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THE ECONOMIC IMPACT OF AI: ADVANCING AUTOMATION, ENHANCING EFFICIENCY, AND EXPANDING MARKETS

Abstract: *The article provides a comprehensive analysis of artificial intelligence technologies' impact on economic processes, forming an idea of their value for stimulating economic growth, increasing productivity, and developing new markets. The study used several general scientific methods of cognition, including synthesis, comparative analysis, systematisation and generalisation methods, and statistical data analysis to collect initial data and correlation analysis to determine the strength and direction of the relationship between the analysis variables. The correlation analysis revealed a negative relationship between the Government AI Readiness Index and the employment rate (r = -0.775), inflation (r = -0.695), and GDP (r = -0.023), which indicates the multidimensional impact of digital transformations on the economic system. The research results confirm the leading role of the implementation of artificial intelligence technologies for the development of geographical regions in the global context and the increase in macroeconomic activity of individual countries.*

Keywords: *fiscal policy, macro-financial stability, foreign economic activity, artificial intelligence technologies, automation of routine tasks*

1. Introduction

At the current stage of the transformation of global economic systems, new technologies, particularly the expansion of artificial intelligence (AI) capabilities, are one of the main factors in increasing production efficiency, optimising business processes and forming innovative markets. New AI-oriented technological solutions have firmly entered the economy, changing traditional approaches to business and opening up new prospects for innovation and efficiency (Alfouzan et al., 2024). The cultivation of this area in the political and socioeconomic space is mainly due to the potential of such technologies to cover a wide range of areas, including the automation of routine tasks and the creation of intelligent analytical systems that can predict economic trends and adapt business strategies to changing conditions (Rane et al., 2024). According to a large-scale dynamic model of the world economy based on the Global Trade Analysis Project (GTAP), the potential economic benefits were distributed taking into account two key aspects, namely, separating the economic effect of the introduction of AI technologies from other macroeconomic factors that can both enhance and offset its impact, in particular, due to changes in global trade policy, financial cycles, fluctuations in commodity prices and geopolitical challenges; and comparing the results of the

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data analysis with the baseline scenario. Thus, the data shown in Figure 1 provides information on the structure of geographical regions regarding economic benefits from artificial intelligence, including 57 economic sectors (PwC, 2025).

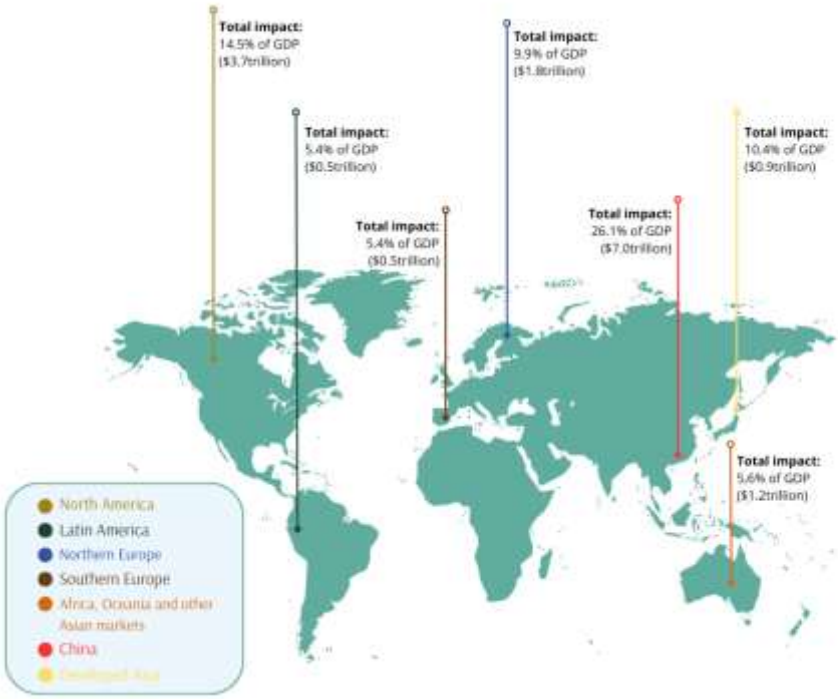

Figure 1. Regional distribution of economic benefits from artificial intelligence in the period up to 2030 (forecast)
Source: PwC (2025)

