Advances in Research on Russian Business and Management
ISSN: 2578-725X, e-ISSN: 2578-7268

Artificial Intelligence, Population Aging, and Economic Growth

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Abstract:

Purpose: The research aims to analyze the current situation in the field of AI technologies in the Russian Federation compared to the world largest economies, its impact on economic growth, and the possibilities of leveling the negative effects of population aging. The research is based on demographic data of the largest economies in the world and the rankings of the development and implementation of AI. The author uses methods of dynamics analysis and comparative analysis to achieve the research goal. Population aging has a predominantly negative impact on economic growth. The largest economies in the world are also leaders in the field of AI technologies. In 2022, the Russian Federation was among the ten leading countries in terms of the number of significant machine learning systems and the number of manufacturers of professional service robots. The level of demographic aging in the Russian Federation is higher than the world average, as in the world's largest economies. AI can be used to solve a variety of problems, including those related to population aging. The government should invest in AI, education, and healthcare for the further successful development and adoption of AI technologies.

Keywords: artificial intelligence, labor force, productivity, health, sustainable development

JEL codes: I150, O33

It cannot be said that artificial intelligence (AI) is massively discussed only in recent years. This miracle, which we associate with science fiction, has been talked about for many decades. Currently, AI technologies are beginning to spread rapidly and find application in a wide variety of spheres of life, influence the lives of ordinary people, and raise questions about the ethics of the use of these technologies and legislative regulation. The fantastic future has already arrived and it is time for humanity to use AI technologies to improve the quality of life and solve various problems that we face. The issues to be solved through AI technologies that will be discussed in this study are the aging of the population and its possible negative impact on economic growth.

Population aging, a consequence of increasing life expectancies and declining fertility rates, stands out as a significant challenge to many advanced and developing economies (Lee

et al., 2020). AI can spur growth by replacing labor with capital in the production of goods and services and in the production of ideas (Aghion et al., 2019). The ability to solve the above issues or reduce their negative impact through AI technologies depends on many factors, such as infrastructure, government regulation, the level of research and development, etc.

As the AI revolution transforms our world, it could herald a utopian future where humanity co-exists harmoniously with machines, or portend a dystopian world filled with conflict, poverty, and suffering (Goralski & Tan, 2020).

This research aims to examine the situation in the field of AI technologies in the Russian Federation in comparison with the world's largest economies, its impact on economic growth, and the possibilities of leveling the negative effects of population aging.

Method

The process of population aging implies that the working population is becoming smaller, and the older working population is less productive; fears about the future existence and development of countries are associated with this. Too many young people, as opposed to the other extreme, too many old people, is also not an unambiguously positive characteristic of the labor force. A large proportion of the young population may indicate the inexperience of the workforce and low qualifications, which can also adversely affect the volume and quality of production of goods and services. On the other hand, a large proportion of the elderly population in certain areas of work can improve the quality of work due to the qualifications and existing skills acquired during a long career. Young or middle-aged employees are preferable in those sectors of the economy that require a healthy and physically strong workforce. Therefore, it cannot be unequivocally stated that the aging of the population harms the economies of countries.

Börsch-Supan et al. (2021) studied the interrelation between age and productivity in the service sector. They showed that while average productivity stays flat, there is variation according to task complexity. Productivity increases with age in teams with more demanding tasks and decreases in routine tasks. From this, if we entrust simpler tasks that do not require enormous experience to less qualified employees (including younger ones) and more complex tasks to older employees, the company will work more efficiently. However, the considered study is limited to the age range of 20–60 years, which does not allow drawing conclusions about older workers. After all, 60 years is not even a retirement age in some countries. For example, in 2023, the retirement age for men in the Russian Federation is already 61.5 years and will rise to 65 years by 2028. Moreover, some people of retirement age continue to work. Therefore, the question of how to analyze the aging of the workforce remains.

Lee et al. (2020) also found evidence that not everything is so clear when assessing the impact of population aging on the economy. This influence can be diverse and depends on many factors. In particular, they analyzed such factors as qualifications, high or low level of education, and the share of information and communication technology (ICT) in the capital stock.

Lu and Liu (2019) note that the direction of research in the field of population aging is changing its vector from the study of trends and causes, aging characteristics, and policy responses to the top-level design of aging policies and programs.

Indeed, the trends and possible negative effects of population aging are already largely clear to the scientific community. Thus, it is necessary to develop measures to manage this phenomenon. Marois et al. (2020) show how negative economic consequences of population aging can be mitigated by changes in migration and labor-force participation.

