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Review Paper

The Influence of Investments in Science and Technology on the Innovative Development of the Global Economic System

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ABSTRACT

The relevance of the influence of investments in science and technology on the innovative development of the world economy is becoming crucial in the context of globalization and rapid technological change. This process has an impact on economic growth, environmental sustainability, and social development, making it a key element for researchers, policy makers, and practitioners. The purpose of the academic paper is to analyze the impact of investments in science and technology on the development of innovations in the world economy. Different types of investments and their impact on innovation processes in different sectors are the objects of the research. The research methodology is based on systemic and structural-functional approaches, which make it possible to comprehensively analyze the complex interrelationships and processes in the field of investments and innovations. The research has revealed that an effective combination of public and private investments is critical to stimulate innovation. The analysis has shown that investments in green innovation and digital transformation are essential for environmental sustainability and sustainable development. The obtained results emphasize the significance of the balance between economic, environmental and social aspects of investments in science and technology. It has also been determined that digital transformation opens up new opportunities for innovation in all sectors of the economy; however, it also creates challenges related to data security and social adaptation. The research results are of considerable practical interest to policy makers, investors, and researchers since they provide an evidence base for formulating strategies for investing in science and technology as well as for developing innovation ecosystems. The provided recommendations and directions for further research in this area are aimed at deepening the understanding of the dynamics of investment and innovation, especially in the context of rapid technological change and global challenges.

HIGHLIGHTS

- Investments in science and technology are a critical driver of innovative development, with global attention and expenditures steadily increasing, reflecting the acknowledgment of their pivotal role in shaping the future of economies and fostering competitiveness.
- The study emphasizes the multifaceted impact of investments, showcasing the positive correlation between government subsidies and private investment, the role of foreign direct investments

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in green innovation, and the transformative effect of digital investments on industrial structure, environmental quality, and overall sustainable development.

Keywords: Investments in science and technology, innovative development, global economy, economic growth, green innovations, public and private investments, change management, economic relations, sustainable development goals, achievement of sustainable development goals

The modern world is characterized by rapid technological changes that dramatically influence all aspects of life. In this context, investments in science and technology are becoming a crucial factor in shaping the future of innovative development. This aspect is of particular importance in the global economy, where each new technology can change the balance of power and open up new opportunities for growth and development.

Analyzing the latest OECD data, we observe that in 2020, global R&D expenditures amounted to 2,4% of global GDP, which is a significant increase compared to previous years. For instance, the United States invested 3,1% of its GDP in R&D, while China invested 2,4% (OECD, 2023). These data emphasize the increasing attention to investments in science and technology at the global level and indicate the growing role of these investments in shaping the innovation potential of national economies. The increase in R&D investments reflects the global awareness of the importance of science and technology as drivers of economic development and competitiveness.

The present academic paper examines various aspects of the impact of investment in science and technology on innovative development. It examines how these investments influence the development of new technologies and procedures as well as how they help create competitive advantages on a global scale using empirical data and theoretical models.

The scientific article includes an analysis of international case studies that demonstrate how investments in the science and technology sector influence the innovation process in different countries. The research also highlights the political aspects, in particular, the role of government strategies and programs in stimulating or restraining innovation potential.

We will try to provide a comprehensive understanding of the impact of investment in science and technology on various areas of the economy and innovation development, opening up new perspectives for research and development in this area.

Analytical Review of the Literature on the Research Topic

The study by Z. Ahmed, M. Ahmad, M. Murshed, M.I. Shah, H. Mahmood, & S. Abbas (Ahmed *et al.* 2022) focuses on the impact of investments in green technologies and technological innovation in G7 countries. The authors analyze how such investments contribute to environmental sustainability and increase the supply of green energy. This research opens up broad prospects for understanding the impact of investment in scientific innovation on economic development.

The issue of financing researches in the field of science, technology and innovation is studied by A. Aleman-Dias (Alemán-Díaz, 2023). In his work, the author analyzes the motivations that drive public funding for STI sphere, thereby providing a comprehensive overview of policy initiatives and their impact on scientific research.

M. Amini and A. Rahmani consider a significant aspect of financial success through compliance with environmental and social goals (Amini & Rahmani, 2023). They offer a comprehensive literature review and research agenda on sustainable investing that emphasizes the importance of integrating environmental and social initiatives into investment strategies.

P. Boeing, J. Eberle, and A. Howell (Boeing, Eberle, & Howell, 2022) study the impact of government subsidies on R&D in China. Their scientific work enhances the understanding of how public funding can stimulate investment in research, technological innovation, and economic growth.

S. F. Boltaevna and A. Upashevna (Boltaevna & Upashevna, 2022) analyze the features of the innovative economy and its evaluation indicators. This study helps identify the key elements that contribute to innovative development in the economy, in particular, in the context of R&D investments.

H. Cui, Y. Cao, C. Feng, & C. Zhang (Cui *et al.* 2023) examine the influence of ICT investments on carbon emissions in China. Their research makes a significant contribution to understanding the multiplier effect of such investments on environmental performance.

I. Djurayeva (Djurayeva, 2023) focuses on the role of investment resources in the effective operation of free economic zones. Her research emphasizes the importance of strategic investment to stimulate innovation and economic development.

The review is concluded by the study conducted by S. Dutta, B. Lanvin, S. Wunsch-Vincent, and L. R. León (Dutta *et al.* 2022), which presents the "Global Innovation Index 2022" and offers an assessment of future innovation development based on the dynamics of technological change and global trends.

