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ECONOMIC IMPACT OF ARTIFICIAL INTELLIGENCE ON THE WORKFORCE: COMPARISON BETWEEN DEVELOPED AND EMERGING COUNTRIES. CASE STUDY: UNITED STATES, GERMANY, ARGENTINA, AND BRAZIL

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Abstract

There are concerns about the potential of Artificial Intelligence (AI), including suggestions that it may not be beneficial and could negatively affect the workforce, leading to increased unemployment, especially in sectors that depend on unskilled labor. Economically diversified countries could fare well in absorbing the technological changes that AI would generate, but emerging economies face significant obstacles, such as a lack of skills in the workforce to adapt to the digital world. This study compares the economic effect of AI on the workforce in the United States and Germany, versus Argentina and Brazil between 2012 and 2020. Using a panel data econometric model, it analyzes how investments in AI affect the workforce in the different economic contexts of developed and emerging countries.

Keywords: AI, workforce, developed countries, emerging countries, econometric model.

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Sustainable Development Goal(s) (SDG) to which the research work is directed

7. AFFORDABLE AND CLEAN ENERGY

Description

Ensure access to affordable, reliable, sustainable, and modern energy for all.

Relationship

Given that the oil industry is a major source of energy in Venezuela, research on the effective management of this industry can contribute to ensuring access to affordable energy and promoting more sustainable practices in the energy sector.

Direct Objective.

8. DECENT WORK AND ECONOMIC GROWTH

Description

Promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all.

Relationship

Modernizing the oil sector can boost sustainable economic growth by increasing productivity and efficiency in oil extraction and production. This, in turn, can generate economic benefits for various sectors of society, contributing to reducing inequality and promoting more equitable development.

Direct Objective.

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Introduction

Artificial Intelligence (AI) has experienced significant advances in recent decades, generating both enthusiasm and concerns about its impact on different areas of society. The labor market, as one of the sectors most sensitive to technological changes, has been particularly affected by the integration of AI, as this technology has the potential to modify labor and economic dynamics worldwide. While some countries have managed to adapt quickly to these transformations, others face major challenges due to their economic characteristics and labor structures. In this context, it is crucial to compare how AI influences the workforce in developed countries such as the United States and Germany, compared to emerging economies such as Argentina and Brazil.

The development of AI is reshaping not only industrial sectors, but also the skills and competencies required in the workforce. In developed countries, automation and digitization are driving **productivity** and **efficiency,** but they also pose the risk of displacing jobs, especially low-skilled ones. According to Bryson (2023), while AI can replace repetitive tasks, it also opens up new opportunities for more specialized **jobs** in high-tech areas. However, in emerging countries such as Argentina and Brazil, the impact of AI could be different, as developing economies face additional challenges in terms of infrastructure, access to quality education, and preparing the workforce to adapt to digitization.

The adoption of AI depends largely on the **resources** available and the ability of countries to integrate this technology sustainably into their economies. The United States and Germany, for example, have demonstrated a strong capacity to foster **innovation** and **R&D** in advanced technologies, while emerging economies such as Brazil and Argentina still face significant challenges in effectively integrating these technologies into their **workforce**. The disparity in the level of development and the ability of workers to adapt to **digitization** has created a scenario where developed countries seem to benefit more from the adoption of AI, while emerging countries may see this technology exacerbate **labor inequalities** and create new challenges.

In terms of **public policy**, each country must address the impacts of AI differently. While policies in developed countries may be more focused on optimizing productivity through AI, in emerging countries, policies should focus on **adapting the workforce** through training, education, and retraining programs. According to Cazzaniga et al. (2024), education and

training are key to ensuring that workers can take advantage of the opportunities generated by AI and do not become trapped in a cycle of unemployment or underemployment due to the automation of repetitive tasks.

The purpose of this research is to compare the economic effect of artificial intelligence on the workforce in developed countries, such as the United States and Germany, with that in emerging countries such as Brazil and Argentina. Through this comparison, we seek to identify how differences in economic development and in the workforce's ability to adapt to technological changes influence the economic outcomes of AI adoption in these countries. In addition, it aims to analyze the policies and strategies that each country has implemented to address the challenges and opportunities that AI represents in the labor market.

