

MACROECONOMIC APPROACH TO OCCUPATIONAL SAFETY AND HEALTH IN NORTH MACEDONIA AND NEIGHBORING COUNTRIES

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Abstract: Occupational safety and health are a significant factor for sustainable economic development, labor productivity and protection of human capital. Occupational injuries and diseases create not only health and social consequences, but also a significant economic burden through direct and indirect costs that affect national economies. Hence, occupational safety is increasingly considered as an integral part of macroeconomic policies and strategies for sustainable development.

The aim of this paper is to analyze the macroeconomic approach to occupational safety and health through a comparative analysis of national policies, institutional frameworks and statistical indicators of occupational injuries in North Macedonia, Serbia, Greece and Bulgaria. The research aims to determine whether differences in the strategic orientations and institutional set-up of the countries are associated with different outcomes in terms of workplace safety. The research has a cross-sectional, comparative and descriptive-analytical design and is based on the analysis of secondary data. A document analysis and comparative method were used, analyzing national strategies, legislation and official statistical reports for 2023 and 2024 as the latest available period. The data were processed with descriptive statistics by calculating the rates of serious and fatal injuries per 100,000 employees.

The results show that there are differences between the analyzed countries in terms of the number and rates of work-related injuries. The highest rate of serious injuries was registered in Serbia (152.5 per 100,000 employees), while the lowest in Bulgaria (77.9). North Macedonia recorded a rate of 105.8, and Greece 99.5 per 100,000 employees. In terms of fatal injuries, the highest rate was recorded in Bulgaria (3.19), followed by Serbia (1.60) and Greece (0.79), while in North Macedonia no fatal injuries were recorded in the analyzed period. Although national data on economic costs are not available, international estimates indicate that work-related injuries can cause economic losses of up to 3.3% of gross domestic product annually. The comparative analysis of the strategic documents shows that all countries recognize occupational safety and health as an important economic factor, but there are differences in the degree of integration of OSH into national economic policies and the institutional capacity for their implementation. The Member States of the European Union demonstrate a more integrated approach, while North Macedonia and Serbia are focused on institutional strengthening and harmonization with European standards.

In conclusion, occupational safety and health represent an important macroeconomic category that affects productivity, public spending and the sustainability of the labor market. The results indicate the need for further strengthening of preventive policies, improvement of recording systems and integration of economic evaluation into national occupational safety policies.

Keywords: occupational safety and health, macroeconomic approach, injuries, costs, national strategies

1. INTRODUCTION

Occupational safety and health represent a significant segment of modern economic policies, as they directly affect labor productivity, the sustainability of human capital and the stability of national economies. In addition to being a concern for individuals and society, occupational illnesses and injuries also pose a significant financial burden, resulting in direct expenses for employers, social funds, and the health system as well as indirect costs from missed workdays and decreased productivity. Occupational safety is viewed as a crucial component of macroeconomic policy and sustainable development initiatives in the context of global competition and integration into European economic flows. Countries, through national strategies, legislation and institutional mechanisms, strive to reduce the number of injuries and accidents, in order to improve the quality of the workforce and reduce economic losses (Gjorgjiev, 2018; Cao et al., 2025).

The aim of this paper is to analyze the macroeconomic approach to occupational safety and health through a comparative analysis of national policies and strategies, as well as through a statistical comparison of occupational injuries and accidents in North Macedonia and three neighboring countries. Through this approach, it is attempted to see the connection between the strategic determinations of the countries and the actual indicators of occupational safety and their economic implications.

2. MACROECONOMIC APPROACH TO OCCUPATIONAL HEALTH AND SAFETY

The theoretical macroeconomic approach to occupational safety and health views this field as a structural component of the economic system that has a direct impact on overall economic performance, placing it outside the constrained parameters of labor legislation and individual protection. Macroeconomics offers an analytical framework in which OSH is regarded as a determinant of human capital, sustainable growth, and fiscal stability. Macroeconomics is a discipline that investigates overall economic flows, including gross domestic product, unemployment, productivity, public consumption, and business cycles. The health and safety of the workforce, a vital component of production, have an impact on the competitiveness of the national economy, the quality of productivity, and the efficient supply of labor (Usikova, 2019). Each work-related injury or occupational disease represents not only an individual loss, but also an economic cost that is reflected in reduced productivity, increased health expenditures and additional pressure on social protection systems (Gjorgjiev, 2018).

