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The effect of scientific productivity on the technology spillover caused by the import of intermediate and capital goods

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EXTENDED ABSTRACT SAMPLE FORMAT

INTRODUCTION

The import of intermediate and capital goods is a significant contributor to economic growth, with technology spillover playing a crucial role in promoting innovation, inventions, and competitiveness. The expansion of scientific productivity is essential to facilitate the necessary technological spillover resulting from the import of these goods. Scientific productivity can be increased by focusing on the number of researchers, laboratories, universities, research institutes, and scientific resources and journals in this field. This increase in scientific productivity can lead to the overflow of knowledge and technology, resulting in the production of products with superior technology. Therefore, promoting scientific productivity in a knowledge-based economy can facilitate the utilization of technology spillover resulting from the import of intermediate and capital goods, ultimately leading to economic growth and development.

METHODOLOGY

This study employs the generalized method of moments (GMM) to examine the impact of the scientific productivity index on technology spillover resulting from the import of intermediate and capital goods in developing countries (G15) between 1996 and 2018.

FINDINGS

The coefficient of technology spillover resulting from the import of intermediate and capital goods exhibits a positive effect with lag, which is in accordance with theoretical expectations. This finding highlights the dynamic nature of technology spillover over time, whereby the function of technology spillover in the current period extends to the next period. The study also reveals that scientific productivity is a significant factor influencing the technology spillover variable resulting from the import of intermediate and capital goods. This can lead to the acquisition of new knowledge and technology, promoting a shift towards a knowledge-based economy focused on producing goods and services with high technology.

In essence, scientific productivity serves as a foundation for improving and changing production processes, providing a competitive advantage in foreign markets. By focusing on knowledge and scientific productivity components, it creates conditions for achieving high technology, leading to technology spillover in the import sector of intermediate and capital goods. Ultimately, it leads to the production of products with high technology.

CONCLUSION

The estimation results indicate a positive and significant impact of scientific productivity on technology spillover resulting from the import of intermediate and capital goods. Additionally, the results reveal that GDP and relative price variables have a positive and significant effect on technology spillover, whereas the exchange rate has a negative and significant effect. Based on the findings, it can be inferred that the countries studied in this research have not yet achieved a favorable position in technology spillover resulting from the import of intermediate and capital goods compared to other countries due to their poor performance in scientific productivity. In light of this, several suggestions are presented to overcome the barriers to technology spillover caused by the import of intermediate and capital goods and harness its benefits, including:

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- Strengthening the relationship between the technology sector and the import of intermediate and capital goods
- Creating a competitive production environment to strengthen technology resulting from the import of intermediate and capital goods
- Managing the import of high-tech goods to utilize imported technology and organizing educational programs related to industries with high technology
- Developing a coherent program to acquire new knowledge and technology and strengthen the production sector of high-tech goods
- Increasing scientific productivity to absorb and spill over technology through the import of intermediate and capital goods

Coordinating monetary, financial, commercial, and foreign exchange policies in line with technology spillover resulting from the import of intermediate and capital goods.

References

Alvarez, R., & López, R. A. (2015). Foreign technology acquisition and changes in the real exchange rate. *The World Economy*, *38*(4), 613–628.

Amavilah, V. H. S. (2006). Technology and per capita real GDP across some African countries. Available at SSRN 937814.

Baltagi, B. H. (2005). *Econometric analysis of panel data.* West Sussex, England: John Wiley & Sons Ltd.

Bassey Okon, E., & Felix Awara, E. (2018). Institutional quality and economic diversification in oil-rich economies: A case study of Nigeria. *Journal of Economics and Sustainable Development*, *19*(14), 57–62.

Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics*, *87*(1), 115–143.

Bournakis, I., & Tsoukis, C. (2016). Government size, institutions, and export performance among OECD economies. *Economic Modelling, 53*, 37–47.

Coe, D. T., Helpman, E., & Hoffmaister, A. W. (2009). International R&D spillovers and institutions. *European Economic Review, 53*(7), 723–741.

Costantini, V., & Liberati, P. (2014). Technology transfer, institutions and development. *Technological Forecasting and Social Change, 88*, 26–48.

Drine, I. (2012). Institutions, governance and technology catch-up in North Africa. *Economic Modelling, 29*(6), 2155–2162.

Fagerberg, J. (1989). Innovation, catching-up and growth. Working Paper 1989137, Centre for Technology, Innovation and Culture, University of Oslo.

Farahanifar, F., Hosseini Shakib, M., Khamseh, A., & Hosnavi Atashgah, R. (2021). Identifying and ranking the factors affecting the overflow of defense technologies to commercial businesses. *Defence Studies, 19*(2), 179–208. Retrieved from https://ds.sndu.ac.ir/article_1470.html (in Persian)

Fayaz, M., & Sandeep, K. (2019). An empirical analysis of the determinants of India's high-technology exports. *Regional and Sectoral Economic Studies, 19*(2), 29–44.

Feenstra, R., & Kee, H. L. (2008). Export variety and country productivity: Estimating the monopolistic competition model with endogenous productivity. *Journal of International Economics, 74*(2), 500–518.

Gao, P. (2015). Government in the catching-up of technology innovation: Case of administrative intervention in China. *Technological Forecasting and Social Change, 96*, 4–14.

