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Contents

Articles

Aneta Kosztowniak, Krzysztof Drapala
ANTI-CRISIS FISCAL POLICY IN THE FACE
OF THE COVID-19 PANDEMIC AND THE ENERGY CRISIS
AND ITS CONSEQUENCES 5

Jarosław Prońko
ECONOMY AND SAFETY 29

Konrad Sałek, Patryk Fajdek
ANALYSIS OF THE IMPLEMENTATION OF THE NIS2 DIRECTIVE
IN THE WEIMAR TRIANGLE COUNTRIES 41

Yuliia Tranovych, Viktoriia Stoika, Kristina Kudak
COMPREHENSIVE ASSESSMENT OF THE FINANCIAL
SUSTAINABILITY OF LOCAL BUDGETS IN CONDITIONS
OF DECENTRALIZATION 53

Agnieszka Zalewska-Bochenko
ARTIFICIAL INTELLIGENCE AS A NEW DIMENSION
OF THE LABOR MARKET 65

ARTICLES

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Aneta Kosztowniak[1], Krzysztof Drapala[2]

ANTI-CRISIS FISCAL POLICY IN THE FACE OF THE COVID-19 PANDEMIC AND THE ENERGY CRISIS AND ITS CONSEQUENCES

Summary

The aim of the article is to diagnose the differences in the anti-crisis fiscal policy in 2020-2022 conducted by the governments of Polish, Czech, Hungarian and Slovak during the COVID-19 pandemic crisis and the energy crisis. The following research questions were asked:

1. What was the fiscal situation of Polish, Czech, Hungarian and Slovak countries after the pandemic and energy crisis at the end of 2024, considering the level and ratio of the deficit and debt of the general government sector to GDP?
2. What fiscal policy measures have the governments of Poland, the Czech Republic, Hungary and Slovakia taken during the pandemic and energy crisis and what was their scale? Which of the countries incurred the lowest and largest costs in relation to GDP?

The results of the empirical analysis indicate that at the end of 2024, i.e. after the pandemic period and the energy crisis, the best fiscal situation was in the Czech Republic, as evidenced by the lowest debt-to-GDP ratios

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and general government deficits. Hungary was in the worst situation, with its indicators clearly exceeding the permissible standards applicable in the European Union (general government deficit of 5.1% of GDP and general government debt of 75.8% of GDP).

During the periods of crisis analyzed, the governments of Poland, the Czech Republic, Hungary and Slovakia took many similar measures to correct them. Hungary incurred the largest expenditure on counteracting the effects of the COVID-19 pandemic in relation to GDP. In turn, the Czech Republic spent the largest expenditure on measures to counteract the energy crisis in relation to GDP, and Hungary the least. The main sources of data were the online databases of Eurostat, the European Central Bank, NATO and Bruegel.

JEL classification codes: H30, E6.

Keywords: anti-crisis fiscal policy, COVID-19 pandemic, energy crisis.

Paper type: Empirical research article.

Introduction

In the event of an economic crisis causing a downturn and a slowdown in economic development, there is a need to take specific measures to overcome difficulties. The solution to this problem is to apply, among others, an anti-crisis fiscal policy (Prokopowicz, 2023).

Measures taken as part of the anti-crisis fiscal policy should contribute to limiting the effects of the crisis in such a way as to maintain the long-term sustainability of public finances, which is the basis for socio-economic development (A. Alińska, 2016). The actions taken should not create any additional threats or risks, for the public finance sector. When deciding on specific fiscal policy measures, the country's macroeconomic situation, changes in debt securities yields and the cost of financing public debt should be considered.

An additional problem during crises may be the increase in systemic risk resulting from the market's assessment of the situation. As noted by DJ Gajewski, P. Karwat, A. Olczyk, A. Werner and J. Wierzbicki (2021), the experience to date related to the outbreak of the global financial crisis has undoubtedly prompted governments to adopt a more interventionist attitude of conduct their policy in crisis conditions.

In recent years, there have been two major macroeconomic shocks. The first shock concerned the outbreak of the COVID-19 pandemic in 2020 and the related disruptions of supply chains, and the second was related to the increase in energy commodity prices because of the outbreak of war in Ukraine in February 2022.

The aim of the article is to diagnose the differences in the anti-crisis fiscal policy pursued in 2020-2022 by the governments of Poland, the Czech Republic, Hungary and Slovakia during the COVID-19 pandemic crisis and the energy crisis. The following research questions were asked:

1. What was the fiscal situation of Polish, Czech, Hungarian and Slovak countries after the pandemic and energy crisis at the end of 2024, considering the level and ratio of the deficit and debt of the general government sector to GDP?
2. What fiscal policy measures have the governments of Poland, the Czech Republic, Hungary and Slovakia taken during the pandemic and energy crisis and what was their scale? Which of the countries incurred the lowest and largest costs in relation to GDP?

1. Review of theoretical literature

The COVID-19 epidemic has caused many negative social and economic effects around the world. SR Baker, N. Bloom, SJ Davis, and SJ Terry (2020) take the view that the COVID-19 pandemic caused even more uncertainty than the global financial crisis of 2008-2009, and even compare it to the uncertainty during the Great Depression of 1929-1933. In turn, K. Czech, A. Karpio, M. Wielechowski, T. Woźniakowski and D. Żebrowska – Suchodolska (2020) indicate that the COVID-19 epidemic has contributed to increased anxiety among consumers, due to the fear of infection, as well as to a change in the mood of entrepreneurs.

F. Grądalski and M. Guzikowski (2020) indicate that the pandemic was an external shock related to the collapse of liquidity on the demand and supply side in connection with the introduction of administrative restrictions on economic activity. This was the reason why there was a collapse of liquidity in the real economy, i.e. in the corporate and household sectors. The introduction of restrictions has had the greatest impact on industries that depend most on human contact. Among them, tourism and hospitality, culture and entertainment, transport and other services should be distinguished. Reduced demand for services contributed to a decrease in their supply in the economy, which translated into a decrease in GDP. At the same time, the supply chain was also interrupted. Therefore, governments decided to take specific actions in fiscal policy, which, along with monetary policy, is the main component of the economic policy of each country.

As part of fiscal policy, many actions can be taken with the use of adequate instruments indicated in the literature on the subject. According to A. Przybylska-Mazur (2015, p. 69), "fiscal policy includes the government's decisions on the size and structure of public spending and the budget deficit". W. Zembura (2006, p. 218), points out that "fiscal policy is the policy of the state implemented with the use of tools for collecting public revenues, as well as the determination of directions and methods of implementation of public expenditure to achieve

strictly defined social and economic goals. According to the definition of S. Owsiak (2017, p. 489), fiscal policy is "the activity of the state consisting in the use of fiscal instruments, i.e. taxes and other public levies, and incurring public expenditures". In addition, fiscal policy also consists in "the use of budget deficits, public debt, guarantees and certainties granted to business entities, etc. to achieve the specified objectives". Z. Fedorowicz (1998, p. 7) points out that fiscal policy consists of several segments, among which the following should be distinguished: budget policy, special purpose fund policy and non-budget economy.