According to economic theory, how businesses, employees, and the government interact determines how safe the workplace is. Businesses weigh costs and benefits when deciding whether to invest in safety since they are logical economic agents. They weigh the possible expenses of accidents, compensation, missed work, and reputational harm against the costs of preventive actions (Cagno et al., 2013; Micheli et al., 2022). However, in actual market conditions, the market does not operate flawlessly. In contrast, workers may demand higher wages for riskier employment because they value the risks while choosing a job. This phenomenon is known as the compensatory wage gap. Insufficient investment in safety is caused by a number of market flaws, including asymmetric information, underestimating of risk, moral hazard in insurance systems, and externalities. In such a context, the role of the state becomes crucial through legislation, inspection and social security mechanisms, with the aim of correcting market dysfunctions and moving towards a more efficient and secure economic equilibrium (Usikova, 2019; Cao et al., 2025).

The macroeconomic dimension of OSH is deepened through the concept of “safety economics”, which analyzes the interdependence between economic processes and safety outcomes. In this approach, the costs of injuries and occupational diseases are considered as part of the total economic burden that can be expressed as a percentage of GDP. These costs include direct medical expenses, indirect losses from reduced productivity, absenteeism, disability and reduced quality of life. Research shows that indirect costs often exceed the direct financial burden, indicating that OSH has a significant impact on long-term economic growth. By aggregating data on lost working days and reduced work capacity, it is possible to obtain a unified indicator of economic risk, which can serve as a basis for strategic planning of national prevention policies (Gjorgjiev, 2018). In addition, macroeconomic cycles have a direct impact on safety outcomes. Increased production activity, quicker work rates, and the hiring of less experienced personnel can all contribute to a rise in work-related injuries during times of economic development. On the other hand, the incidence of injuries in some industries may decline during recessions and periods of increased unemployment, but this is frequently due to decreased economic activity rather than higher safety regulations. These pro- and anti-cyclical trends demonstrate that OSH must be included when examining structural shifts, industrial transformation, and technology advancement rather than being examined separately from economic dynamics (Pouliakas & Theodossiou, 2013).

Working conditions are significantly shaped by institutional and larger macro-social factors in addition to economic cycles. The degree of protection and the application of safety regulations are influenced by the power dynamics between the government, employers, and unions, as well as the characteristics of the labor market and social protection systems. Working conditions can be indirectly improved or worsened by fiscal policy, industrial strategy, and employment policies. This emphasizes the importance of considering OSH as a "upstream" determinant of economic fairness and health. As a feedback mechanism within the macroeconomic system, the large societal costs of inadequate safety can also lead to institutional reforms, more regulation, and the redesign of compensation systems (Cagno et al., 2013).

Therefore, the macroeconomic theoretical framework for OSH suggests a multi-layered model wherein the context is formed by economic growth, structural changes, and globalization; risk is regulated and distributed through institutional mechanisms; the level of investment in safety is determined by the microeconomic behavior of businesses and employees; and the results of health and safety generate economic ramifications that are reflected in GDP, productivity, and public spending. In this way, workplace safety and health is not a side issue; rather, it is an essential part of an economic plan that aims to preserve human capital, promote sustainable growth, and maintain macroeconomic stability over the long run (Tomba et al., 2021).

3. NATIONAL STRATEGIES AND INSTITUTIONAL FRAMEWORKS FOR OCCUPATIONAL HEALTH AND SAFETY IN NORTH MACEDONIA AND NEIGHBORING COUNTRIES

Within the framework of national policies for occupational safety and health, the strategic documents of North Macedonia, Serbia, Greece and Bulgaria position OSH as an integral part of the system of economic and social governance. Although their primary focus is regulatory and institutional, all documents recognize the economic logic that a safe and healthy workforce is a prerequisite for productivity, labor market stability and sustainable economic growth. In this sense, OSH is treated as an instrument for the protection and advancement of human capital, which justifies its analysis within the framework of the macroeconomic approach.

