

Artificial intelligence and international trade: Mechanisms of impact and preconditions for effective adoption in developing economies, with a focus on Iran

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Article Info	Abstract
Original Article Main Object: Economics Scope: Iran Received: 28 August 2026 Revised: 20 September 2026 Accepted: 28 September 2026 Published online: 24 October 2026 Keywords: artificial intelligence (AI), competitive advantage, Global Value Chains (GVC), international trade, trade costs.	This study aims to explain the mechanisms through which artificial intelligence affects international trade. It first develops a conceptual framework to analyze how this technology influences firms' export performance and, ultimately, a country's trade patterns. It then examines the practical realization of these mechanisms by investigating the experiences of China, South Korea, and Singapore in applying artificial intelligence to trade and customs-related activities and by comparing these experiences with the components of the proposed conceptual framework. The findings indicate that access to artificial intelligence alone is insufficient to capture its potential benefits. Rather, the availability of data and digital infrastructure, capabilities for data processing and integration, skilled human resources, and appropriate organizational and institutional arrangements play a critical role in transforming this technology into an effective operational tool. An analysis of Iran's foreign trade structure further shows that the country faces a high concentration of export products and destinations, a considerable share of relatively low value-added goods, and constraints on market access and international transactions arising from trade sanctions. In this context, the application of artificial intelligence—particularly in market identification, demand analysis, product development, information processing, and supply chain management—can help reduce certain information and coordination costs and improve some dimensions of export competitiveness. Such applications may contribute to addressing existing export constraints and enhancing the country's trade performance.

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Extended Abstract

1. Introduction

The growing use of artificial intelligence (AI) is changing the way firms produce, process information, assess markets, and organize their commercial activities. These changes have implications for international trade because the ability to use AI can affect not only production efficiency but also the costs associated with finding information, identifying customers, forecasting demand, managing risks, and coordinating activities across markets. The effects, however, are unlikely to be the same across firms and countries. AI does not operate independently of the technological, human, organizational, and institutional environment in which it is adopted. Differences in access to data, digital infrastructure, skilled labour, managerial capabilities, and institutional arrangements may therefore determine the extent to which firms and countries can translate AI capabilities into economic and trade-related outcomes.

2. Aims

Against this background, this study examines the mechanisms through which AI can affect international trade and considers how these mechanisms may influence firms' export performance and, more broadly, countries' trade patterns.

3. Methodology

The study follows a theoretical-analytical approach based on a targeted review of the academic literature and reports published by international organizations. Its objective is not to estimate a direct or universal causal effect of AI adoption on exports. Instead, it develops a conceptual framework that traces how changes at the firm level can be transmitted to broader trade outcomes. The framework focuses on five channels. AI can raise productivity and improve product quality by supporting production decisions, process optimization, and resource allocation. It can also reduce some information and coordination costs by making it easier to search for market information, identify potential customers and business partners, and process large volumes of trade-related information. A further channel operates through forecasting and risk management, where improved prediction can support decisions concerning demand, inventories, supply chains, and market conditions.

4. Discussion

AI may also contribute to the expansion of trade in digital services, while its effects on productivity, information costs, and organizational capabilities can influence how activities are distributed across global value chains.

These mechanisms do not imply that access to AI technology automatically generates economic benefits. The ability to use AI

effectively depends on complementary inputs and capabilities. Reliable and accessible data, appropriate digital and computing infrastructure, skilled human resources, and organizational capacity are particularly relevant in this regard. Institutional arrangements also affect the extent to which data can be integrated and used, AI applications can be incorporated into administrative and business processes, and the associated risks can be managed. Differences in these conditions help explain why the adoption of similar technologies may produce different outcomes across countries. Within the proposed framework, AI can affect both comparative and competitive advantages, although these concepts are not treated as interchangeable. Changes in productivity and relative production costs may influence comparative advantage, whereas changes in firms' capabilities, quality, information costs, and organizational performance may affect their competitive position in international markets.