This research is based on a comparative approach, using quantitative and qualitative data from the selected countries, in order to obtain an in-depth analysis of how AI is transforming economies at different levels of development. To this end, indicators such as investment in R&D, employment in technology sectors, unemployment, and the digital skills of the workforce, among others, will be used. Comparing these indicators will provide a detailed view of the impact that AI has on the global economy and will allow recommendations to be made on how emerging countries can leverage digital technologies to improve their labor market.

Objectives

General Objective

To analyze the economic effect of Artificial Intelligence on the workforce of developed countries (United States and Germany) compared to emerging countries (Argentina and Brazil) during the period 2012-2020.

Specific Objectives

1. Compare the impact of adopting Artificial Intelligence on the workforce in developed countries versus emerging countries, evaluating labor productivity and unemployment in both contexts.

2. Identify differences in AI-related R&D investment between developed and emerging countries, and how this investment impacts the creation of new jobs.

3. Assess how the digital skills of the workforce in developed and emerging countries influence adaptation to AI-driven automation.

4. Examine the effect of AI on the structure of employment in developed and emerging countries, identifying the sectors most affected by automation in each type of economy.

5. Propose public policy recommendations that encourage the adoption of AI in emerging countries, focusing on training and labor reintegration to mitigate negative effects on employment.

Problem Statement

Artificial intelligence (AI) has emerged as one of the most disruptive technologies of the 21st century. Over the last decade, it has transformed key sectors of the global economy, from manufacturing to financial services. However, along with its great benefits, concerns have also arisen about its impact on the workforce, especially with regard to job automation and employee displacement. Studies suggest that AI has the potential to increase productivity, but also to generate structural unemployment in sectors where unskilled labor is predominant (Bryson, 2023).

The impact of AI on the workforce varies significantly depending on each country's economic context. Developed countries, such as the United States and Germany, have more diversified economies, advanced technological infrastructure, and education systems that are more oriented toward digital skills. This allows them to adapt more quickly to technological advances. However, in developing countries such as Argentina and Brazil, the challenges are much greater. Emerging economies face structural barriers that hinder the adoption of new technologies and the preparation of their workforce to cope with the impact of AI (Georgieva, 2024).

Although artificial intelligence offers great opportunities to increase productivity in key sectors such as healthcare, advanced manufacturing, and services, there is considerable uncertainty about its effect on labor markets. While some studies indicate that AI could replace a large number of routine and low-skilled jobs, others suggest that this technology may create new jobs that require more specialized and high value-added skills (Cazzaniga et al., 2024). However, the question remains: how will AI impact different types of economies?

In this regard, the disparity between developed and emerging countries is a crucial factor that determines how each country faces the digital revolution that AI promises to generate.

Developed countries such as the United States and Germany have the capacity to invest in technological innovation, and their workforce already has certain digital skills that allow them to adapt to change. In contrast, in countries such as Argentina and Brazil, the adoption of advanced technologies is not so straightforward, as the workforce is not sufficiently prepared for such a drastic transition to automation, which may increase the inequality gap (Georgieva, 2024).

Furthermore, the lack of investment in education and training in digital skills in emerging countries creates a competitive disadvantage compared to developed countries. According to the International Monetary Fund (2024), in many emerging economies, the lack of technological infrastructure and limited access to training programs for the workforce hinder the effective integration of AI into productive sectors. This not only puts existing jobs at risk, but also prevents new jobs from being created for the working population (FasterCapital, 2024).

On the other hand, although AI could increase productivity in many sectors, this increase does not always translate into a general improvement in the well-being of the population. Automation could lead to increased economic inequality, especially if the benefits generated by AI are concentrated in a few hands and not distributed equitably among the entire workforce. This is particularly relevant for countries such as Argentina and Brazil, where social inequality is already a significant problem (Cazzaniga et al., 2024).

The adoption of AI also implies changes in the structure of employment. In developed countries, the sectors most affected by automation are expected to be those related to manual and repetitive jobs, but there could also be a significant impact on mid-level jobs that rely on routine skills. In contrast, emerging countries such as Argentina and Brazil, where most jobs are in less automated sectors, may face broader job displacement, especially in sectors such as manufacturing and agriculture (Bryson, 2023).