In North Macedonia, the Strategy for Occupational Safety and Health 2021–2025 and the accompanying Action Plan set the framework for the development of a national system of prevention, enhanced inspection supervision and alignment with the European legislation. The document emphasizes the need to reduce occupational injuries and occupational diseases through systematic risk management and improved institutional coordination. Although the strategy does not use explicit macroeconomic terminology, it implies the link between safety and economic efficiency by emphasizing the reduction of economic losses from injuries, increasing productivity and improving the competitiveness of the economy. Through the announced digitalization and modernization of the OSH system, the state seeks to establish more efficient risk management, which indirectly contributes to labor market stability and rationalization of public expenditures related to health and social costs (Ministry of Economy of North Macedonia, 2021). In Serbia, strategic documents and the new legal framework for occupational safety and health for the period 2024–2027 set prevention as a central goal of national policy. Legislative changes are aimed at increasing employer responsibility, improving risk management and improving supervision and control mechanisms. The documents emphasize the need to reduce the number and severity of injuries, as well as to strengthen the system of recording and data analysis. This approach reflects the economic logic that work-related injuries represent a burden for companies, the social security system and the state budget. In this way, OSH is embedded in the broader framework of economic stability and the development of a competitive economy, where prevention is treated as an investment in long-term productivity and workforce security (Ministry of Labour, Employment, Veteran and Social Affairs of the Republic of Serbia, 2024). Greece has a National Strategy for Health and Safety at Work 2022–2027, which is aligned with the European Framework Strategy and the principles of sustainable and inclusive economic growth. The strategic document emphasizes that improving working conditions contributes to boosting productivity, reducing social inequalities and stabilizing the labor market. Particular emphasis is placed on the modernization of institutions, improving inspection mechanisms and developing a system for collecting and analyzing data on injuries and occupational risks. Through this, OSH is integrated into broader economic policies, recognizing its impact on public spending, the health system and the quality of human capital. The strategy treats prevention as a means of reducing the economic and social costs associated with occupational accidents (Ministry of Labour and Social Affairs of Greece, 2022).

In Bulgaria, the National Programme for Occupational Safety and Health 2025–2027 sets the framework for the systemic improvement of safety in the context of technological and industrial transformations. The document emphasizes the need for alignment with European standards, improving institutional coordination and developing modern risk management mechanisms. It recognizes the economic aspect of OSH by highlighting the impact of injuries on productivity, healthcare costs and the functioning of the social security system. The programme envisages improving statistical monitoring and data analysis, which creates a basis for assessing the economic burden of occupational risks and for carrying out informed policies aimed at sustainable development (Ministry of Labour and Social Policy of the Republic of Bulgaria, 2025).

In all these national documents, OSH is treated as part of broader economic and social policy, with an emphasis on prevention, institutional strengthening and alignment with European standards. Although the degree of explicit connection with macroeconomic indicators varies, there is a common conceptual assumption that the protection of workers' health and safety is a prerequisite for labor market stability, sustainable economic growth, and long-term protection of human capital.

4. MATERIALS AND METHODS

The main research problem addressed in the paper is: are there differences in the rates of occupational injuries, economic consequences and institutional policies for OSH in North Macedonia and neighboring countries?

The research has a cross-sectional design, has a comparative, descriptive-analytical character and is based on the analysis of secondary data. The aim is to perform a comparative analysis of the number of non-fatal serious and fatal injuries at work, their economic burden (if cost data are available), as well as the national strategies and institutional frameworks for OSH in North Macedonia, Serbia, Greece and Bulgaria. The research aims to determine whether differences in the normative and institutional setting are reflected in different economic and statistical outcomes

related to occupational safety. The research provides a systematic overview of the macroeconomic dimension of OSH through the analysis of aggregate data for 2023, i.e., the latest available report, as well as through a comparison of national policies in the selected countries.

The research used a document analysis method (national strategies and OSH legislation) and a comparative method. Data sources include official reports from national institutions, ministries of labor, labor inspectorates, as well as international databases (EU-OSHA, ILO, Eurostat, Decent work Balkans).

Quantitative data were processed using descriptive statistics (frequencies, rates, percentages). The results are presented in tables and graphs in order to clearly visualize the differences between countries. Qualitative analysis of the strategies was carried out by identifying recurring concepts and economic indicators in the documents, which allows their systematic comparison in the results and discussion.

5. COMPARATIVE ANALYSIS OF OCCUPATIONAL SAFETY AND HEALTH IN NORTH MACEDONIA AND NEIGHBORING COUNTRIES

Table 1 presents descriptive statistics on the number of *serious and fatal injuries* and the rate of serious and fatal injuries at work per 100,000 employees. Figure 1 contains a graphical representation of the rate of serious injuries at work for the countries studied, while Figure 2 presents the rate of fatal injuries in the four countries.