As for fiscal policy objectives, they are divided into two groups, i.e. fiscal and non-fiscal objectives (M. Sobol, 2024, p. 235). M. Dynus (2007, p. 13) considered the main goal of fiscal policy to be "supporting the economic development of the country, as well as striving to maintain sustainable and stable economic growth". On the other hand, I. Popa and D. Codreanu (2020) indicate that the main task of fiscal policy in the case of developed economies is to maintain a full level of employment and stabilize economic growth, and in the case of developing countries, properly directed fiscal policy is to create the right conditions for achieving rapid economic growth. A responsibly conducted fiscal policy contributes to increasing macroeconomic stability and enables long-term fiscal stability, which increases investor confidence in the economy and promotes economic growth (Działo, 2012). According to the Keynesian trend, the goal of anti-crisis fiscal policy is usually to stimulate demand by increasing the budget deficit, as indicated by, among others. K. Kalinowska (2013) and others.

2. Review of anti-crisis measures

With the outbreak of the COVID-19 pandemic, governments have had to take specific measures to mitigate the detrimental effects of the shock to the economy and to develop solutions to emerging social problems.

According to IMF (2025a, b) and ECB (2025) data, of the four countries analyzed, Poland incurred the largest nominal expenditure in connection with the outbreak of the COVID-19 pandemic, which amounted to USD 38.5 billion (EUR 35.6 billion). Slovakia spent the least on this spending, i.e. US$6.3 billion (EUR 5.8 billion). On the other hand, in terms of the ratio of anti-pandemic expenditure to GDP, the highest expenditure was incurred by Hungary, whose anti-crisis package amounted to 11.5% of GDP. Lower expenditures were observed in Poland, which amounted to 4.5% of GDP (Table 1).

In terms of anti-crisis solutions, the surveyed countries showed many similarities. Countries incurred expenditures primarily on:

- providing medical care,
- weight subsidies,
- increasing or introducing social benefits and other benefits,
- periodic exemptions of enterprises from paying social security contributions,
- tax exemptions or reductions or special reliefs,
- supporting the industries most affected by the crisis by introducing subsidies or a moratorium on loans,
- other various measures to improve the liquidity of companies.

As D. Prokopowicz (2022) observed, because of the rapid recovery from the recession of economies around the world, the prices of energy and industrial raw materials began to rise as early as 2021. This process was exacerbated by Russia's invasion of Ukraine, which took place on February 24, 2022, about two years after the outbreak of the epidemic. The war in Ukraine has contributed to an increase in fossil fuel prices on energy commodity exchanges, which has also translated into an increase in electricity prices. This was reflected in the increase in the prices of products and services, which was associated with an increase in inflation. Many countries have provided military support and humanitarian aid to Ukraine, and economic sanctions have been imposed on Russia, which has exacerbated supply chain disruptions (Kosztowniak, 2023) and strongly affected the situation in the energy sector. The combination of expansionary monetary and fiscal policies at the time created inflationary pressures on a scale not seen in decades (OECD, 2023).

Table 1. Main measures of the anti-crisis fiscal policy related to the outbreak of the COVID-19 pandemic

	Countermeasures taken	Total aid (billion)
Poland	• increasing support for health care in the form of investments in infrastructure, telemedicine and digitization; • wage subsidies for enterprise employees up to 40% of the average wage; • introduction of childcare allowance due to school closures; • introduction of a monthly allowance for self-employed people; • introduction of a solidarity allowance for people who lost their jobs after 15 March 2020, which was paid for 3 months (between June and August 2020); • increasing unemployment benefits by 39% for the first 90 days of unemployment; • providing guarantees and wage subsidies; • granting liquidity loans by the Polish Development Fund for enterprises affected by the lockdown (largely non-repayable aid); • introduction of subsidies to interest on bank loans under the BGK Interest Subsidy Fund; • coverage by the state budget of 100% or 50% of social security contributions for micro and small enterprises in crisis-affected industries for 3 months; • refraining from collecting PIT and CIT taxes on liquidity loans obtained under the Financial Shield of the Polish Development Fund; • expanding the group of entrepreneurs entitled to taxation at a lower CIT rate of 9%; • introduction of "Estonian CIT"; • exemption from VAT on import and intra-Community acquisition of goods that were to be donated to the Material Reserves Agency, the Central Sanitary and Anti-Epidemic Reserves Database and single-purpose hospitals; • VAT reduction on medicinal products, biocidal products, COVID-19 medicines and vaccines, and donations to the health service; • exemption from excise tax on coal products; • suspension of market fee collection; • introducing the possibility of exemption from real estate tax by local governments for entrepreneurs who have suffered losses as a result of the outbreak of the COVID-19 epidemic; • exemption from tax on income from buildings; • introducing a PLN 500 voucher for all teachers for IT equipment used for distance learning; • leasing subsidies in the transport industry; • co-financing by the Industrial Development Agency for the costs incurred for the restructuring of enterprises; • introducing the possibility of carrying forward losses from 2020 to tax returns in 2019 or 2020; • introduction of a tourist voucher of PLN 500 for each child eligible for the 500+ Programme (the voucher could only be used in Poland); • creation of a COVID Fund worth PLN 100 billion to counteract the negative effects of the pandemic; • allocating additional funds for public investment in road and rail infrastructure and supporting companies managing airports; • support for local government investments under the Government Local Investment Fund in the amount of PLN 12 billion.	$ 38.50 (approx. 35.6 EUR)* (4.5% of GDP)

Continued Table 1.