P. Fears & Canales (Fears & Canales, 2023) explore the role of science, technology and innovations in transforming global food systems. Their work points to the importance of innovative approaches in addressing global nutrition challenges, emphasizing the need to invest in research and development of new technologies.

F. Foffano, T. Scantamburlo, and A. Cortés (Foffano, Scantamburlo & Cortés, 2023) analyze AI investments for social good, focusing on the strategies of European countries. Their study opens up perspectives on the impact of public investment in AI on social development and innovations.

B.A. Gyamfi, D.K. Agozie, and F.V. Bekun (Gyamfi, Agozie & Bekun, 2022) examine how technological innovations, foreign direct investments, and natural resources can contribute to the BRICS economies in the modern industrial era. This study provides insights into the interactions between investments, innovations and economic development.

Jianguo, D., K. Ali, F. Alnori, & S. Ullah (Jianguo *et al.* 2022) study the correlation between financial development, technological innovations, institutional quality, and environmental quality in OECD countries. Their analysis emphasizes the role of financial investments in supporting innovations and their impact on sustainable development.

M.A. Khalil and K. Nimmanunta (Khalil & Nimmanunta, 2023) compare traditional and green investments. They explore their impact on innovations and financial and environmental prospects. This study opens new perspectives for understanding the impact of investment on sustainability and innovation activity.

P.A. Khan, S.K. Johl, S. Akhtar, M. Asif, A.A. Salameh, & T. Kanesan (Khan *et al.* 2022) examine the open innovation of institutional investors and the higher education system, focusing on creating an open approach for quality education. Their approach shows how investments can contribute to the achievement of sustainable development goals.

Yu. Kyrylov, V. Hranovska, G. Zhosan, and I. Dotsenko (Kyrylov *et al.* 2022) study the innovative development of agricultural enterprises in Ukraine in the context of the fourth industrial revolution. Their scientific work emphasizes the importance of innovations and investments for adapting to new production conditions and challenges.

Ultimately, H.S. Lalani, S. Nagar, A. Sarpatwari, R.E. Barenie, J. Avorn, B.N. Rome, & A.S. Kesselheim (Lalani *et al.* 2023) analyze the US public investments in the development of mRNA vaccines for COVID-19. Their research reflects the significant impact of public funding on scientific achievements and innovations in medicine.

V. Leal Filho, D.G. Vidal, C. Chen, M. Petrova, M.A.P. Diniz, P. Yang and others (Leal Filho *et al.* 2022) have assessed the necessary investments, new technologies and infrastructure to achieve the Sustainable Development Goals. This study highlights the significance of integrated investments across sectors for addressing global environmental and social challenges.

Yu. Ning, J. Cherian, M.S. Sial, S. Álvarez-Otero, W. Comite, & M. Zia-Ud-Din (Ning *et al.* 2023) explore the role of green bonds as a new driver of sustainable green finance, energy efficiency investments, and economic growth at the global level. This study shows how innovative financial instruments can contribute to environmental and economic development.

B. Peng, I. Zhao, E. Elahi, and A. Wang (Peng *et al.* 2023) explore the impact of investments in environmental protection, green innovation, and solid waste management in China. Their empirical study is based on panel data and it emphasizes the role of investments in stimulating innovation and improving environmental policy.

M. Perez-Alaniz, H. Lenihan, J. Doran, and N. Hewitt-Dandas (Perez-Alaniz *et al.* 2023) study financial resources for researches and innovations in small and large firms, analyzing whether more resources actually contribute to greater innovation activity. This study provides an understanding of the impact of financial capabilities on the innovation potential of organizations.

B.D.F. Qizi (Qizi, 2023) analyzes the impact of the attractiveness of the investment environment on the social-economic development of regions on the example of the Navoi region. This scientific work emphasizes the importance of creating favorable conditions for investors as a catalyst for regional development.

D. Sala, I. Bashynska, O. Pavlova, K. Pavlov, N. Chorna, and R. Chornyi (Sala *et al.* 2023) study investment and innovation activity in the field of renewable energy sources in the electricity industry of the southeastern region of Ukraine. Their analysis points to the significance of investments in stimulating innovations in this area.

H.N. Shahzadi, M. Ali, R.K. Ghafoor, and S.U. Rahman (Shahzadi *et al.* 2023) examine whether innovations and foreign direct investments influence renewable energy consumption in developing countries. This study shows how innovations and investments can contribute to the energy transition.

F.B. Shakirova (Shakirova, 2022) analyzes models of innovation development and their interrelation with economic growth (Shakirova, 2022), as well as the importance of investments in the development of innovations in the economy (Shakirova, 2022). These studies demonstrate how investments and innovation strategies affect the overall economic development of countries.

V. Song and H. Han (Song & Han, 2022) study the bilateral impact of foreign direct investments on the efficiency of green innovations based on data from 30 Chinese provinces. This research shows how foreign investment can stimulate environmental innovations and contribute to sustainable development.

M.K. Suyunovich and K.J. Shakhriyorovich (Suyunovich & Shakhriyorovich, 2022) analyze the mechanism of innovative development of digital transformation processes in regional industry. Their scientific work focuses on the role of innovations in digitalization and its impact on economic development.

S. Ullah, S. ur Rahman, & Ch. A. Rehman (Ullah, Rahman, & Rehman, 2023) use an asymmetric ARDL approach to analyze the impact of public investments and technological innovations on environmental pollution. Their analysis shows how government investments can influence the environment by stimulating innovations.

R. Wang, M. Usman, M. Radulescu, J. Cifuentes-Faura, and D. Balsalobre-Lorente (Wang *et al.* 2023) examine how technological innovations, financial development, foreign direct investments, and energy consumption contribute to environmental sustainability in developing European countries. Their research opens up ways to achieve environmental sustainability through innovations.

