Unemployment in Croatia: Trends and Challenges in the Digital Age (2010-2024)

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Abstract

This paper investigates the trend of unemployment in the Republic of Croatia during the period from 2010 to 2024, using econometric methods of time series analysis. By applying linear trend models and second-degree trend-polynomials, the research quantifies the tendency of decreasing the number of unemployed, while simultaneously identifying oscillatory movements within the observed period. Data analysis shows that the peak of unemployment was recorded in 2013, followed by a significant decline, which is reflected both in absolute values and in structural changes in the shares of unemployed by gender and age. In addition to quantitative analysis, the paper looks at the challenges of the digital era and the transition to Industry 5.0, emphasizing the need for managing organizational changes and adapting the education system. This transformation places new demands on the workforce, which is reflected in the need for lifelong learning, retraining and the development of digital competencies, especially in the context of the application of artificial intelligence. This indicates a two-way impact - on the one hand, technological progress can result in the loss of traditional jobs, while on the other hand, it opens up opportunities for the creation of new, better jobs.

Key words: unemployment; econometric analysis; trends time series; economic variables; modeling

Introduction

In modern economies, unemployment represents one of the most demanding challenges, given that work is a fundamental human activity and a key driver of social and economic development. Long-term unemployment not only negatively affects growth and public finances, but also contributes to the degradation of human capital, reducing consumption and slowing the expansion of capital markets. These economic factors, along with increasing fiscal costs and the extent of inequality in society, make unemployment a critical problem facing many countries and the Republic of Croatia (Durbić, 2016). In the Croatian context, lack of employment is associated with a lack of production and income, which further exacerbates social inequalities, especially in times of crisis when the unemployed suffer significantly more consequences than those who are employed (Mrnjavac, 2002). Furthermore, the digital era and the transition to Industry 5.0 bring turbulent changes to the labor market, where managing organizational change becomes crucial for adapting to new challenges and ensuring competitiveness (Kolade & Owoseni, 2022). This paper therefore seeks to shed light on the complexity of the unemployment problem and explore how modern technologies and organizational changes can contribute to solving this challenge.

The aim of the paper is to investigate the essence of unemployment in the Republic of Croatia over the last decade, to analyze the trend of unemployment using the methods of linear trend and second-degree trend-polynomial, and to consider economic variables that affect unemployment. The paper also aims to analyze seasonal changes in unemployment, with special emphasis on the impact of tourist seasons, and to compare unemployment trends in the Republic of Croatia with the countries of the European Union. In the context of the transition towards Industry 5.0, the aim is to emphasize the need for managing organizational changes and adapting the education system to respond to the challenges of the labor market in the digital era.

The purpose of the paper is to analyze the problem of unemployment in the Republic of Croatia through the prism of its impact on economic development, public finances, human capital and social inequality, and to examine the possibilities of managing organizational changes in the digital era and the transition towards Industry 5.0, in order to mitigate the negative consequences of long-term unemployment.

Conceptual definition of unemployment

Unemployment can be defined as "the share of the unemployed workforce, i.e. the difference between the number of employed and unemployed persons" (Torstensson, 2022). The total unemployment rate, which includes persons aged 15 to 74, is measured using the Labour Force Survey, according to which an unemployed person is considered to be a person who is not employed, but is available to start work within 14 days and has been actively looking for work during the last four weeks or has been waiting for employment for more than three months from the moment of measurement. Persons who have been laid off or are working part-time are not

counted as unemployed. Unemployment can be categorized as open or hidden (Bejaković, 2003).

Three types of unemployment are most commonly distinguished: frictional, structural and cyclical. In addition, seasonal and technological unemployment occur (Bejaković, 2003). In the Republic of Croatia, cyclical unemployment is more pronounced during the tourist season. The accelerated growth of economic activity in tourism (Żegleń et al., 2019), which also has a positive impact in Croatia, and is reflected in the growth of investments and the creation of new jobs, which consequently reduces unemployment in directly and indirectly related economic sectors. The tourism yield, understood as the injected consumption of tourists, can be defined based on the economic contribution (Dwyer, 2016). On the other hand, increasing robotization, although improving the economy, leads to job losses. New jobs that are being created impose demands for new knowledge and the adaptation of the education system (Nikolić, 2021). Further turbulent shifts are expected with the entry into the digital era and the application of artificial intelligence (AI), which in the era of Industry 5.0 results in the combination of human intelligence with the most modern technologies and a fundamental transformation of the organizational structure (Xu et al., 2021).

