

The Economic Impact of Artificial Intelligence as a General Purpose Technology and Its Innovations in Economic Research

Yingliang Wan¹, Hong Tao², Yiheng Zhao¹, Liqian Huang¹

¹ School of Data Science, Xianda College of Economics and Humanities, Shanghai International Studies University, Shanghai 200083, China

² School of Business, Xianda College of Economics and Humanities, Shanghai International Studies University, Shanghai 200083, China

ABSTRACT

Artificial Intelligence (AI) is rapidly becoming a key driver of modern economic development, with its impact spanning multiple facets of both microeconomic and macroeconomic levels. At the microeconomic level, AI significantly alters consumer behavior and business operations by enhancing individual decision-making efficiency and optimizing internal corporate management. Simultaneously, as a General Purpose Technology (GPT), AI fosters productivity improvements, industrial structure transformations, and the emergence of new growth drivers at the macroeconomic level. This study systematically analyzes the application of AI across different economic agents, exploring its profound effects on the labor market, industrial organization, and innovation ecosystems.

KEYWORDS

Artificial Intelligence; General Purpose Technology; Economic Impact; Automation; Economic Research

1. INTRODUCTION

1.1. Research Background

In recent years, artificial intelligence (AI) technologies and theories have made significant advancements, becoming a crucial driver of global economic development. Since the Dartmouth Conference, AI has evolved from symbolism to connectionism, and further to deep learning, continuously expanding its application domains and influence. Currently, AI technologies demonstrate strong application potential across numerous industries [1]. For instance, in the field of Go, AlphaGo defeated top world players using deep learning algorithms, showcasing AI's exceptional capabilities in complex decision-making. In natural language processing, large language models such as GPT-4 have achieved a high level of understanding and generation of human language, greatly advancing applications in intelligent customer service, content creation, and more [2].

The global AI market size continues to expand, with expectations of maintaining high growth rates in the coming years. According to market research institutions, the global AI market is projected to exceed several hundred billion dollars by 2024, with China holding a significant position in the global market, particularly in the Asia-Pacific region, where its market share is steadily increasing [3]. The Chinese government places high importance on the development of AI technologies, actively promoting research and application through a series of policies and strategies. This proactive

approach facilitates the widespread adoption of AI across various sectors such as industry, healthcare, and finance. Consequently, this not only enhances China's competitiveness in the global AI landscape but also injects new momentum into the economic growth of the Asia-Pacific region.

1.2. Research Significance

As a disruptive technology, artificial intelligence has profound impacts on economic operations and industrial structures. Firstly, AI significantly enhances production efficiency and reduces operational costs through automation and intelligentization, driving the transformation and upgrading of traditional industries. For example, intelligent robots and automated production lines in the manufacturing sector not only increase production efficiency but also optimize resource allocation and reduce labor costs. Secondly, AI technology fosters the development of emerging industries such as big data analytics, cloud computing, and intelligent services. These new industries not only create numerous employment opportunities but also promote the optimization and upgrading of the economic structure.

In the field of economic research, the introduction of AI brings revolutionary changes to economic theories and empirical methods. Traditional economic research relies on classical econometric models and limited data sources, whereas AI technologies, through machine learning and big data analytics, provide more abundant and diverse data sources and analytical tools. This enables economists to more accurately understand and predict complex economic phenomena. Additionally, the application of AI technology drives the innovation of economic theories, facilitating the formation of new theories and the refinement of existing ones, thereby enhancing the depth and breadth of economic research.

1.3. Research Questions

This study aims to systematically analyze the multifaceted impacts of artificial intelligence on the economy, addressing the following core questions: Firstly, what specific effects does AI technology have on microeconomic agents, including individuals and enterprises? For example, how does AI manifest its role in enhancing individual decision-making efficiency and optimizing enterprise management? Secondly, as a General Purpose Technology (GPT), what role does AI play at the macroeconomic level? Specifically, how does AI technology influence productivity, industrial organization, and economic growth? Lastly, what innovations do AI technologies bring to economic theories and research methods within economic research? For instance, how do machine learning and big data analytics specifically apply to economic research, and what improvements do they bring to traditional economic models?