Given the presented regional differentiation of economic benefits from the introduction of AI, it is important to emphasise the significant potential of such technologies to influence GDP growth in different parts of the world, regardless of other related factors and challenges for the region. China (projected GDP growth of 26.0% in 2030) and North America (projected growth of 14.5% by 2030) will receive the most significant economic benefits from AI, equivalent to USD 10.7 trillion, almost 70.0% of the global GDP. This is equivalent to a total of USD 10.7 trillion and accounts for almost 70.0% of the global economic impact. At the same time, differences in the impact of AI on regional economies are due to the heterogeneous level of technological development, investment in digital infrastructure, and the ability to automate key industries. Thus, the relevance of studying the role of AI in the economy lies in the fact that such technologies are currently driving global economic change, contributing to the formation of new markets and optimising productivity at the regional level.

This research article aims to provide a comprehensive analysis of the impact of artificial intelligence technologies on economic processes, to form an idea of their value for stimulating economic growth, increasing productivity, and developing new markets. The article also aims to study the role of artificial intelligence development in key macroeconomic indicators in the regional context and further characterise macroeconomic trends.

2. Literature review

The digitalisation of modern society is marked by a radical transformation of the economic landscape due to the intensive introduction of artificial intelligence, which will, in the long run, expand opportunities for business processes, marketing, human resources, public administration, financial services, and education (Bielialov et al., 2023; Kussainov et al., 2023; Khatniuk et al., 2023). The positive impact of the integration of AI technologies on economic processes is manifested in several key areas, in particular, at the organisational level; such technologies stimulate the optimisation of business processes, automation of operations, and improvement of decision-making processes (Aldoseri et al, 2023; Alrumi, 2024; Badmus et al., 2024; Susilo & Susanto, 2024), while in the macro context, they have an impact on increasing productivity in various sectors of the economy, increasing innovation potential, creating new markets, which leads to overall economic growth. In addition, the development of AI technologies due to the ability to process large amounts of data and predict trends has the potential to develop innovative business models and ensure overall economic growth (Rane et al., 2024). Apsilyam et al. (2024) also mention the possibilities of its implementation in specialised sectors of the economy, in particular, in industry, AI is used to monitor the condition and predict equipment malfunctions, to perform monotonous and routine tasks on production lines, and to automate product quality control processes. An OECD report (OECD, 2019) shows that AI-enabled ecosystems can also support small and medium-sized enterprises as they embark on an AI journey and create a competitive environment.

According to a study by Susilo & Susanto (2024), the integration of AI technologies can significantly improve operational efficiency, in particular, reduce data processing time by up to 66% to ensure the efficiency of tasks, free up resources for strategic initiatives by reducing operational losses by up to 20% through the automation of repetitive tasks, and increase the accuracy of decision-making by 29% to ensure efficient resource allocation and strategic planning. In addition, the transition to automation requires retraining of employees, as the development of artificial intelligence causes the loss of demand for some professions and the overall restructuring of the labour market (Djama, 2024). In this context, Liu (2024) notes the applicability of AI applications, such as automated production lines and intelligent customer service, in increasing productivity and transforming the labour market in favour of changing labour needs. Automation of routine tasks allows companies to optimise costs and focus on strategic development, increasing economies' overall competitiveness in the global context (Mathew et al., 2023). However, it is also important to note the possible negative consequences, as Acemoglu and Restrepo (2020) provide a historical example of excessive automation negatively affecting the labour market through low productivity and the knock-on effect, finding that areas of the US that were most exposed to industrial automation in the 1990s and 2000s experienced significant adverse employment and wage effects.

Integrating AI technologies at the economic system level significantly changes new markets in various sectors of the economy. In particular, Masood (2024) and Wang et al. (2024) note the potential change in the labour market and job restructuring due to increased productivity in developed economies. In this context, Meng (2024) explores the increased job creation and transformation of existing roles in data analytics and automation, which requires retraining and upskilling the workforce. However, there are several challenges for developing countries to reap the benefits of AI technologies, with Masood (2024) and Strusani and Houngbonon (2019) noting limited infrastructure and slow and patchy adoption, highlighting the need for tailored workforce strategies. Other

opportunities for the application of artificial intelligence in emerging markets include the creation of individual marketing content that increases consumer engagement and brand loyalty, as well as its applicability for developing a projective strategy by the trends of such a market (Apsilyam et al., 2024; Bobro et al., 2024; Şenyapar, 2024). A controversial issue in contemporary scientific discourse also considers the ethical foundations of the widespread use of AI technologies. The works of Camilleri (2024), Şenyapar (2024), and Yanamala et al. (2022) also express concern about data privacy and consumer consent in the use of AI technologies, which requires responsible action.

