

The Impact of the Digital Economy on Total Factor Productivity: Evidence from Developing Asian Countries

*Ezzatalla Hashemzehl***Reza Zeinalzadeh ****Mohsen Zayandehroodi****DOI: <https://doi.org/10.22096/esp.2025.2065560.1828>

Received Date: 11/07/2025 - Accepted Date: 23/09/2025

Abstract

Productivity stands as a fundamental driver of economic growth and development, commanding significant attention from both advanced and developing economies in recent decades. The growth of productivity is shaped by various factors contingent upon national conditions and economic environments. Notably, the digital economy—supported by the expansion of information and communication technology (ICT) and its infrastructure—offers substantial opportunities for enhancing productivity. This study examines the effect of digital economy indicators on total factor productivity (TFP) in a selection of developing Asian countries from 2003 to 2022 using a panel data model with fixed effects. Estimation results reveal that the E-Government Development Index and the E-Commerce Index exert a positive and statistically significant impact on TFP. Furthermore, a composite digital economy index also demonstrates a positive and significant influence on TFP. These findings suggest that policymakers in developing Asian economies can foster total factor productivity by strategically advancing digital economy indicators.

Keywords: Total Factor Productivity; Digital Economy; E-Government; E-Commerce; ICT Infrastructure.

JEL Classification: O33, O47, L86, C23.

* PhD student in Economics, Department of Economics, Ke.c., Islamic Azad University, Kerman, Iran.

Email: hashemzehl@iau.ac.ir

** Assistant Professor, Department of Economics, Ke.c., Islamic Azad University, Kerman, Iran. (Corresponding Author)

Email: Zeinal1350@iau.ac.ir

*** Associate Professor, Department of Economics, Ke.c., Islamic Azad University, Kerman, Iran.

Email: Roody1345@iau.ac.ir



Bibliography

- Aghion, Philips, Richard Blundell, Rachel Griffith, Peter Howitt, and Susanne Prantl. "The Effects of Entry on Incumbent Innovation and Productivity." *The Review of Economics and Statistics* 91, no. 1 (2009): 20-32.
- Ahmad, Nisar, Inayatullah Jan, Saif Ullah, and Sidra Pervez. "Impact of Agricultural Credit on Wheat Productivity in District Jhang, Pakistan." *Sarhad Journal of Agriculture* 31, no. 1 (2015): 65-69.
- Balk, Bert. M. "Scale Efficiency and Productivity Change." *Journal of Productivity Analysis* 15 (2001): 159-183.
- Barro, Robert. J. "Inequality, Growth and Investment." *NBER Working Paper Series*, no. w7038 (1999): 1-54.
- Czernich, Nina, Oliver Falck, Tobias Kretschmer, and Ludger Woessman. "Broadband Infrastructure and Economic Growth." *The Economic Journal* 121, no. 552 (2011): 505-532.
- Dahl, Christian M., Hans Christian Kongsted, and Anders Sørensen. "ICT and Productivity Growth in the 1990s: Panel Data Evidence on Europe." *Empirical Economics* 40, no. 1 (2011): 141-164.
- Dhaoui, Iyad. "E-Government for Sustainable Development: Evidence from MENA Countries." *Journal of the Knowledge Economy* 13, (2021): 2070-2099.
- Elsadig Musa, Ahmed. "The Role of FDI Intensity in Achieving Productivity-Driven Growth in the Malaysian Economy." *Applied Econometrics and International Development* 10, no. 1 (2010): 195-208.
- Friedman, Thomas L. *The World is Flat, the Globalized World in the Twenty-First Century*. London: Penguin Books, 2006.
- Gal, Peter, Giuseppe Nicoletti, Christina von Ruden, Stephane Sorbe, and Theodore Renault. "Digitalisation and Productivity: In Search of the Holy Grail-Firm-Level Empirical Evidence from EU Countries." *International Productivity Monitor, Center for the Study of Living Standard* 37 (2019): 39-71.
- Godwin, Myovella, Mehmet Karacuka, and Justus Haucap. "Digitization and Economic Growth: A Comparative Analysis of Sub-Saharan Africa and OECD Economies." *Telecommunications Policy* 44, no. 2 (2020): 1-12.
- Gong, Chongyi. "Impact of Human Capital Inequality on Total Factor Productivity in Chian." *Modern Economy* 7, no. 5 (2016): 561-566.
- Griliches, Zvi. "R & D and the productivity slowdown." *American Economic Review* 70, no. 2 (1980): 343-348.