	Countermeasures taken	Total aid (billion)
Hungary	• allocation of approximately HUF 245 billion to healthcare; • abolition of social security contributions for companies most affected by the crisis; • periodic reduction of health insurance contributions; • exemption of small enterprises (mainly from the services sector) from corporate income tax, deferral of income tax payments in the case of enterprises from industries most affected by the crisis; • introduction of tax relief for media due to losses in advertising revenues; • suspension of tax arrears collection procedures for the duration of the state of emergency; • wage subsidies; • creation of the Anti-Epidemic Protection Fund and the Economy Protection Fund aimed primarily at protecting jobs and industries most affected by the crisis; • introducing support for enterprises producing for export through the state-owned Exim Bank (investment subsidies, preferential working capital loans and a guarantee and insurance system); • purchase of bank bonds by the government up to HUF 150 billion; • introduction of interest-free loans for SME sector companies, • payment of additional pension.	$17.8 (approx. 16.4 EUR)* (11.5% of GDP)
The Czech Republic	• purchase of medical equipment, vaccines and tests; • debt relief for hospitals; • bonuses for employees of the public sector, hospitals, emergency services and health control stations; • financing of the salaries of employees of restricted industries by 80% up to CZK 39,000/month, which was later extended to 100% up to CZK 50,000/month; • introduction of a care allowance for parents of children up to 13 years of age; • introduction of an allowance for self-employed people caring for children under 13; • covering 50% of rent costs for companies renting office space; • introducing programmes supporting sports, culture, tourism, transport, agriculture and other sectors subject to restrictions; • introduction of a one-off cash benefit for pensioners in the amount of CZK 5,000; • introducing the possibility of reducing the tax base in 2018 and 2019 in connection with the introduction of a state of emergency in 2020 and the resulting losses; • introducing a support subsidy for the self-employed, small businesses and contractors; • reduction of the effective personal income tax rate and increase of tax reliefs; • reduction of road tax for trucks; • temporary suspension of collection of solidarity tax from companies; • introduction of a temporary exemption for employers employing up to 50 employees from the obligation to pay social insurance contributions; support in the form of salary compensation was granted after meeting certain conditions;	$ 22.6 (approx. 20.9 EUR)* (9.2% of GDP)

Continued Table 1.

	Countermeasures taken	Total aid (billion)
The Czech Republic	• introduction of an allowance for employees in quarantine in the amount of CZK 370 per day; • VAT rate reduction to 10% for services related to accommodation, sports and cultural services • reduction of the road tax rate for vehicles over 3.5 tonnes and reduction of excise duty on diesel fuel; • abolition of real estate acquisition tax; • introduction of extraordinary accelerated depreciation of assets acquired in 2020 and 2021 and an increase in the depreciation limit for tangible fixed assets; • deferment of advance payments for social security and health insurance contributions for a period of 6 months for the self-employed; • the provision of interest-free loans in the amount of CZK 0.9 billion by the Czech National Development Bank, the remaining support was covered by state guarantees for loans from commercial banks under the COVID I programme; • providing guarantees for the SME sector worth a total of CZK 500 billion under the COVID III programme, as well as other guarantees under the COVID II and COVID Plus programmes, aimed at travel agencies and the sports and other industries. • introducing a moratorium on bank loans for 6 months; • waiver of penalties for failure to pay property tax and late submission of tax returns.	$ 22.6 (approx. 20.9 EUR)* (9.2% of GDP)
Slovakia	• increased spending on medical care; • introducing wage compensation for companies and self-employed people affected by the crisis, as well as subsidies for people without an income; • increasing unemployment benefits, sickness benefits and care benefits; • introducing a periodic exemption from paying social security contributions for businesses and self-employed persons; • reducing the requirements of the Labor Code and administrative burdens on enterprises; • deferment of PIT and CIT tax payments in the event of a drop in revenues by more than 40%; • moratorium or rent subsidies; • launch of the state guarantee program; • introducing the possibility of deferring loan repayment for a period of up to 9 months for individuals, self-employed persons and SMEs; • introduction of temporary protection for companies against creditors.	$6.3 (approx. 5.8 EUR)* (5.9% of GDP)

Source: Own study based on: IMF (2025), Gajewski et. al. (2021), Kacperska et. al. (2023), ECB (2025a). *own calculations based on ECB data, value in EUR calculated on the basis of the average USD/EUR exchange rate in 2024, 1 USD = 0.9239 EUR;

In turn, in terms of expenditure on limiting the negative effects of the energy crisis, based on calculations from the Bruegel (2025) and ECB (2025) databases, it results that the highest expenditure was incurred by Poland (EUR 12.4 billion, i.e. approx. USD 13.4 billion) and the lowest by Hungary (EUR 2.7 billion, i.e. approx. USD 2.9 billion).

The value of aid for counteracting the energy crisis in relation to GDP was the highest in the Czech Republic and Slovakia (both 3.8% of GDP) and the lowest in Hungary (1.7% of GDP) (Table 2).

Table 2. Main anti-crisis fiscal policy measures in connection with the energy crisis

	Remedial measures taken	Total value of aid (in billion)
Poland	• introduction of a protective supplement for households; • introduction of the Anti-Inflation Shield 1.0., including: reduction of excise tax on fuel to the minimum permitted by the EU and electricity to 0%, as well as reduction of VAT on gas from 23% to 8% and electricity from 23% to 5%, a 0% tax rate on retail sales of fuels was introduced, and a protective supplement for the poorest households was implemented, ranging from PLN 400 to PLN 1,150; • introduction of the Anti-Inflation Shield 2.0., including: a reduction of VAT on fuel to 8%, 0% VAT on basic food products and natural gas, as well as an extension of the 5% VAT reduction on electricity, a reduction of VAT on heat, 0% VAT on fertilisers, and a reduction of gas tariffs for public utility institutions and housing communities and cooperatives; • Anti-Putin Shield including: 8-month credit holidays, a change in the interest rate on credits, subsidies from the Borrower Support Fund in the amount of PLN 2,000/month and a reduction of the personal income tax from 17% to 12%; • introduction of a solidarity tax on excess profits for energy and coal companies; • introduction of the “Moje głowy” (My Heat) programme, under which it was possible to obtain a subsidy and install heat pumps in new houses with a higher energy standard of buildings; • reduction of excise tax on light diesel fuel; • introduction of a one-off coal allowance of PLN 3,000 for households whose main source of heating is coal or coal-based fuels containing at least 85% hard coal; • reduction of electricity and gas tariffs to a specified limit for households, businesses and public utilities; • introduction of a VAT refund for households using gas heating up to a certain average monthly income per person; • reducing heating and hot water charges for households and public utility institutions.	12.4 EUR (approx. $13.4)* (2.2% of GDP)

Continued Table 2.