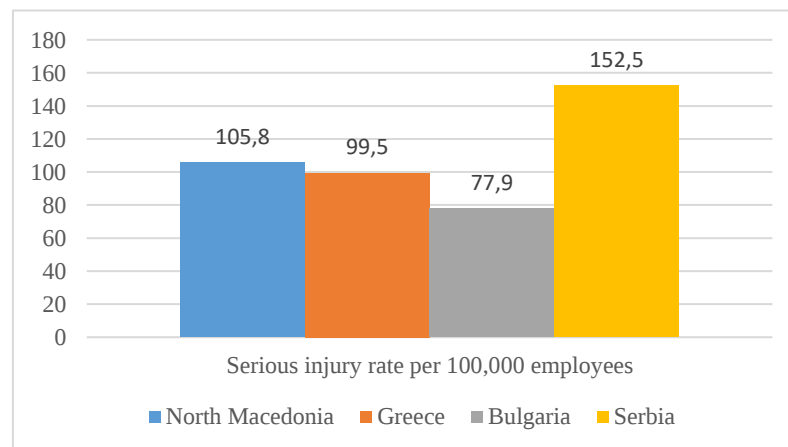
Table 1. Number and rate of serious and fatal injuries in the Republic of North Macedonia and neighboring countries

	Number of serious injuries	Serious injury rate per 100,000 employees	Number of fatal injuries	Fatal injury rate per 100,000 employees
North Macedonia	728	105,8	0	0
Greece	4674	99,5	37	0,79
Bulgaria	2197	77,9	90	3,19
Serbia	4386	152,5	46	1,60

Source:

Ministry of Economy of North Macedonia. (2021). *Strategy for Occupational Safety and Health 2021–2025 and Action Plan 2021–2023*. Skopje: Ministry of Economy of North Macedonia; Ministry of Labour and Social Affairs of Greece. (2022). *National Strategy on Occupational Safety and Health 2022–2027*. Athens: Ministry of Labour and Social Affairs; Ministry of Labour and Social Policy of the Republic of Bulgaria. (2025). *National Programme on Occupational Safety and Health 2025–2027*. Council of Ministers of the Republic of Bulgaria; Ministry of Labour, Employment, Veteran and Social Affairs of the Republic of Serbia. (2024). *Strategy for Occupational Safety and Health 2024–2027*. Belgrade: Ministry of Labour, Employment, Veteran and Social Affairs.

Chart 1. Rate of serious injuries at work in the Republic of North Macedonia and neighboring countries

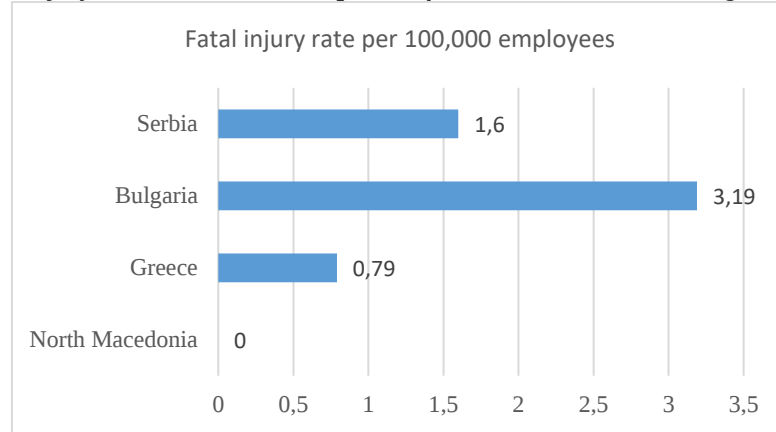


Source:

Ministry of Economy of North Macedonia. (2021). *Strategy for Occupational Safety and Health 2021–2025 and Action Plan 2021–2023*. Skopje: Ministry of Economy of North Macedonia; Ministry of Labour and Social Affairs of Greece. (2022). *National Strategy on Occupational Safety and Health 2022–2027*. Athens: Ministry of Labour

and Social Affairs; Ministry of Labour and Social Policy of the Republic of Bulgaria. (2025). *National Programme on Occupational Safety and Health 2025–2027*. Council of Ministers of the Republic of Bulgaria; Ministry of Labour, Employment, Veteran and Social Affairs of the Republic of Serbia. (2024). *Strategy for Occupational Safety and Health 2024–2027*. Belgrade: Ministry of Labour, Employment, Veteran and Social Affairs.