1.4. Research Methods and Structure

This study employs a combination of literature review and theoretical analysis to systematically collate and summarize existing research findings on the economic impacts of AI, thereby constructing a theoretical framework. Concurrently, through case studies and empirical analysis, the study delves into the specific applications of AI technologies across different economic agents and their economic effects. The case studies will select representative industries and enterprises to analyze the performance and outcomes of AI technology in practical applications. Empirical analysis will utilize data models to quantitatively assess the impact of AI technologies on productivity, employment, and economic growth.

The structure of the paper is organized as follows: Chapter 1 serves as the introduction, outlining the research background, significance, questions, and methods and structure. Chapter 2 reviews the development history of artificial intelligence, covering its origins, the evolution of key technologies, and the progression of research methods. Chapter 3 provides an in-depth analysis of the specific impacts of AI at both microeconomic and macroeconomic levels. Chapter 4 explores the application

of AI technologies in economic research and their innovations in economic theories and methods. Chapter 5 offers an outlook on the future development trends and research directions of AI in the economy. Chapter 6 concludes the study, summarizing the research findings and proposing policy recommendations and future research directions.

Through this structured arrangement, the study will systematically and comprehensively analyze the multidimensional impacts of artificial intelligence on the economy, providing theoretical support and practical guidance for academic research and policy-making in related fields.

2. DEVELOPMENT HISTORY OF ARTIFICIAL INTELLIGENCE

2.1. Origin and Definition of Artificial Intelligence

The origin of Artificial Intelligence (AI) can be traced back to the 1950s, particularly marked by the convening of the Dartmouth Conference in 1956. This event signified the official birth of AI as an independent academic discipline. During the Dartmouth Conference, scholars systematically explored the possibility of machines simulating human intelligence, introduced the term "Artificial Intelligence," and laid the foundational research framework for the field. Early AI research primarily focused on symbolism, which aimed to simulate human cognitive processes through symbols and rules. Researchers of this period believed that intelligence could be achieved through explicit logical and reasoning rules, leading to the development of applications such as logic reasoners and expert systems. However, symbolism also faced numerous challenges, particularly its limitations in handling fuzzy and uncertain information.

Over time, connectionism emerged, emphasizing the simulation of neural network structures and functions to achieve intelligence. This perspective posited that intelligence arises from the parallel processing and connectivity of a large number of simple units, akin to the functioning of neurons in the human brain. The development of connectionism propelled advancements in neural networks and deep learning technologies, enabling AI to achieve significant breakthroughs in fields such as image recognition, speech recognition, and natural language processing. In recent years, symbolism and connectionism have gradually merged, giving rise to hybrid intelligent systems that combine the strengths of symbolic reasoning and connectionist approaches, thereby enhancing AI's application capabilities and flexibility.

2.2. Development of Key Technologies

The evolution of key technologies has played a crucial role in the development of Artificial Intelligence. Early research on neural networks aimed to mimic the connectivity of human brain neurons. However, due to limited computational power and insufficient data support, the application scope of these early networks was constrained. With the continuous advancement of computer hardware and the advent of the big data era, machine learning technologies have rapidly progressed. Machine learning enhances AI systems' autonomous learning capabilities and adaptability by enabling computers to learn patterns and rules from data without explicit programming.

Deep learning, a subfield of machine learning, employs multi-layer neural network structures to efficiently process complex data and extract features. Deep learning has achieved breakthrough advancements in areas such as image recognition, speech recognition, and natural language processing, driving the widespread application of AI technologies. For example, Convolutional Neural Networks (CNNs) have significantly improved accuracy in image recognition, while Recurrent Neural Networks (RNNs) and their variants, such as Long Short-Term Memory networks (LSTM), have demonstrated exceptional performance in natural language processing. Additionally, novel deep learning models like Generative Adversarial Networks (GANs) have further expanded

AI's application boundaries, showcasing immense potential in content generation and augmented reality.

Significant technological breakthroughs have not only advanced AI theory but also facilitated its extensive application in the economy. Image recognition technologies are widely used in manufacturing quality control and medical imaging analysis, enhancing production efficiency and diagnostic accuracy. Natural language processing technologies play vital roles in intelligent customer service, automatic translation, and content creation, transforming communication methods and information acquisition processes. The development of these key technologies has not only enhanced the functionality and performance of AI systems but also provided robust support for the digital transformation of various industries.