H. Wen, K. Zhong, and C.S. Lee (Wen, Zhong & Lee, 2022) study the impact of digitalization and competition strategies on corporate innovations using data from Chinese manufacturing companies. This study shows how digital technologies can influence the innovation activities of enterprises.

J. Wen, K.W. Okolo, I.K. Ugwuoke, and K. Kolani (Wen *et al.* 2022) examine the impact of renewable energy, energy efficiency, and technological innovation on trade, investment, and human capital development. This study contributes to the understanding of how different factors interact to stimulate innovation in the energy sector.

C. Wu, *et al.* (Wu *et al.* 2022) analyze whether government subsidies improve innovation investments of new energy companies using data from Chinese public companies. This study indicates the significance of government support for stimulating innovations in new energy.

K. Yang, *et al.* (Yang *et al.* 2023) study the impact of China's investment in high-speed railways on the regional economy and pollutant emissions. This research emphasizes how large infrastructure investments can influence economic development and environmental performance.

L. Zhang, H.B. Saydaliev, & S. Ma (Zhang, Saydaliev & Ma, 2022) analyze whether investments in green finance and technological innovations improve renewable energy efficiency and the achievement of sustainable development goals. This scientific work demonstrates the interconnection between green investment, innovations, and sustainability.

I. Zhao and co-authors (Zhao *et al.* 2023) explore the role of the digital economy, industrial structure, and environmental quality, assessing the impact of investments in education, green innovations, and economic globalization. This study demonstrates the comprehensive impact of these factors on sustainable development.

The studies collectively provide a comprehensive overview of current issues related to investment in science and technology and its influence on various aspects of economic and environmental development, from regional infrastructure to global sustainable development goals.

The Aim of the Research

The purpose of the present academic paper is to analyze the influence of investments in science and technology on innovative development in the context of the global economic system. Special attention is paid to the mechanisms through which these investments contribute to technological innovation, economic growth and sustainable development.

For the purpose outlined, the following tasks were set for us:

- to evaluate the interrelation between investments in science and technology and the effectiveness of innovations in different industries and regions. The proposed analysis will be focused on understanding how different types of investment (foreign direct investment, government subsidies, private investment) influence the innovation process and its efficiency;
- to characterize the impact of investments in science and technology on environmental sustainability and the introduction of green innovations. This task involves analyzing the impact of these investments on environmental indicators, such as reduced pollutant emissions, renewable energy efficiency, and energy efficiency;
- to study the role of digital transformation and the digital economy in innovative development, including the impact of investments in digital technologies on industrial structure and environmental quality (including an assessment of how the digital economy contributes to sustainable development and influences global economic trends).

The Research Methodology

The methodology of the present research is based on the systemic and structural-functional approaches, which make it possible to deeply analyze and evaluate complex processes and interrelationships in the field of investment in science and technology and their impact on innovation development.

The systemic approach involves considering investments in science and technology as a comprehensive system that includes various elements and processes. This allows analyzing both internal and external factors affecting innovation activities. The systematic approach makes it possible to identify the crucial components and connections that shape the process of innovation creation and evaluate the impact of investments on numerous aspects of the economy and society.

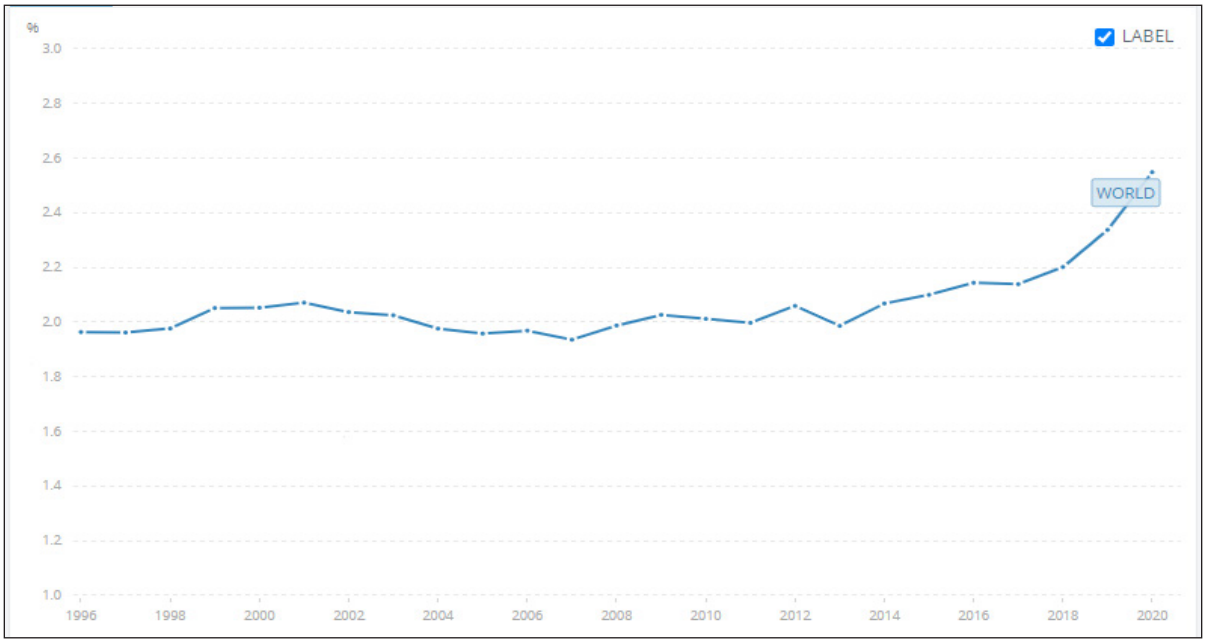
The structural-functional approach provides an opportunity to consider investments and innovations in the context of their functional role in the development of the economy and society. It focuses on the functional aspects of innovation processes and their impact on achieving the goals of economic growth, environmental sustainability and social progress. This approach helps understand how investments in science and technology contribute to achieving specific functional goals and their implications for different sectors of the economy.