From an economic perspective, unemployment is studied in the context of its relationship with economic growth, inflation, and the current account balance. Theoretically, it is assumed that an increase in unemployment results in a decrease in inflation, while a decrease in unemployment stimulates an increase in consumption, production, and wages (Picardo, 2022). Although the correlation between unemployment and inflation is not always clearly expressed by statistical methods, it is possible that both variables influence each other.

Unemployment trends in the Republic of Croatia

The dynamics of unemployment trends show a significant decline and slowdown in the unemployment rate in the Republic of Croatia, especially when looking at the seasonally adjusted rate over the last decade. The sharp decline in the second half of 2021 and the first part of 2022 led to a crossing of the horizontal axis, entering the expansion phase, but the slowdown in the decline in the last few months resulted in a transition to the slowdown phase, as shown in Figure 1.

Influence of migration on unemployment

With the accession of the Republic of Croatia to the European Union, borders were opened for the working population, which led to a sudden outflow of working-age people. The working-age population among the unemployed is present in all age groups, but the increase in the number of unemployed in the age groups of 50–54 and 55–59 is particularly noticeable after the peak of total unemployment, which indicates the departure of the young working-age population towards the open labor market.

Figure 1. Dynamics rate unemployment in the Republic Croatia
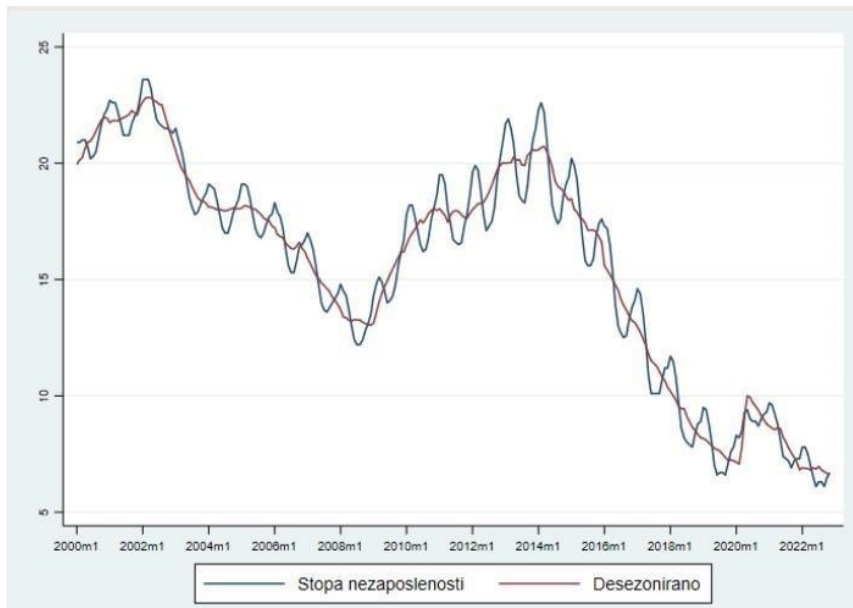
Source: MacroHUB (2022)

Due to the continuous aging of the population, one of the significant factors is the lack of a native workforce. The population of Croatia is characterized by: a) depopulation (negative natural increase); b) emigration of the working-age population; d) total depopulation; e) accelerated aging of the population. It is clear that the demographic development of the population of the Republic of Croatia is unfavorable. The demographic aging of the population affects the creation of an imbalance between retirees and the working-age population. Demographic indicators indicate that men are more prone to migration.

The relationship between the educational structure and the labor market, according to the 2021 Census, shows that males with secondary school education dominated. The trends in unemployment are unusual, given that the demand for labor in the labor market in the Republic of Croatia is constantly growing (especially during the tourist season), while the working-age native population, which could fill these gaps, is continuously leaving abroad. It is clear that the problems of unemployment in the Republic of Croatia lie in the long-standing bad policies of employment, labor and pension systems, and are a consequence of bad economic decisions and solutions, especially tax policy, and the policy of excessively high benefits. The structure of the workforce seeking employment also has a significant impact.

The oscillatory movement of unemployment has continued continuously since 2013 and the entry of the Republic of Croatia into the European Union. According to the data obtained, the total number of employees in the Republic of Croatia in 2022 compared to 2013 increased by 250,000. As for the employment structure, the number of women and men in the active working population is almost equal, which brings a variety of offered occupations and better filling of the necessary capacities and workforce. On the other hand, a significant drop in unemployment in 2023 compared to 2013 of

almost 75% is also visible. One of the causes of the significant drop in the unemployed is the large number of emigrating working-age population outside the borders of the Republic of Croatia.