3. Research methods

Qualitative analysis

The synthesis of literature sources was used to summarise scientific approaches to the impact of digitalisation on economic processes, identify key trends in the development of AI technologies and their impact on new markets, and identify challenges and opportunities associated with the transformation of the labour market and changes in business models in the context of automation and innovative business strategies.

Comparative analysis was used to characterise the regional distribution of economic benefits from introducing and developing new AI technologies. Secondary statistics from PwC (2025) were used to collect data on the share of AI technologies in the GDP of different geographical regions. The sample includes such regions as North America, China, Developed Asia, Latin America, and Southern Europe, as well as Africa, Oceania, and other Asian markets, as these regions are experiencing significant economic changes due to the integration of AI into various sectors of the economy.

The systematisation method was used to identify key trends and factors in developing artificial intelligence technologies and to study the factors that change the dynamics of the US Government AI Readiness Index indicators in 2020-2024.

The generalisation method was used to form trends in the development of AI technologies, identify the benefits of their further development and implementation at all levels of social activity, and substantiate the problems of their implementation in economic systems.

Quantitative analysis

The statistical data analysis method was used to collect data on the Government AI Readiness Index and macroeconomic activity in the United States in 2020-2024. The central object of analysis is the development of AI technologies and the macroeconomic activity of the United States, given its leading position in the government's readiness to implement AI technologies. This makes the country a benchmark example for the study. To ensure the accuracy and stability of the identified trends and relationships between the level of readiness to integrate AI and economic indicators, the initial data was generated from 2020 to 2024, as shown in Table 1.

The annual growth rate of the indicators was calculated in MS Excel using the following formula:

$$T_p = \frac{y_i - y_0}{y_0} * 100 \qquad (1)$$

where y_i is the current level of the series, and y_0 is the initial (first) level.

We used the min-max normalisation formula in Excel to assess the relationships between the analysis variables. This approach made it possible to bring all the values of the indicators in the data set to [0,1], which allows for a correct comparison of indicators with different units of measurement. The calculation of normalised indicators was performed using the following formula:

$$X_{norm} = \frac{X - X_{min}}{X_{max} - X_{min}} \qquad (2)$$

where X is the initial value of the indicator, and $X_{(max)}$) and $X_{(min)}$) are the maximum and

minimum values of the indicators in the data set.

Next, a correlation analysis was conducted to determine the strength and direction of the relationship between the values of the Government AI Readiness Index as an independent variable and macroeconomic indicators, i.e. the dependent variables of the analysis. The formula for calculating the Pearson correlation coefficient (r) is as follows:

$$r_{xy} = \frac{\sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^{n}(x_i - \bar{x})^2}\sqrt{\sum_{i=1}^{n}(y_i - \bar{y})^2}} \quad (3)$$

where n is the number of observations, and x and y are the values of the variables.

Table 1. Initial data of the study of the impact of artificial intelligence on US macroeconomic indicators in 2020–2024

Timeline	Government AI Readiness Index		Macroeconomic indicators		Fiscal indicators		Macro-financial stability indicators	
	Rank	Total	GDP, USD Billion	Emplo-yment Rate, %	Exports, USD Billion	Imports, USD Billion	Tax Receipts, USD Billion	Inflation Rate, %
2020	1	85,48	21323	61,1	207935	251717	2159,246	2,5
2021	1	88,16	23594	57,4	198275	261054	2471,212	1,4
2022	1	85,72	25744,11	59,7	231087	316652	3219,173	7,5
2023	1	84,8	27356,4	60,2	257830	327789	2905,043	6,4
2024	1	87,03	29167,78	60,2	259211	326148	3029,856	3,1

Source: FRED (2024), Hankins et al. (2023), Nettel et al. (2022), Nettel et al. (2024), O'Neill (2025), Rogerson et al. (2022), Shearer et al. (2020), Statista (2024), Trading Economics (2024a), Trading Economics (2024b), Trading Economics (2024c), Trading Economics (2024d)

However, the CORREL function in Excel was used to optimise the analysis process and reduce the likelihood of errors in calculations. The significance level of $p < 0.05$ was used to assess the statistical significance of the results, which indicates the reliability of the results and the low probability of the random nature of the correlations found. The initial assumption of the correlation analysis is that there is a stable relationship between the level of readiness of governments to implement artificial intelligence technologies and macroeconomic, fiscal and macro-financial indicators, which is confirmed by statistically significant correlation coefficients.