2.3. Evolution of Research Methods

The evolution of research methods in Artificial Intelligence reflects the field's progression from theoretical exploration to practical application. Early AI research predominantly employed human-centered methods, emphasizing the simulation of human cognitive processes to achieve intelligence. This approach relied on explicit rules and logical reasoning, attempting to replicate human thought processes through precise models. However, as research advanced, scholars increasingly recognized that relying solely on rules and symbols was insufficient for effectively addressing complex and dynamic real-world environments, prompting a shift towards more flexible and data-driven research methods.

The rise of connectionist methods marked a significant transformation in AI research methodologies, emphasizing the realization of intelligence through vast amounts of data and parallel computing. The introduction of neural networks and deep learning technologies enabled AI systems to autonomously learn and optimize from data without relying on pre-established rules. This shift not only enhanced the adaptability and generalization capabilities of AI systems but also excelled in handling complex and high-dimensional data. Furthermore, the development of deep learning methods has spurred the emergence of new research approaches such as reinforcement learning and transfer learning, which further augment AI systems' abilities in autonomous decision-making and cross-domain applications.

In recent years, hybrid research methods have gradually become mainstream, combining the strengths of symbolism and connectionism in an effort to balance rule-driven and data-driven approaches. Hybrid methods enhance the interpretability and transparency of AI systems while also improving their robustness and flexibility in complex environments. This methodological evolution has not only enriched the research paradigms of AI but also provided more robust methodological support for AI applications across a broader range of economic sectors.

2.4. Current Development Trends and Future Directions

Currently, Artificial Intelligence is in a rapid development phase, characterized by diversification and deep integration. Research on Artificial General Intelligence (AGI) has become a significant direction in the field, aiming to develop intelligent systems with broad cognitive and autonomous learning capabilities. Although achieving AGI still faces numerous technical and theoretical challenges, progress in this area has outlined the future trajectory of AI development. Concurrently, the application of Artificial Specialized Intelligence (ASI) is deepening across various specialized fields, driving the digital transformation and intelligent upgrading of industries.

The enhancement of big data and computational power is a key factor driving AI development. The accumulation of vast amounts of data provides rich training resources for machine learning and deep learning, enabling AI systems to discover patterns and regularities in larger and higher-dimensional datasets. Simultaneously, advancements in cloud computing and high-performance computing technologies have significantly boosted the computational capacity and processing efficiency of AI

systems, facilitating the efficient training and deployment of complex deep learning models. These technological advancements not only accelerate the pace of AI research but also expand its application scope across different economic sectors.

Looking ahead, the development of Artificial Intelligence will increasingly focus on the autonomy, interpretability, and ethics of intelligent systems. In terms of autonomy, AI systems will further enhance their autonomous decision-making and self-optimization capabilities, enabling them to learn and adapt autonomously in more complex and dynamic environments. Regarding interpretability, researchers will strive to improve the transparency and explainability of AI systems, making their decision-making processes clearer and more understandable to meet trust and regulatory requirements in practical applications. From an ethical standpoint, as AI technologies become more widespread, issues such as data privacy, algorithmic fairness, and ethical risks will receive greater attention, driving the development of AI technologies within compliant and ethical frameworks.

Moreover, the integration of Artificial Intelligence with other emerging technologies will become an important development direction in the future. The combination of technologies such as the Internet of Things (IoT), blockchain, and quantum computing will further expand the application boundaries of AI, fostering the emergence of new business models and economic ecosystems. Interdisciplinary research and innovation will also drive the deep application of AI in the economy, promoting the optimization of economic structures and the sustainability of social development. Overall, the prospects for Artificial Intelligence are broad, and it is expected to play an increasingly important and diversified role in the future economy.

3. ECONOMIC IMPACT OF ARTIFICIAL INTELLIGENCE

Artificial Intelligence (AI), as a disruptive technology, is reshaping economic structures and operational mechanisms across multiple levels. This chapter delves into the specific impacts of AI on both microeconomic and macroeconomic scales, analyzing its supplementary effects on productivity to comprehensively reveal AI's profound influence on the economy.

3.1. Microeconomic Impact

3.1.1. Individual Level

The impact of Artificial Intelligence at the individual level primarily manifests in enhanced decision-making efficiency and increased privacy risks. AI technologies, through data analysis and intelligent recommendation systems, enable individuals to make decisions more swiftly in areas such as consumption, investment, and career choices [4]. However, as AI systems become more reliant on personal data, issues of privacy breaches and data security become more prominent [5]. Individuals must balance the benefits of improved efficiency with the need to protect their privacy, navigating the trust and dependency on AI technologies.