	Remedial measures taken	Total value of aid (in billion)
Hungary	• introduction of a cap on petrol and gas prices of HUF 480; • providing a non-refundable subsidy for small petrol stations in the amount of HUF 20/litre of petrol and exempting all petrol stations from the obligation to maintain energy efficiency; • reduction of excise duty by 20 HUF/litre; • reducing electricity and gas prices for households; • an increase in the maximum amounts of support for: undertakings active in the agricultural sector at EUR 62 000, undertakings active in the fisheries and aquaculture sectors at EUR 75 000 and undertakings active in all other sectors; • introduction of a programme under which households could obtain firewood from state forest farms at a price of HUF 30,000 for a maximum of 10 m3 ^{of} wood; • the introduction of the "Factory Rescue Programme", under which the government provided 25 companies with funds totalling HUF 27.5 billion for investments in energy efficiency; • periodic coverage of electricity costs for SMEs in the tourism and processing industries; • introduction of temporary price limits on selected food products; • introduction of a tax on windfall profits for energy companies.	2.7 EUR (approx. $2.9)* (1.7% of GDP)
The czech republic	• exemption of electricity and gas bills from VAT; • exemption of households and holiday homes from fees for electricity from renewable sources; • introducing discounts on electricity bills with direct payments for low-income families, pensioners and retirees; • introduction of support for enterprises in the form of a 0% interest guarantee to cover operating costs within the framework of Guarantee Program for 2015–2023 through the National Development Bank in the event of a 100% increase in electricity bills; • introducing electricity subsidies for households and businesses and covering fees for electricity from renewable energy sources; • reduction of regulated prices for electricity and gas and provision of compensation to energy suppliers; • introduction of a 60% tax on windfall profits for energy companies and banks • provision of credit support to the energy company ČEZ by the Czech Ministry of Finance in the amount of EUR 3 billion to ensure the company's liquidity; • temporary reduction of excise tax on petrol and diesel by CZK 1.5/litre; • abolition of road tax for passenger cars, buses and trucks up to 12 t.	9.2 EUR (approx. $10)* (3.8% of GDP)

Continued Table 2.

	Remedial measures taken	Total value of aid (in billion)
Slovakia	• reduction in electricity tariffs; • support for companies in the form of compensation for electricity and gas bills totalling EUR 360 million (maximum EUR 500,000/month per company) and compensation for public utilities totalling EUR 200 million (maximum EUR 200,000/month per entity); • reduction of fees for the distribution of electricity on the unregulated market; • reducing heating and gas bills for households; • introduction of a tax on extraordinary profits for producers of electricity with a capacity of 0.9 kW and energy suppliers; • introduction of a one-off child benefit of 100 euros; • increasing family benefits and increasing tax relief for families with children; • acceleration of payment of the 13th pension; • providing subsidies for social services; • a one-off increase in the allowance for a newborn child.	3.7 EUR (approx. $4)* (3.8% of GDP)

Source: Own study based on: Bruegel (2025); Sklenář (2023); ECB (2025a). *own calculations based on ECB data, USD value calculated on the basis of the average EUR/USD exchange rate in 2024, 1 EUR = 1.0824 USD.

It is worth noting that although the Visegrad Group countries used different tools in response to the energy crisis, in many cases the same solutions were introduced. All countries used:

- tax on excess profits, which was paid mainly by companies from the energy and coal sectors,
- aid mechanisms for households and businesses in the form of compensation, price caps, subsidies or tariff reductions in connection with increased gas, electricity and heating bills,
- in addition, Poland, the Czech Republic and Hungary reduced VAT or excise duty on fuels,
- and Hungary even introduced price caps for petrol and diesel, although this ultimately contributed to increased demand and led to shortages at petrol stations, so the price cap was quickly lifted (Sklenář, Łoskot- Strachota, Oravcova , Kotek & Takácsné Toth, 2023).

3. Overview of the economic situation and the effects of the crisis

3.1. Changes in GDP growth rate

In order to assess the consequences of the discussed crises, i.e. the pandemic and the energy crisis, based on Eurostat and NATO data and Bruegel analyses, the most important macroeconomic indicators for the period 2018-2024 were compiled, i.e.

- GDP (%)

- electricity and gas prices for businesses and households (in EUR per kWh)
- general government deficits/surpluses (in % of GDP)
- defence expenditure (in % of GDP)
- general government debt (in % of GDP).

The analysis of the impact of the COVID-19 pandemic on changes in the GDP rate in the Visegrad Group countries in 2020 shows that the strongest decline in growth occurred in the Czech Republic (-5.3%) and Hungary (-4.5%), with weaker declines in Poland (-2.0%) and Slovakia (-3.3%). The recovery processes were most noticeable in 2021[3] in Hungary (7.1%) and Poland (6.9%), with weaker growth in Slovakia (4.8%) and the Czech Republic (4.0%).

According to A. Wildowicz – Szumarska (2021), the reaction of fiscal authorities in the event of unpredictable and extraordinary events in the economy called black swans (*black swan*), plays an important role in the functioning of households and enterprises. The situation forced governments to introduce expansionary fiscal policy, in conditions of almost zero interest rates. Protective measures for enterprises operating in industries covered by the so-called *lockdown,* which contributed to the protection of jobs, were of particular importance in mitigating the effects of the pandemic (Kacperska, Gomółka, Kasprzak, Łukasiewcz & Wróblewski, 2021).

In 2022, the positive GDP growth rate was maintained, although it was already lower than in 2021. The highest GDP growth was achieved by Hungary (5.6%) and Poland (4.6%). In 2023, a significant decline in GDP was recorded in all the countries studied. This was most noticeable in the Czech Republic (-0.1%) and Hungary (-0.9%), which fell into recession. The decline in GDP in 2023 was the result of the turbulence that occurred after the Russian attack on Ukraine, affecting many EU countries. It resulted from a decline in domestic consumer and foreign demand, primarily German and Scandinavian (Gołębiowska & Jóźwik, 2023) (Table 3).

Table 3. GDP dynamics in 2018-2024 (in %)

	2018	2019	2020	2021	2022	2023	2024*
Poland	5.9	4.5	-2.0	6.9	4.6	0.2	4.0
Hungary	5.4	4.9	-4.5	7.1	5,6	-0.9	1.3
The czech republic	2.8	3.6	-5.3	4.0	2.8	-0.1	0.6
Slovakia	4.0	2.5	-3.3	4.8	1.9	1.6	2.1

*data for Q2 Source: Own study based on: Eurostat (2025a); Eurostat (2025b)

[3] High GDP growth in 2021 were effect low (or negative) base in 2020.

3.2. Conditions and changes in electricity and gas prices

In the context of energy security and the reasons for the outbreak of the energy crisis, several important conclusions are provided by a review of the literature. As emphasized by L. Elak , A. Chrząszcz, S. Żurawski and N. Urbańska (2022), the goal of each country should be to ensure energy security, because energy supply plays an important role in achieving economic development. D. Katarzyński and G. Przekota (2024) add that the stability of energy markets is crucial for achieving economic growth and price stability. Supply and demand shocks in the form of the COVID-19 pandemic and the war in Ukraine contributed to the emergence of market fluctuations in the energy carrier market. In turn, G. Gałek (2023) noted that with the outbreak of the war in Ukraine, the topic of energy security gained even more importance. He drew attention to the high dependence of European Union countries on energy resources from Russia. P. Orłowska (2024), on the other hand, indicated that Russia uses energy as a weapon, which is why the diversification of supplies has become a priority task for European countries.