Comparison of unemployment in Croatia and European Union

The European Union operates as a single market with 27 countries, where unemployment brings a number of difficulties for the entire economy. Therefore, it is possible to draw a parallel between the Republic of Croatia and the European Union. The unemployment rate in the EU stagnated in December 2024 at the level of the previous month, while in Croatia it fell below the average in the eurozone. The European Union has also been struggling with the concept of long-term unemployment for a long time.

Table 1. Unemployment rate in European Union countries, May, 2023

Unemployment rate	Country
Belgium	5.6
Bulgaria	4.0
Czech Republic	2.7
Denmark	6.1
Germany	3.4
Estonia	7.5
Ireland	4.4
Greece	10.3
Spain	11.6
France	7.4
Croatia	5.1
Italy	6.7
Cyprus	4.7
Latvia	6.9
Lithuania	7.2
Luxembourg	6.3
Hungary	4.3
Malta	3.2
Netherlands	3.6
Austria	5.1
Poland	2.9
Portugal	6.5
Romania	5.3
Slovenia	3.5
Slovakia	5.4
Finland	8.2
Sweden	8.2

Source: Authors' work using Eurostat data (2024a)

As for the EU countries, in May 2024 (Table 1), the average unemployment rate in the EU is 5.78%, the median value is 5.4%, while the dominant unemployment rate is bimodal and amounts to 5.1% (Croatia and Austria) and 8.2% (Finland and Sweden).

Continuing the analysis, it is important to highlight the extreme values. The highest unemployment rate was recorded in Spain (11.6%), which indicates significant challenges on the labor market and potential structural problems in that country. On the other hand, the lowest unemployment rate was recorded in the Czech Republic (2.7%), which may reflect successful employment policies and more stable economic conditions.

Also, Greece records a high rate of 10.3%, while countries such as Germany (3.4%) and the Netherlands (3.6%) show significantly lower values. This dispersion of indicators testifies to the heterogeneity of the labor market within the EU, where different economic, institutional and political factors lead to significant variations in unemployment rates.

In order to reduce unemployment at the European Union level, the Social Policy Agreement was concluded, which lists some basic objectives: a) combating social exclusion in the labor market; b) reducing social exclusion in society; c) combating and eliminating discrimination in the world of work. By addressing the reduction of unemployment, i.e. by enabling equal access to the labor market for all community structures, it can also achieve: a) better protection of minorities; b) a higher level of social protection; c) freedom of movement in the labor market (Obadić, 2017).

An analysis of the dynamics of the unemployment rate in the European Union over the observed period of 10 years shows a continuous annual decline in the unemployment rate in the European Union, until approximately 2020 (Eurostat, 2024b). The reason for the slight increase in unemployment in that year was caused by the COVID-19 pandemic, which significantly affected the economy of each country as a whole, namely: a) a significant increase in the prices of goods; b) a decrease in income; c) an increase in the cost of energy and other derivatives; d) the impossibility of the flow of goods; e) an increase in unemployment; f) the dismissal of workers; g) labor market uncertainty and h) GDP decline. In the observed period, the highest unemployment rates were achieved by Greece 16.3%, Spain 15.5%. At that time, the unemployment rate in the Republic of Croatia was 7.5%, ranking tenth in the EU, one could say in the golden mean, and the best results, i.e. the lowest unemployment rate, were achieved by the Czech Republic 2.6% and Poland 2.7%. The unemployment rate in the EU was 5.9% in December 2024.
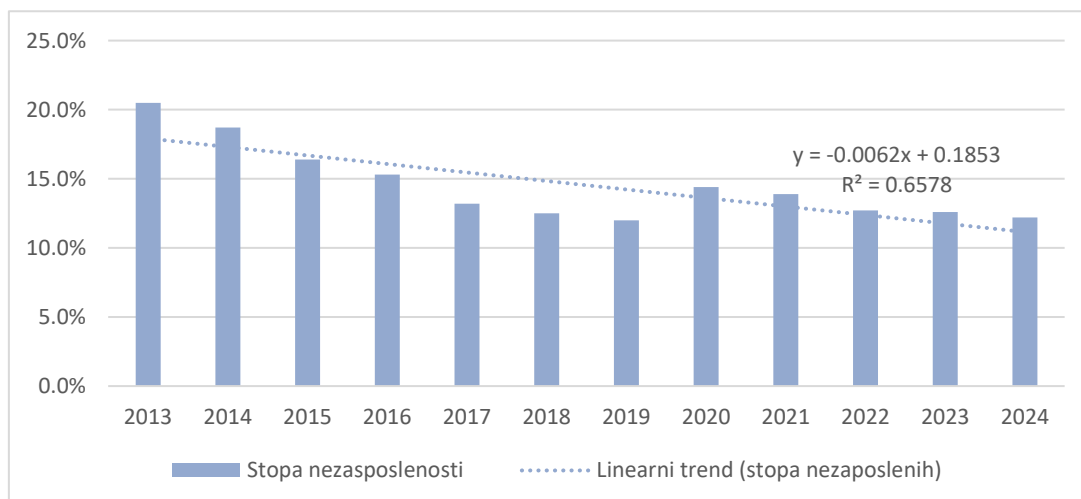
Youth unemployment

