

Unlocking New Growth Frontiers in the Digital Age¹

I. Introduction

This year's Nobel Prize in physics celebrated the role of artificial intelligence (AI) in revolutionising the way we work and live. It is widely believed that AI and robotics will usher in a new wave of secular innovation, much like past breakthroughs in steam power and personal computers.² Silently, new technologies are offering a way out of the cross currents of diverging macroeconomic and policy pathways, geopolitical tensions, geoeconomic fragmentation and climate change in which the global economy is transfixed. Accordingly, these technologies are heralding a brighter future, arguably holding the key for many emerging and developing economies to escape the middle-income trap.³ It is estimated that generative AI itself could increase global GDP by \$7-10 trillion over the next three years.⁴ Large language models are estimated to increase the productivity levels of workers by 8 to 36 per cent.⁵

¹ Inaugural address delivered by Michael Debabrata Patra, Deputy Governor, Reserve Bank of India (RBI) at the DEPR Conference on 'Digital Technology, Productivity and Economic Growth in India' on November 13, 2024 at Jaipur. Valuable comments received from Sakshi Awasthy, Sreerupa Sengupta, Ashish Khobragade, Himani Sekhar, Akshara Awasthi, Swastik Yadav, Rajib Das and editorial help from Vineet Kumar Srivastava are gratefully acknowledged.

² Brynjolfsson, E., and McAfee, A. (2014). *The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Technologies*. *WW Norton & Company*; Haldane, A. (2017). *Productivity Puzzles*. Speech at the London School of Economics.

³ World Bank. (2024). *The Middle-Income Trap*. World Development Report.

⁴ JP Morgan. (2024). *Is Generative AI a Game Changer?*

⁵ Kalyani and Hogan. (2024). *AI and Productivity Growth: Evidence from Historical Developments in Other Technologies*. Federal Reserve Bank of St. Louis.

Over the past three decades, the digital revolution has been transforming the world, eclipsing all past revolutions. It is estimated that the global digital economy accounts for more than 15 per cent of global GDP⁶. Digital technologies are reshaping our lives through their impact on economic growth, employment, consumer welfare and living standards. These technologies are democratising innovation and entrepreneurship, being less costly than conventional technologies to scale up and are seen as transfiguring innovators into entrepreneurs.⁷

India is at the forefront of the digital revolution. Financial technology (FinTech) is speeding up digital payments. The India Stack is expanding financial inclusion, galvanising banking infrastructure and public finance management systems covering both direct benefit transfers and tax collections. Vibrant e-markets are springing up and expanding their reach. It is estimated that the digital economy currently accounts for a tenth of India's GDP; going by growth rates observed over the past decade, it is poised to constitute a fifth of GDP by 2026.⁸

India is uniquely positioned to unlock new growth avenues and optimise existing ones with its digital public infrastructure (DPI), a vibrant information technology (IT) sector and a burgeoning youth population, including one of the largest AI talent bases. Forecasts suggest that Generative AI will contribute \$359-438 billion to India's GDP by 2029-30.⁹

⁶ United Nations. (2023). Opening Session of Global Development Initiative Digital Cooperation Forum.

⁷ Panagariya, A. (2022). Digital Revolution, Financial Infrastructure and Entrepreneurship: The Case of India. *Asia and the Global Economy*, 2(2), 100027.

⁸ Chandrasekhar, R. (2023). Address by Minister of State for Electronics and Information Technology and Skill Development and Entrepreneurship. GPI Global Summit in Pune, June 12.

⁹ Ernst and Young. (2023). *Is Generative AI beginning to deliver on its Promise in India? Aldea of India Update*

Indian firms' integration of AI into production processes has increased from 8 percent in 2023 to 25 percent in 2024.¹⁰ India has also committed Rs. 1.25 trillion towards its semiconductor industry development.¹¹

Yet, new technologies also involve challenges: disruptions in respect of traditional technologies and the labour market; resource-intensity - demanding substantial investment in technology, learning, and infrastructure; potential cyber threats and data breaches; ethical concerns, data privacy and potential malicious use.

It is in this context of these opportunities and challenges that I have chosen 'Unlocking New Growth Frontiers in the Digital Age' as the theme of my address.