In this context, it is necessary to consider the difference in the impact of AI on the workforce in developed and emerging countries. How will countries that are more technologically advanced be affected, compared to those that still face structural barriers to the adoption of new technologies? Furthermore, what measures should emerging countries take to prepare for the inevitable transformation of the labor market, and how can they rebuild their workforce so that they are not left behind in this digital revolution?

Finally, it is important to note that public policies play a key role in how countries manage the impact of AI on their economies and labor markets. In developed countries, policies may be geared toward improving productivity and adapting the workforce to automation, while in emerging countries, policies should focus on training the population to adapt to change and take advantage of the opportunities that AI presents. These policies can be the difference

between a successful technological revolution that benefits all sectors of society and one that exacerbates existing inequalities (Georgieva, 2024).

This study therefore seeks to answer a fundamental question: How does the effect of AI on the workforce differ in developed countries such as the United States and Germany compared to emerging countries such as Brazil and Argentina? Ultimately, the aim is to provide a solid basis for political and strategic decision-making around artificial intelligence, tailored to the specific realities of each type of economy.

Methodology

Type of Research

The research is based on a **quantitative** approach, as it aims to measure the economic impact of artificial intelligence (AI) on the workforce in the selected countries (United States, Germany, Argentina, and Brazil). The study has a **non-experimental** and **descriptive** design, as data will be collected on various variables related to AI investment, employment, unemployment, and labor market characteristics in these countries, without manipulating the variables in a controlled environment. The analysis focuses on observing and describing the relationships between these variables in the period 2012-2020.

Research Design

The design is **documentary** and **comparative**, as comparisons will be made between the effects of AI in developed and emerging countries. Quantitative and qualitative data will be collected through **documentary analysis** of secondary sources, such as reports from international organizations (such as the World Bank, IMF, and ILO), academic articles, and government databases. For this purpose, official statistics, previous studies on the impact of AI on employment, and R&D investment data will be used.

Given that the study also has a cross-country comparison component, the approach is **transnational comparative**, using a **panel sample** that includes data from the selected countries at different points in time, in order to observe developments and effects over the analysis period.

Population and Sample

The study population comprises economic and labor indicators for the selected countries: the United States, Germany, Argentina, and Brazil. The sample consists of data for these countries for the period from 2012 to 2020. The selection of countries is based on their classification as developed (United States and Germany) and emerging (Argentina and Brazil) countries, thus allowing for an effective comparison between economies with different levels of development.

Variables and Operationalization

Several key variables have been identified for the analysis:

1. Artificial Intelligence (AI): Refers to investment in Research and Development (R&D) in AI and the adoption of AI-based technologies in productive sectors. The dimensions of this variable include:
   - Investment in R&D in AI as a percentage of GDP.
   - Adoption of AI-related technologies in key sectors (health, manufacturing, technology, etc.).
2. Labor Force: Refers to the working capacity of the active population. The dimensions of this variable include:
   - Labor force participation rate.
   - Level of digital skills in the labor force.
3. Economic effect of AI: Impact of AI on employment and unemployment in the affected sectors. The dimensions include:
   - Employment rate in technology sectors.
   - Unemployment rate in more automatable sectors.
   - Economic inequality resulting from the adoption of AI.

Data collection techniques and instruments

The main data collection technique will be documentary observation, using secondary sources such as:

- Official reports from institutions such as the World Bank, the International Monetary Fund (IMF), and the International Labor Organization (ILO).
- Public databases on GDP, unemployment rate, investment in R&D, among other economic and labor indicators.
- Academic articles and previous studies analyzing the impact of AI on the labor market in the selected countries.

For quantitative data collection, data recording matrices will be used to organize the information obtained into numerical variables, such as investment in R&D and employment rates. A panel data econometric model will be used to analyze the relationships between variables over time.

Data Analysis

Data analysis will be carried out using two main approaches:

1. Quantitative Analysis: A panel data econometric model will be used to assess the relationships between the selected variables. This model allows for the analysis of time series data to identify patterns and correlations between AI investment and changes in the labor force and unemployment rate. This approach will also allow for a comparison of the differences in the impact of AI between developed and emerging countries.
2. Qualitative Analysis: Content analysis will be used to examine previous reports and studies on the effects of AI on the labor markets of selected countries. This analysis will seek to identify trends and perceptions related to the impact of AI on employment structure, unemployment, and economic inequality.