4. Results and discussion

Currently, the development of artificial intelligence technologies is one of the driving forces of the modern economy, whose role, according to many scholars, is manifested through the promotion of automation of production processes (Apsilyam et al., 2024; Mathew et al., 2023), increasing the efficiency of enterprises (Susilo & Susanto, 2024) and creating new markets (Bobro et al., 2024; Şenyapar, 2024; Strusani & Houngbonon, 2019). AI's contribution to the economic system covers various financial, industrial, healthcare, and logistics sectors. According to the Government AI Readiness Index in 2024, the United States ranks first in the field of AI development (87.03), while other leading countries include France (79.36), Canada (78.18), and Germany (76.9). As for the US investments in AI development, according to AIPRM (2024), they amounted to USD 328548 million in 2019-2023. USD, including USD 67911 million in 2019. At the same time, the country's largest competitor, China, currently ranks second, investing about 60% less over the same period (USD 132665 million). According to a study by Hine and Floridi (2024), the American approach to AI development has undergone

significant changes during its popularisation in society, depending on the political leadership. In particular, US President Joseph Robinette Biden Jr.'s administration has implemented a strategy combining market orientation with more active state involvement, emphasising the role of the United States as a global technology leader. This has given the country a new impetus to develop innovative technologies. At the same time, international cooperation is recognised as important, particularly in the context of increased competition with China. However, difficult geopolitical circumstances may complicate constructive dialogue between states, potentially limiting the opportunities for creating a Good Global AI Society. The dual nature of the further development of AI technologies in the United States, which simultaneously contributes to the growth of productivity and economic opportunities and acts as a tool for global competition, requires the country's government agencies to balance economic interests while maintaining innovation and international relations. Therefore, given the complexity of integrating AI into established economic structures, an important aspect is to assess the US government's ability to adapt and implement AI (Figure 2), which directly affects the effectiveness of economic strategies.

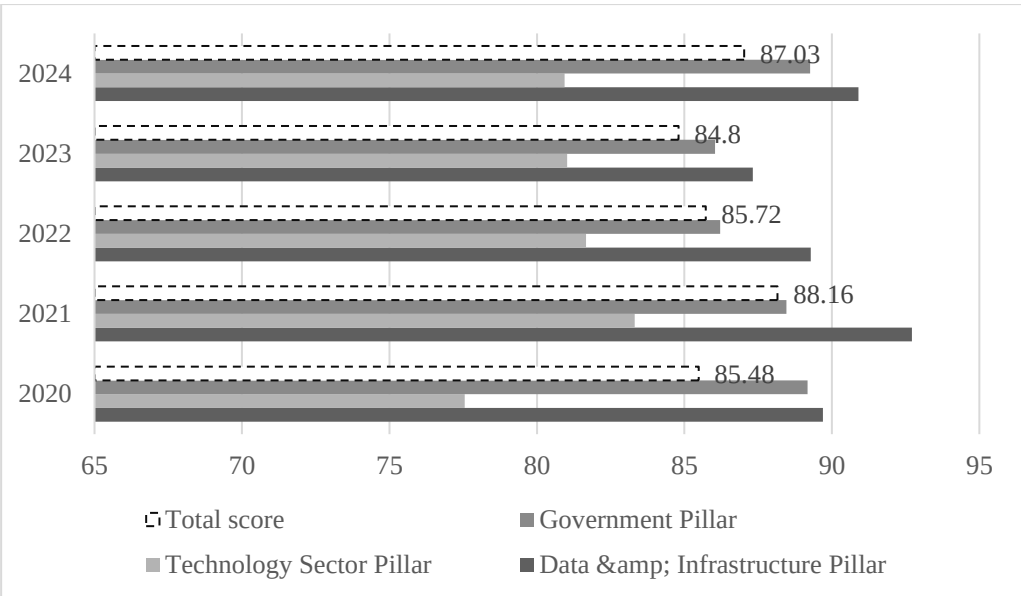

Figure 2. Dynamics of changes in the US Government AI Readiness Index in 2020–2024
Source: Hankins et al. (2023), Nettel et al. (2022), Nettel et al. (2024), Rogerson et al. (2022), Shearer et al. (2020)