However, recent studies still focus on the negative effects of population aging on the economy. As noted by Mason and Lee (2022), this is due to the fact that labor productivity is highest in the middle years of life.

Before measuring the negative effect of population aging and trying to manage and reduce it, it is necessary to correctly measure the aging of the population. Skirbekk et al. (2019) claim that chronological age may frequently not be the best measure.

An investment component is an important component of the human resource management system. Yang et al. (2021) have substantiated the structure of investments in health, which will contribute to economic growth and reduce the negative consequences of population aging.

Thus, the problems arising in connection with the aging of the population are proposed to be solved in many ways. These are legislative regulation of the retirement age (namely, its increase), migration policy, and investments in healthcare. However, attention should be paid to another factor that can play a significant role in solving this problem. This is a technological factor. In the era of Industry 4.0, information technology can and should become the head of the toolkit for solving various problems of humankind. In the context of an aging population and slowing economic growth, great hopes are placed on AI technologies.

Allam and Dhunny (2019) argue that the implementation of AI can substantially aid in urban governance and urban economic growth. They introduced a new Smart City framework that supports the additional use of big data and artificial intelligence with a primary focus on urban sustainability and livability.

Changing the technological order, even with a well-thought-out strategy for introducing innovations brings a lot of positive effects for society and the economy and creates a threat to certain segments of the population (Aly, 2022).

AI can become a growth driver for emerging economies. Mhlanga’s (2021) results pointed to the fact that AI has a strong influence on poverty reduction and the improvement of the certainty and reliability of infrastructure.

Sapci and Sapci (2019) note that when discussing topics related to the aging of society, the most discussed areas are novel patient monitoring, smart home technologies, intelligent algorithm and software engineering, and robotics technologies. Unfortunately, most studies in these areas have poor reference standards without an explicit critical appraisal. Therefore, it is clear that there is still a lot of work to be done before we can say that the problems of an aging society are finally being addressed in a comprehensive manner using AI technologies.

Further in this study, the author analyzes the dynamics of the aging of society and the development of AI technologies in the Russian Federation in comparison with the world's largest economies. The study is based on the World Development Indicators of The World Bank, the Global AI Index by Tortoise Media, and "Artificial Intelligence Index Report 2023" by Stanford Institute for Human-Centered Artificial Intelligence (HAI). The author uses methods of dynamics analysis and comparative analysis to achieve the research goal of the study.

Results

Over more than 60 years, there has been an increase in the proportion of the world's population aged 65 years and above from 5.02% to 9.62% (Figure 1).