In the analysis of the structure of the unemployed in the EU, the age-gender structure occupies a special place, with an emphasis on youth unemployment (Eurostat, 2024b). In December 2024, the youth unemployment rate was 15.0% in the EU. In December 2024, the unemployment rate for women was 6.1% in the EU, stable compared to the

previous month, and the unemployment rate for men was 5.7%, also stable compared to November 2024. In the euro area, the unemployment rate for women was 6.5%, an increase from 6.4% in the previous month, and the unemployment rate for men was 6.1%, stable compared to November 2024. The estimates are based on the globally used standard definition of unemployment of the International Labour Organization.

The trend of the youth unemployment rate in the European Union in the observed period has a downward trend. There is a noticeable spike in 2020, caused by the COVID pandemic, which significantly affected the increase in the youth unemployment rate in the labor market. The youth unemployment rate in individual European Union countries varies, with the Czech Republic at 4.2%, Germany at 5.0%, Spain at 22.4% and Greece at 22.3%. An almost parallel correlation is evident between the general unemployment rate and the youth unemployment rate in the labor market.

Chart 1. Dynamics of the youth unemployment rate in European Union

$y = -0.0062x + 0.1853$
$R^2 = 0.6578$

Legend: Stopa nezasposlenosti   Linearni trend (stopa nezaposlenih)

Source: Authors' work using Eurostat data (2024b)

According to the latest available annual data in December 2024, the seasonally adjusted unemployment rate in the Republic of Croatia is 4.5%.

The impact of Industry 5.0 on unemployment

Industry 5.0 brings turbulent changes, represents a shift towards a more balanced and sustainable approach to industrial production and the use of technology, with a strong focus on human-centricity, resilience and sustainable development (Adel, 2022). Industry 5.0 is defined through three fundamental elements. First, Industry 5.0 is characterized by a focus on humans. This paradigm is marked by intensive technological progress that is focused on supporting and improving human capacities. The application of adaptive robots and modern recognition and interaction technologies enables better synergy between humans and machines, thus creating a

safer, more diverse and reliable work environment and enabling the performance of more complex tasks. Second, the emphasis on value creation is a fundamental feature of Industry 5.0. This approach goes beyond the traditional focus exclusively on shareholder profit, promoting a fair and equitable distribution of value within regional and global industrial networks. In this way, it contributes to the creation of inclusive business models that foster comprehensive social and economic development. Third, Industry 5.0 is characterized by a commitment to sustainability, where economic productivity is aligned with socio-ecological progress. This era of industrial development seeks to establish sustainable practices that minimize negative environmental impacts, foster a circular economy, and enable long-term, sustainable growth. Industry 5.0 focuses on major socio-ecological goals such as responsible consumption and production, promoting renewable energy, inclusive growth, and social protection (Rojko, 2021). It aims to address sustainable development issues by incorporating circularity, sustainable innovation, and renewable energy to prevent environmental degradation.

With its focus on integrating human creativity and modern technologies, it has multiple implications for the labor market and unemployment (Xu et al., 2021). On the one hand, increased automation and the application of AI may lead to a reduction in the number of traditional jobs, thereby increasing the risk of technical unemployment. On the other hand, the focus on human-centered approaches encourages the creation of new job opportunities that require advanced skills, thereby encouraging the adaptation of the workforce and reducing structural unemployment. Also, the transition towards Industry 5.0 encourages the development of programs for retraining and lifelong education, enabling workers to successfully adapt to new technological requirements. Overall, the successful implementation of the principles of Industry 5.0 can contribute to the reduction of long-term unemployment through innovation and the creation of new, better jobs, provided that adequate resources for education and training are provided. Suffice it to say that the digital era and the application of AI have entered the big gates, bringing turbulent changes and the loss of 97 million jobs and the opening of 85 million new jobs with the necessary knowledge of AI are predicted (Krstić, 2024). According to a new analysis by the International Monetary Fund (IMF), AI should affect almost 40% of all jobs (Liang, 2024). It is the contingent of the young workforce that will be the first to adapt to these changes.