In general, the Government AI Readiness Index scores show steady growth, which can be explained by the country's concomitant implementation of political and economic initiatives aimed at developing infrastructure to support AI technologies. The most significant increase in the Data & Infrastructure Pillar was observed in 2021, mainly due to a 61% increase in federal commitments to artificial intelligence from fiscal year 2020 to 2022, which amounts to USD 2.3 billion in quantitative terms. (GovWin, 2023). The further decline is explained by economic difficulties (in particular, the inflation rate in the United States rose to a record high of 9.1% in June 2022 (Statista, 2025) and rising geopolitical tensions, which are generally associated with the beginning of Russia's full-scale invasion of Ukraine, the resumption of rivalry between

Russia and the Western world, and growing tensions between the US and China (SETAV, 2022), which is also widely discussed by the scientific community (Al-Hasnawi, 2022; Shevchenko et al., 2023; Hine & Floridi, 2024). Further positive developments in the dynamics of the Government AI Readiness Index may be associated with the White House's intention to increase investment in the creation of new artificial intelligence infrastructure, including the involvement of the private sector in the creation of a project of an enterprise called the Stargate Project, which currently plans to invest more than $500 billion in data centres focused on AI. The White House also plans to invest more than USD 500 billion in AI-focused data centres (da Silva et al., 2025).

In order to understand the impact of artificial intelligence technologies and their implementation at all levels of US social activity, it is necessary to characterise their role in stimulating automation, increasing efficiency, and forming new markets. Therefore, the primary purpose of further calculating the annual growth rates of macroeconomic indicators was to select three groups of variables: macroeconomic (GDP, Employment Rate), which reflects the overall productivity of the economy; fiscal (Exports, Imports), which reflects changes in productivity and labour market structure; macro-financial stability (Tax Receipts, Inflation Rate), which indicates financial risks and the adaptability of the economic system to digital transformations. Relevant data was selected through statistical analysis of the Government AI Readiness Index and US macroeconomic activity in 2020-2023. The results of calculating the annual growth rates of indicators for the analysis of macroeconomic trends in the context of AI technology development are shown in Table 2.

Table 2. Dynamics of annual growth rates of indicators for analysing macroeconomic trends in the context of AI technology development

Timeline	Govern-ment AI Readiness Index	Macroeconomic indicators		Fiscal indicators		Macro-financial stability indicators	
		GDP	Employment Rate	Exports	Imports	Tax Receipts	Inflation Rate
2020	-	-	-	-	-	-	-
2021	3,135236	10,65047	-6,055646	-4,645683	3,709324	14,44791	-44
2022	-2,767695	9,112952	4,006969	16,54873	21,29751	30,26697	435,7143
2023	-1,073262	6,262753	0,837521	11,5727	3,51711	-9,758096	-14,66667
2024	2,629717	6,621412	0	0,535624	-0,500627	4,296425	-51,5625

Source: calculated by the author

The general trend indicates a steady increase in macroeconomic indicators through 2024, accompanied by moderate changes in fiscal and macro-financial indicators. While the employment rate remained at the level of the previous period, and the US GDP growth of 2.3% in 2024 mainly indicates a steady economic growth, driven by a significant increase in consumer spending (by 4.2%) in the fourth quarter of 2024 (Trading Economics, 2024e), other indicators have undergone more significant changes. In particular, a slight increase in exports (0.54%) and a decrease in imports (-0.5%) in 2024 is the result of the stabilisation of global supply chains and the recovery of international trade after the COVID-19 pandemic and the rise in geopolitical tensions since 2022; the growth rate of US tax revenues in 2024 reached 4.3% due to increased economic activity and higher corporate profits; and a significant decrease in inflation in 2024 (by 51.56%) was mainly due to the effective monetary policy of the US Federal Reserve Board (2024). aimed at reducing the A visualisation of the results of calculating the growth rates of key indicators by category is shown in Figure 3.