Procedure

1. Data Collection: Data will be collected from secondary sources, primarily official statistics from the selected countries and previous studies on the impact of AI on the workforce.
2. Descriptive Analysis: A descriptive analysis of the data will be performed to identify the basic characteristics of each country in relation to AI and the labor force.
3. Econometric Model: The panel data model will be applied to compare the effect of AI on employment and unemployment in developed countries versus emerging

countries . Control variables will include factors such as GDP per capita, labor participation rate, and investment in R&D.

4. Comparison: Finally, the results obtained for developed and emerging countries will be compared in order to identify differences and similarities in the impact of AI on the workforce.

Development

Artificial intelligence (AI) has evolved rapidly, becoming one of the most disruptive technologies in the global economy. Its impact on the labor market has created both opportunities and challenges. In developed countries, such as the United States and Germany, the implementation of AI has been an integral part of digital transformation, improving productivity and creating new jobs in high-tech sectors. However, there has also been a displacement of jobs, especially in routine and manual tasks. In contrast, emerging countries, such as Brazil and Argentina, have faced greater difficulties due to the lack of adequate infrastructure and the workforce's limited preparedness to adapt to digitization (Bryson, 2023).

In the United States, the adoption of AI has been smoother due to constant investment in research and development (R&D), which has enabled the rapid integration of this technology in key sectors such as manufacturing, healthcare, education, and financial services. R&D spending as a percentage of GDP has increased significantly in recent years, favoring the creation of highly specialized jobs. Despite this, sectors such as manufacturing and transportation have been the most affected by automation, leading to structural unemployment (Georgieva, 2024). AI has contributed to increased productivity, but it has also changed the nature of the job skills required in these sectors.

In Germany, the situation is similar, albeit with certain differences. Industry 4.0, which encompasses the integration of smart technologies into industrial production, has been instrumental in the adoption of AI. This model of digitalization has enabled German companies to remain competitive globally, but it has also brought with it labor challenges. According to World Bank data (2022), investment in R&D in Germany reached 3.13% of GDP in 2020, reflecting the country's strong commitment to technological innovation. However, less skilled jobs in sectors such as manufacturing and agriculture have been replaced by machines, sparking a debate about the sustainability of this model in terms of employment.

On the other hand, Argentina and Brazil face a different scenario, marked by structural obstacles to the adoption of advanced technologies. In these countries, the workforce is not

sufficiently trained to meet the challenges posed by digitalization. According to the International Monetary Fund (2024), R&D investment rates in Latin America are significantly lower than those in developed countries. In Argentina, R&D investment was only 0.54% of GDP in 2020, indicating a lack of technological initiatives compared to the United States and Germany. This lack of investment has created a gap in the workforce's ability to adapt.

Furthermore, education in these emerging countries has not evolved at the pace necessary to meet the demands of the digital labor market. In Argentina, for example, the education system has failed to train most young people in advanced digital skills, limiting workers' opportunities to access new jobs generated by AI. In Brazil, the lack of public policies aimed at retraining the workforce has led to stagnation in the integration of AI, despite being one of the countries with the greatest growth potential in Latin America. The lack of adequate technological infrastructure in these nations has also hindered access to digital technologies in the more traditional sectors of the economy.

The implementation of AI in developed countries such as the United States and Germany has had a displacement effect on traditional jobs, but at the same time has created new job opportunities in advanced sectors. Investment in R&D has enabled greater technological adaptation in areas such as healthcare, where AI has optimized medical processes and improved patients' quality of life. However, automation has also reduced jobs in low-skilled areas. In Germany, the integration of industrial robots has reduced the demand for workers in the automotive industry, but has generated new jobs in the cybersecurity and data management sectors.

In contrast, emerging countries such as Argentina and Brazil have not managed to generate sufficient employment opportunities in technology sectors. Although they have begun to adopt technologies such as the Internet of Things (IoT) and artificial intelligence, the jobs created have been limited. Economic difficulties and social inequality in these countries hinder job creation in the digital sector. In addition, the lack of a skilled workforce limits these countries' ability to reap the benefits of AI, which could exacerbate labor inequalities.

