

The Intrinsic Logic and Future Prospects of the Impact of Digitization on International Trade

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Abstract. The rapid advancement of digital technologies since the 21st century has significantly changed the landscape of international trade. The spatial and informational asymmetries are no longer a problem thanks to big data, artificial intelligence, blockchain, and other new technologies that drastically lower transaction costs while increasing efficiency and market reach. These innovations have catalyzed many new business models, such as cross-border e-commerce and digital services trade. This paper consists of three chapters. The author will present an analysis encompassing the reformation of classical trade theories by digitalization, then summarize the mechanisms driving trade transformation by digital technologies, and focus on the empirical paradoxes and controversies arising from this shift. In this paper the study finds that digitization has promoted the extension of traditional trade theories, while restructuring global value chains by elevating the export quality of the manufacturing sector's products and maximizing the value of economies of scale. However, the digital revolution is accompanied by challenges such as data monopolies, the digital divide, and ethical risks, which necessitate a multidisciplinary governance framework to balance efficiency with equity. These problems should not be overlooked. In summary, this paper advocates that future research needs to coordinate technological and institutional innovation and also promote cooperation between digital governance norms and the international trade regime. These methods aim to provide theoretical underpinnings and pragmatic pathways for the further development of digital trade.

Keywords: Digitalization, international trade, classical trade theory, global value chain, digital divide

1. Introduction

The operational patterns of global economic activities has been transformed by the rapid development of digital technologies especially big data, artificial intelligence, blockchain and cloud computing. With the development of digital technologies, production, distribution, and consumption chains are reconstructed. Some new models including cross-border e-commerce, digital services trade, and digital transformation of global supply chains find their new positions. These new digital trade models are experiencing change of their roles significantly in global expansion. The World Trade Organization (WTO) reporting that, more than 60% of total trade in services are digital services trade. There is no doubt that digital services trade is becoming the core driver of international trade growth.

International trade's traditional ways have been constrained by far physical space, information asymmetry, and high transaction costs. Digitalization breaks through these bottlenecks by reducing

transaction costs, enhancing efficiency, and expanding market coverage. Traditional trade theories (e.g., comparative advantage theory) focus on explaining the new phenomena arising from digital technologies. Digitalization's impact on trade is necessary to be researched because it could advance theoretical innovation and provide fresh ideas for global value chain theory. Especially, digitalization can lower participation costs for SMEs and developing countries in international trade. It will potentially narrow their divide with developed countries and make them more competitive in international trade. In particular, by optimizing logistics routes, intelligent logistics systems help reduce emissions of carbon. Digitalization can be a useful choice for facilitating the development of green trade.

Now more and more scholars notice the importance of digital technologies' usage in international trade. They are focusing on how to use big data in international trade. Some of them try to make theoretical innovations that challenge conventional frameworks and deepen economic theories. In terms of mechanisms, the study focuses on the reorganization of trade participants' roles within reorganized value chains and digital transformation. In order to improve regulatory systems and lessen social contradictions, scholars have developed new theoretical frameworks in response to the new challenges brought about by digitalization.

This paper systematically reviews existing literature and then theories concerning three dimensions: the evolution of classical trade theories under digitalization, the operational mechanisms of technology-driven trade transformation, and current problems and challenges the digital revolution is facing. Through summarizing existing theories and following the newest theoretical innovation, it aims to contribute to ongoing academic contribution in this field.

2. Digitalization propels the evolution of classical trade theories

Digitalization refers to the process of transforming information or business models from the physical world into digital formats. And also, digitalization can optimize, integrate, and innovate them, make the more useful to people. Its core objectives are to enhance efficiency, reduce costs, and create new value. It also can improve transparency, make the international trade fairer. Digitalization's function is not only on technological application, but also on organizational structures of business. New business processes, commercial models, and even socio-cultural paradigms will appear during the development of Digitalization. In international trade, digitalization mainly reflected in the digitization of information, processes, and services. It is reshaping trade methods and the character of goods. Digitalization acts on international trade will facilitate the modernization of traditional trade theories. New theories can elevate trade efficiency, reduce transaction costs. It means corporate risks will be mitigated. Small and medium-sized enterprises (SMEs) will be effect more obviously than big companies. These effects promote sustainable development in the global trade industry.

Platform economies are an important form of digital economic. According to Cainiao Network's official reports and the China Smart Logistics Development White Paper, Alibaba's intelligent logistics platform Cainiao Network, has integrated big data forecasting, IoT tracking, and automated sorting to increase its yxiangdaily package processing capacity during Singles' Day from 152 million parcels in 2013 to 1.36 billion in 2023. The platform also reduces logistics costs as a percentage of revenue from 15% to 8%. It has reduced the average inventory turnover period for merchants by 25% by using demand prediction algorithms. New business models have been sparked by the pervasiveness of digitalization in international trade, giving economic growth new impetus.