Moreover, the dependence on algorithms has potential implications for personal behavior and decision-making. AI algorithms analyze individuals' historical data and behavioral patterns to predict and influence future behaviors [6]. This influence can be positive, such as helping individuals optimize time management and health habits, but it can also have negative effects, such as limiting the diversity and autonomy of personal choices or even leading to behavioral dependencies [7].

3.1.2. Enterprise Level

At the enterprise level, Artificial Intelligence significantly enhances decision quality, value creation, and internal management optimization. AI technologies, through big data analytics and intelligent forecasting, assist businesses in making more accurate strategic decisions, optimizing supply chain management, and increasing production efficiency. For instance, predictive maintenance systems in manufacturing can anticipate equipment failures, reducing downtime and maintenance costs. In the

financial sector, AI algorithms can more accurately assess credit risks and market trends, optimizing investment portfolios.

The diversity of AI applications across different industries also reflects its varied economic impacts. In the health insurance industry, AI improves the precision of insurance product pricing and risk management through data analysis and risk assessment. In the new media sector, AI-driven content recommendation systems enhance user experience and advertising precision, driving rapid growth in the digital advertising market. Additionally, the application of AI technologies promotes the accumulation and management of intangible assets within enterprises. Through technological innovation and data accumulation, companies enhance their competitiveness and market value.

3.1.3. Economic Agents Level

The potential impact of General Artificial Intelligence (AGI) as a new type of economic agent is increasingly evident. AI systems not only exist as tools but also possess characteristics of economic agents, such as autonomous decision-making and self-optimization capabilities. The emergence of such new economic agents may alter traditional corporate structures and market competition dynamics, steering economic ecosystems towards human-AI symbiosis.

Building a human-AI symbiotic economic ecosystem is a crucial aspect of AI's economic impact. Human-AI symbiosis means that humans and AI systems collaborate in economic activities, leveraging their respective strengths to achieve optimal resource allocation and maximum efficiency. For example, in the production process, AI systems handle data analysis and process optimization, while human employees focus on creative and strategic tasks, thereby enhancing overall production efficiency and innovation capacity.

3.2. Macroeconomic Impact

3.2.1. AI as an Automation Tool

As an automation tool, AI significantly impacts economic growth at the macroeconomic level by improving production efficiency, reducing operational costs, and ensuring product quality. The application of AI technologies in manufacturing, logistics management, and quality control enables enterprises to achieve higher production efficiency at lower costs, thereby driving overall economic growth.

However, the widespread application of AI also disrupts the labor market, leading to adjustments and redistribution of employment structures. On one hand, AI replaces some repetitive and low-skilled jobs, resulting in a reduction of these positions. On the other hand, the application of AI creates new high-skilled jobs, such as data scientists, AI engineers, and intelligent system maintenance personnel. Therefore, the labor market must adapt to these structural changes by enhancing the skill levels of the workforce through education and training to meet new employment demands.

3.2.2. AI as a General Purpose Technology (GPT)

As a General Purpose Technology, AI possesses extensive application potential and profound economic impacts. The defining characteristic of GPTs is their ability to be widely applied across multiple industries and fields, fostering continuous technological progress and complementary innovation. The ongoing advancements in AI technology drive transformations in industrial organization and the formation of new growth drivers for economic expansion.

AI's influence on industrial organization is evident in its facilitation of supply chain optimization and value chain extension. Through intelligent production and management, enterprises achieve more efficient resource allocation and more flexible production models, enhancing the competitiveness of entire industrial chains. Simultaneously, the application of AI technologies promotes the development of emerging industries such as smart manufacturing, intelligent transportation, and smart healthcare.

These emerging industries not only optimize economic structures but also create numerous new growth points.

In terms of economic growth, AI as a GPT significantly propels sustained economic expansion by enhancing productivity and fostering innovation. The application of AI technologies not only increases the production efficiency of existing industries but also spawns new industries and business models, further driving economic diversification and high-quality development.