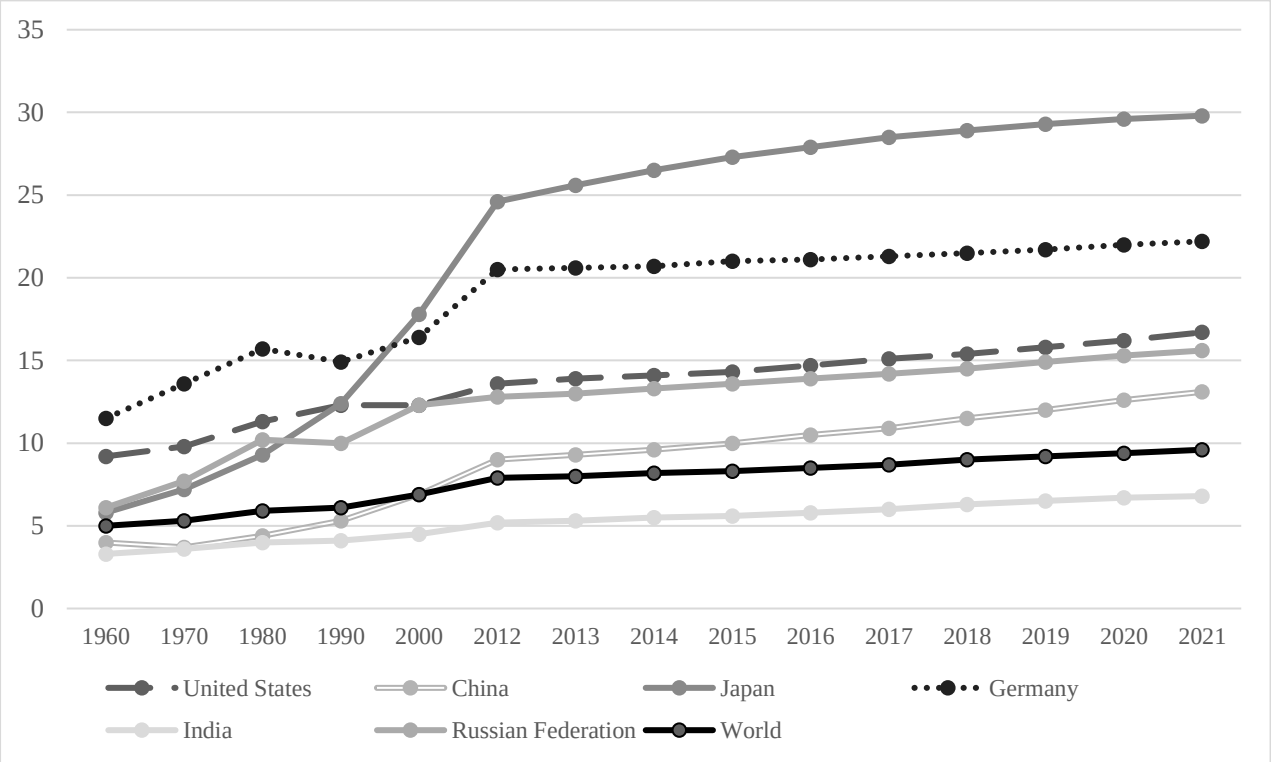

Figure 1

Population ages 65 and above (% of total population)

Source: Compiled by the author based on World Development Indicators (World Bank, 2023)

The top five economies in the world by GDP (the USA, China, Japan, Germany, and India in 2022) have also experienced an increase in population aging. However, demographic aging in India is occurring at a slower pace than the global average and other considered countries. The level of demographic aging in the Russian Federation, which is the 9th largest economy in the world in 2022, is close to the level of the USA. It has changed from 6.1% in 1960 to 15.6% in 2021. Japan has the largest proportion of the elderly population, which increased from 5.8% in 1960 to 29.8% in 2021.

The largest economies in the world (the USA and China) are also leaders in the field of AI technologies. Comparing the development of AI technologies in the Russian Federation with the five leading countries in terms of GDP, it can be noted (Figure 2) that the strength of the Russian Federation is that the national government is deeply committed to AI and has commitments to spend on AI development within the framework of national strategies. Russia overtook India in terms of the level of AI infrastructure. The level of commercialization of AI technologies in the Russian Federation is extremely low.