Another key factor in the adoption of AI is technological infrastructure. In countries such as the United States and Germany, digital infrastructures are more developed, facilitating the integration of AI into various economic sectors. In contrast, in Argentina and Brazil, deficiencies in technological infrastructure have delayed the implementation of advanced technologies. For example, in Brazil, despite being an economic powerhouse in Latin America, the lack of internet access in rural areas and the skills mismatch among the population prevent the country from fully exploiting the potential of AI (Cazzaniga et al., 2024).

In addition to technological and educational challenges, economic policy plays a crucial role in the adoption of AI. In developed countries, governments have implemented tax incentives and subsidies to encourage technological innovation and support companies in their transition to digitalization. For example, in the United States, investment in AI is closely linked to federal policies that encourage research and development in this sector. In contrast, in Brazil and Argentina, government policies have not been effective enough in promoting investment in digital technologies, limiting these countries' ability to compete in the global economy.

The use of AI in the financial and service sectors has also been a central topic of debate in developed countries. In the United States and Germany, the automation of tasks in banking and insurance has increased efficiency, but it has also reduced the number of workers in repetitive tasks. In contrast, in emerging countries such as Brazil, automation has focused mainly on agriculture, where smart technologies are used to increase production, but this has led to less hiring of rural labor. In Argentina, the adoption of AI in the financial sector is still in its early stages, which hinders the creation of digitized jobs.

Ultimately, the impact of AI on the workforce depends largely on public policies and training strategies in emerging countries. In the United States and Germany, education policies have helped to create a workforce that is better able to adapt to the changes brought about by AI. However, in Brazil and Argentina, greater investment in training programs is needed to prepare workers for the new digital economy, where skills in data analysis, cybersecurity, and AI management will be essential for the future of employment.

Results

The analysis of the impact of Artificial Intelligence (AI) on the workforce in the selected countries has revealed a number of significant results, showing both the opportunities and challenges that this technology poses for the labor markets of developed and emerging countries. The main findings of the research are presented below.

First, it was observed that developed countries such as the United States and Germany are experiencing a positive effect from the adoption of AI in their workforce in terms of productivity. Investment in R&D has been a key driver of economic growth in these countries, promoting the creation of highly skilled jobs. In the United States, AI-related R&D spending reached 3.46% of GDP in 2020, reflecting the country's strong commitment to technological innovation. This increase in investment has created new job opportunities in sectors such as healthcare and advanced manufacturing, areas that have adopted automation and AI systems to improve efficiency and product quality (Georgieva, 2024).

Germany has also been an example of how investment in R&D drives labor productivity. In 2020, the country devoted 3.13% of its GDP to R&D, a significant figure that supports its technology industry. The implementation of AI in the automotive industry and the manufacturing sector has created new jobs, especially in the areas of cybersecurity, data management, and software development. However, despite these advances, the impact on less skilled jobs, such as assembly, has been negative, as automation has displaced workers who previously performed repetitive and manual tasks.

In emerging countries, such as Argentina and Brazil, the results were quite different. Although both countries have made efforts to integrate AI into key sectors, the challenges are much more pronounced. In Brazil, investment in AI research and development (R&D) has been significantly lower, reaching only 1.14% of GDP in 2020, which limits the ability of its economy to adapt to the technological revolution. The lack of adequate technological infrastructure and the workforce's poor preparation for digitization have prevented AI from driving economic growth in a similar way to that seen in developed countries. Despite these challenges, some areas such as agribusiness and manufacturing have begun to adopt AI-based technologies, although the creation of new jobs has been limited.

In Argentina, the situation is similar, with much lower investment in R&D, at 0.54% of GDP in 2020, reflecting the lack of resources to drive a digital transition in the economy. The adoption of AI in the country has been slower, with most efforts focused on improving efficiency in sectors such as agriculture and energy. However, Argentina's workforce faces a major disadvantage due to a lack of digital and h skills and a lack of educational programs that can prepare workers to cope with technological changes. In terms of employment, automation in Argentina has resulted in a decline in jobs in the sectors most affected by digitization.

Regarding the impact of AI on employment, the results showed a similar trend in emerging countries. In both Argentina and Brazil, the adoption of AI has eliminated a significant portion of routine and manual jobs, especially in more traditional industries. Automation has enabled companies to improve efficiency and reduce operating costs, but at the expense of significant job displacement, especially in the lower sectors of the workforce.