It is worth adding that the European Union decided to impose sanctions on Russia, which also hit its energy sector. Among others, the following were introduced:

- price ceiling for sea transport of crude oil and petroleum products,
- bans on the import of Russian crude oil, petroleum products, coal, LPG and the re-export of LNG (European Council , EU sanctions against Russia, 2025).

According to Eurostat's publication, EU energy mix and import dependency (2025) Slovakia and Hungary were among the top three analyzed European Union member states that were most dependent on energy imports from Russia in 2020. The demand for imports of Russian energy resources was, respectively, in the case of:

- Slovakia 57.3%,
- Hungarian 54.2%,
- Polish 35%
- Czech 23.7%.

The reasons for the increase in electricity prices were explained by, among others, M. Korczan (2023), who mentioned among the probable reasons, among others, the economic recovery after the pandemic, which increased the demand for energy. He pointed out that during the so-called *lockdowns* , the demand for energy decreased, which resulted in a slowdown in its production. In addition, the supply chain was broken, which delayed investments in new deposits or new mining walls, which, combined with the recovery of the economy after the pandemic (supported by various types

of government aid in the form of social transfers and protective measures), contributed to supply shortages of energy resources, which contributed to the increase in their prices. In turn, G. Ancyparowicz (2024) also indicated that the increase in energy prices was intensified by Russia's invasion of Ukraine in February 2022.

Eurostat data on electricity prices for enterprises in the Visegrad Group countries examined show that after a growth phase from 2021 in all countries, the highest rates in 2023 were recorded in Hungary (Figure 1.)

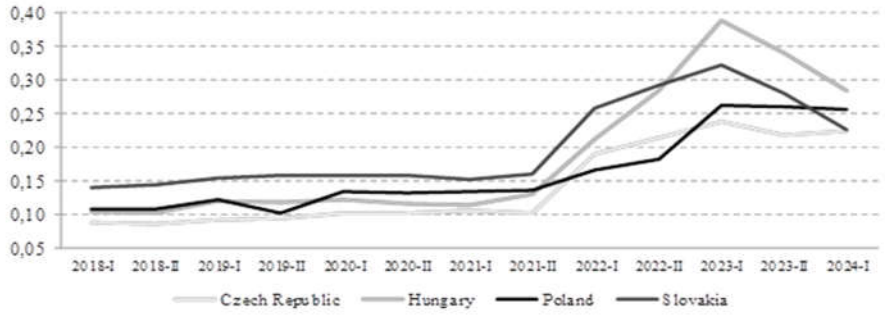

Figure 1. Electricity prices for companies in 2018-2024 (in EUR per kWh; energy consumption from 500 MWh to 1,999 MWh)
Source: Own study based on: Eurostat (2025c)

In the case of electricity prices for households, they have been rising since the second half of 2022. In the first half of 2024, these prices in the Czech Republic were about three times higher than the lowest prices in Hungary (Figure 2).

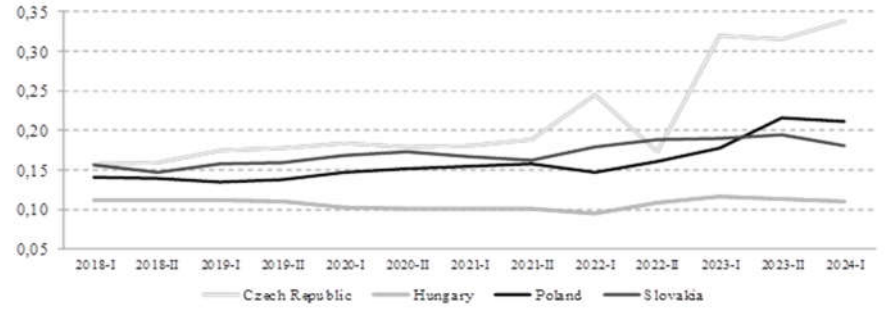

Figure 2. Electricity prices for households in 2018–2024 (in EUR per kWh; energy consumption from 2,500 kWh to 4,999 kWh)
Source: Own study based on: Eurostat (2025d)

In addition to changes in electricity prices on global markets, there was a significant increase in oil prices. As K. Pronińska (2023) recalled, Russia's aggression against Ukraine caused, among other things, a shock on the gas market, which was associated with an increase in its prices. Until about the first half of 2022, gas prices for companies were more or less at a similar level, but after the outbreak of the war in Ukraine, they increased significantly, including prices in Hungary (0.1982 EUR, II.2022). Ultimately, after temporary fluctuations, gas prices for companies were comparable in the four countries analyzed in the first half of 2024, although the highest prices were recorded in Poland (Chart 3).

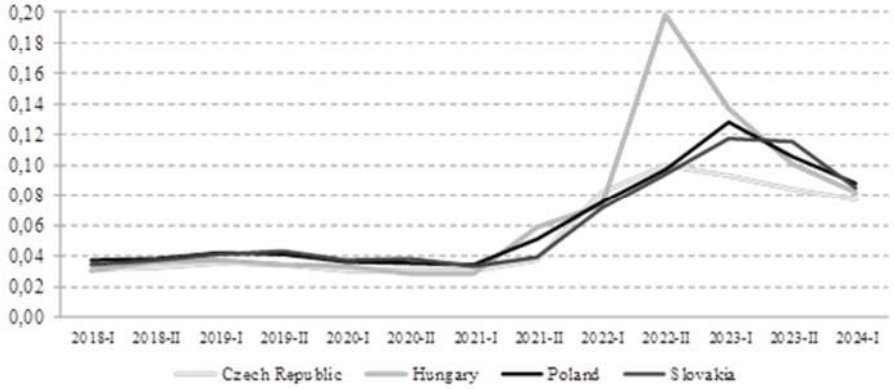

Figure 3. Gas prices for companies in 2018-2024 (in EUR; consumption from 10,000 GJ to 99,999 GJ)
Source: Own study based on: Eurostat (2025e)

In the case of gas prices for households, there were significant differences between the Group countries. These prices rose more significantly from 2021 to 2023, stabilizing in 2024. Among the countries, the highest price level was maintained in the Czech Republic, with an additional significant increase from the first half of 2021 (intensified by the outbreak of the war in Ukraine in February 2022) to the first half of 2023. There was a slight decrease in prices from the first half of 2023. At the end of the analyzed period (2024-I), household gas prices in the Czech Republic were more than four times higher than prices in Hungary (Figure 4).