In international trade, the widespread adoption of digitalization not only alters trade modalities but also poses new challenges to classical trade theories. New challenges driving theories' innovation and evolution. With the integration of emerging factors such as technology, traditional trade theories are no longer fully address contemporary trade-related economic issues. Now, international trade needs theoretical modernization. Forward-thinking economists have introduced tools such as big data

modeling and internet analytics into international trade research. By incorporating successful case studies from the digitalized trade era, these scholars have developed innovative theoretical frameworks, using big data to solve challenges posed by digitalization, have won a huge success.

The gravity model has become a primary research lens for analyzing digitalization's impact on international trade. Building upon heterogeneous firm models and their extensions, scholars such as Si Jichun et al. incorporated internet connectivity into consumer utility and demand functions, refining the gravity model. Their analysis of bilateral trade data across 190 countries demonstrated that the Internet reduces fixed costs for market entry, thereby fostering an increase in the number of foreign trade enterprises [1]. This effect was particularly pronounced in smaller nations and WTO member states. Similarly, Qiu Jiayang and Sun Chunlu empirically examined the Regional Comprehensive Economic Partnership (RCEP), constructing a theoretical model and advancing frontier gravity model specifications to explain how digital transformation shapes the dynamics of international trade service exports [2].

Traditional cost theories have also been noticed in the new age. Liu Hongkui, Zhao Wenxia, and Deng Quheng extended Nobel laureate Ronald Coase's transaction cost theory to analyze digital trade and global supply chains. Their research identified data as a new element in global industrial and value chains, with digital platforms generating novel value streams that reconfigure nations' comparative advantages and reshape the global trade landscape [3]. In exploring the mechanisms of technology-driven trade transformation, Cao Jianhai and Guo Wen integrated transaction cost economics from the New Institutional Economics school with emphasizing asset specificity, bounded rationality, and opportunism with production cost theory from the Neoclassical school. Their analytical framework revealed that under internet-enabled conditions, firms with comparative disadvantages tend to reduce vertical boundaries through outsourcing and virtualized operations, while those with comparative advantages expand their vertical integration [4].

3. The mechanisms of digital technology-driven trade transformation

Right now, digital technology is developing rapidly. It is reshaping the global trade landscape strongly. Its impact is as strong as the Industrial Revolution's transformation of the world economy. In this transformation, digital technology has not only altered traditional trade practices but also redefined the rules of international trade. From the booming growth of cross-border e-commerce to the cross-border flow of digital services, from the precise delivery of intelligent logistics to the trust reconstruction enabled by blockchain technology, digital technology is permeating and revolutionizing every aspect of international trade. This transformation influences manufacturing trade through specific pathways such as improving product quality and altering corporate profit models. More importantly, it has created new trade forms and business models, driving the restructuring and upgrading of global value chains. Understanding the mechanisms of digital technology-driven trade transformation is significant to theoretical and practical research. In practice, it is important for finding future trends in international trade and making effective trade policies.

Manufacturing is the source of trade. Research by Xie Jing and Wang Shaohong indicates that the digital economy has become a critical driver for the transformation and upgrading of manufacturing exports. Moreover, it can enhance export product quality. Specifically, a 1% increase in digitalization levels improves manufacturing product quality by 0.05%. Given China's status as a manufacturing powerhouse, the development of the digital economy is particularly crucial [5]. Yang Xinming highlights that the digital economy integrates "economies of scale" with "economies of scope" at the micro level, thereby changing traditional corporate profit models. At the meso level, network platform-centric organizational models supported by big data have reshaped market structures, while at the macro level, big data has transformed resource allocation mechanisms, generating profound economic changes [6].

In summary, digitalization is an important force for the development of international trade in the new times. Many scholars and experts support that digitalization will be a large impact on the international trade landscape, or even reconstruct it into a new morphology. However, research gaps remain in areas such as the economies of scale and product differentiation under digitalization. In the information age, international trade participants are moving from traditional enterprises to platform-based entities. That will bring regulatory challenges in the digitalized trade sphere. Building on existing literature, this study will employ case analyses to explore the principles and impacts of digitalization. Tring to promote healthy, green, and sustainable development of international trade, ensure the rationality and fairness of progress, and enhance its pivotal role in the global economy.

4. Controversial issues and empirical paradoxes

In the process of digital technology reshaping international trade, the clash between ethical concerns and economic logic has been a central research dilemma. On one hand, advocates support that digital technology makes new global dividends by enhancing efficiency and breaking geographical barriers. On the other hand, critics highlight its ethical risks, including exacerbated data monopolies, erosion of labor rights, and the widening digital divide between the Global North and South. This clash of views is further enhanced in empirical studies. Some data show that digital platforms can significantly lower trade barriers for small and medium-sized enterprises (SMEs). On the other hand, some evidence shows that algorithmic biases and arguments over data sovereignty are producing inequality. This contradiction between economic efficiency and ethical values led academia to rethink the "double-edged sword" effect of digitalized trade. How to embed human rights considerations into the growth process of technology has become an important question for resolving these controversies.