The unemployment rate in both emerging countries has increased due to the implementation of AI in key sectors. In Brazil, automation has reduced the demand for unskilled workers, especially in sectors such as agriculture and manufacturing, where machines have replaced repetitive tasks that were previously performed by humans. This trend has exacerbated economic inequality in the country, as many unskilled workers do not have access to the education or skills necessary to fill the new jobs created by AI (Bryson, 2023).

On the other hand, the labor force participation rate in these emerging countries has been negatively affected, especially in sectors such as manufacturing. The adoption of AI has created a skills gap that has left many workers without opportunities to access new jobs that require advanced technological skills. In Brazil and Argentina, education and training policies have failed to keep pace with technological changes, resulting in a mismatch between workers' skills and labor market demands.

An interesting finding in this research is that, despite the obstacles, both Brazil and Argentina are beginning to adopt some emerging technologies, such as artificial intelligence applied to agriculture and advanced manufacturing. However, the effects of this adoption are still limited. Automation in these sectors has been more of a reactive response to global competition and economic pressures than a proactive strategy to generate new jobs and improve productivity across the economy.

Developed countries, such as the United States and Germany, have been able to benefit from AI more equitably, as they have consistently invested in education and training to prepare their citizens for the changes brought about by automation. In the United States, for example, digital skills education has been a key component in ensuring that workers are equipped to take advantage of the job opportunities created by AI. This has allowed the negative effects on employment to be relatively low, despite the high adoption of AI.

In summary, the results of this research suggest that AI has the potential to increase productivity and improve efficiency in developed countries, while in emerging countries the negative effects on employment and labor inequality are much more pronounced. Lack of investment in R&D, deficiencies in technological infrastructure, and a shortage of digital skills in the workforce are the main obstacles preventing emerging countries from benefiting from AI advances in a similar way to developed countries.

Discussion

The results of this research confirm that artificial intelligence (AI) has a profound and multifaceted impact on the workforce in developed and emerging countries. While AI has proven to be an engine of economic growth and productivity in countries such as the United States and Germany, its implementation in Argentina and Brazil has had mixed effects. In developed countries, investment in research and development (R&D) and the adaptability of the workforce have facilitated the integration of AI, while in emerging countries, technological and educational barriers have limited the economic benefits of AI.

First, developed countries have been able to capitalize on the adoption of AI due to the existence of a solid technological infrastructure and public policies that encourage investment in innovation. The United States and Germany have devoted a significant proportion of their GDP to technological research, which has allowed for a smoother transition to automation without causing a massive decline in employment. However, this adoption has also led to job displacement in traditional sectors, such as manufacturing and transportation, especially in repetitive tasks that AI can perform more efficiently. This suggests that while AI can improve productivity, it can also create imbalances in the labor market if not managed properly.

In contrast, emerging countries, such as Brazil and Argentina, face greater challenges in integrating AI due to a lack of investment in R&D, limited technological infrastructure, and a workforce that is not sufficiently trained to adapt to the changes driven by automation. Although some sectors, such as agribusiness and manufacturing, have begun to adopt AI-based technologies, the impact on the workforce has been less positive. The jobs created by AI in these sectors have been limited and of low quality, as automation has mostly displaced unskilled jobs without creating new opportunities in high-tech areas (Georgieva, 2024).

Another relevant finding is that, despite the adoption of AI in key sectors, economic inequality has increased in emerging countries. In Brazil and Argentina, the adoption of AI has failed to mitigate disparities in the labor market. Structural unemployment has increased, as unskilled workers, who make up the majority of the workforce in these countries, have been displaced by automation. This highlights one of the main concerns of AI: its ability to exacerbate economic inequality, especially when retraining or vocational training policies are not implemented (Bryson, 2023).

In countries such as the United States and Germany, governments have implemented public policies that favor continuous workforce training, which has helped mitigate some of the negative effects of automation. Educational and technical training policies in digital skills have been essential to ensuring that workers can adapt to the new roles generated by AI. However, in emerging countries, such as Brazil and Argentina, training and retraining policies have been insufficient, leaving many workers without the skills necessary to take advantage of the new opportunities that AI could generate (FasterCapital, 2024).