The use of these methodological approaches will make it possible to assess the impact of investments in science and technology on innovative development, taking into account both direct effects and the broader social-economic context.

RESULTS

(I) In today's rapidly evolving world, the importance of investing in science and technology to drive innovation is of particular importance. This is confirmed by statistical indicators.

It is obvious that the global economy continues to progressively increase investments in science and technology in order to strengthen the innovative component of the production sector. Such investments are critical for the development of



Source: *(The World Bank, 2023).*

Fig. 1: Research and development (R&D) activities in relation to GDP (1996-2021)

new technologies, methods and approaches that can revolutionize industries ranging from medicine to manufacturing and energy. Understanding how various investment kinds interact and how they influence the effectiveness and success of innovation is essential to this process (Shavarskyi *et al.* 2022).

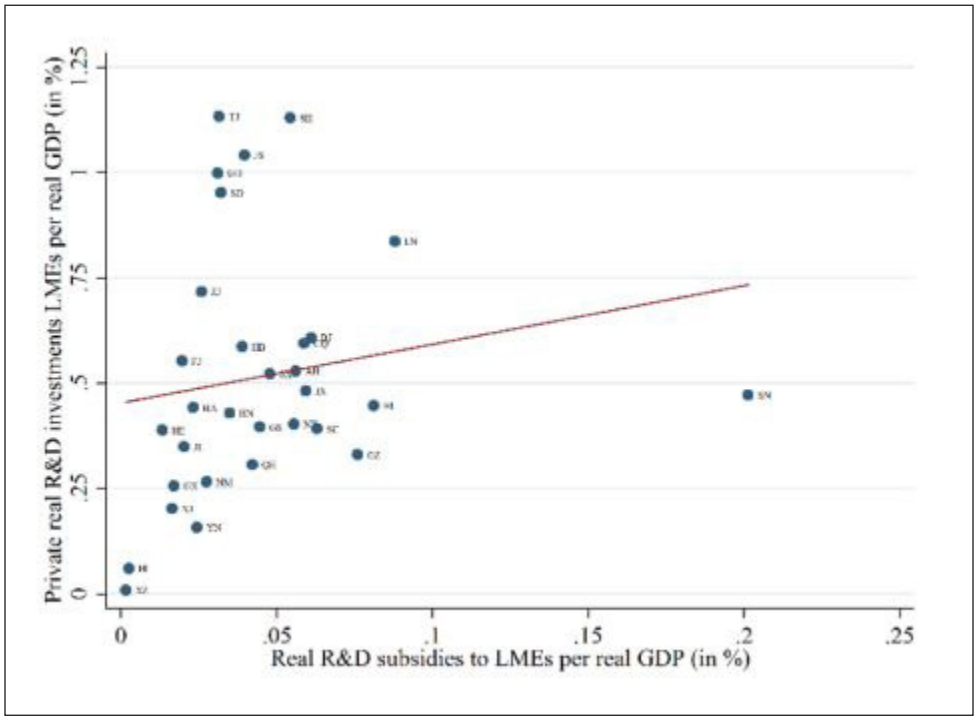
Foreign direct investments (FDI) play a significant role in the transfer of technology and innovative practices to different regions and industries. They provide the necessary funding as well as facilitate the exchange of knowledge and experience, which is crucial to innovative development. For instance, a study in 30 Chinese provinces revealed that FDI contributed to the effectiveness of green innovation by supporting the development of more sustainable and environmentally responsible technologies.

Government subsidies, on the other hand, can significantly influence innovation activity, especially in areas where large initial investments are required and where risk is higher. The government can stimulate innovative projects that might not be supported by the private sector due to their long-term nature or high risk by funding research and development (Dvigun *et al.* 2022). For instance, scholars prove that government subsidies have a positive impact on investment in innovations by new energy companies, stimulating their growth and development.

The analysis presented above shows that there is a positive correlation between government subsidies for R&D for low- and middle-income enterprises, on the one hand, and the level of private investment in this area relative to GDP, on the other one. This most likely demonstrates that state investments and economic incentives can encourage the private sector to increase its own R&D expenditures, which can also have a positive impact on the innovative development of the economy.

Private investments are also crucial in stimulating innovation. Private investors are generally looking for new opportunities to achieve high profits, and innovations can often offer such opportunities. They can contribute to the commercialization of new technologies by providing the necessary resources for prototyping, testing, and bringing products to the market. Thus, private investments play a key role in transforming innovations from scientific ideas into real commercial products.

Overall, this chapter emphasizes that investments in science and technology, regardless of their source, are critical to driving innovations, contributing not only to technological progress but also to economic growth, environmental sustainability and social well-being.