Methodology

This paper conducted an empirical study of the basic parameters of unemployment using the method of modeling time series of the unemployed in the Republic of Croatia in the specified period. Analyzing the current trends in unemployment in the Republic of Croatia, the following research question was formed:

- o RQ1. Did the application of linear and parabolic models in the analysis of time series of unemployment in the period from 2010 to 2024 show a statistically significant decrease in the number of unemployed, and what are the specific characteristics of these trends?

The goal of time series analysis is to describe the development of the phenomenon over time, interpret the variations of the phenomenon and, of course, predict the future level of the phenomenon. The dynamic structure of a time series can be investigated on the basis of a single equation, or the subject of analysis can be the cause-and-effect relationship of several time series, which is carried out on the basis of vector models (Bahovec and Erjavec, 2009). Time series data usually have a special feature, associated with a series of observations, which makes the development of special methods of demometric analysis necessary. The standard model of time series behavior distinguishes several of their components. Most time series show at least four components: (1) a trend component Tt; (2) a seasonal component St; (3) a cyclical component Ct; (4) an irregularity component It. Many time series show a tendency to slowly increase or decrease over time, indicating a trend component. Variables are selected and demographic models are specified. Using these components, we can define the time series as an additive model:

$$X_t = T_t + S_t + C_t + I_t \qquad (1)$$

Alternatively, in other circumstances, we can define a time series as a product of its components, i.e., as a multiplicative model - often represented by a logarithmic additive model:

$$X_t = T_t \cdot S_t \cdot C_t \cdot I_t \qquad (2)$$

A more modern approach to time series analysis involves the construction of a formal model in which various components are directly or indirectly included in the description of the behavior of the time series data. The components of time series can be analyzed using econometric methods. A trend is a long-term tendency of a certain phenomenon to develop over time. It is considered that the best option is to plan in the direction of the trend. Namely, time series can be stationary or have a trend. If a time series contains a trend, this means that the data series has a long-term upward or downward tendency. The trend can take on different patterns that describe a certain phenomenon. Linear trend estimation expresses the data as a linear function, which means that the phenomenon changes by approximately the same absolute amount in each unit of time. If dynamic time series are used, it is also possible to create an analytical framework and properly express the long-term tendency of the phenomenon to develop over time. The trend is expressed as a function of time using a model with estimated parameters. In this paper, a linear trend model of the form:

$$\hat{y}_t = \hat{a}_1 t + \hat{a}_0 \qquad (3)$$

Given the oscillatory movements of the total number of unemployed, a parabolic trend (second degree polynomial trend or quadratic trend) of general form was also used with the estimated parameters:

$$\hat{y}_t = \hat{a}_2 t^2 + \hat{a}_1 t + \hat{a}_0 \qquad (4)$$

Trend models are first specified, quantified, i.e., the relationship between the parameters of such models is determined and an analytical form, i.e. the form of this relationship, is found. Model building is the process of selecting variables and specifying their properties. The model variables are determined, and the essential relationship between them is observed. The exogenous variable is time, the endogenous variable is the number of unemployed in the Republic of Croatia in the period from 2010 to 2024. This trend model has also been applied as a forecasting tool that considers that the future will be similar to the past. This method is reliable only for shorter periods, it is not suitable if the phenomenon shows significant irregularities. Therefore, we should not be committed to a fixed trend or seasonal patterns, but we can allow for the possibility that these components change over time (Newbold et al., 2020).

Results

Based on empirical data in the observed period, it is clear that the peak of unemployment was recorded around 2013. Therefore, it is of utmost importance to analyze the structure of the unemployed by gender and age in that period. In 2013, the maximum unemployment rate was 345,112 people, with the share of women being 52.75% and men being 47.25%. In the following years, a continuous decline in the number of unemployed was recorded, and the structure of unemployment shows an increasingly equal share of women and men. The maximum decline was achieved in 2023, when the number of unemployed was 108,921, with the share of women being 57.05% and men being 42.95%, which represents a decrease of 68.43% compared to 2013.