Chart 2. Fatal injury rate at work in the Republic of North Macedonia and neighboring countries



Source:

Ministry of Economy of North Macedonia. (2021). *Strategy for Occupational Safety and Health 2021–2025 and Action Plan 2021–2023*. Skopje: Ministry of Economy of North Macedonia; Ministry of Labour and Social Affairs of Greece. (2022). *National Strategy on Occupational Safety and Health 2022–2027*. Athens: Ministry of Labour and Social Affairs; Ministry of Labour and Social Policy of the Republic of Bulgaria. (2025). *National Programme on Occupational Safety and Health 2025–2027*. Council of Ministers of the Republic of Bulgaria; Ministry of Labour, Employment, Veteran and Social Affairs of the Republic of Serbia. (2024). *Strategy for Occupational Safety and Health 2024–2027*. Belgrade: Ministry of Labour, Employment, Veteran and Social Affairs.

According to the results obtained, Serbia has the highest number with 4386 injuries and a rate of 152.5, while Bulgaria has the lowest number with 2197 injuries and a rate of 77.9. North Macedonia records 728 injuries with a rate of 105.8, while Greece has 4674 injuries with a rate of 99.5 per 100,000 employees. According to the results obtained from the latest available country reports, Bulgaria has the highest number of fatal injuries with 90 cases and a rate of 3.19 per 100,000 employees, North Macedonia records no fatal injuries, Serbia has 46 fatal injuries with a rate of 1.60, and Greece 37 fatal injuries with a rate of 0.79 per 100,000 employees.

Although there are no official data on the *economic costs* of work-related injuries for North Macedonia, Serbia, Bulgaria and Greece, estimates from the European Agency for Safety and Health at Work (EU OSHA) and the International Labour Organization (ILO) indicate that the direct and indirect costs of work-related injuries and occupational diseases can reach around 3.3% of a country's GDP per year. This indicates the significant economic burden carried by non-fatal and fatal injuries, which one of the objectives of this research is to assess in the context of national OSH policies and practices.

The comparative analysis of national strategies and macroeconomic policies for occupational safety and health in North Macedonia, Serbia, Bulgaria and Greece shows certain similarities, but also differences in the approach to managing occupational risks and their economic significance.

In all the analyzed countries, occupational safety and health are integrated into national policies for employment, social protection and economic development, which indicates the recognition of work-related injuries as a factor affecting productivity, human capital and public spending. However, the level of institutional development and the focus of policy measures vary between countries.

Bulgaria and Greece, as EU member states, show a more pronounced integration of OSH into broader economic policies, with strategies aligned with the European frameworks for sustainable growth, job quality and prevention of occupational risks. In these countries, the emphasis is on systemic risk management, monitoring of working conditions and long-term reduction of economic losses related to work-related injuries.

On the other hand, North Macedonia and Serbia place greater emphasis in their strategies on institutional strengthening, improving legislation and improving inspection. The macroeconomic approach in these countries is aimed at gradual harmonisation with European standards and the development of preventive mechanisms in order to reduce the rate of injuries and improve working conditions. In addition, strategic documents in Serbia emphasize the

economic consequences of injuries through productivity losses and burden on the social security system, while in North Macedonia policies are more oriented towards prevention and raising awareness of occupational safety. In Bulgaria and Greece, a broader approach is observed, which also includes new risks related to technological changes, psychosocial factors and modern forms of work.

Hence, the comparison shows that all four countries recognize the importance of occupational safety and health as a macroeconomic category, but there are differences in the level of integration of OSH into national economic policies, institutional capacity and strategic planning priorities.

6. DISCUSSION

The results indicate that there are differences between the analyzed countries in the rates of serious and fatal injuries at work and in the approach to the development of OSH policies. Although all countries have established strategies and institutional mechanisms, the level of their implementation and integration into economic policies varies.

North Macedonia records average values in terms of injury rates compared to neighboring countries, which indicates the existence of a normative framework, but also the need for further improvement of preventive measures and institutional supervision. The higher rates in Serbia, as opposed to the relatively lower indicators in Bulgaria and Greece, can be associated with differences in the degree of compliance with European standards and the practical implementation of OSH policies.

The lack of national data on the economic costs of work-related injuries in all countries analyzed is a significant limitation, but estimates that losses reach around 3.3% of GDP highlight the macroeconomic importance of occupational safety and the need to strengthen preventive policies.

7. CONCLUSION

The results obtained indicate that occupational injuries represent a significant health and economic burden, which is in line with data from European and global analyses. Despite the existence of legislation, the costs associated with injuries and occupational diseases remain high, which highlights the need for more effective implementation of preventive measures and improvement of the occupational safety and health system.

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