The practical relevance of these mechanisms is examined through the experiences of China, South Korea, and Singapore. The analysis focuses particularly on the application of AI in trade and customs-related activities, where large volumes of data, repeated administrative procedures, and the need for timely risk assessment create clear areas for technological application. The experiences of these countries show that AI applications have generally been developed alongside digital infrastructure, integrated data systems, and organizational arrangements that allow information to be processed and used in decision-making. Their experience also indicates that the effectiveness of AI is closely related to the quality of the underlying data and to the ability of public agencies and firms to incorporate technological tools into existing processes. The comparison therefore provides practical evidence for the complementary conditions identified in the conceptual framework rather than serving as a basis for estimating a general causal effect.

The implications of this framework are particularly relevant to Iran given the structure of its foreign trade. Iranian exports remain concentrated in a relatively limited number of products and destinations, while a considerable share consists of goods with relatively low value added. Restrictions on market access and international transactions associated with trade sanctions further increase the costs and difficulties of entering and maintaining relationships in foreign markets. Under these conditions, applications of AI that address information and coordination constraints may be more relevant than general technological adoption. Potential areas of application include identifying export markets and foreign buyers, analysing demand and customer preferences, supporting product development, processing trade information, forecasting demand, and improving supply chain management. These applications cannot remove the structural constraints affecting Iran's foreign trade and

should not be interpreted as guaranteeing higher exports. Their potential contribution lies in reducing specific information and coordination costs and in improving selected dimensions of firms' export competitiveness, provided that the necessary data, infrastructure, skills, organizational capabilities, and institutional conditions are in place.

5. Conclusion

The analysis consequently suggests that the relationship between AI and international trade is better understood as a set of interconnected mechanisms rather than as a direct relationship between technology adoption and export growth. AI can influence firms' productivity, market-related decisions, information costs, and organizational capabilities, with potential implications for comparative advantage, competitive positioning, and participation in global value chains. The magnitude and direction of these effects, however, depend on the conditions under which the technology is used. For Iran, the policy relevance of AI therefore lies primarily in its targeted application to specific constraints in foreign trade, particularly those related to market information, demand analysis, product development, trade-information processing, and supply chain coordination. Policies in this area need to consider the complementary conditions that determine whether access to AI can be translated into effective use and, ultimately, into improvements in firms' ability to compete in international markets.

Conflict of interest

The authors declared no conflicts of interest.

Ethical considerations

The authors have completely considered ethical issues, including informed consent, plagiarism, data fabrication, misconduct, and/or falsification, double publication and/or redundancy, submission, etc. This article was not authored by artificial intelligence. In the final writing of the article, ChatGPT (GPT-6 OpenAI) was used only for linguistic enhancement and editing and to assist in the translation of parts of the text. The scientific responsibility, data analysis, accuracy of references, and final content of the article rests with the authors.

Data availability

The dataset generated and analyzed during the current study is available from the corresponding author on reasonable request.

References

- Aggarwal V, Karwasra N. (2025). "Artificial intelligence v/s human intelligence: A relationship between digitalization and international trade". *Future Business Journal*. 11(1): 16. <https://doi.org/10.1186/s43093-025-00438-5>.
- Agrawal A, Gans J, Goldfarb A. (2018). *Prediction Machines: The Simple Economics*