II. Digitalisation and Productivity: Navigating the Paradox

The contribution of digitalisation to growth should be reflected through its impact on productivity. This nexus has, however, sparked an animated debate. There is a view that tangible gains from technological innovations remain elusive; as Robert Solow said, "You can see the computer age everywhere but in the productivity statistics."¹² This paradox may not be confined to just measurement issues, but may extend beyond to demographic trends and slower diffusion. The "realist" view acknowledges that technology alone cannot drive productivity and progress; rather, what matters is its integration into the real economy. A heterodox approach with

¹⁰ Business Standard. (2024). *AI-led Firms report Higher Growth, Outpace Peers in Revenue, Productivity*. October 15.

¹¹ Press Information Bureau. (2024). PM participates in 'India's Techade: Chips for Viksit Bharat' Program.

¹² Solow, R., (1987) We'd better watch out, New York Times Book Review, July 12, page 36.

appropriate policies for skilling and job creation, supported by progressive institutions, would probably be the right way to head towards the future.

Productivity patterns are likely to be increasingly shaped by the growing role of digital services and intangible capital. Business spending on digital technologies is surging¹³. Prices of digital assets (including information and communication technology or ICT) have continued to decline rapidly, which has enabled businesses to operate more efficiently, allowing them to offer competitive products and services. Technological innovations are raising productivity through financial intermediation in terms of expanding financial products and services, efficiency gains in service delivery, and using digital innovations to mitigate risks. Digitalisation also has the potential to improve cross-border financial flows by reducing the cost of sending remittances while enhancing speed and transparency.

The KLEMS framework would help capturing the effects of digitalisation by measuring its contribution to improvements in the quality of labour and capital, in addition to its direct contribution to value added and total factor productivity. Aggregated capital and labour will have to be disaggregated into ICT capital, human capital, and other complementary investments in which digitally enabled investments and services form inputs of production. This disentanglement can prove to be challenging, including due to the non-availability of comprehensive information.

Applying the KLEMS growth accounting decomposition, the share of the ICT sector in India's total gross value added (GVA) has increased over time, especially for ICT-using services. The contribution of ICT capital to output growth, which was 5.0 per cent during 1981-91, registered a sharp increase to about 16.0 per cent during 1992-2000. ICT

¹³ Van Ark, B. (2016). The Productivity Paradox of the New Digital Economy. *International Productivity Monitor*, 31, 3-18.

capital's contribution to GVA moderated to 14.3 per cent during 2001-2010 and further to 10.3 per cent during 2011-2023. New digital technologies also influence labour productivity growth within the KLEMS framework. The share of ICT investment per person in labour productivity growth in India was 8.4 per cent in 1981-90, which increased to 20.8 per cent during 1992-2000 but moderated to 17.4 per cent during 2001-2010 and 11.3 per cent during 2011-23¹⁴ indicating some evidence of Solow's productivity paradox for the post-GFC period, which is broadly consistent with similar trends globally.

Since the end of the technology boom period of the early 2000s, global total factor productivity (TFP) growth has remained relatively modest, averaging around 0.2 per cent per annum during 2010-2024.¹⁵ The weakness in global productivity growth is mostly confined to mature economies, mainly Europe, whereas emerging economies have fared better, particularly in Asia. Multiple interlinked factors have accentuated the productivity slowdown ranging from ageing societies, all-time-high debt levels, decline in business dynamism especially among smaller firms and the scarring effects of the COVID-19 pandemic.¹⁶ New headwinds – weak investment; supply chain and logistics disruptions; trade and investment fragmentation – may also act against gains in allocative efficiency, constituting risks to the global productivity outlook.

¹⁴ Chattopadhyay, S. Sengupta, S and Joshi, S. (2024): New Digital Economy and the Productivity Paradox, RBI Bulletin October 2024.

¹⁵ Total Economy Database (2024), The Conference Board, accessed through <https://data-central.conference-board.org/>

¹⁶ Dieppe, A. (Ed.). (2021). *Global productivity: Trends, drivers, and policies*. World Bank Publications.