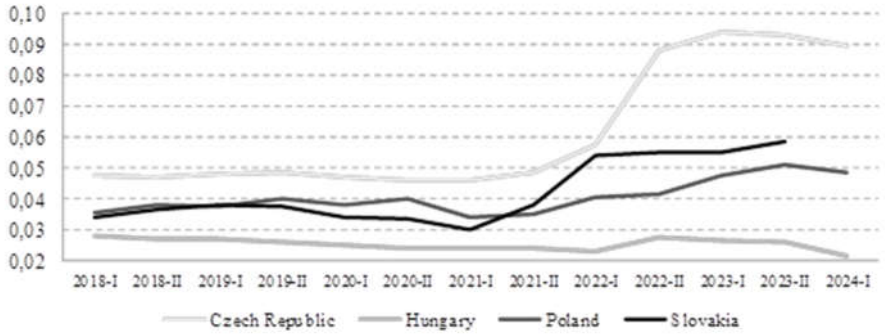

Figure 4. Gas prices for households in 2018-2024 (in EUR; consumption from 20 GJ to 199 GJ)
Source: Own study based on: Eurostat (2025f)

3.3. Financial situation in government and local government institutions

In order to maintain public finances in good shape, the Member States of the European Union are obliged to comply with the fiscal rules contained in the Stability and Growth Pact of 1997. In its original form, the document consisted of the European Council resolution of 17 June 1997, as well as two other regulations: Council Regulation No. 1466/97/EC and Council Regulation No. 1467/97, both of 7 July 1997. The former concerned the surveillance of budget positions and the coordination of economic policies, while the latter referred to the introduction of the excessive deficit procedure.

In 2005, these regulations were amended, but they proved insufficient, as some EU Member States still had problems with ensuring budget balance during the financial crisis of 2008. As a result, eight more EU regulations were issued, and one international treaty was signed. Specifically, the so-called six-pack and two-pack, which strengthened the monitoring of economic policies in the Member States, and the Treaty on Stability, Coordination and Governance of 2012, which introduced more restrictive provisions than those contained in the Stability and Growth Pact.

According to the rules in force in the EU, the general government deficit cannot exceed 3% of GDP at market prices, and the general government debt cannot exceed 60% of GDP at market prices (European Union, Stability and Growth Act).

However, due to the outbreak of the COVID-19 pandemic, the EU decided to introduce the so-called "general escape clause", thanks to which member states could incur increased spending on measures aimed at supporting economies in the face of the crisis. It expired at the end of 2023,

but unfortunately some countries still had problems with maintaining the deficit and debt of the government sector at an acceptable level (European Parliament , Post-Covid fiscal rules). In connection with this, the Council of the European Union decided in 2024 to initiate the excessive deficit procedure against seven EU Member States, including Poland, Hungary and Slovakia (European Council, Stability and Growth Pact).

It should be noted that the only country with a general government surplus in 2018-2019 was the Czech Republic (0.9% of GDP and 0.3% of GDP). In turn, since 2020, each of the analyzed countries has had a deficit. The largest sector imbalance was characterized by Hungary (-7.6% of GDP) and the lowest deficit was shown by Slovakia (-5.3% of GDP). The large increase in deficits in 2020 was related to numerous government measures related to easing the pandemic situation. Slightly lower deficits compared to 2020 were recorded in 2022, despite the fiscal authorities implementing aid measures to counteract the negative effects of the energy crisis. In the year under review, the largest general government deficit was again in Hungary (-6.2% of GDP), and the smallest in Slovakia (-1.7% of GDP).

In the years 2020-2024, the persistence of deficits at an elevated level was a common feature of all the countries analyzed. The outbreak of the war in Ukraine mobilized the countries of the region (including Poland) in particular to increase military spending, which could have contributed to the deterioration of the public finance situation. According to data for Q2 2024, the rule regarding the level of the general government deficit was not fulfilled by Poland, Hungary and Slovakia (Figure 5).

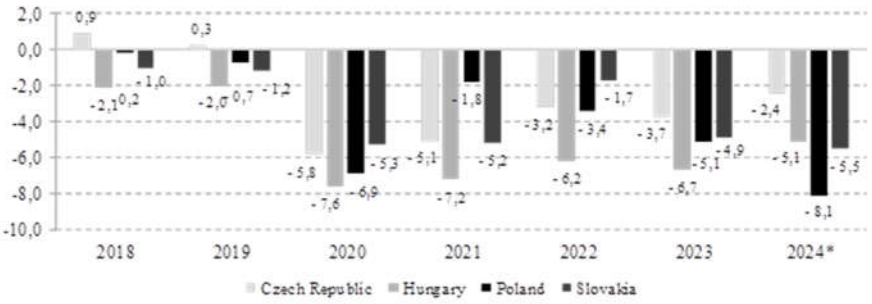

Figure 5. General government deficit/surplus in 2018-2024 (in % of GDP)
*Data for Q2 2024
Source: Own study based on: Eurostat (2025g); Eurostat (2025h)

According to NATO data for 2018-2024, Poland had the largest defense spending of all the Visegrad Group countries. This spending ranged from 2.0% of GDP in 2018-2019, 2.2% of GDP in 2020-2022, rising to 4.1%

of GDP in 2024 (forecast). NATO data for 2023 indicate a huge increase in spending among all the analyzed countries , which was related to the need to improve the defense potential of countries in connection with Russia's attack on Ukraine. Unfortunately, although the increased spending was fully justified, the European Commission decided to include Poland in the excessive deficit procedure and did not exclude defense spending from this procedure PAP Biznes (19/06/2024). According to a later announcement by the European Commission spokesman, V. Nuyts , defence spending was to be included in the initiated procedure (PAP Biznes, 4/11/2024).

In 2024, the estimated defense spending in Poland (4.1% of GDP) was significantly higher than in other countries, than in Hungary and the Czech Republic (2.1% of GDP) and Slovakia (2.0% of GDP). In 2024, each of the analyzed countries was to fulfill the agreements of the NATO North Atlantic Council from the Wales Summit in 2014, according to which the alliance countries committed to spending at least 2% of GDP on NATO defense (05/09/2024) (Figure 6).