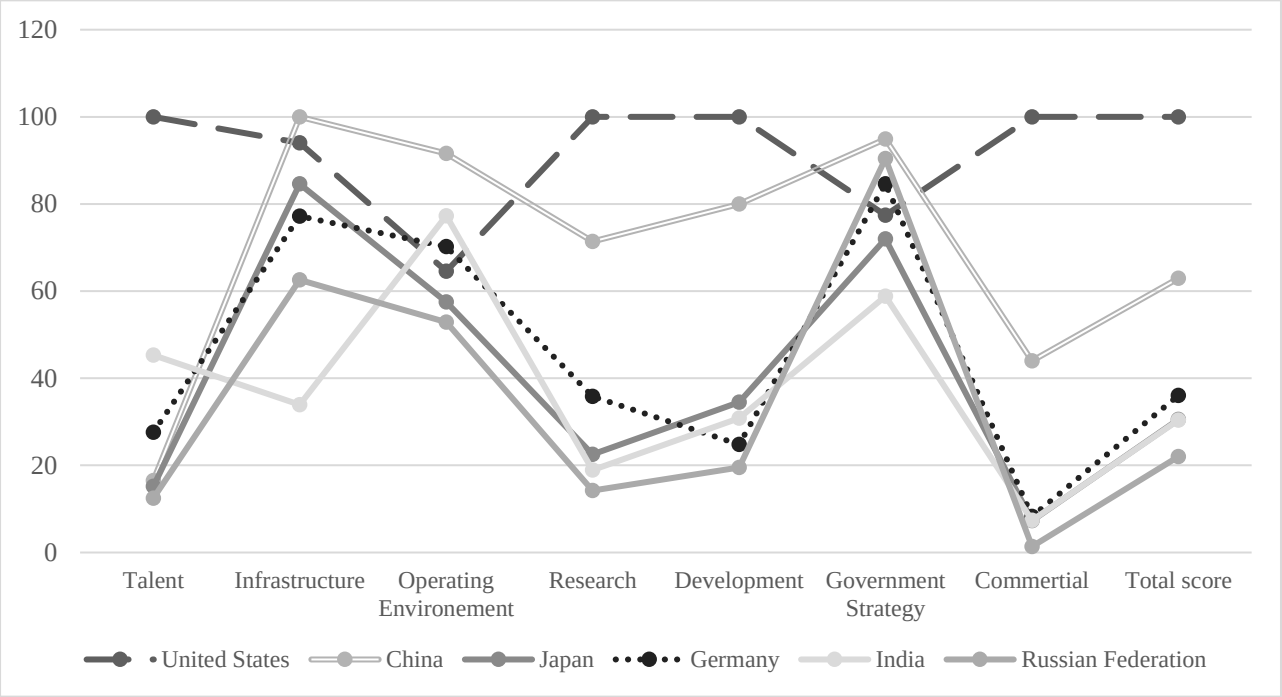

Figure 2

Top big economies' rankings on their level of investment, innovation, and implementation of AI

Source: Compiled by the author based on "The Global AI Index" (Tortoise Media, 2023)

According to Figure 2, the total score of the Russian Federation is slightly lower than the rest of the considered countries. The talent sub-pillar focuses on the availability of skilled practitioners for the provision of AI solutions. Talent is closely interrelated with research and development, which is the reason for a not satisfactory level of these sub-pillars either. Infrastructure and operating environment have average estimates. The government strategy is the most promising sub-pillar for the Russian Federation.

According to "Artificial Intelligence Index Report 2023" by Stanford University, the Russian Federation was included the list of countries with significant machine learning systems in 2022. The number of manufacturers of professional service robots in 2022 was 52 in Russia, 225 in the USA, and 104 in China.

The Russian Federation has every chance to successfully develop and implement AI technologies, reduce the negative effects of population aging, and help accelerate economic growth.

Discussion

The above analysis raises the question of the direct and indirect impact of AI on economic growth. For example, decisions to increase labor productivity are systems of direct AI impact. If the decision is aimed, for example, at monitoring human health, then we will not see a direct impact on economic growth. However, it is possible to trace a chain of improved interactions that will definitely lead to a positive economic effect. We can monitor the health of a working or a non-working person. In the first case, monitoring can prevent work-related injuries and disruptions in production due to a sudden disability of an employee. In this case, the health monitoring system will minimize the potential damage to the production system and reduce the negative economic effect. In the second case, health monitoring reduces the burden on social services and on the working relatives of a disabled person. It also reduces the burden on emergency medical services. In this case, we get an indirect effect; presumably no less significant for the economy, given the trend towards an aging population.

The presence of direct and indirect impacts of AI on economic growth suggests the need for future research design that will take these aspects into account.

Rising automation is happening in a period of growing economic inequality, raising fears of mass technological unemployment and a renewed call for policy efforts to address the consequences of technological change (Frank et al., 2019). The impacts are still uncertain and shall depend on a number of different factors (Aly, 2022).

AI cannot impact a country's growth in isolation. AI must be coupled with an educated and healthy population. Therefore, the government should invest in the education sector and health sector.

The development of technologies is inextricably linked with education, skills, and competencies that people receive in the process of learning and working. The acquired knowledge is necessary to manage complex systems and make scientific and technological discoveries that can become the basis for creating new sectors of the economy (Markhaichuk & Panshin, 2022).

Conclusion

The research was devoted to the analysis of the current situation in the field of AI technologies in the Russian Federation compared with the world's largest economies, its impact on economic growth, and the possibilities of leveling the negative effects of population aging.

Over more than 60 years, the world has seen an increase in the share of the population aged 65 years from 5.02% to 9.62%. The level of demographic aging in the Russian Federation, which is the 9th largest economy in the world in 2022, is close to the level of the USA. It has changed from 6.1% in 1960 to 15.6% in 2021.

In 2022, the Russian Federation is among the ten leading countries in terms of the number of significant machine learning systems and the number of manufacturers of professional service robots. The strength of the Russian Federation is that the national government is deeply committed to AI and is committed to spending on AI development as part of national strategies.

The weak side is the extremely low level of commercialization of AI technologies in the Russian Federation.

For further research on the role of AI technology in solving the issues of population aging and slowing economic growth to be successful, it is necessary to improve the methods of collecting information about the labor processes of employees, and the operations they perform. There is still a lot of work to be done to provide high-quality research, based on the results of which the governments of countries will be able to make informed decisions and regulate the development and implementation of AI technologies.

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