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The Transformative Effects of AI on Employment: A Regression Analysis of Selected OCED Nations

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Abstract

In cyber space era, the potential of AI has charismatic power to transform various sectors of society by improving efficiency, accuracy, and safety. This research study aims to investigate the association between increasing application of AI and its effect on employment status. Data on employment status, wage rates, and AI application in percentage term are extracted from secondary sources such as the OECD. The findings reveal that Germany and the United Kingdom have the highest number of people employed in reference period, indicating a robust workforce. Estonia, on the other hand, has room for growth in terms of employment opportunities. It is noted that Luxembourg and the Netherlands offer the highest minimum annual wages in Europe. The study also highlights the variation in AI utilization by firms, with Luxembourg and the Netherlands leading the way, while Greece and Romania have lower adoption rates. Regression analysis shows that both AI utilization and annual wage rates significantly affect employment status. Higher AI utilization is associated with lower employment levels, suggesting potential job replacement through automation. Conversely, higher wages are linked to increased employment status, indicating that attractive wages can attract and retain more workers. Interestingly, the study suggests that AI utilization has a larger impact on employment status than wage rates. However, it is crucial to note that these findings represent regression analysis of selected variables for reference period and should not be interpreted as causation. To fully capitalize on the benefits of AI, collaboration between policymakers, businesses, and communities is essential to equip the workforce with the necessary skills to adapt and thrive in an AI-driven economy. This approach will maximize the potential benefits of AI while mitigating any negative impacts on employment.

Key words: Artificial Intelligence, OECD, European Union**,** Employment, Regression Analysis

Introduction

Artificial intelligence (AI) has the potential to greatly improve various aspects of our lives, such as healthcare, public administration, transport, industry, and agriculture. By utilizing AI, countries can achieve more accurate and efficient medical diagnoses, automate dangerous and repetitive tasks, enhance cybercrime prevention, and minimize energy consumption. Additionally, AI can contribute to fewer traffic accidents, better utilization of resources like energy and water, reduced work-related injuries, and minimized environmental impact. By 2025, the economic impact of AI, knowledge work automation, and autonomous vehicles is projected to reach between €6.5 and €12 trillion annually. The European Union (EU) recognizes the significance of AI and aims to enhance

cooperation and competitiveness in this field while upholding European values. The EU's approach encompasses technological, ethical, legal, and socio-economic aspects to advance research, industrial capacity, and ensure that AI serves European citizens and the economy. There is growing concern about the impact of AI deployment on the labor market, particularly when it comes to worker displacement. However, some experts argue that the effect of AI on employment may be different from previous technological advancements. In a study by Autor, Levy, and Murnane (2003), it was proposed that jobs consist of routine and non-routine tasks. Historically, technological progress focused on automating routine tasks, such as record-keeping, calculations, and information search - all of which can be programmed into computers. Additionally, industrial robots were developed to handle routine manual tasks like welding, painting, or packaging. Consequently, the main impact of these technologies was the substitution of workers in low- and middle-skill occupations.

The EU has already invested substantial amounts in AI-related areas, including robotics, cognitive systems, big data, and future technologies through programs such as Horizon 2020 and Structural and Investment Funds. Another €2.6 billion has been dedicated to AI-related research, while robotics alone has received €27 billion from Horizon 2020 and private investments. Additionally, €700 million has been allocated for skills development, with €2.3 billion specifically focused on digital skills.In conclusion, the EU is committed to investing in AI and leveraging its benefits to improve various sectors of society, ultimately making people's lives easier, safer, and more efficient.

OECD Countries refer to the member countries of the Organization for Economic Co-operation and Development (OECD), an international organization that aims to promote economic growth and social progress. As of 2021, there are 38 member countries in the OECD, including some of the world's most advanced and developed economies. Here are some key concepts associated with OECD countries:

General Outlines

1. Economic Development: OECD countries are known for their high levels of economic development. They have achieved significant levels of economic growth, resulting in high per capita income and quality of life for citizens. OECD countries generally have well-developed infrastructure, advanced technology, and efficient public services.

2. Social Welfare: OECD countries emphasize social welfare and have well-established social safety nets. They prioritize providing healthcare, education, unemployment benefits, and pension programs to ensure the well-being of their populations. The welfare system varies across countries but generally aims to address inequalities and support vulnerable groups.

3. Education and Innovation: OECD countries place a strong emphasis on education and innovation. They invest heavily in research and development, promote entrepreneurship, and have well-developed systems for higher education. The OECD's Program for International Student Assessment (PISA) measures educational performance and helps member countries improve their educational systems.

4. Environmental Sustainability: Many OECD countries are pioneers in promoting environmental sustainability. They implement policies to reduce greenhouse gas emissions, promote renewable energy sources, and adopt sustainable practices. The OECD regularly conducts environmental performance reviews to assess member countries' progress in meeting environmental goals.