- of Artificial Intelligence. Harvard Business Review Press.
- Baldwin R. (2016). *The Great Convergence: Information Technology and the New Globalization*. Harvard University Press.
- Bhattacharyya R, Banerjee K. (2025). "Artificial intelligence, trade convergence and deglobalisation: A cross-country analysis". *Foreign Trade Review*. <https://doi.org/10.1177/00157325251362548>.
- Bonfiglioli A, Crinò R, Filomena M, Gancia GA. (2025). *Comparative Advantage in AI-Intensive Industries: Evidence from US Imports* (No. 11642). CESifo Working Paper. <https://www.ifo.de/en/cesifo/publications/2025/working-paper/comparative-advantage-ai-intensive-industries-evidence-us-imports>.
- Brynjolfsson E, Li D, & Raymond LR. (2025). "Generative AI at work". *The Quarterly Journal of Economics*. 140(2): 889-942. <https://doi.org/10.1093/qje/qjae044>.
- Chishty SK, Sayari S, Mohamed AH, Mallick MF, Khan N, Inkesar A. (2025). "The utilization of artificial intelligence in the export performance of MNCs: The role of cultural distance". *Administrative Sciences*. 15(5): 160. <https://doi.org/10.3390/admsci15050160>.
- Coase RH. (1937). "The nature of the firm". *Economica*. 4(16): 386-405. <https://doi.org/10.1111/j.1468-0335.1937.tb00002.x>.
- ESCAP: United Nations Economic and Social Commission for Asia and the Pacific & ADB: Asian Development Bank (2026). *Asia-Pacific Trade Facilitation Report 2026: Harnessing Artificial Intelligence in Trade Facilitation*. Bangkok: United Nations Economic and Social Commission for Asia and the Pacific and Asian Development Bank. <https://doi.org/10.22617/TCS260220-2>.
- Ferencz J, López González J, Oliván García I. (2022). "Artificial intelligence and international trade: Some preliminary implications". *OECD Trade Policy Papers*. No. 260. OECD Publishing. <https://doi.org/10.22617/TCS260220-2>.
- Gao Y. (2023). "Unleashing the mechanism among environmental regulation, artificial intelligence, and global value chain leaps: A roadmap toward digital revolution and environmental sustainability". *Environmental Science and Pollution Research*. 30(10): 28107-28117. <https://doi.org/10.1007/s11356-022-23898-6>.
- Gereffi G, Humphrey J, Sturgeon T. (2005). "The governance of global value chains". *Review of International Political Economy*. 12(1): 78-104. <https://doi.org/10.1007/s11356-022-23898-6>.
- Goldfarb A, Trefler D. (2019). "Artificial intelligence and international trade". In A. Agrawal, J. Gans & A. Goldfarb (Eds.). *The Economics of Artificial Intelligence: An Agenda* (pp. 463–492). University of Chicago Press.
- Hidalgo C, Micco A. (2024). "Computerization, offshoring and trade: The effect on developing countries". *World Development*. 180. <https://doi.org/10.1016/j.worlddev.2024.106617>.
- Ianchovichina E, Devarajan S, Lakatos C. (2016). "Lifting economic sanctions on Iran: global effects and strategic responses". *World Bank Policy Research Working Paper*. <https://doi.org/10.1596/1813-9450-7549>.
- Jovanovic B, Rousseau PL. (2026). "AI and Task Efficiency". *Journal of Monetary Economics*. 157. <https://doi.org/10.1016/j.jmoneco.2025.103877>.
- Kumar S, Vandana V, Kumar V, Chatterjee S, Mariani M, de Massis A. (2025). "The role of artificial intelligence capabilities in enhancing export performance: A study of ambidexterity and dynamic capabilities". *International Marketing Review*. 42(4): 698-714. <https://doi.org/10.1108/IMR-10-2024-0426>.
- Lall S. (2000). "The technological structure and performance of developing country manufactured exports, 1985-98". *Oxford Development Studies*. 28(3): 337-369. <https://doi.org/10.1080/713688318>.
- Lin C, Xiao S, Tang P. (2024). "Does artificial intelligence improve export technical complexity upgrade of manufacturing enterprises? Evidence from China". *SAGE*

