun S. Ho and Peter J. Wilcoxon develops an intertemporal general equilibrium model to find the macro economic impact of carbon tax under three revenue cycling options-lump sum redistributions, capital tax reductions, and labor tax cuts. The paper finds that welfare gains are obtained under capital tax reductions and labour tax cuts when emission accounting is viewed from top down rather than bottom up accounting standard. Here when sectors buys energy inputs at common price the accounting standard is classified as top down or supply side accounting. Whereas when different sectors pay different price then that is labeled as bottom up or demand side accounting. Jing Cao, Mun S.Ho and Wenhao Hu use another Computable General Equilibrium (CGE) framework to assess if carbon tax can help achieve the Paris climate change target for China. Koji Nomura, Kozo Miyagawa and John D Samuels provide benchmark estimates of price differentials between Japan and the US based on a price accounting model. They find that Japanese industries are more price competitive in manufacturing whereas US industries are more price competitive in services. Marshall Reinsdorf and Paul Schreyer measure consumer inflation in a digital economy and suggest adjustment in consumption deflator in OECD countries to account for cost savings from digital economy. Ana Aizcorbe, David M. Byrne and Daniel E. Sichel attempt to develop a quality adjusted price index of digital products which shows a faster decline in adjusted deflator of smartphones over the last two decades than the currently published official measures in the US.

On trade and productivity linkages, Marcel P. Timmer and Xianjia Ye extends the KLEMS framework to incorporate GVC model and find that productivity growth in GVCs would be overestimated when the standard assumption of perfect competition is used in global factor markets. In another chapter, Kun Young Yun presents the Dynamic General Equilibrium model to evaluate the welfare effects of tax policy in the US and finds that welfare gains are the maximum when capital is efficiently allocated across the entire private sector and the labour income tax is flattened.

On welfare related issues, Daniel T. Slesnick discusses the limitations of GDP as a measure of social welfare and develops a consumption based

social welfare function which can be used as a benchmark to compare real per capita GDP. In the last chapter by Barbara M. Fraumeni and Michael S. Christian study the trend of economic growth and productivity in the US by incorporating an expanded accounting system that incorporates for changes in human capital by gender.

Despite being a compendium of several well researched articles, the book overall leaves behind some unsettled issues that would require its readers to refer to other literature on the subject. First, TFP growth as a ‘residual’, besides technological progress may reflect a myriad of factors that influence growth. These includes implication of changes in government policies, external shocks, measurement errors and shifts in production possibilities (Hulton 2001). Second, the book includes chapters on welfare issues, but does not cover much on labour productivity estimates. Studies have shown that in the long run, nation’s ability to increase the standard of living of its people depends on its ability to increase the output per worker. Third, on the empirical chapters in the volume, there is no clear explanation as to why the rapid progress in ICT and digital technologies does not halt the slowdown in productivity statistics worldwide.

To sum up, this book brings together recent productivity related studies covering both advanced and emerging market economies which have so far been analysed in isolation. This precious compilation is a useful resource for researchers and policymakers who are interested in studying the dynamics of productivity growth and the role of policy in fostering the productivity led growth of an economy.

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