3.2.3. Productivity and Economic Growth

AI's impact on productivity is dual-faceted; on one hand, it significantly enhances productivity through technological advancements and process optimization, while on the other hand, it may cause short-term productivity fluctuations due to technological substitution and market adjustments. Overall, the positive effects of AI on productivity dominate, and in the long term, the widespread application of AI technologies will continue to drive productivity improvements and accelerate economic growth.

Drawing a parallel to the Information and Communication Technology (ICT) productivity paradox, AI technology also faces similar challenges. While ICT initially brought significant productivity improvements during its early application stages, the rate of productivity growth slowed as the technology became more widespread and its applications matured. AI technology is likely to experience similar phase adjustments in the future, with the pace of productivity enhancement potentially slowing due to technological saturation and market adaptation. However, with continuous innovation and the expansion of application domains, AI is expected to sustain productivity growth across a broader range of fields.

3.3. Supplementary Productivity Effects

3.3.1. Industry Integration and Industrial Structure Transformation

The penetration and application of AI technologies across different industries promote the integration of industries and the transformation of industrial structures. Cross-industry applications of AI not only enhance production efficiency and innovation capabilities within each industry but also drive the evolution of new business models and industrial organizations. For example, the integration of AI technologies in the financial and healthcare sectors has given rise to intelligent finance and intelligent healthcare, respectively, driving rapid development and transformation within these industries.

The emergence of new business models, such as platform economy and sharing economy, relies on AI technologies to achieve efficient resource allocation and intelligent service delivery. These new business models not only enhance economic operational efficiency but also create new economic growth points, fostering the optimization and diversification of the economic structure.

3.3.2. Economies of Scale and Network Effects on the Demand and Supply Sides

On the demand side, the customization and differentiated pricing mechanisms of AI products and services meet the personalized needs of different consumers, promoting market demand diversification and the realization of economies of scale. AI technologies, through precise market analysis and intelligent recommendations, help enterprises better understand and satisfy consumer demands, enhancing market responsiveness and service quality.

On the supply side, the application of AI technologies facilitates the realization of economies of scale and network effects. Enterprises achieve optimal resource allocation and effective cost control through large-scale data analysis and intelligent production, thereby improving overall production efficiency. Additionally, the network effects of AI technologies enable enterprises to form closer industrial collaborations and ecosystems through data sharing and collaborative innovation, further promoting economic agglomeration effects and collaborative development.

In summary, the multifaceted impacts of Artificial Intelligence on both microeconomic and macroeconomic levels, combined with its supplementary effects on productivity, comprehensively demonstrate the significant and far-reaching role of AI technologies in contemporary economies. These impacts not only drive the enhancement of economic efficiency and the optimization of industrial structures but also foster new growth drivers and diversified economic development, laying a solid foundation for the sustained prosperity of future economies.

4. ARTIFICIAL INTELLIGENCE AND ECONOMIC RESEARCH

Artificial Intelligence (AI) plays a significant role not only in economic operations and industrial structures but also profoundly influences the research methodologies and theoretical developments within economics. This chapter explores the new data sources and methods introduced by AI in economic research, as well as the contributions of economists in the AI field, revealing how AI drives theoretical innovation and methodological advancements in economics.

4.1. New Data and Methods in Economic Research

4.1.1. Diversification of Data Sources

With the advancement of artificial intelligence technologies, the availability of diverse data sources in economic research has significantly expanded. Traditional economic data primarily originates from government statistics, corporate reports, and surveys. However, the widespread use of platform data, corporate big data, and online experimental data now provides economists with richer and more detailed data resources. Platform data, such as the vast amounts generated by social media, e-commerce, and mobile applications, can reflect consumer behavior and market dynamics. Corporate data encompasses various aspects of production, sales, and supply chains, providing a foundation for in-depth analysis of business operations and industry development. Online experimental data, obtained through virtual experiments and simulated environments, assist researchers in testing economic theories and policy effects. This diversification of data sources not only enhances the precision and breadth of economic research but also offers economists new research perspectives and methodologies.

4.1.2. Machine Learning and Causal Inference

The application of machine learning technologies in economic research has brought significant improvements and innovations to traditional econometric methods. Traditional econometric methods rely on predefined models and assumptions, whereas machine learning can automatically identify patterns and relationships from large datasets, enhancing the flexibility and predictive capabilities of models. In the realm of causal inference, machine learning methods utilize complex data analyses and algorithm optimizations to help researchers more accurately identify causal relationships, reducing model misspecifications and biases. For example, the application of machine learning algorithms in resource allocation and market design can optimize resource distribution and improve market efficiency, thereby advancing the development of economic theories and the optimization of practical applications.