Source: *(Boeing et al. 2022).*

Fig. 2: The connection between government R&D subsidies and private investment in low- and middle-income enterprises

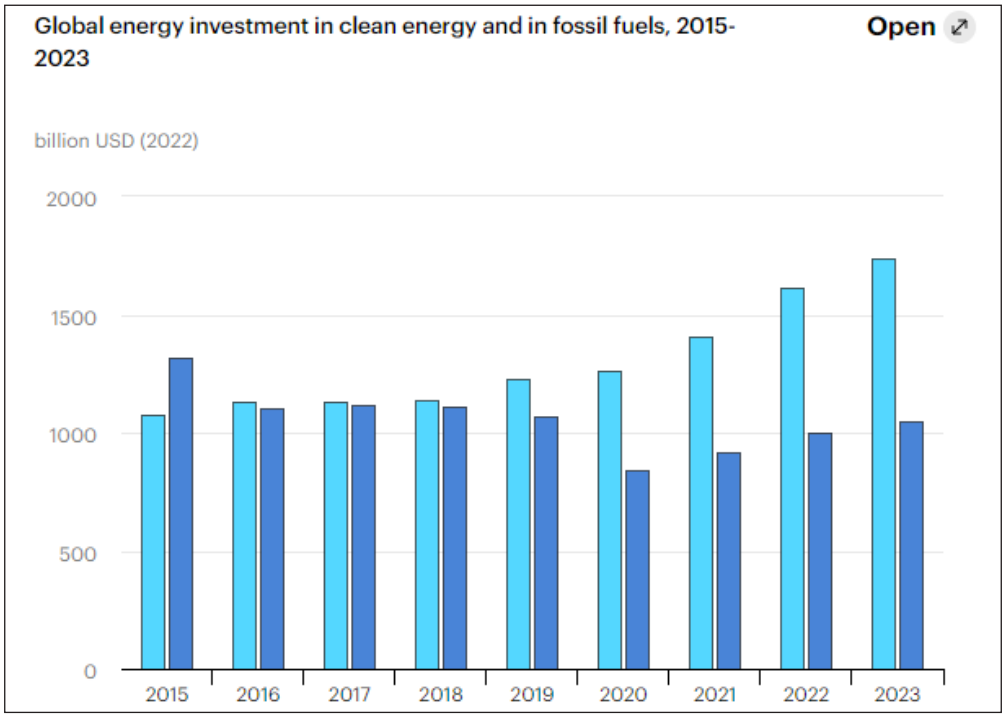
(II) The development of green innovations and environmental sustainability are two important facets of contemporary innovation development. Investments in science and technology play a crucial role in supporting this direction since they facilitate the creation and dissemination of environmentally sound technologies and processes. This chapter focuses on analyzing the impact of investments in green innovations and their contribution to environmental sustainability.

Green innovations cover a wide range of technologies and approaches, from renewable energy sources to energy-efficient production processes and environmentally friendly materials. The importance of these innovations lies in their ability to reduce the negative impact on the environment, in particular, by reducing greenhouse gas emissions and improving resource efficiency (Kovalko *et al.* 2022). In particular, studies in the energy sector show how investments in research and development can promote renewable energy, increasing energy security and reducing dependence on fossil fuels.

For instance, according to data of the International Energy Agency (IEA), investments in clean energy have increased by 40% since 2020. This growth is the result of efforts aimed at reducing emissions, as well as the economic viability of advanced clean energy technologies. In 2020, one out of 25 cars sold was electric; in 2023, this figure is one out of 5. In addition, more than 500 gigawatts of renewable energy generation capacity is expected to be added in 2023, representing a new record (World Energy Outlook, 2023).

In addition, investments in green innovations are important for supporting sustainable development in various industries. For instance, investments in environmentally friendly technologies in industry can help reduce the environmental impact of production processes. In addition, the development of new environmental-friendly materials can have a significant impact on various industrial sectors, including construction, automotive, and packaging.

Investing in green innovations not only contributes to environmental sustainability but can also open up new commercial opportunities, boosting economic growth and job creation. For instance, the renewable energy market offers ample opportunities for innovations, from solar and wind power to bioenergy and geothermal energy. These technologies can help reduce environmental impact and create new economic opportunities, paving the way for sustainable development.



Source: *(Global investment, 2023)*

Fig. 3: Global investments in clean energy and fossil fuels, 2015-2023

Thus, investments in science and technology play a crucial role in stimulating green innovations, which are essential for achieving environmental sustainability and sustainable development around the world (Bazaluk *et al*. 2022). These innovations can be fundamental to solving global environmental challenges while ensuring economic growth and environmental preservation.

(III) Digital transformation and the development of the digital economy play a vital role in modern innovation development. This chapter focuses on the impact of digital investments on industrial structure, environmental quality, and overall sustainable development. In particular, it analyzes how digitalization can help optimize production processes, increase resource efficiency and develop environmentally sustainable practices.

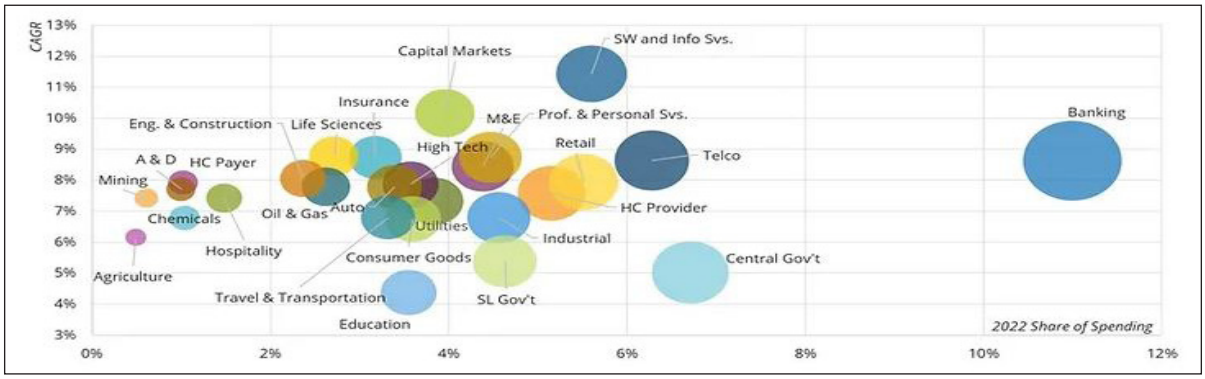
Investments in digital technologies, such as artificial intelligence, big data, block chain, and the Internet of Things, play a significant role in increasing the efficiency and innovation potential of the industry. These technologies provide companies with the ability to optimize their processes, reduce costs, and implement more sustainable production methods. For instance, digitalization in manufacturing can contribute to the smart management of resources, reducing waste and energy consumption, which has a positive impact on environmental performance (Karpenko *et al.* 2019).