Table 2. Number unemployed in the Republic Croatia (2010-2024), total and according to gender

	Men	Women	Total
2010.	136,806	165,619	302,425
2011.	141,409	163,924	305,333
2012	152,079	172,244	324,323
2013	163,070	182,042	345,112
2014.	153,484	174,702	328,187
2015	130,698	155,208	285,906
2016	107,947	133,913	241,860
2017.	83,145	110,823	193,967
2018.	66,402	87,139	153,542
2019.	57,125	71,525	128,650
2020.	67,229	83,595	150,824
2021.	60,987	75,828	136,816
2022.	49,465	66,662	116,127
2023.	46,780	62,141	108,921
2024.	51,198	68,522	119,720

Source: CES (2024)

Using empirical time series data to show the trend of unemployment in the Republic of Croatia, a linear trend of the form:

$$\hat{y}_t = 347776 - 18809t \qquad (5)$$

With the coefficient of determination $\left(R^2 = 0,8996\right)$ which indicates an exceptionally high representativeness of the model, it is evident that the total number of unemployed in the Republic of Croatia during the period from 2010 to 2024 fell on average annually, in absolute terms, by 18,809 unemployed persons. Given the oscillatory movements of the number of unemployed in the Republic of Croatia in the observed period, a parabolic trend was also applied. The required parabolic trend model is:

$$\hat{y}_t = 41,959t^2 - 19396t + 349049 \qquad (6)$$

With the coefficient of determination $\left(R^2 = 0,8596\right)$, it can be concluded that the value of the constant term $\left(\hat{a}_0\right)$ represents the trend value for 2009, i.e. the period preceding the first period for which the value of the time variable is equal to 0, in this example it is 2010. The coefficient $\left(\hat{a}_1\right)$ shows that the trend value of the total number of unemployed in the Republic of Croatia during the period from 2010 to 2014, in this case indicates a decrease, a fall, annually linearly by 19396 unemployed $\left(\hat{a}_1 = -19396\right)$, while the coefficient $\left(\hat{a}_2\right)$ shows a certain increase, an acceleration of the growth of the total number of unemployed $\left(\hat{a}_2 = 41,959\right)$. Despite the long-term tendency of the average unemployment rate to fall, the consequences of unemployment on the labor market in the Republic of Croatia are significant.

Based on the data shown in the figure (Graph 2) and in Table 2, it is evident that both trends (linear and parabolic) are moving in the direction of a further decrease in the total number of unemployed in the Republic of Croatia, but with different dynamics. The linear trend predicts a significantly faster and continuous decline in the number of unemployed, which is reflected in extremely low values for 2027 (around 28 thousand). The parabolic trend also indicates a decrease in the number of unemployed, but at a slower pace, so the estimated values for 2025 are still over 90 thousand, while by 2027 they drop to approximately 78 thousand. The graph shows that until 2024 the number of unemployed was moving in a downward direction. If this trend continues, both linear and parabolic models suggest a further decrease in the number of unemployed in the coming years. However, the linear model can sometimes overestimate the rate of decline (because it assumes a uniform decline), while the parabolic trend allows for a certain "smoothing" of the decline, which may be more realistic if it is assumed that at some point the decrease in unemployment will slow down.

The research results show that the total number of unemployed people in the Republic of Croatia is decreasing in the observed period from 2010 to 2024, which is confirmed by both the linear and parabolic time series models. The linear model (5) indicates an

average annual decrease of 18,809 unemployed persons, and the coefficient of determination indicates a high representativeness of this model. In parallel, the application of the parabolic model (6) enabled a more detailed look at oscillatory movements in the number of unemployed people, with the value of the constant term interpreted as the trend value for 2009, the period preceding the beginning of the analysis. The results obtained with the coefficients from this model suggest that during the period from 2010 to 2014, a steady decline in the number of unemployed was recorded, with a certain acceleration of the decrease in the early stages, while a slower decline was observed in later periods.