4.1.3. AI Applications in Economic Experiments

The application of artificial intelligence technologies in economic experiments has greatly expanded the possibilities and depth of experimental research. Traditional economic experiments typically rely on human participants to make decisions and interact, whereas AI systems can participate as "subjects," enhancing the efficiency and controllability of experiments. AI systems can simulate complex economic behaviors and market environments, enabling researchers to better mimic dynamic interactions in real economic settings and test the applicability and robustness of economic theories under various conditions. Additionally, the use of AI in game theory experiments helps in

deeply understanding participants' strategic choices and behavioral patterns, thereby advancing the refinement and development of economic theories.

4.1.4. Challenges and Opportunities

Despite the numerous opportunities AI brings to economic research, it also presents a series of challenges. Firstly, the "black box" nature of AI systems makes their decision-making processes difficult to interpret, increasing issues related to the transparency and credibility of research results. Secondly, data security and privacy protection become significant ethical concerns, requiring economists to balance data utilization with privacy protection when employing AI technologies. Moreover, the rapid development of AI technologies demands continuous updates and adaptations of research tools and methods in economics to address new types of data and analytical requirements. Faced with these challenges, economists need to actively explore solutions, such as developing interpretable AI models, enhancing data privacy protection measures, and promoting interdisciplinary collaboration to improve the scientific rigor and standardization of research methodologies.

4.2. Economists' Contributions to Artificial Intelligence

4.2.1. Historical Figures' Interdisciplinary Contributions

In the intersection of artificial intelligence and economics, many outstanding economists have made significant contributions. For example, John von Neumann's pioneering work in game theory and computer science laid the theoretical foundations for AI development. Herbert Simon, through his studies on decision-making processes and cognitive psychology, promoted the application of AI in economic decision-making and management. These historical figures facilitated the deep integration of AI and economics through interdisciplinary research, expanding the boundaries and application scope of economic studies.

4.2.2. Contemporary Economists' Research

In the present day, economists continue to play a crucial role in the field of artificial intelligence, advancing both the application of AI technologies in economic activities and the theoretical development of economics. Contemporary economists focus on AI regulation issues, researching how to balance technological innovation with ensuring market fairness and data privacy. They also delve into the roles of intelligent agents in economic activities, analyzing the interactions between AI systems and human economic agents. Furthermore, economists actively engage in the study of human-AI symbiotic economic theories, exploring how policy and institutional design can optimize human-AI collaboration to enhance overall economic efficiency and social welfare. These studies not only enrich economic theories but also provide policy support and theoretical guidance for the application of AI technologies, fostering deep cooperation and mutual development between economics and AI.

5. FUTURE PROSPECTS

Artificial Intelligence (AI), as a cutting-edge technology, is continuously evolving and profoundly influencing the future direction of economic development. This chapter explores the potential impacts of AI on future economies, encompassing health and sustainable development, regulatory and policy recommendations, and the deepening collaboration between economics and AI. Additionally, it proposes key directions for future research, including the intersection of AI and economics and the impact of technological advancements on economic laws, aiming to provide guidance for further understanding and addressing the economic transformations brought about by AI.

5.1. Future Economic Impacts of Artificial Intelligence

5.1.1. Health and Sustainable Development

In the future, Artificial Intelligence will play a crucial role in promoting health and sustainable development. AI technologies contribute to sustainable economic growth by optimizing resource allocation, increasing production efficiency, and facilitating the application of green technologies. In the medical field, AI will further enhance the accuracy of disease diagnosis and the personalization of treatment plans, improving the efficiency and coverage of public health systems. Simultaneously, the application of AI in environmental monitoring, energy management, and smart city construction will help reduce resource waste, lower carbon emissions, and promote the development of a green economy.

Moreover, the widespread adoption of AI technologies will drive the development of intelligent manufacturing and smart agriculture, elevating the automation and intelligence levels of production processes, reducing human errors and resource wastage, and enhancing the resilience and sustainability of supply chains. By promoting technological innovation and green transformation, AI will become an essential tool for achieving global sustainable development goals, contributing to the construction of a more environmentally friendly and efficient economic system.

