



**भारतीय रिज़र्व बैंक**  
**RESERVE BANK OF INDIA**

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**RBI-Occasional Papers-Vol. 44, No.1, 2023**

Today, the Reserve Bank of India releases [Volume 44, No.1, 2023 of its Occasional Papers](#), a research journal containing contributions from its staff. This issue contains three articles and four book reviews.

**Articles:**

**[1. Harnessing Artificial Neural Network to Gauge the Systemic Risk Exposure of Banks in India](#)**

This paper harnesses the Artificial Neural Network Quantile Regression (ANN-QR) model to estimate the systemic risk exposure of major banks in India. The model employs a 'Leaky ReLU' activation function to capture non-linearity in risk spillover. The estimated model detects the major periods of systemic stress in the last 15 years and suggests that smaller private sector banks are more exposed to systemic risks during stress periods. The model can help in gauging early signs of rise in systemic risk exposure of banks and can complement the micro-prudential risk assessment toolkit of supervisors to initiate timely remedial actions.

**[2. Total Factor Productivity Growth in Indian Agriculture: Accounting for Land Quality](#)**

This paper attempts to include land as an input in the KLEMS-type production function and estimate agricultural total factor productivity growth (TFPG). The estimates suggest that the rate of agricultural TFPG was 0.8 per cent per annum between 1980 and 2019 without accounting for land. However, it increased to 2.0 per cent and 1.8 per cent per annum with the inclusion of land and land quality, respectively. Using growth accounting decomposition, the paper finds that the contribution of TFPG to agricultural output growth increased from 48 per cent in the 1980s to 78 per cent in the 2010s. Examination of the drivers of agricultural TFP in the long-run using an Autoregressive Distributed Lagged (ARDL) model suggests that public gross capital formation (GCF) stock, research and development, mechanisation in agriculture and favourable terms of trade significantly improve agricultural productivity in India.

**[3. COVID-19 and Productivity Performance of MSMEs and Large Firms in India](#)**

This paper examines productivity performance of micro, small and medium enterprises (MSMEs) *vis-à-vis* large firms in India's organised manufacturing sector in the backdrop of COVID-19. To address simultaneity and endogeneity associated with firm size and productivity, the paper applies the Levinsohn and Petrin method to an unbalanced panel to estimate the production function and calculate the total factor productivity (TFP). The results suggest that productivity levels in financial years 2012

to 2022 were comparable between MSME firms and large firms, with the latter performing marginally better. TFP growth stagnated in the pre-pandemic period for both MSMEs and large firms. Post-COVID-19, productivity increased for both large firms and MSMEs, with productivity growth in MSMEs catching up with that of large firms.

### **Book Reviews:**

This issue of the RBI Occasional Papers also contains four book reviews:

1. Parul Singh reviews the book "[Forks in the Road: My Days at RBI and Beyond](#)" written by Dr. C. Rangarajan. The book is not only a memoir accounting the professional journey of Dr. Rangarajan but also a fascinating account of India's economic story. The book describes the key events since the 1980s, particularly in the areas of money and finance. The narrative, spanning pivotal moments in India's economic history, offers lessons in crisis management, the art of policymaking, and the enduring pursuit of a balanced and equitable growth trajectory.
2. Bajrangi Lal Gupta reviews the book "[The Eight Per Cent Solution](#)" written by Nikhil Gupta. The book analyses the Indian economy by dividing it into household, corporate, government and external sectors instead of the traditional division into agriculture, industry and services sectors. Drawing upon the interconnectedness among these sectors and assessing the financial health of each sector, the book argues that 2020s can be deemed as a healing decade with structural changes so that the growth of 8 per cent can be achieved in the later decades.
3. Alisha George reviews the book "[Chip War: The Fight for the World's Most Critical Technology](#)" written by Chris Miller. The book offers an extensive historical account of how the microchip technology came into being and how these chips are directing geo-political headwinds. Given the critical role played by semiconductors in the electronic industry, and thereby having far-reaching implications for consumer goods, computing, communications, healthcare, defence and renewable energy systems, the book argues that a nation enjoying supremacy in semiconductor technology can become a global superpower in today's world.
4. Ashish Ranjan reviews the book "[Defi and the Future of Finance](#)" written by Campbell R Harvey, Ashwin Ramachandran and Joey Santoro. The book gives insights about decentralised finance and various terminologies associated with Defi along with the basic mechanism behind major Defi projects. The book explains the various advantages of using decentralised finance. At the same time, it also mentions various shortcomings in the Defi system, which may build up systemic risks.