- Open*. 14(3): 1-18. <https://doi.org/10.1177/21582440241267126>.
- Liu J, Qin C, Chu X. (2025). "Development of corporate artificial intelligence and the quality of export products". *finance research letters*. 78. <https://doi.org/10.1177/21582440241267126>.
- Liu Y, Jiang X, Shi Y, Yang Y. (2024). "Artificial intelligence and the position of manufacturing in global value Chains". *Sustainability*. 16(3). <https://doi.org/10.3390/su16031341>.
- Oxford Insights. (2025). "Government AI readiness index 2025". <https://oxfordinsights.com/ai-readiness/government-ai-readiness-index-2025/>.
- Ozturk O. (2024). "The impact of AI on international trade: Opportunities and challenges". *Economies*. 12(11). <https://doi.org/10.3390/economies12110298>.
- Parliamentary Research Center. (2025). "An assessment of Iran's foreign trade using trade-related indicators". *Economic Studies Office* (Trade Group). <https://rc.majlis.ir/fa/report/show/1837818>. [in Persian]
- , (2020). "Assessment of Iran's non-oil exports: An analysis of non-oil export trends". *Economic Research Deputy*. https://report.mrc.ir/article_8211.html. [in Persian]
- Porter ME. (1990). *The Competitive Advantage of Nations*. Free Press.
- Qin M, Li Y, Qiu S, Jiang Z. (2025). "How does artificial intelligence enhance corporate participation in global value chains? Evidence from Chinese a-share listed companies". *Telecommunications Policy*. 49(9). <https://doi.org/10.1016/j.telpol.2025.103026>.
- Ricardo D. (1817). *On the Principles of Political Economy and Taxation*. Dover Publications.
- Singapore Customs. (2025). "Shaping what's next: annual report 2025". <https://file.go.gov.sg/customsannual2025.pdf>.
- Trade Promotion Organization of Iran. (2023). Reports on the Country's Foreign Trade Performance, Various Years. <https://tpo.ir/%DA%AF%D8%B2%D8%A7%D8%B1%D8%B4%D8%B9%D9%85%D9%84%DA%A9%D8%B1%D8%AF-%D8%AA%D8%AC%D8%A7%D8%B1%DB%8C>. [in Persian]
- UNCTAD: United Nations Conference on Trade and Development. (2025). *Technology and Innovation Report 2025: Inclusive Artificial Intelligence for Development*. United Nations. <https://unctad.org/publication/technology-and-innovation-report-2025>.
- Wang Y, Li J. (2017). "ICT's effect on trade: Perspective of comparative advantage". *Economics Letters*. 155: 96-99. <https://doi.org/10.1016/j.econlet.2017.03.022>.
- WCO: World Customs Organization. (2025). "Case study on the adoption of artificial intelligence (AI) and machine learning (ML) in China customs". Brussels. <https://www.wcoomd.org/en/media/newsroom/2025/january/smart-customs-project-releases-a-case-study-on-the-adoption-of-ai-and-ml-in-china-customs.aspx>.
- Williamson OE. (1985). *The Economic Institutions of Capitalism: Firms, Markets, Relational Contracting*. Free Press.
- World Bank. (2021). World Development Report 2021: Data for Better Lives. <https://doi.org/10.1596/978-1-4648-1600-0>.
- WTO: World Trade Organization. (2024). "Trading with intelligence: How AI shapes and is shaped by international trade". https://www.wto.org/english/res_e/publications_e/trading_with_intelligence_e.htm.
- , (2025). "World Trade Report 2025: Making trade and AI work together to the benefit of all". https://www.wto.org/english/res_e/publications_e/wtr25_e.htm.
- , (2018). "World Trade Report 2018: The future of world trade—How digital technologies are transforming global commerce". Geneva. https://www.wto.org/english/res_e/publications_e/wtr18_e.htm.
- Xu L. (2026). "The spatial spillover effects of artificial intelligence on export

- sophistication”. *Technology in Society*. 86(C).
<https://doi.org/10.1016/j.techsoc.2026.103281>.
- Xu X, Tian C. (2025). “Does artificial intelligence improve the quality of export products? Evidence from China”. *Applied Economics Letters*. 32(1): 9-13.
<https://doi.org/10.1080/13504851.2023.2244224>.
- Zhang Z, Deng F. (2023). “How can artificial intelligence boost firms’ exports? Evidence from China”. *Plos one*. 18(8).
<https://doi.org/10.1371/journal.pone.0283230>.
- Zheng D, Wang T. (2025). “Do industrial robot applications upgrade the global value chain position? Empirical evidence from China”. *International Review of Economics & Finance*. 99. <https://doi.org/10.1016/j.iref.2025.104012>.

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