5.1.2. Regulatory and Policy Recommendations

With the rapid advancement of Artificial Intelligence technologies, their economic and social impacts have become increasingly significant. Therefore, it is particularly important to establish effective regulatory and policy frameworks. The necessity of AI regulation lies in ensuring the safety, fairness, and transparency of technologies, as well as preventing potential risks and negative impacts. Specifically, regulatory policies should encompass data privacy protection, algorithmic transparency, ethical standards, and accountability mechanisms to safeguard individual rights and public interests.

Implementing AI regulation faces numerous challenges, including technological complexity, the need for international cooperation, and the dynamic nature of technological environments. To address these challenges, policymakers need to collaborate closely with technology experts and stakeholders to develop flexible and forward-looking regulatory measures. Additionally, market design schemes for AI regulation based on economic frameworks will help balance innovation and risk, promoting the healthy development and widespread application of AI technologies.

5.1.3. Deepening Collaboration between Economics and AI

The deepening collaboration between economics and Artificial Intelligence will drive theoretical and methodological innovations, enhancing the scientific and applicative aspects of economic research. In terms of theoretical innovation, economists can leverage AI technologies to construct more complex and dynamic economic models, gaining deeper insights into market mechanisms and the inherent laws of economic behavior. Regarding methodological innovation, AI offers new tools and methods, such as machine learning and big data analytics, which significantly enrich the research techniques in economics, improving the precision and efficiency of economic analyses.

Furthermore, the collaboration between economics and AI will promote interdisciplinary research, fostering the integration of social sciences with natural sciences. By combining knowledge and technologies from different fields, economists can more comprehensively analyze and solve complex economic problems, enhancing the scientific and effective nature of policy formulation. This deepened collaboration not only contributes to the advancement of economic theory but also provides new theoretical support and practical guidance for the application and innovation of AI technologies, fostering the close cooperation and mutual development of economics and AI.

5.2. Future Research Directions

5.2.1. Intersection of AI and Economics

In the future, the intersection of AI and economics will become a significant direction in both academic and practical fields. Constructing and analyzing new economic ecosystems will help in understanding the comprehensive impact of AI technologies on industrial structures, market competition, and economic growth. Through interdisciplinary approaches, researchers can explore the application patterns and economic effects of AI in different economic sectors, revealing the interactive relationship between technological progress and economic development.

Additionally, in-depth research on the application and economic impact of AI in emerging industries will provide important references for policy formulation and industrial planning. Researchers can evaluate the actual effects of AI technologies in fields such as intelligent manufacturing, smart transportation, and fintech through empirical analysis and case studies, exploring their specific impacts on employment, productivity, and economic structural adjustments. These studies will offer scientific support for optimizing economic structures and promoting high-quality development.

5.2.2. Technological Advancements and Economic Laws

Continuous advancements in Artificial Intelligence technologies pose new challenges and alignments with traditional economic laws. Future research needs to thoroughly investigate how AI technological progress affects production functions, market structures, and economic growth models. Specifically, researchers should focus on the role of AI in resource allocation, production efficiency, and innovation capabilities, analyzing its contributions to the supplementation and refinement of economic growth theories.

Simultaneously, the integration and innovation of scientific development laws with economic theories will promote the modernization and adaptability of economic theories. By incorporating the dynamic developments of AI technologies, economists can construct more dynamic and complex economic models to explain and predict new trends and patterns in economic phenomena. This integration not only enriches the theoretical framework of economics but also enhances the explanatory power and policy guidance capacity of economics concerning real economic issues.

In summary, the future prospects section not only reveals the broad impacts and potential opportunities of Artificial Intelligence in the economy but also emphasizes the necessity of addressing the challenges it brings. Through the promotion of health and sustainable development, effective regulatory and policy recommendations, and the deepening collaboration between economics and AI, the future economy will become more intelligent, efficient, and sustainable. Meanwhile, clear future research directions will provide academic and practical fields with continuous exploration and innovation paths, aiding in the achievement of sustained economic prosperity and comprehensive social progress.