5. International Cooperation: OECD countries engage in extensive international cooperation in various fields. They work together to develop policies and guidelines, share best practices, and coordinate on international issues such as trade, taxation, and climate change. The OECD acts as a platform for countries to exchange ideas and cooperate in enhancing their economic and social policies.

Overall, OECD countries strive to maintain and improve their economic performance while ensuring the well-being of their citizens. They often serve as models for other countries seeking to enhance their economic and social development.

Over the past decade, the countries belonging to the Organisation for Economic Co-operation and Development (OECD) have witnessed significant advancements in the adoption and utilization of artificial intelligence (AI) by firms operating within their borders. AI has transformed the way businesses operate, enhance productivity, and create innovative solutions across various industries. According to data from the World Intellectual Property Organization, between 2010 and 2019, the number of AI-related patents filed by OECD countries grew by a staggering 222%. This immense growth reflects the increasing recognition of AI as a valuable tool for firms to gain a competitive edge in the global marketplace. Moreover, AI has become instrumental in enhancing efficiency, improving decision-making processes, and driving economic growth. In recent years, OECD countries such as the United States, Japan, and Germany have emerged as global leaders in AI development and implementation. These countries have fostered a conducive environment for AI innovation through supportive policies, investment in research and development (R&D), and strong collaboration between academia and industry. For instance, the United States has witnessed substantial investment in AI, with leading tech firms such as Google, Microsoft, and Amazon significantly contributing to its development and application.

The impact of AI is not limited to the tech sector alone. It has permeated various industries, including healthcare, finance, manufacturing, and transportation, among others. For instance, AI is revolutionizing healthcare through applications such as medical imaging analysis, drug discovery, and personalized medicine. In finance, AI algorithms are being utilized for risk assessment, fraud detection, and algorithmic trading. Even traditional manufacturing industries are leveraging AI to optimize production processes, automate quality control, and enhance supply chain management. However, along with the benefits, the adoption of AI by firms in OECD countries has posed challenges as well. Issues such as job displacement, ethical considerations, and the potential for bias in algorithms have emerged as areas of concern. Policymakers and regulators are increasingly focusing on addressing these challenges through the development of guidelines and frameworks to ensure responsible and ethical AI deployment. In conclusion, the past decade has witnessed a rapid growth in the adoption of AI by firms in OECD countries. This has not only boosted productivity and competitiveness but also transformed numerous industries. While the potential of AI is immense, it is crucial to strike a balance between maximizing its benefits and addressing the associated challenges to ensure a sustainable and inclusive future.

Objective of the study

The following the objectives of research study.

- To analyze the relationship between the adoption of artificial intelligence (AI) technologies and changes in employment status in selected OECD nations, using regression analysis.
- To analyze impact of AI on employment trends in OECD nations.

Literature review

Lane and Saint-Martin, (2021) since AI remains a nascent technique, there is currently a dearth of tangible fact regarding its impact on the job space. Existing studies, primarily conducted in the United States, have not conclusively shown significant displacement of workers due to AI implementation. Moreover, the available literature is limited in scope. Thus, a comprehensive assessment of the effects of AI on the labor market is yet to be established, highlighting the need for further research and analysis in this evolving field.

Acemoglu, Autor and Hazell (2020) they conducted a study investigating the impact of AI adoption on hiring practices within US companies possessing task structures compatible with AI capabilities. Their findings indicate that AI exposure is associated with a shift in the skills demanded by these firms, although no substantial evidence of employment effects at the occupational level was observed. However, firms exposed to AI seem to limit their recruitment in non-AI positions compared to other companies. The researchers suggest that while the current employment impact of AI may be insufficient to be detected in aggregate data, as the adoption of AI spreads, its influence on employment may become more apparent.

Fossen and Sorgner, (2019) AI is currently advancing in areas that involve complex, cognitive tasks typically performed by skilled professionals in office settings. However, these professionals also rely on abilities that AI lacks, such as social intelligence and inductive reasoning. While highly educated workers are more likely to adapt to new technologies due to their familiarity with digital tools and participation in training, they may also face higher costs in adjusting their task-specific human capital. This suggests that the benefits of AI may be more accessible to workers with higher levels of education, but they also face challenges in the process.

Research Methodology

Research Design

In this study, an exploratory research design was utilized to investigate the impact of AI adoption on employment trends in OECD countries. The primary objective was to uncover potential associations between the use of AI technology and wage rates and employment status in these selected nations.

Subjects of the Study

The target group for this study comprised OECD nations that have integrated AI applications into their respective economies.