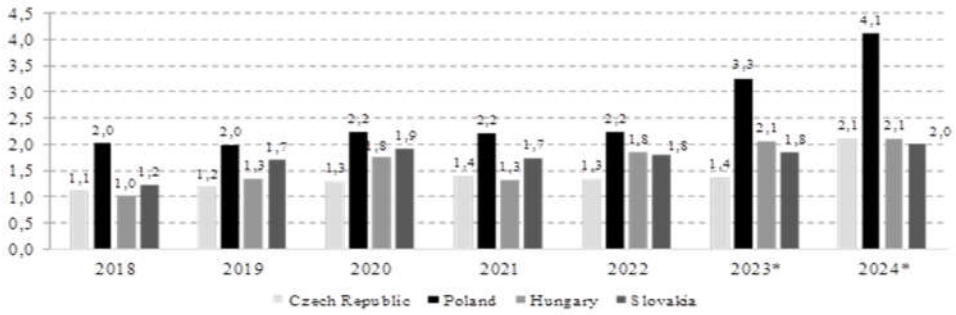

Figure 6. Defence expenditure in 2018-2024 (in % of GDP)
Source: Own study based on: NATO (2024). *forecasted expenses

The consequences of the aforementioned expenditures counteracting the negative consequences of the COVID-10 pandemic, the energy crisis and defence expenditures are the final changes in public debt. Eurostat data for 2018-2024 show that throughout the analysed period, the highest general government debt among the countries surveyed was recorded in Hungary (oscillating around 70-80% of GDP), and the lowest in the Czech Republic (30-44% of GDP). According to data for Q2 2024, the general government debt rule was not met by Hungary and Slovakia (Figure 7).

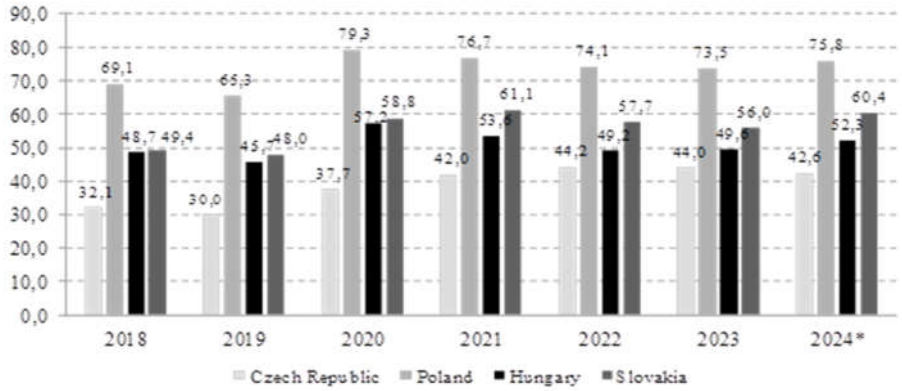

Figure 7. General government debt in 2018–2024 (in % of GDP)
*Data for Q2
Source: Own study based on: Eurostat (2025i); Eurostat (2025j)

Summary

The events of recent years are a perfect example of how important it is for state authorities to respond appropriately in crisis situations. The actions of the governments of Poland, Hungary, the Czech Republic and Slovakia in the area of fiscal policy have certainly limited the unfavorable phenomena related to the COVID-19 pandemic and the outbreak of war in Ukraine.

Referring to the aim of the work, it should be stated that in fiscal terms, the described crises were endured most gently by the Czech Republic, which was characterized by the lowest debt and deficit indicators of the general government sector. Due to the inclusion of Poland, Slovakia and Hungary in the excessive deficit procedure in 2024, the governments of the above-mentioned countries may be forced to reduce expenditure. However, this may be exceptionally difficult due to the need to increase defense spending in the face of the threat from Russia. Nevertheless, it seems that the greatest efforts to improve the budgetary situation should be made by Hungary, whose indicators were at a much higher level than the other examined countries of the Visegrad Group, and clearly exceeded the acceptable standards for the deficit and debt of the general government sector applicable in the European Union.

During the COVID-19 pandemic and the energy crisis, the governments of Poland, the Czech Republic, Hungary, and Slovakia have taken various actions to alleviate the crisis situations that have occurred. During the epidemic, each country incurred additional expenditures necessary to provide adequate medical care, introduced wage subsidies, increased or established new social

benefits and other benefits, periodically exempted companies from paying social insurance contributions, reduced taxes or introduced exemptions or special reliefs, or supported the industries most affected by the epidemic in the form of subsidies or a moratorium on loans. In relation to the GDP of a given country, Hungary spent the largest funds to combat the pandemic crisis and its effects.

In response to the energy crisis, the countries studied implemented a tax on excess profits, which was imposed primarily on companies from the energy and coal sectors, and introduced aid programs for businesses and households in connection with increased electricity, gas and heating bills. Other actions worth mentioning included reducing VAT and excise duty on fuels. The Czech Republic and Slovakia allocated the largest funds for energy crisis mitigation in relation to GDP, while Hungary allocated the smallest.

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ARTICLES

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ECONOMY AND SAFETY

Abstract

The aim of this article is to indicate the close links between economics and safety, which depend to a large extent on the ability to satisfy one's own needs. We satisfy them by consuming material goods, the allocation of which in society often does not meet the expectations of its members. This is where most social conflicts, both cold and hot, arise. So what should this allocation look like to minimize the likelihood of conflicts? Some guidelines in this regard are provided by conclusions from economic theories.

Keywords: economics, safety, Pareto optimum, Kaldor-Hicks optimum, Nash equilibrium.

JEL classification: A12.

Introduction

The statement that safety is a state of non-threat, peace, certainty, raises a number of questions of a metaphysical nature: What kind of certainty and peace are we talking about? Is it the lack of changes in our lives and surroundings? Or something completely different? What really is safety, often perceived as a modern substitute for happiness (Chojnacki i Świniarski, 2007)?

These questions touch on an eternal problem that has plagued people: What is the meaning of our existence? Where are we heading? What do we expect?

The search for answers to such questions is one of the fundamental issues of various philosophical and religious systems. Most of us, more or less

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consciously, determine the meaning of life individually, supporting ourselves with our: beliefs, convictions, knowledge and feelings (Prońko J., 2007). However, beyond the personalized meaning of life, there is some general tendency – an imperative – resulting from the construction of the Universe, directing the search for and realization of the purpose of life and the individual meaning of existence. We can search for this command starting from different assumptions and following different paths of reasoning. A sketch of one such path is included in the content of this article.

1. The essences of safety

Its basic assumptions can be formulated as follows:

- one of the most desirable goals in the modern world, the achievement of which individuals, communities, nations and humanity as a whole desire, is safety;
- we achieve goals (meaning of life) through actions;
- the behavior (action) of each of us is conditioned by the general laws of functioning of the Universe and human societies.

Taking the above assumptions into account, it can be stated that the appropriate level of safety is achieved through our own actions and those of other people, conditioned by the objective laws of nature and the laws of functioning of human societies.

Therefore, discovering the essence of safety should begin with an attempt to read the key aspects of the Universe, of which we are a part, for our considerations. The most authoritative field of science in this regard seems to be physics. One of the oldest and most developed fields, which aims to describe the Universe and the laws that govern it.