6. CONCLUSION

This study systematically analyzes the multidimensional impacts of Artificial Intelligence (AI) on the economy, encompassing its profound effects on both microeconomic and macroeconomic levels, as well as its applications and theoretical innovations in economic research. By reviewing the development history of AI, exploring its specific impacts on individuals, enterprises, and the overall economy, and examining the methodological innovations AI has brought to economic research, this paper comprehensively reveals the significant role of AI as a General Purpose Technology (GPT) in the contemporary economy.

6.1. Research Summary

Firstly, AI significantly enhances individual decision-making efficiency and enterprise management levels at the microeconomic level, promoting value creation and internal optimization. However, this process is also accompanied by issues such as privacy risks and algorithmic dependence, necessitating a balance between efficiency improvements and risk mitigation. Secondly, as a GPT, AI drives productivity enhancements, industrial structure optimization, and the emergence of new growth drivers at the macroeconomic level. However, it also impacts the labor market, requiring adjustments and retraining of the workforce. Additionally, the widespread application of AI fosters industry integration and the emergence of new business models, further promoting the diversification of the economy.

In the field of economic research, AI technologies enrich economic research tools and methodologies by providing diversified data sources and advanced analytical methods, enhancing the precision and depth of research. Simultaneously, the contributions of economists in the intersection of AI and economics drive theoretical innovation and deepen empirical research, fostering a close integration between economics and technological sciences.

6.2. Theoretical and Practical Implications

This study demonstrates that AI, as a powerful technological force, is redefining various aspects of economic operations. Its impacts are both positive and bring new challenges. Economic research must keep pace with technological advancements, deeply understanding the mechanisms and applications of AI technologies to better predict and guide economic changes. At the same time, policymakers need to establish scientifically sound regulatory frameworks that promote AI innovation and application while effectively mitigating potential risks, ensuring social equity and economic stability.

6.3. Future Research and Collaboration Directions

To comprehensively understand and address the economic transformations brought about by AI, future research should further explore the impact of AI technological advancements on traditional economic laws, investigate pathways for constructing human-AI symbiotic economic ecosystems, and develop effective regulatory policies. Additionally, deepening interdisciplinary collaboration by integrating research outcomes from economics, computer science, ethics, and other fields will help form more comprehensive theoretical frameworks and practical guidelines, promoting the healthy development of AI technologies in the economy.

6.4. Concluding Remarks

In summary, the importance of Artificial Intelligence in the contemporary economy cannot be overlooked. Its multidimensional impacts are profoundly changing economic structures and operational mechanisms. Economic research plays a critical role in understanding and guiding AI development, necessitating continuous innovation in theories and methods, and promoting interdisciplinary collaboration to address the complex challenges facing future economies. Through the combined efforts of scientific research and policy support, AI technologies will better serve economic development and social progress, achieving sustainable economic prosperity.

ACKNOWLEDGEMENTS

This research was funded by the 2024 Annual School-level Research Project of Shanghai International Studies University, Xian Da College of Economics and Humanities (Grant No. A3107.24.1801.2410)

REFERENCES

- [1] Wang Q, Hao Y, Cao J. Learning to traverse over graphs with a Monte Carlo tree search-based self-play framework [J]. *Engineering Applications of Artificial Intelligence*, 2021, 105: 104422.
- [2] Mann B, Ryder N, Subbiah M, et al. Language models are few-shot learners [J]. *arXiv preprint arXiv: 2005.14165*, 2020, 1.
- [3] Mettler A. *The Future of the Logistics Industry in the European Union: An Outlook to 2032 Supported by Current and Upcoming Market Trends* [D]. Universidade NOVA de Lisboa (Portugal), 2022.
- [4] Johnson S, Acemoglu D. *Power and progress: Our thousand-year struggle over technology and prosperity* [M]. Hachette UK, 2023.
- [5] Hongladarom S. *Shoshana Zuboff, The age of surveillance capitalism: the fight for a human future at the new frontier of power*: New York: Public Affairs, 2019, 704 pp. ISBN 978-1-61039-569-4 (hardcover) 978-1-61039-270-0 (ebook) [J]. 2023.
- [6] Richmond G, Cho C, Gallagher H A, et al. Fast and slow thinking to address persistent and complex problems in teaching and Learning [J]. *Journal of Teacher Education*, 2021, 72(4): 401-404.
- [7] Slussareff M. O'Neil, Cathy. 2016. *Weapons of Math Destruction: How Big Data Increases Inequality and Threatens Democracy*. Crown [J]. 2022.