These conclusions are confirmed by the data of the analytical company IDC, according to which in 2022, global investment in digital technologies amounted to 8,1 trillion US dollars, which is 6,2% more than in 2021. This indicator exceeded IDC's forecasts, which predicted growth of 5,7% (IDC, 2023).

The largest investments in digital technologies were allocated to:

- cloud computing (2,6 trillion USD, an increase of 19.6%);
- artificial intelligence (1,9 trillion USD, an increase of 23.2%);
- big data (USD 1,4 trillion USD, an increase of 20.9%).

Investments in digital technologies were high in all regions of the world, but they increased most significantly in the Asia-Pacific region (APAC), where they amounted to 3,9 trillion USD, up 13,7% from 2021. In the United States, investments in digital technologies amounted to 2,5 trillion US dollars, which is 6,1% more than in 2021.



Source: *(Worldwide ICT Spending Guide, 2023).*

Fig. 4: Share of global ICT spending in 2022 and compound annual growth rate (CAGR) by industry

The largest investors in digital technologies were as follows:

- the USA (2,5 trillion USD);
- China (2,1 trillion USD);
- Europe (1.9 trillion USD) (IDC, 2023).

At the same time, the aforementioned expert company IDC offers the following analysis of the share of global expenditures on information and communication technologies (ICT) in 2022 and the compound annual growth rate (CAGR) by industries:

The analysis displayed above shows the percentage share of information and communication technology (ICT) spending in various industries in 2022 and the compound annual growth rate (CAGR) of these expenditures. In particular, such industries as banking, public administration, telecommunications, healthcare, and others are highlighted. The size and position of the balls on the chart can be used to evaluate both the absolute value of spending and the dynamics of its change over time. For instance, banking is the sector with the largest share of ICT spending and also has one of the highest CAGRs. This indicates active digitalization and investment in technology in this area.

It is evident that the development of the digital economy is opening up new avenues for innovation in many sectors. Digitalization makes it possible for companies to better understand their customers' needs, optimize supply chains, and implement more flexible business models. It also contributes to increased productivity and innovation, which is crucial for sustainable economic development (Popov *et al.* 2021).

In the context of the digital economy, investments in education and the development of human capital are also crucial. Training qualified personnel capable of working effectively with the latest technologies is essential for successful digital transformation. Thus, investments in education and training are important to support innovative development and digital integration in all sectors of the economy.

It should be emphasized that investments in digital technologies and the digital economy are essential for stimulating innovation, optimizing industrial processes, and promoting sustainable development. Digital transformation is playing a crucial role in the current innovation landscape, influencing economic growth, environmental sustainability and quality of life.

DISCUSSION

We strongly believe that the central feature of the debate within the scope of our research is the interrelationship between investment and innovation, which has multiple dimensions and influences.

The first important aspect of the discussion concerns the role of public funding in stimulating innovations. In particular, we are talking about the efficiency of public investments compared to private investments. On the one hand, state funding is critical to support long-term research and development that may be too risky for the private sector. On the other hand, there is a risk of inefficient use of resources and bureaucratic complications. From our perspective, the balance between public and private investment is crucial for achieving optimal innovation outcomes.

The second important aspect of the discussion concerns the impact of investment on environmental sustainability. Transitioning to a green economy and the development of sustainable technologies require significant investments. However, a debate arises over the speed and direction of this transition. From our point of view, investments in green innovations should be aimed at achieving a balance between economic efficiency and environmental sustainability. This requires the integration of environmental goals into the main economic strategies.

The role of digital transformation is the third aspect of the discussion. There is no doubt that digitalization opens up new opportunities for innovation in all sectors of the economy; however, it also brings challenges related to data security, employment, and social adaptation. From our point of view, it is important to keep in mind that digital transformation is not an ultimate goal; it should serve as a means to improve the efficiency, accessibility, and quality of products and services.

In general, these discussions reflect the complexity and multidimensional impact of R&D investment on innovation development. It is important to consider these various aspects in order to develop effective investment strategies that take into account the needs of economic growth, environmental sustainability and social well-being.

CONCLUSION

The influence of investments in science and technology on the creative evolution of the global economic system has been thoroughly examined in the present academic paper with consideration given to both the theoretical and practical aspects of this impact. Our research has confirmed that investments in these areas are crucial for stimulating innovations and sustainable economic development.

We have revealed that the balance between public and private investment in science and technology is crucial for achieving optimal innovation outcomes. On the one hand, public investments are necessary to support research in high-risk areas and to develop basic sciences; while on the other hand, the private sector plays a crucial role in commercializing innovations.

Our research has also shown that investments in green innovation and digital transformation are essential for environmental sustainability and sustainable development. The development and implementation of environmentally friendly technologies that reduce the negative impact on the environment are critical to ensuring a sustainable future.