For India, average labour productivity growth from 2021 to 2024 is estimated at 5.2 per cent as against 2.1 per cent among emerging markets and developing peers and 0.6 per cent among mature economies.¹⁷ India has witnessed rapid progress in digitalisation, drawing on its foundational strength in ICT services. What began as streams of IT services has now swelled into powerful currents, with model enablers like the Digital Public Infrastructure (DPI) and digital platforms like the Unified Payments Interface (UPI) acting as bridges. Global Capability Centers (GCCs) are already exploiting India's technological progress and expanding India's footprint in global trade in services. The productivity growth of the ICT sector, both ICT-producing and ICT-using industries, consistently outperformed the non-ICT sector during 1980 to 2020. The influence of ICT on productivity, however, was most significant from 1980 to 2010.¹⁸ In the following decade, *i.e.*, from 2010 to 2020, the productivity gap between ICT and non-ICT sectors narrowed considerably, mirroring the widespread productivity slowdown across the globe after the global financial crisis (GFC). These findings require deeper investigation, but they do underscore the changing dynamics of digital technologies and raise important questions about how we might renew productivity growth in an increasingly digital world.

III. Digitalisation of Indian Finance

Micro-level evidence from surveys of Indian banks shows that while all of them have implemented mobile and internet banking, 75 per cent offer online account opening, digital KYC, and digitally enabled doorstep

¹⁷ Total Economy Database (2024), The Conference Board, accessed through <https://data-central.conference-board.org/>

¹⁸ Chattopadhyay, S. Sengupta, S and Joshi, S. (2024): New Digital Economy and the Productivity Paradox, RBI Bulletin October 2024.

banking. Additionally, 60 per cent provide digital lending, 50 per cent offer payment aggregator services, 41 per cent use chatbots, 24 per cent have adopted open banking, and 10 per cent have integrated Internet of Things (IoT) technology.¹⁹ Private sector banks are leading this technology adoption.

An AI-assisted review of the latest annual reports of Indian banks reveals various instances of productivity gains by SCBs from digitalisation. Examples include monthly savings of 14,500 person-days, 25-30 per cent decline in customer acquisition costs, reduction of the use of 84 tons of paper, saving of four lakh litres of fuel in commutes to banks by customers, 40 per cent reduction in customer wait times at branches, 50 per cent reduction in the compliance monitoring time and shortening account opening time to less than a day.²⁰ Aadhaar – India’s unique identification number – has halved the cost of conducting the Know Your Customer process in India²¹.

The Unified Payments Interface (UPI) hit a milestone of 16.6 billion transactions in a month in October 2024, with improvements in its capabilities like successful instant debit reversals at 86 per cent (77 per cent in the same month last year). Innovations in the digital credit landscape such as Account Aggregators, OCEN²², and financial services on ONDC²³ have also contributed to productivity gains. As of March 2024, ONDC operates in over 720 cities, with orders at 49.72 million²⁴. The Trade Receivables Discounting System (TReDS) addresses the credit

¹⁹ Reserve Bank of India. (2024). Report on Currency and Finance 2023-24: India’s Digital Revolution.

²⁰ Sourced from annual reports (2023-24) of select scheduled commercial banks.

²¹ Government of India, 2024. *Economic Survey 2023-24*.

²² Open Credit Enablement Network.

²³ Open Network for Digital Commerce.

²⁴ Department for Promotion of Industry and Internal Trade (DPIIT), Annual Report 2023-24.

gap of MSMEs estimated at around ₹52.2 trillion by connecting them with banks, and clients, with a reduction in funding costs up to 2.5 percentage points²⁵. The value of invoices financed through TReDS have surged more than 23 times. As of October 2024, around 5,000 active FinTechs are involved in providing various financial and technical solutions to businesses, including MSMEs, helping businesses better manage their operations and improve supply chain finance²⁶.

Around 40 per cent of the rural population and 78 per cent in the 20-30 years age group in the overall population use internet in India, with approximately one-third of households engaging in online purchases of consumables and services, one-fourth in buying of consumer durables, and nearly one-tenth in food purchases²⁷. The rising importance of embedded financing is reflected in its share in FinTech funding, which has grown from two per cent in 2020 to nine per cent in 2024.²⁸ The global market for embedded finance is estimated at USD 66.8 billion in 2022 and is projected to experience a CAGR of 25.4 per cent from 2023 to 2032²⁹.