Source of Data

To support the research, secondary data was collected from a variety of reliable sources, including the official OECD website. In addition, both published and unpublished sources were accessed to ensure comprehensive data collection.

Data Presentation, Analysis and Discussion

Table: 1

Country	@Employment (2021)	*Annual (2021) Minimum Wages At current price	#AI use
Belgium	3,159	26254.1	10.32
Bulgaria	2,210	10029	3.29
Croatia	1,201	14494.1	8.74
Estonia	426	11633.9	2.77
France	18,085	24497.4	6.67
Germany	22,074	26268.1	10.56
Greece	2,870	15530.5	2.61
Hungary	3,392	12859.9	2.98
Ireland	1,414	20916	7.88
Latvia	570	10080.2	3.72
Lithuania	943	15678.2	4.45
Luxembourg	220	28148.8	13
Netherlands	4,388	27095.9	13.1
Poland	11,649	17569.2	2.86
Romania	6,257	15054	1.38
Slovenia	709	19966.2	11.73
Spain	13,497	20329.1	7.67
United Kindom	18,236	24550.9	2.69

Source: www.oecd.org

@ persons In thousand,*in dollar # in percent.

The table provides data on employment status in thousand, minimum annual wages in dollars at a constant rate, and the use of artificial intelligence (AI) by firms in various European countries. From the employment status perspective, Germany and the United Kingdom have the highest number of people employed, with 22,074 thousand and 18,236 thousand respectively. On the other hand, Estonia has the lowest employment with only 426 thousand people. Regarding minimum annual wages, Luxembourg has the highest at $28,148.8, followed by the Netherlands at $27,095.9. Romania has the lowest minimum annual wage at $15,054. In terms of AI usage by firms, Luxembourg leads again with 13%, followed closely by the Netherlands at 13.1%. Greece and Romania have the lowest AI usage at 2.61% and 1.38% respectively.

It is also interesting to note that countries with higher employment rates, such as Germany and the United Kingdom, also tend to have higher minimum annual wages. This may indicate a correlation between employment opportunities and wage levels.

Luxembourg stood out in this analysis, having both the highest minimum annual wage and the highest percentage of firms using artificial intelligence. This suggests that Luxembourg is a prosperous country where

businesses are able to invest in advanced technologies like AI, which may contribute to higher wages and employment rates.

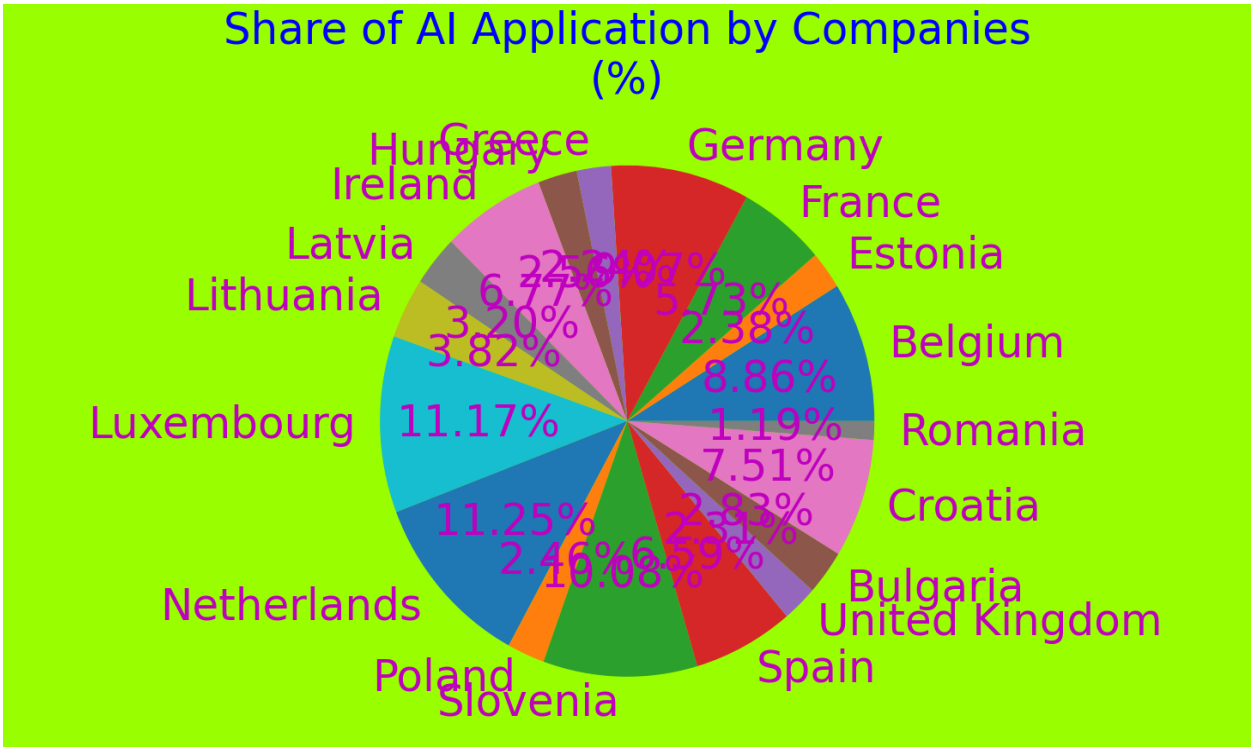
On the other hand, Romania has the lowest minimum annual wages and the lowest percentage of firms using AI. This could indicate a lower level of technological advancement and potentially less economic prosperity in the country.