Our findings also point to the need for further exploration in this area, especially in the context of determining optimal investment strategies that take into account various aspects of innovation development, including social, economic and environmental factors.

Given the results obtained, it is recommended for future studies to examine in more detail the interrelationship between different types of investments and their impact on specific innovation projects. It is also important to examine the influence of international trends and global economic changes on investment strategies in science and technology.

REFERENCES

Ahmed, Z., Ahmad, M., Murshed, M., Shah, M.I., Mahmood, H. and Abbas, S. 2022. How do green energy technology investments, technological innovation, and trade globalization enhance green energy supply and stimulate environmental sustainability in the G7 countries? *Gondwana Res.*, **112**: 105-115.

Alemán-Díaz, A.Y. 2023. Motivations guiding public research funding in science, technology and innovation (STI) policy: a synthesis. In *Handbook of Public Funding of Research* (pp. 38-54). Edward Elgar Publishing.

Amini, M. and Rahmani, A. 2023. Achieving Financial Success by Pursuing Environmental and Social Goals: A Comprehensive Literature Review and Research Agenda for Sustainable Investment. *World Information Technology and Engineering Journal*, **10**: 1286-1293.

Bazaluk, O., Havrysh, V., Nitsenko, V., Mazur, Y. and Lavrenko, S. 2022. Low-cost smart farm irrigation systems in kherson province: Feasibility study. *Agronomy*, **12**(5).

Boeing, P., Eberle, J. and Howell, A. 2022. The impact of China's R&D subsidies on R&D investment, technological upgrading and economic growth. *Technological Forecasting and Social Change*, **174**: 121212.

Boltaevna, S.F.A. and Upashevna, A.L. 2022. Signs of Innovation Economy and its Assessment Indicators. *Specialusis Ugdymas*, **2**(43): 3178-3190.

Cui, H., Cao, Y., Feng, C. and Zhang, C. 2023. Multiple effects of ICT investment on carbon emissions: Evidence from China. *Environmental Science and Pollution Res.*, **30**(2): 4399-4422.

Djurayeva, I. 2023. The importance of investment resources in the effective functioning of free economic zones and directions for its improvement. *Science and Innovation*, **2**(A4): 5-10.

Dutta, S., Lanvin, B., Wunsch-Vincent, S. and León, L.R. (Eds.). 2022. *Global Innovation Index 2022: What is the Future of Innovation-driven Growth?* (Vol. 2000). WIPO.

Dvigun, A.O., Datsii, O.I., Levchenko, N.M., Shyshkanova, G.A. and Dmytrenko, R.M. 2022. Rational use of fresh water as a guarantee of agribusiness development in the context of the exacerbated climate crisis. *Science and Innovation*, **18**(2): 85-99.

Fears, R. and Canales, C. 2023. The Role of Science, Technology and Innovation in Transforming Food Systems Globally. *Science and Innovations for Food Systems Transformation*, 831.

Foffano, F., Scantamburlo, T. and Cortés, A. 2023. Investing in AI for social good: an analysis of European national strategies. *AI & Society*, **38**(2): 479-500.

Global investment in clean energy is on course to rise to USD 1.7 trillion in 2023. IEA. Available at: https://www.iea.org/data-and-statistics

Gyamfi, B.A., Agozie, D.Q. and Bekun, F.V. 2022. Can technological innovation, foreign direct investment and natural resources ease some burden for the BRICS economies within current industrial era?. *Technology in Society*, **70**: 102037.

Jianguo, D., Ali, K., Alnori, F. and Ullah, S. 2022. The nexus of financial development, technological innovation, institutional quality, and environmental quality: evidence from OECD economies. *Environmental Science and Pollution Research*, **29**(38): 58179-58200.

Karpenko L.M., Koev S.R., Kashchena N.B., Grushko V. and Khorosheniuk A. 2019. Formation of the stakeholders account model in conditions of sustainable development. *Academy of Accounting and Financial Studies Journal*, **23**(2): 1-7.

Khalil, M.A. and Nimmanunta, K. 2023. Conventional versus green investments: Advancing innovation for better financial and environmental prospects. *Journal of Sustainable Finance & Investment*, **13**(3): 1153-1180.

Khan, P.A., Johl, S.K., Akhtar, S., Asif, M., Salameh, A.A. and Kanesan, T. 2022. Open innovation of institutional investors and higher education system in creating open approach for SDG-4 quality education: a conceptual review. *Journal of Open Innovation: Technology, Market, and Complexity*, **8**(1): 49.

Kovalko, O., Eutukhova, T. and Novoseltsev, O. 2022. Energy-related services as a business: Eco-transformation logic to support the low-carbon transition. *Energy Engineering: Journal of the Association of Energy Engineering*, **119**(1): 103-121.

Kyrylov, Y., Hranovska, V., Zhosan, H. and Dotsenko, I. 2022. Innovative Development of Agrarian Enterprises of Ukraine in the Context of the Fourth Industrial Revolution. In *AIP conference proceedings* (Vol. 2413, No. 1). AIP Publishing.

Lalani, H.S., Nagar, S., Sarpatwari, A., Barenie, R.E., Avorn, J., Rome, B.N. and Kesselheim, A.S. 2023. US public investment in development of mRNA covid-19 vaccines: retrospective cohort study. *BMJ*, **380**.

Leal Filho, W., Vidal, D.G., Chen, C., Petrova, M., Dinis, M.A.P., Yang, P., ... & Neiva, S. 2022. An assessment of requirements in investments, new technologies, and infrastructures to achieve the SDGs. *Environmental Sciences Europe*, **34**(1): 1-17.