Eliminating barriers can achieve equitable trade and economic globalization. Yang Dong and Lele advocate actively aligning with other high-standard trade rules within the WTO framework. This approach aims to ensure technical safeguards for secure cross-border data transmission, thereby addressing the data flow barriers erected by nations under security rationales and offering a Chinese solution to global digital challenges [7]. Yang Tao and Zhang Hongchun focus on issues of digital fairness and justice, recognizing that digitalization is a "double-edged sword." While producing huge productivity, it also worsens real-world inequalities. They argue that upholding digital equality is essential for the sustainable development of a digital society, a task characterized by complexity and dynamism requiring long-term research [8].

Trade transformation now stands at the crossroads of ethical reflection and economic rationality. It is too difficult for the explanatory ability of traditional theoretical frameworks. Current research finds the core contradiction of the fairness problem is the coexistence of technological inclusivity and distributional imbalance. The conflict between efficiency-first principles and human-centric values is getting worse. These arguments reflect the structural contradictions of the global digital era. Resolving this deadlock requires the construction of a more inclusive analytical system. Methodologically, this requires integrating different subjects and multidimensional views. Practically, it needs the synergistic evolution of digital governance rules and the international trade system. Incorporating algorithmic transparency to bring digital public goods into the restructuring of the global economic order is also meaningful. Only by abandoning the opinion of technological neutrality and seeking balances between efficiency and fairness can economic globalization develop sustainably. Future research must go beyond the opposition of technology to determine everything. The cooperation of technological evolution and institutional innovation is necessary for expanding the boundary of the digital economy.

5. Conclusion

This study systematically analyzed the lasting effect of digital technologies on the international trade. Digital technologies make a huge impact on theoretical frameworks and reality. The research finds that big data, artificial intelligence, and blockchain have been widely used in international trade. New technology has redefined every step of global trade by reducing transaction costs, enhancing resource allocation efficiency. Market boundaries are expanded because of the saving of resources. Technological innovation also catalyzed new models such as cross-border e-commerce and digital service trade, emerging as a core driver of international trade growth.

At the theoretical level, digitalization has spurred innovation in classical trade theories. At the practical level, digital technologies have significantly optimized trade efficiency and reshaped global division of labor. It is improving manufacturing export quality and integrating economies of scale and scope. However, digitalization also carries some risks. Data monopolies, algorithmic biases, and the digital divide between the Global North and South will course unfair problem. It shows the natural contradiction between technology development and social equality.

Build a digital treatment framework is meaningful for multilateral cooperation. International trade participants should jointly build unified standards for cross-border data flow and privacy protection. International organizations such as the WTO can be a great platform for building standards. In order to enhance the social contributions of digital technology, the government should formulate regulations on algorithm transparency and provide digital public goods such as digital infrastructure assistance to developing countries to solving the problem of uneven distribution of technological dividends. Small and medium-sized enterprises should be emphasized in digital transformation. The government should reduce their cost of entering digital platforms through tax incentives, technology subsidies, and other policies. Helping them better integrate into the global value chain.

In summary, digital technology serves both as an engine for international trade transformation and a new imperative for global governance. Only through the deep integration of theoretical innovation, policy coordination, and technological ethics can the dual goals of efficiency and fairness in digital trade be achieved. Digital technology will definitely inject new power into the sustainable development of the global economy.

References

- [1] Si, J. C., Deng, K. Q., & Zhang, R. H. (2024). Does the Internet Promote International Trade? Evidence From Gravity Models and Firm Data. *Systems Engineering - Theory & Practice*, 44(9), 2915-2933.
- [2] Sun, C. L., & Bi, J. Y. (2024). The Impact of Digital Economy Development on the Efficiency of International Trade Service Exports: An Empirical Study Based on RCEP Countries. *Journal of Commercial Economics*, (15), 141-144.
- [3] Liu, H. K., Zhao, W. X., & Deng, Q. H. (2022). Theoretical Analysis of Global Industrial Chain Transformation Under the Background of Digital Trade. *Social Sciences in Yunnan*, (4), 111-121.
- [4] Cao, J. H., & Guo, W. (2017). The Impact Mechanism of the Internet on Enterprise Boundaries. *Research on Economics and Management*, 38(12), 109-116.
- [5] Xie, J., & Wang, S. H. (2022). Digital Economy and Upgrading of Export Product Quality for Manufacturing Enterprises. *Wuhan University Journal (Philosophy & Social Sciences)*, 75(1), 101-113.
- [6] Yang, X. M. (2017). Digital Economy: The Economic Logic of Deep Transformation of Traditional Economy. *Journal of Shenzhen University (Humanities & Social Sciences)*, 34(4), 101-104.
- [7] Yang, D., & Le, L. (2025). The Paradox and Transcendence of International Trade Regulations on Cross-Border Data Flow. *Modern Economic Research*, (3), 1-10.
- [8] Yang, T., Zhang, H. C., & Zhuang, Y. H. (2025). Unbeatable Justice: A Systematic Review and Prospect of Domestic and Foreign Research on Digital Inequality. *E-Government*, 1-16.