- Gumah, Mohamed E., and Zulikha Jamaluddin. "What Is The Digital Economy and How to Measure It." *Knowledge Management International Conference and Exhibition (KMICE)* (2006): 378-382.
- Jahangard, Esfandiar Teymour Mohammadi, Ali Asghar Salem, and Forough Esmaeily Sadrabadi. "Intangible Capital Industries with Higher Digital Technology Intensity and Total Factor Productivity." *Iranian Journal of Economic Research* 28, no. 94 (2023): 9-47. [In Persian]
- Jess, Benhabib, and Mark M. Spiegel. "The Role of Human Capital in Economic Development: Evidence from Aggregate Cross-Country Data." *Journal of Monetary Economics* 34, no. 2 (1994): 143-173.
- Jodki, Maryam, and Hossein Ali Hasanpour. "Identification and Ranking of Factors Affecting the Improvement of Employee Productivity Using the Technique of Network Analysis Process (ANP); Case Study: National Standard Organization of Iran)." *Scientific-Promotional Quarterly of Standard and Quality Management* 8, no. 2 (2018): 38-65. [In Persian]
- Jorgenson, Dale, and Zvi Griliches. "The Explanation of Productivity Change." *Review of Economic Studies* 34, no. 99 (1967): 29-64.
- Karen, Layne, and Jungwoo Lee. "Developing Fully Functional E-Government: A Four Stage Model." *Government Information Quarterly* 18, no. 2 (2001): 122-136.
- L'Hoest, Raphael. "The European Dimension of the Digital Economy." *Intereconomics* 36, no. 1 (2001): 44-50.
- Liu, Zhiqiang. "Foreign Direct Investment and Technology Spillover: Theory and Evidence." *Journal of Development Economics* 85, no. 85 (2008): 176-193.
- Mahmodzadeh, Mahmod, Saleh Ghavidel, and Seyedeh Fateme Chavoshi. "The Effects of E-Commerce on Employment and Productivity in Iran." *Economic Research* 18, no. 68 (2018): 153-185. [In Persian]
- Majeed, Muhammad Tariq, and Amna Malik. "E-Government and Economic Growth: A Panel Data Analysis." *Kashmir Economic Review* 26, no. 1 (2020): 1-18.
- Maksim, Belitski, Julia Korosteleva, and Lucia Piscitello, L. "Digital Affordances and Entrepreneurial Dynamics: New Evidence from European Regions." *Technovation* 119, no. 3-4 (2023): 1-40.
- Maryam Nouraienejad. "The Digital Gap." *The Global Network of Communication Scholars* 1, no. 2 (2006): 1-19. [In Persian]
- Mehrabani, Fatemeh, Soghra Ghobadi, and Ali Rezaeeyan. "Investigation of