Chart 2. Trend of total number unemployed in the Republic Croatia from 2010 - 2024
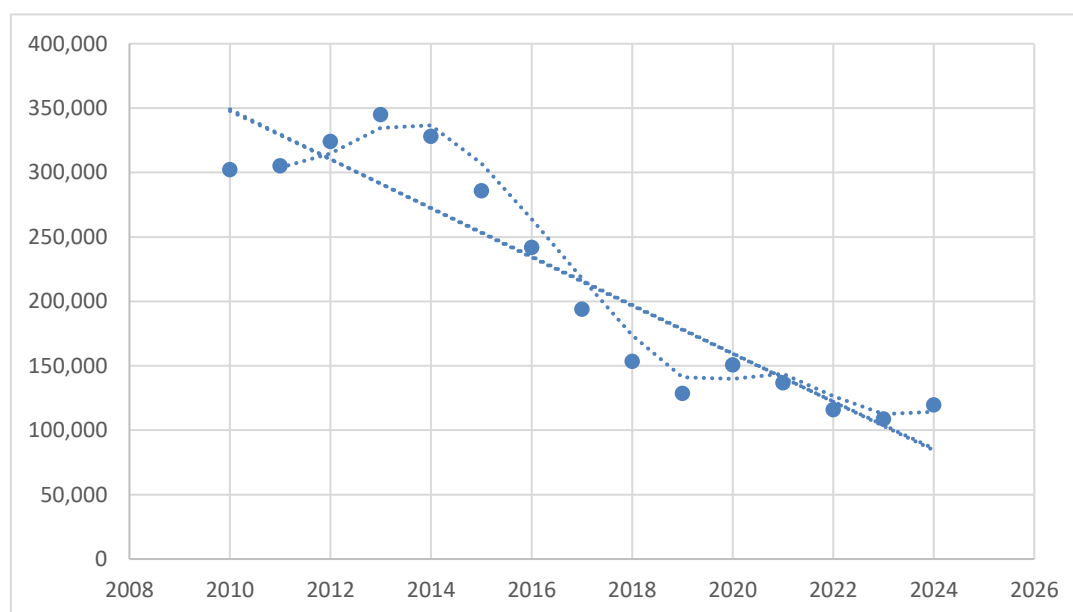
Source: Author's work, according to CBS data (2024)

Table 2. Forecasts total number unemployed in the Republic Croatia

Year	Linear trend	Parabolic trend
2025	65,643.06	94,468.77
2026	46,834.16	86,124.97
2027	28,025.27	78,518.13

Source: Author's work

Both models predict a decline in unemployment, but the linear model shows a significantly more optimistic decline than the parabolic one. For a more accurate assessment of future trends, a broader context is often considered (e.g. economic cycles, migration trends, employment measures), in order to gain a more balanced insight into the real possibilities of reducing the number of unemployed.

These results, despite the long-term tendency of the average unemployment rate to decline, indicate significant consequences of unemployment on the labor market. The high decline in absolute numbers cannot be viewed in isolation, but it is also necessary to consider the structural changes that have occurred in the economy, demographic processes, and migration trends. For example, with the accession of the Republic of Croatia to the European Union, borders were opened for the working population, which led to a massive outflow of working-age people, and thus to changes in the demographic structure of the labor force. Combined with the increase in living costs and standards, potential employees are increasingly deciding to retrain or seek employment abroad, which further affects the sensitivity of the labor market.

In parallel with the quantitative analysis, these results also require a qualitative interpretation in the context of macroeconomic changes. The decrease in the number of unemployed, although positive in absolute terms, may hide structural problems such as a shortage of labor in certain sectors or a mismatch between the educational qualifications of the labor force and market requirements. In this sense, time series models not only serve to predict future trends, but also as a tool for identifying potential risks in the adjustment of the labor force to technological and demographic changes.

Further analysis shows that, despite the general decline in unemployment, the consequences of this phenomenon for society remain significant. The decline in the number of unemployed in certain periods may be accompanied by increased competition for remaining jobs, which potentially affects the qualitative aspects of employment and social stability. Given the complexity of factors affecting the labor market, it is necessary to continuously monitor trends and implement additional analysis models in order to better understand the causes and consequences of these changes. These results therefore provide a basis for further research that could include the integration of demographic variables, macroeconomic indicators, and analysis of the sectoral structure of the workforce, all with the aim of designing more effective employment policies and adapting the labor market in conditions of rapid technological transformation.

Discussion

A parallel can be drawn between the labor markets of the European Union and the Republic of Croatia and it can be concluded that there is a mutual influence of the labor market, and the mass migration of the working-age, primarily young, educated population in both directions. The situation on the labor market in the Republic of Croatia is quite complex and the figures fluctuate significantly, both on an annual basis and in the observed period of the last 10 years, with a long-term tendency of a continuous decline in the number of unemployed. There are several reasons: a) a mild recovery of the labor market in the Republic of Croatia; b) the opening of borders to the European Union, and easier finding a job in other destinations and c) seasonality, which is significantly more noticeable with the arrival of the tourist season.

Most countries implement passive and active measures to alleviate unemployment and improve the position of the unemployed population. Passive measures mostly relate to material insurance during unemployment, which usually consists of several types of rights (Bejaković, 2003).