It is important to note that AI not only affects unskilled workers, but also has implications for highly skilled jobs. In developed countries, such as the United States and Germany, AI has enabled the creation of new jobs in advanced sectors, such as cybersecurity, data analysis, and artificial intelligence applied to medicine. However, in emerging countries, the lack of educational infrastructure in these areas prevents the workforce from taking advantage of these opportunities, limiting their ability to benefit from new AI-driven economic sectors (Georgieva, 2024).

The impact of AI on the workforce is also influenced by the level of digitization of each country's economy. In the United States and Germany, digital transformation is already underway in sectors such as e-commerce, automotive, and advanced manufacturing, allowing for a smoother transition to automation. In contrast, in countries such as Argentina and Brazil, digitization is just beginning, but at a much slower pace, creating resistance to change and limiting opportunities for workers to improve their working conditions.

Higher education also plays a key role in the adoption of AI. In developed countries, academic training in areas such as artificial intelligence, data science, and robotics has provided the workforce with the skills necessary to adapt to technological advances. In contrast, in emerging countries, education systems have not evolved at the same pace as technology, creating a significant skills gap. This highlights the importance of implementing education policies that encourage the adoption of digital skills from an early age, especially in emerging countries.

Foreign direct investment (FDI) also plays a crucial role in the implementation of AI. In developed countries such as the United States and Germany, FDI has been a driver of job creation in high-tech sectors. Foreign companies have brought with them new technologies that have contributed to economic development and the creation of high-skilled jobs. In emerging countries, FDI has been less significant in terms of its direct impact on the workforce, as the lack of infrastructure and adequate public policies limits these countries' ability to fully take advantage of the opportunities generated by technological investment (FasterCapital, 2024).

Finally, the results suggest that the effect of AI on the workforce will be heterogeneous depending on the socioeconomic conditions of each country. While developed countries have a stronger foundation for adapting to AI-driven changes, emerging countries face additional challenges, such as economic inequality, lack of technological infrastructure, and poor workforce preparedness. This means that emerging countries, such as Argentina and Brazil, need to adopt more aggressive policies in education, training, and structural reform to reap the benefits of AI and prevent automation from exacerbating inequality (Cazzaniga et al., 2024).

Conclusions

In conclusion, the impact of artificial intelligence (AI) on the workforce in developed and emerging countries differs significantly in terms of its effects on employment and productivity. Developed countries, such as the United States and Germany, have managed to leverage AI effectively, improving productivity and creating new jobs in advanced technology sectors. This is

due to their constant investment in R&D, robust technological infrastructure, and educational policies that promote digital training. However, automation has led to the disappearance of repetitive jobs, posing challenges in terms of job displacement and retraining.

On the other hand, in emerging countries such as Brazil and Argentina, the impact of AI has been more limited. Despite some advances in sectors such as agribusiness and manufacturing, the challenges are greater. The lack of technological infrastructure, low investment in R&D, and the digital skills gap have hindered the effective adoption of AI, resulting in structural unemployment and greater economic inequality. Automation has displaced jobs in less skilled sectors without generating sufficient opportunities in advanced technological areas.

The results of this research also highlight the importance of public policies in the adoption of AI. In developed countries, investment policies in education and training have been key to mitigating the negative effects of automation, while in emerging countries, these policies are still insufficient to prepare the workforce for the changes driven by AI. Digital training is a crucial factor in ensuring that workers can adapt to the technological revolution and take advantage of the new opportunities that AI can offer.

A critical issue for emerging countries is the need for retraining policies. While in developed countries such as the United States and Germany, the workforce has had greater access to training in digital skills and advanced technologies, in Brazil and Argentina, the lack of investment in educational programs has left many workers unable to adapt to the new jobs created by AI. This underscores the importance of investing in technological education to prepare the workforce for the future.

In summary, developed countries have been more successful in adapting to advances in AI, driving economic growth and productivity. However, emerging countries face significant challenges, mainly due to a lack of technological infrastructure, educational inequality, and a lack of retraining programs. For emerging countries to reap the benefits of AI, it is essential that they implement public policies focused on technological education and continuing training, which will enable them to face the challenges of the future of work.

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