- The Mutual Effect of Knowledge-Based Economy and TFP and Their Relationship: Case Study on developed, Emerging Developing Countries.” *Journal of Economic Essays: an Islamic Approach* 11, no. 21 (2014): 125-160. [In Persian]
- Moradhasse, Niloufar, and Fatemeh Hosseinzadeh Tirabadi. “The Effect of E-Commerce on Labor Productivity (A Study in The Factories of East Azarbaijan Province).” *Applied Economics* 4, no. 15 (2014): 53-64. [In Persian]
- Moradhasse, Niloufar, Mir Saied Kazempour. “Evaluating the Effect of E-Government Expansion on Labor Productivity: The Case of Developing Countries.” *The Economic Research (Sustainable Growth and Development)* 23, no. 1 (2023): 85-112. [In Persian]
- Nakatani, Ryota. “Total Factor Productivity Enablers in the ICT Industry: Cross-Country Firm Level Analysis.” *Telecommunications Policy* 45, no. 9 (2021): 1-13.
- Nambisan, Satish. “Digital Entrepreneurship: Toward a Digital Technology Perspective of Entrepreneurship.” *Entrepreneurship Theory and Practice* 41, no. 6 (2017): 1029-1055.
- Nelson, Richard, and Edmund S. Phelps. “Investment in Humans, Technological Diffusion, and Economic Growth.” *The American Economic Review* 56, no. 1/2 (1966): 69-75.
- Pan, Wenrong, Tao Xie, Zhuwang Wang, and Lisha Ma. “Digital Economy: An Innovation Driver for Total Factor Productivity.” *Journal of Business Research* 139, no. C (2022): 303-311.
- Pritchett, Lant. “Where has all the Education Gone?” *World Bank Economic Review* 15, no. 3 (2001): 367-391.
- Ravinesh Kumar, Roland, Peter Josef Stauvermann, and Aristeidis Samitas. “The Effects of ICT on Output per Worker: A Study of the Chinese Economy.” *Telecommunications Policy* 40, no. 2-3 (2016): 102-115.
- Restuccia, Diego, and Richard Rogerson. “Policy Distortions and Aggregate Productivity with Heterogeneous Establishment.” *Review of Economic Dynamics* 11, no. 4 (2008): 707-720.
- Robert D, Atkinson, and Andrews S. McKay. “Understanding the Economic Benefits of the Information Technology Revolution.” *SSRN Electronic Journal* (2007): 1-79.
- Rong, Ke. “Research Agenda for the Digital Economy.” *Journal of Digital Economy* 1, no. 1 (2022): 20-31.

- Sayfolahi, Naser, and Hatef Hazeri. "The Effect of Financial Development on Labor Productivity: Co-integration Application in Dynamic Panel Data." *Monetary & Financial Economics* 24, no. 14 (2017): 252-271. [In Persian]
- Shi, Liangping, Suyun Wang, and Jingjing Wang. "Economic analysis from Stock to Flow: On the Construction of Theoretical Framework of Flow Economics." *Academia Monthly* 15, no. 1 (2019): 28-50.
- Solarin Sakiru, Adebola, and Pritish Kumar Sahu. "The Effect of Research Intensity on Total Factor Productivity in OECD Countries during 1890-2018: Evidence from a New Poisson Pseudo Maximum Likelihood Estimation Approach." *Quality & Quantity: International Journal of Methodology* 58, no. 3 (2023): 2389-2412.
- Solow, Robert. M. "Technical Change and the Aggregate Production Function." *Review of Economics and Statistics* 39, no. 3 (1957): 312-320.
- Stigler, George. J. "Trends in Output and Employment." *National Bureau of Economic Research* (1947): 1-11.
- Tinbergen, Jan. "Zur Theorie der Langfristigen Wirtschaftsentwicklung." *Weltwirtschaftliches Archiv*, Band 55, no. 1 (1942): 511-549.
- Tranos, Emmanouil, Tasos Kitsos, and Raquel Ortega-Argilés. "Digital Economy in the UK: Regional Productivity Effects of Early Adoption." *Regional Studies* 55, no. 12 (2020): 1924-1938.
- Ur Rehman, Naqeeb, and Giulia Nunziante. "The Effect of Digital Economy on Total Factor Productivity in European Region." *Telecommunication Policy* 47, no. 10 (2023): 1-16.
- Van, Nguyen Thi Thian, and Nguyen Thien Duy. "Digital Economy: Overview of Definitions and Measurement Criteria." *IEEE* (2020).
- Wu, Maoguo, and Xierui Han. "Influence of Economic Openness on Total Factor Productivity: Evidence from Chinas Belt and Road Initiative." *Sustainability* 14, no. 20 (2022): 1-24.