In conclusion, as far as research question RQ1 is concerned, at first glance, superficially, the answer is positive. The linear trend method shows that the Republic of Croatia experienced a drastic drop in unemployment after 2013 and the indicators continue to trend downward. By analyzing the essence of the unemployment problem in the Republic of Croatia, oscillatory changes were observed in the aforementioned period, and the analysis using the second-degree trend-polynomial method of the total number of unemployed in the Republic of Croatia during the period from 2010 to 2014, in this case indicated a decrease and at the same time a certain increase, i.e. an acceleration of the growth of the total number of unemployed. The reason for this trend in total unemployment in the Republic of Croatia is found in the seasonal component of the trend, where the tourist season has a major impact on the reduction of the unemployment rate. Seasonality remains one of the biggest problems, because the summer season still dominates with the largest number of arrivals and overnight stays. The consequences of unemployment on the labor market in the Republic of Croatia are significant.

Conclusion

The results of the research show that unemployment in the Republic of Croatia recorded a decreasing trend in the period from 2010 to 2024, with the linear model suggesting a faster decline, while the parabolic model indicates a more moderate and realistic course of the decrease in the number of unemployed. Both methods confirm that the peak of unemployment was reached in 2013, followed by a continuous decline that continued until 2024. However, taking into account demographic changes, intensive migration flows and the seasonality of the labor market, it is clear that the decline in unemployment is not exclusively the result of economic recovery, but also a consequence of the mass departure of the working-age population and temporary employment during the tourist season. The main contributions of the paper can be summarized in several points. First, the paper offers a quantitative analysis based on two econometric methods (linear and parabolic trend), which deepens the existing scientific debate on unemployment trends in Croatia and the broader European context. Second, it points to the role of seasonality and mass migration in shaping structural changes in the labor market, which is of particular importance for public policy makers. Third, the special value of the research is reflected in the connection of the results with the challenges of Industry 5.0 and the digital era, where the importance of continuous education and adaptation of the workforce to new technologies is emphasized. Finally, the paper contributes to the debate on the long-term sustainability of the Croatian labor market, highlighting the need to align educational programs with the growing demand for digital and AI competencies.

Although the results point to positive developments, it is necessary in future research to integrate broader macroeconomic and demographic indicators, as well as qualitative analyzes in order to obtain a more complete insight into the causes and consequences of unemployment. In the context of the increasingly intensive introduction of AI and automation, further monitoring of these trends becomes crucial for timely shaping of employment policies, reform of the educational system and management of organizational changes in the coming period.

It is easy to draw common parallels on the labor market of the European Union, given that a similar situation prevails on the labor market in the Republic of Croatia. Fluctuations in one market that are significantly reflected in another and vice versa are closely related.

Unemployment represents an economic cost for society as a whole. In periods of high unemployment, the greatest economic losses of the modern economy occur.

The relationship between economic variables is very important when implementing various economic policies. Today, Croatia has a problem of brain drain, which stimulates unemployment as a form of migration of highly educated experts. In the past, these were individual emigrations, but today in the Republic of Croatia it is a mass phenomenon, dominated by prominent scientists and experts. The consequences are a slowdown in the development of the emigration country and economic progress of the immigration country. The labor market in the Republic of Croatia has been characterized by a high share of long-term unemployment in recent years. The effects of these events are multiple.

The transition to Industry 5.0 is a complex process that emphasizes the need for a balanced, inclusive, human-centered approach. Continued research in this area will further help in designing the framework and refining strategies and solutions, contributing to the global realization of the multiple benefits of Industry 5.0. The limitation of this work is in the forecast values obtained by extrapolating the trend. The forecast values showed a further tendency of unemployment to fall. This was the expected result, since this trend model was applied as a forecasting tool that takes into account that the future will be similar to the past. This method is reliable only for shorter periods, it is not suitable if the phenomenon shows significant irregularities. Namely, with the expected job losses expressed in millions, a gap will arise between the current and the necessary workforce structure in the future for new jobs with AI knowledge, which will lead to a turbulent increase in unemployment. It will take a certain period of time for the unemployment situation to rebalance. Researching turbulent changes in the labor market in the digital era will be the subject of research in a future work.

In conclusion, the readiness of the labor contingent of the Republic of Croatia to enter the digital era is questionable. The biggest problem is the age and educational structure of the working population. There is an unquestionable need to improve educational programs with the application of AI, as one of the most significant innovations of recent decades, for the needs of the digital era (Krstić, 2024). The

education system needs to adapt to the growing importance of AI, with a focus on lifelong learning and training.

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