Ning, Y., Cherian, J., Sial, M.S., Álvarez-Otero, S., Comite, U. and Zia-Ud-Din, M. 2023. Green bond as a new determinant of sustainable green financing, energy efficiency investment, and economic growth: a global perspective. *Environmental Science and Pollution Research*, **30**(22): 61324-61339.

OECD, 2023. Gross domestic spending on R&D (indicator). Available at: https://doi.org/10.1787/d8b068b4-en

Peng, B., Zhao, Y., Elahi, E. and Wan, A. 2023. Investment in environmental protection, green innovation, and solid waste governance capacity: empirical evidence based on panel data from China. *Journal of Environmental Planning and Management*, **66**(6): 1229-1252.

Perez-Alaniz, M., Lenihan, H., Doran, J. and Hewitt-Dundas, N. 2023. Financial resources for research and innovation in small and larger firms: Is it a case of the more you have, the more you do?. *Industry and Innovation*, **30**(2): 189-232.

Popov, O.O., Iatsyshyn, A.V., Iatsyshyn, A.V., Kovach, V.O., Artemchuk, V.O., Gurieiev, V.O., . . . Kiv, A.E. 2021. Immersive technology for training and professional development of nuclear power plants personnel. *Paper presented at the CEUR Workshop Proceedings*, 2898 230-254. Available at: www.scopus.com

Qizi, B.D.F. 2023. Analysis of the Influence of the Investment Environmental Attractiveness on the Socio-economic Development of Regions (On the Example of Navoi Region). *Nexus: Journal of Advances Studies of Engineering Science*, **2**(5): 131-141.

Sala, D., Bashynska, I., Pavlova, O., Pavlov, K., Chorna, N. and Chornyi, R. 2023. Investment and Innovation Activity of Renewable Energy Sources in the Electric Power Industry in the South-Eastern Region of Ukraine. *Energies*, **16**(5): 2363.

Shahzadi, H.N., Ali, M., Ghafoor, R.K. and Rahman, S.U. 2023. Does Innovation and Foreign Direct Investment Affect Renewable Energy Consumption? Evidence from Developing Countries. *Pakistan Journal of Humanities and Social Sciences*, **11**(2): 926-935.

Shakirova, F.B. 2022. Innovative development models and their relationship with economic growth. *Galaxy International Interdisciplinary Research Journal*, **10**(10): 662-665.

Shakirova, F.B. 2022. The importance of investment in the development of innovation in the economy. *Confrencea*, **7**(7): 61-62.

Shavarskyi, I., Falshtynskyi, V., Dychkovskyi, R., Akimov, O., Sala, D. and Buketov, V. 2022. Management of the

longwall face advance on the stress-strain state of rock mass. *Mining of Mineral Deposits*, **16**(3): 78-85.

Song, W. and Han, X. 2022. The bilateral effects of foreign direct investment on green innovation efficiency: Evidence from 30 Chinese provinces. *Energy*, **261**: 125332.

Suyunovich, M.K. and Shakhriyorovich, K.J. 2022. Innovative Development Mechanism Of Digital Transformation Processes In Regional Industry. *Journal of Pharmaceutical Negative Results,* pp. 492-502.

The World Bank. Research and development expenditure (% of GDP). Available at: https://data.worldbank.org/indicator/GB.XPD.RSDV.GD.ZS

Ullah, S., ur Rahman, S. and Rehman, C.A. 2023. Public Investment, Technological Innovations, and Environmental Degradation: Asymmetric ARDL Approach. *Pakistan Journal of Humanities and Social Sciences*, **11**(2): 736-747.

Wang, R., Usman, M., Radulescu, M., Cifuentes-Faura, J. and Balsalobre-Lorente, D. 2023. Achieving ecological sustainability through technological innovations, financial development, foreign direct investment, and energy consumption in developing European countries. *Gondwana Research*, **119**: 138-152.

Wen, H., Zhong, Q. and Lee, C.C. 2022. Digitalization, competition strategy and corporate innovation: Evidence from Chinese manufacturing listed companies. *International Review of Financial Analysis*, **82**: 102166.

Wen, J., Okolo, C.V., Ugwuoke, I.C. and Kolani, K. 2022. Research on influencing factors of renewable energy, energy efficiency, on technological innovation. Does trade, investment and human capital development matter? *Energy Policy*, **160**: 112718.

World Energy Outlook, 2023. Available at: https://www.iea.org/reports/world-energy-outlook-2023/executive-summary

Worldwide ICT Spending Guide: Enterprise and SMB by Industry, New Industries Forecst, July, 2023.

Wu, Z., Fan, X., Zhu, B., Xia, J., Zhang, L. and Wang, P. 2022. Do government subsidies improve innovation investment for new energy firms: A quasi-natural experiment of China's listed companies. *Technological Forecasting and Social Change*, **175**: 121418.

Yang, Q., Wang, Y., Liu, Y., Liu, J., Hu, X., Ma, J., ... and Tao, S. 2023. The impact of China's high-speed rail investment on regional economy and air pollution emissions. *Journal of Environmental Sciences*, **131**: 26-36.

Zhang, L., Saydaliev, H.B. and Ma, X. 2022. Does green finance investment and technological innovation improve renewable energy efficiency and sustainable development goals. *Renewable Energy*, **193**: 991-1000.

Zhao, Y., Kong, X., Ahmad, M. and Ahmed, Z. 2023. Digital Economy, Industrial Structure, and Environmental Quality: Assessing the Roles of Educational Investment, Green Innovation, and Economic Globalization. *Sustainability*, **15**(3): 2377.