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Quarterly Journal of Quantitative Economics
(former Economic Studies)

Gil, P. M., Afonso, O., & Brito, P. (2019). Economic growth, the high-tech sector, and the high skilled: Theory and quantitative implications. *Structural Change and Economic Dynamics, 51,* 89–105.

Green, S., Melnyk, A., & Powers, D. (2002). Is economic freedom necessary for technology diffusion? *Applied Economics Letters, 9*(14), 907–910.

Griliches, Z. (1988). Productivity puzzles and R&D: Another nonexplanation. *Journal of Economic Perspectives, 2*(4), 9–21.

Groba, F., & Cao, J. (2015). Chinese renewable energy technology exports: The role of policy, innovation and markets. *Environmental and Resource Economics, 60,* 243–283.

Jalalabadi, A., Aziznezhad, S., & Mostaghimi, M. R. (2007). The effect of macroeconomic variables on intermediate-capital goods import in Iran's industry. *Economics Research, 7*(24), 77–101. Retrieved from https://joer.atu.ac.ir/article_3298.html (in Persian)

Javed, S. A., & Liu, S. (2018). Predicting the research output/growth of selected countries: Application of Even GM (1, 1) and NDGM models. *Scientometrics, 115,* 395–413.

Kabaklari, E., Duran, M. S., & Üçler, Y. T. (2018). High-technology exports and economic growth: Panel data analysis for selected OECD countries. *Forum Scientiae Oeconomia, 6*(2), 47–60.

Kubota, M. (2009). Real exchange rate misalignments: Theoretical modeling and empirical evidence.

Kumar, R. R., Stauvermann, P. J., & Patel, A. (2016). Exploring the link between research and economic growth: An empirical study of China and USA. *Quality & Quantity, 50,* 1073–1091.

Laverde-Rojas, H., & Correa, J. C. (2019). Can scientific productivity impact the economic complexity of countries? *Scientometrics, 120*(1), 267–282.

Lee, S., & Bozeman, B. (2005). The impact of research collaboration on scientific productivity. *Social Studies of Science, 35*(5), 673–702.

Lichtenberg, F. R., & De La Potterie, B. van P. (1998). International R&D spillovers: A comment. *European Economic Review, 42*(8), 1483–1491.

Leylian, N. , ebrahimi, M. , zare, H. and Haghighat, A. (2023). Assessing the short run and long run effects of foreign direct investment, human capital and financial development on the economic growth of different income groups in developing countries (application of the panel cointegration approach). *Quarterly Journal of Quantitative Economics (JQE), 20*(3), 35-77. doi: 10.22055/jqe.2021.36604.2339 (in Persian)

Hosseinpoor, A. and ghorbanpour, A. (2023). Provide a model based on the dimensions of circular economy, clean production and the fourth generation industrial revolution to improve the sustainable productivity of manufacturing industries. *Quarterly Journal of Quantitative Economics (JQE), 20*(2), 165-185. doi: 10.22055/jqe.2022.39085.2433 (in Persian).

Mehregan, N., Dehghanpur, M. R., & Dehmoobed, B. (2011). Factors that affect high-tech industries export. *Journal of Science and Technology Policy, 3*(4), 69–83. Retrieved from https://jstp.nrisp.ac.ir/article_12829.html (in Persian)

Mirzaee, F., & Jalaee Esfandabadi, S. A. (2014). Studying the real exchange rate (Edwards' model) on spillovers of technology in Iran. *Quarterly Journal of Quantitative Economics (JQE), 11*(2), 41–67. Retrieved from https://jqe.scu.ac.ir/article_11849.html (in Persian)

Nguyen, T. V., & Pham, L. T. (2011). Scientific output and its relationship to knowledge economy: An analysis of ASEAN countries. *Scientometrics, 89*(1), 107–117.

Shah Abadi, A., & Davari Kish, R. (2015). The impact of natural resource abundance and economic freedom on technology spillovers in selected

countries. *Journal of Technology Development Management, 3*(2), 151–178. https://doi.org/10.22104/jtdm.2016.359 (in Persian)

Shahabadi, A., Mousavi, M. H., & Shayganmehr, S. (2017). The impact of technology spillover through foreign direct investment and product import on the production share of renewable energies in total energy. *Journal of Technology Development Management, 5*(2), 99–122. https://doi.org/10.22104/jtdm.2018.1707.1598 (in Persian)

Shahabadi, A., & Salimi, S. (2015). Impact of good governance on R&D intensity of selected developed and developing countries. *Journal of Science and Technology Policy, 8*(2), 35–46. Retrieved from https://jstp.nrisp.ac.ir/article_13849.html (in Persian)

Smith, M., Gorgoni, S., & Cronin, B. (2019). International production and trade in a high-tech industry: A multilevel network analysis. *Social Networks, 59*, 50–60.

Sotudeh, H., & Yaghtin, M. (2014). Indicators and models for measuring researchers' scientific productivity. *Journal of Science and Technology Policy Letters, 4*(1), 47–62. (in Persian)

Toutkoushian, R. K., Porter, S. R., Danielson, C., & Hollis, P. R. (2003). Using publications counts to measure an institution's research productivity. *Research in Higher Education, 44*, 121–148.

Zhang, J., & Sun, F. (2019). Research on the factors affecting the export of high-tech products in Jiangsu province under Sino-US trade war. In *2018 International Symposium on Social Science and Management Innovation (SSMI 2018)* (pp. 463–470). Atlantis Press.