The use of AI by firms varies widely across the countries analyzed. The Netherlands, Luxembourg, and Spain have relatively high percentages of firms utilizing AI, indicating a greater adoption of advanced technologies in these countries. In contrast, Greece, Romania, and the United Kingdom have lower percentages, suggesting a slower adoption of AI in these economies.

Overall, the data presented in the table illustrates the diverse employment statuses, wage levels, and AI usage across European countries. It highlights the importance of various factors, such as economic development, technological advancement, and labor market conditions, in shaping these indicators.

In conclusion, there is significant variation in employment status, minimum annual wages, and the use of AI by firms across European countries.

Figure:1



Source: www.oecd.org

Regression Model

$Yij = \alpha j + \beta\ AIij + \gamma\ Xij + uij$

Where Yij is dependent variable(employment status of selected sample countries), α, β, γ are coefficients of parameters (AI and Wage rate) , uij is error term.

Table: 2

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.692[a]	.479	.409	5513.362
a. Predictors: (Constant), Annual_wage, AI_use				

Table: 3

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	418985243.829	2	209492621.914	6.892	.008[b]
	Residual	455957404.171	15	30397160.278		
	Total	874942648.000	17			
a. Dependent Variable: Employment						
b. Predictors: (Constant), Annual_wage, AI_use						

Table: 4

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-7206.433	4495.081		-1.603	.130
	AI_use	-1343.698	481.921	-.747	-2.788	.014
	Annual_wage	1.166	.314	.993	3.708	.002
a. Dependent Variable: Employment						

Based on the regression analysis, we can see that the use of AI in percent by companies in OECD countries and annual wage rate have a significant effect on employment status at a 0.05 level of significance.
The constant term in the regression, -7206.433, suggests that when both the use of AI and annual wage rate are zero, the predicted value for employment status is -7206.433.
The coefficient for AI_use, -1343.698, suggests that for every one unit increase in the use of AI in percent, the predicted employment status decreases by 1343.698 units, holding all other variables constant. This implies that a higher use of AI is associated with lower employment status.
The coefficient for Annual_wage, 1.166, suggests that for every one unit increase in annual wage rate at constant rate in dollars, the predicted employment status increases by 1.166 units, holding all other variables constant. This implies that a higher annual wage rate is associated with higher employment status.

Both of these coefficients are statistically significant, as indicated by their t-values and p-values. The standardized coefficients, which provide a measure of the relative importance of each variable, suggest that AI_use has a larger impact on employment status compared to Annual_wage.
In summary, this regression analysis indicates that the use of AI and annual wage rate have a significant influence on the employment status of companies in OECD countries. A higher use of AI is associated with lower employment, while a higher annual wage rate is associated with higher employment.

Conclusion

In conclusion, AI has the potential to revolutionize various sectors of our society, improving efficiency, accuracy, and safety. The employment status data shows that Germany and the United Kingdom have the highest number of people employed, indicating a strong workforce. On the other hand, Estonia has room for growth in terms of employment opportunities. Minimum annual wages differ across Europe, with Luxembourg and the Netherlands offering the highest wages. Lastly, AI utilization by firms varies, with Luxembourg and the Netherlands at the forefront, while Greece and Romania have lower adoption rates. Overall, AI can significantly enhance multiple aspects of our lives. The regression analysis shows that both AI utilization and annual wage rates have a significant impact on employment status. A higher use of AI is associated with lower levels of employment, suggesting that automation could potentially replace certain job roles. On the other hand, a higher annual wage rate is associated with increased employment status, indicating that higher wages may attract and retain a greater number of workers. Interestingly, the standardized coefficients suggest that AI utilization has a larger impact on employment status compared to annual wage rates. However, it is important to note that these findings represent correlations and should not be interpreted as causation. To fully harness the benefits of AI, policymakers, businesses, and communities must work together to ensure that the workforce is equipped with the necessary skills to adapt and thrive in an AI-driven economy. By doing so, we can maximize the potential benefits of AI while mitigating any potential negative impacts on employment.

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