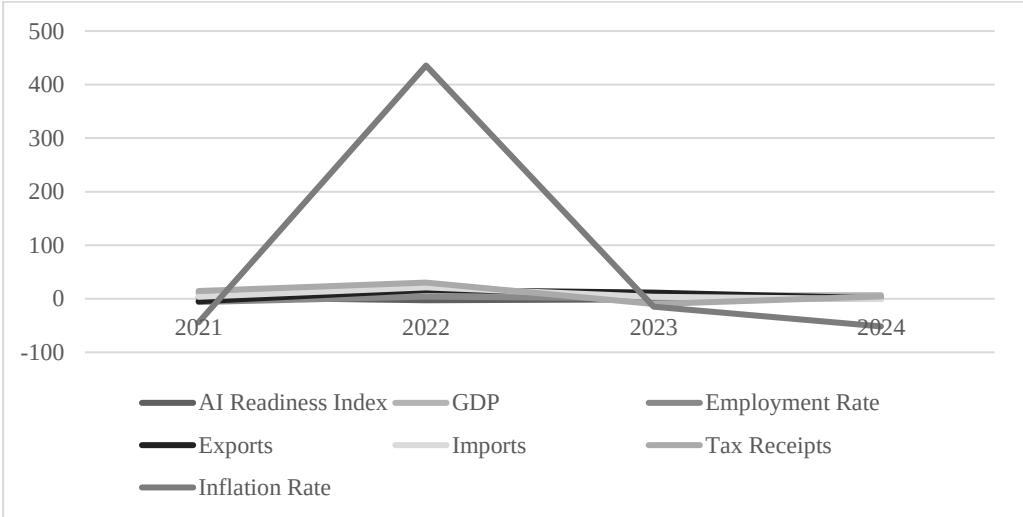

Figure 3. Visualisation of the annual growth rates of the studied indicators
Source: compiled by the author

The results of the calculations demonstrate the consistency of changes in macroeconomic, fiscal and macro-financial indicators, which indicates the importance of the role of US government policy in financial stabilisation and stimulating innovative development. In this context, the Government AI Readiness Index dynamics confirm that government support for digital transformation, particularly artificial intelligence technologies, drives the country's further economic growth. Nevertheless, it is important to determine the extent and nature of the relationship between macroeconomic indicators and the development of AI technologies. Therefore, first of all, to assess the relationships between the analysis variables that have different units of measurement, they were normalised to eliminate differences in the scales of different indicators. The calculation results of normalised indicators, which are presented in Table 3, will ensure the correctness of further correlation analysis.

Table 3. Results of calculating normalised indicators for assessing the relationships between the analysis variables

Timeline	Government AI Readiness Index	Macroeconomic indicators		Fiscal indicators		Macro-financial stability indicators	
		GDP	Employment Rate	Exports	Imports	Tax Receipts	Inflation Rate
2020	0,202381	0	1	0,158527	0	0	0,180328
2021	1	0,289492	0	0	0,122739	0,294328	0
2022	0,27381	0,563573	0,621622	0,538467	0,853599	1	1
2023	0	0,769097	0,756757	0,977337	1	0,703631	0,819672
2024	0,66369	1	0,756757	1	0,978428	0,821387	0,278689

Source: calculated by the author

Considering the preliminary analysis of the initial data, a correlation analysis was conducted between the values of the Government AI Readiness Index and the macroeconomic variables of the analysis (GDP, Employment Rate, Exports, Imports, Tax Receipts, and Inflation Rate). The purpose of this analysis is to identify

statistically significant correlations between the implementation of innovations in public administration and macroeconomic indicators. The statistical significance of the correlations is determined by the p-value ($p < 0.05$), which indicates a low probability of randomness of the results. Due to the normalisation of indicators, correlation analysis ensures the comparability of all variables within a single scale. To obtain the analysis results shown in Figure 4, we used the CORREL function in Microsoft Excel. The initial assumption of the correlation analysis is that there is a stable relationship between the level of readiness of governments to implement AI technologies and the observed trends in macroeconomic, fiscal, and macro-financial indicators.