Digitalisation is transforming the efficiency of public services. In 2024, the average number of daily e-transactions to access public services has increased by 56 per cent (y-o-y)³⁰. During 2023-24, ₹6.9 lakh crore has been transferred through the digitally powered Direct Benefit Transfers (DBT) under 314 schemes benefiting 176 crore beneficiaries. Over the

²⁵ Business Standard, 2024. RBI's 'TReDS' platform bridging \$600 bn funding gap for smaller firms. October 22.

²⁶ Based on Tracxn Database, accessed as on October 17, 2024.

²⁷ RBI Staff Estimates based on Household Consumption Expenditure Survey 2022-23 Unit level data.

²⁸ Based on Tracxn Database, accessed as on October 22, 2024.

²⁹ PwC, 2024. *Embedded Finance: A Strategic Outlook*.

³⁰ RBI staff estimates based on data available on etaal (Electronic Transaction Aggregation and Analysis Layer) portal for the year 2024 against 2023.

years, these DBTs have resulted in estimated cumulative cost savings of ₹3.5 lakh crore up to March 2023³¹.

IV. Digitalisation and the Reserve Bank of India (RBI)

The Reserve Bank of India (RBI) has been at the forefront of digitalisation, aiming to leverage technology for productivity and efficiency gains across the financial ecosystem. Some of the critical milestones in digital payments are the introduction of Real Time Gross Settlement (RTGS) and National Electronic Funds Transfer (NEFT) in 2004 and 2005, respectively – which now operate 365*24*7 – followed by the establishment of the National Payments Corporation of India (NPCI) in 2008.

The launch of the UPI in 2016 is a significant milestone with positive externalities that are transcending our national borders. In recent years, the Reserve Bank has continued to foster financial innovation by introducing Central Bank Digital Currency (CBDC) pilots and setting up the Reserve Bank Innovation Hub (RBIH). The Reserve Bank has also announced a new technology platform called the Unified Lending Interface (ULI) which is set to transform the lending landscape in India by making credit more accessible to underserved populations such as small businesses and rural borrowers through reducing documentation requirements and simplifying the loan application process.

India is also closely involved with international organisations that are exploring the linkage of open finance API-based frameworks of different countries in a multilateral construct through initiatives like Project Nexus and mBridge. Under India's G20 Presidency, the Global Digital Public Infrastructure Repository has been mooted as a resource base for key

³¹ Direct Benefit Transfer (DBT). 2024. Homepage. Retrieved from: <https://dbtbharat.gov.in>

lessons and knowledge available from the actual experiences of G20 members and guest countries.

The overall approach has been to balance risk mitigation and financial innovation, maintaining clear communication with stakeholders, and adapting supervisory processes.³² Five policy priorities drive the Reserve Bank's engagement: digital financial inclusion; digital public infrastructure (DPI); customer protection and cyber security; sustainable finance; and global integration and cooperation.³³

V. Conclusion

The interaction of digitalisation with economic growth and productivity is a complex one, yet to be unravelled fully. There is no doubt, however, that digital technologies can generate TFP gains by streamlining processes, enhancing the synergy between workers and capital, and driving automation. The potential for digital technology to drive productivity gains could be far greater if supported by robust institutions, policies, and skills that support innovation and facilitate technology adoption. Exploiting the growth-enhancing potential of digitalisation and new technologies will involve judiciousness and a skilful balancing of risks and rewards so as to enhance the gains while minimising disruptions.

Complementary policies will play a key role in unlocking new growth energies by reaping the productivity gains offered by digital technologies. They will involve setting priorities like (i) expanding the knowledge frontier by improving within firm technical and managerial capabilities; (ii)

³² Reserve Bank of India (2024). Report on Currency and Finance 2023-24: India's Digital Revolution.

³³ Das, S. (2024). FinTech Innovations for India @100: Shaping the Future of India's Financial Landscape. RBI Speeches. August 28, 2024.

promoting competition to reduce market concentration; and (iii) efficient resource reallocation.³⁴ As Paul Krugman aptly noted, “*Productivity isn’t everything, but in the long run it is almost everything.*”³⁵

Thank you.

³⁴ OECD, E. (2019). Digitalisation and Productivity: A Story of Complementarities.

³⁵ Krugman, P. R. (1997). *The Age of Diminished Expectations: US Economic Policy in the 1990s*. MIT Press.