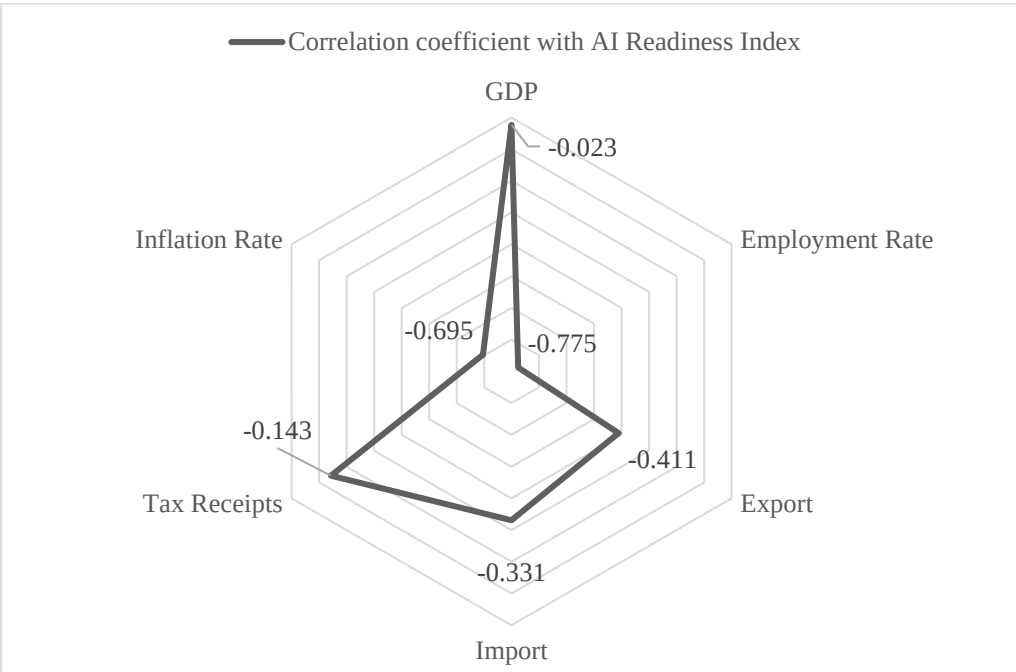

Figure 4. Visualisation of the results of the correlation analysis of normalised values of the studied variables
Source: compiled by the author

The results of the correlation analysis revealed a negative relationship between the Government AI Readiness Index and all macroeconomic variables analysed. The strongest negative correlation observed between the level of government readiness to implement AI technologies and the employment rate ($r = -0.775$) is mainly due to potential structural changes in the labour market in response to technological shifts. In particular, according to the OECD report (OECD, 2019), modern policies should facilitate the transition of people to new occupational orientations and ensure continuous education, training, and skills development, given the prospects for replacing human labour components and the nature of the labour market through the implementation of AI technologies. Similar considerations can be found in the works of Du (2024), Liu (2024), and Sevcenko et al. (2022), who emphasise the impact of digitalisation phenomena, including the development of AI, on employment levels, causing a redistribution of labour between sectors, and Djama (2024), who emphasises

the need for a systematic approach to retraining and training of personnel in the context of their adaptation to AI. A significant negative correlation is also observed with the inflation rate (r= -0.695), which may be due to the impact of digital technologies on price stability and the effectiveness of government regulation of the economy. In this context, Jaumotte et al. (2023) note that digital technologies can reduce inflationary pressures by increasing the efficiency of markets and government regulatory policies. At the same time, the correlation between the Government AI Readiness Index and GDP is insignificant (r= -0.023), which may indicate the complex interaction between AI adoption and overall economic performance. Similar results are also reported by Wang et al. (2024), who point to a change in the structure of foreign trade flows in countries with a high level of technological development. Thus, the findings confirm the initial assumption that there is a relationship between the level of readiness for AI adoption and macroeconomic indicators. However, the nature of this relationship indicates the multidimensional impact of digital transformations on the economic system.

5. Conclusion

The results of the study confirm the leading role of the implementation of artificial intelligence technologies for the development of geographical regions in the global context and the increase in macroeconomic activity of individual countries, in particular, the impact of such technologies on economic productivity, the labour market and financial stability of the United States. The study made it possible to assess the structural changes caused by digital technologies and their implications for the labour market and financial stability. The trends, advantages, and disadvantages identified in the study are an important contribution to the scientific understanding of the role of artificial intelligence in shaping the dynamics of macroeconomic, fiscal, and macrofinancial indicators. Future research is suggested to address the existing gap and expand the analysis by including additional variables, such as the level of innovation activity, investments in research and development, and socioeconomic impacts of automation. In addition, it is important to conduct a comparative analysis, which involves expanding the sample to include countries from other geographical regions and different levels of economic development. In addition, using more sophisticated models, such as machine learning, will allow us to detail the nature of the relationships between variables and improve the predictive accuracy of research.

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