About five hundred years before Christ, Heraclitus of Ephesus (540-480 BC) uttered the famous words: panta rhei (everything flows, nothing stands still). They constitute an aphoristic approach to the theory of changeability he constructed, called variabilism. According to it, the most important feature of every being is constant becoming and passing away, which is the result of the uninterrupted clash of opposites.

For Heraclitus and a whole host of scientists, up until the mid-19th century, time was something absolute, independent of other quantities, flowing at its own pace and visualizing changes taking place. All the laws of physics known up to that time were symmetrical with respect to time. If time appeared in these laws, it did not matter whether it flowed into the future or back into the past. Only common sense dictated that solutions resulting from the flow of time into the past should be rejected, because such phenomena had never been observed.

This imprecision, or rather uncertainty, in physical theories was removed only

by the second law of thermodynamics formulated by R. Clausius (1822-1888). We cannot prove it using mathematical apparatus and theories. It is only a generalization of conclusions resulting from experience (Resnick i Halliday, 1973), allowing us to determine which of the processes described theoretically are possible to realize in reality. According to one of the formulations of this principle: spontaneous processes that begin with one equilibrium state and end with another equilibrium state can proceed only in such a direction, which is associated with an increase in the sum of entropy of the system and the surroundings (Resnick i Halliday, 1973).

Therefore, each natural process can only proceed in the direction of increasing entropy. Its effect is the performance of a certain amount of work by the system, much greater than the potential expenditure of energy initiating the process. As a result, the work balance of the process is positive, i.e. the entropy of the system and the environment increases. Restoring the system to its original state requires the expenditure of work much greater than the work obtained in the natural process. Moreover, restoring the initial state proceeds along a different trajectory than the natural process. This causes the return to the original state to leave a trace in the system and its environment. Hence, for an external observer, restoring the original state is a completely different process than the natural process.

Without a deeper insight into the essence of physical phenomena, we can state that only irreversible processes occur around us. This allows us to associate causes and effects and chronologically arrange events. If reversible processes occurred around us, and within us, it would not be possible. Therefore, the development of knowledge determining our actions anticipated by decisions would be impossible.

We should therefore follow Heraclitus and say: panta rhei – everything flows. Tomorrow nothing will be the same as today. Although the changes may be imperceptible, they are inevitable. Leading gradually to lasting transformations of the Reality surrounding us and ourselves.

Based on this universally recognized and widely used principle in physics, we can state that the world around us and we ourselves are subject to constant change – evolution. Therefore, identifying safety with stability of conditions is pure utopia. Because regardless of us, the Reality is variable and it is impossible to stop the changes occurring in it. In conclusion: the essence of safety cannot be reduced to stabilization. It can therefore be initially assumed that the essence of safety is reduced to giving these changes the expected, desired direction by us and being certain of achieving the right effect or calm about it.

2. Development as the main motive of human actions

The variability of the Universe and ourselves is an undeniable attribute of Reality. We all want to direct this variability towards the effects we expect.

Giving direction to the changes taking place forces us to undertake various actions anticipated by our ideas of the future and decisions. We are aware of the fact that each of us has a different idea of the future, and others expect changes. Therefore, our decisions and actions are very different. Therefore, an important problem in the context of common safety is to find an answer to the fundamental question: What motivates people to act? What guides our actions? In seeking answers to these questions, let us reach for theories describing human attitudes and social behaviors. In particular, the motivators of their actions, i.e. factors that stimulate us to act and inspire them.

The problem of motivation was noticed in science quite early. It seemed that there was a certain mechanism that prompted people to take specific actions. A mechanism that could be discovered and applied to managing people. Initially, it was assumed that motivation was strongly related to the characteristics of a given person. However, it quickly turned out that the more important factors determining human action are the needs occurring at a given moment, rather than character traits. This resulted in replacing motivational theories of traits with theories of needs. In these theories, the causes of different behaviors of people in an organization are explained by referring to the basic paradigm: stimulus, organism, reaction.

Focusing only on the two most widespread theories of needs: Abraham Maslow and Clayton Alderfer (ERG theory), we can state that human needs are arranged in a certain hierarchy from existential needs, through affiliation needs to self-fulfillment. However, the main message of these theories is not so much the specification of needs, but the statement of their hierarchy and progression and regression (ERG theory). These features make us realize that the main goal of our actions and the meaning of life is continuous and undisturbed development through the satisfaction of needs placed higher and higher in the hierarchy (J. Prońko, 2007).

Failure to satisfy higher-order needs leads to frustration, which may result in more intense satisfaction of lower-order needs or an increasingly stronger striving to satisfy higher-order needs.

Needs theories have played a huge role in creating employee motivation systems. However, the effects of their application in practice have been too far from theoretical predictions. That is why we are increasingly inclined to combine trait theories with needs theories. Because human personality is much more complex than previously thought, and reducing our behaviors only to innate and acquired traits, or current needs, seems to be a far-reaching simplification. It is rather the combination of these elements that controls our behaviors. A combination that is often difficult to extrapolate, giving ambiguous results.

Analyzing the assumptions of various theories of motivation and psychological concepts of man, and in particular basing ourselves on the most extensive of them: the concept of the complex man, we can draw the following conclusions:

- Man is by nature an egoistic being whose main goal is permanent development realized by meeting an increasingly wide range of needs. Moreover, each satisfied need gives rise to several new ones.
- Man is a rational being who realizes the impossibility of satisfying his needs outside of society. Therefore, during his life he belongs to many different communities and social groups.
- He identifies most closely with the goals of an organization or community whose goals he believes are consistent with his own.
- People belong to organizations and societies through microstructures, i.e. small social groups with deep emotional and informational connections of the peer-to-peer type.
- The method of achieving goals is strongly dependent on the adopted system of values – principles of conduct acquired in the process of upbringing and self-education.
- The system of moral values is relatively stable, although it is also subject to evolution under the influence of long-term stimuli.

The above conclusions are strongly correlated with existentialism, a contemporary philosophical trend initiated by Søren Kierkegaard (1813-1855). Although, if we call existentialists all those who made human existence the center of philosophy, then they were already Socrates, St. Augustine, Pascal. The main idea of this trend is the conviction that man, as the only one of all beings: constantly creates himself what he is, making his own internal choices in which he expresses his freedom. From the basic assumptions of this philosophical trend it follows that the meaning of human life and the basic purpose of his existence is constant development, change, striving to improve one's own living conditions, to discover new aspects of life, to spiritual transformation.

3. Material goods are a determinant of our development

As it was mentioned, one of the main motives of our actions, at least in terms of their purpose, is to satisfy needs. As for the way of achieving goals, it mainly depends on the system of values shaped by upbringing.

The needs that drive us to act are diverse, from subsistence needs to cultural needs, and they are constantly evolving with the civilizational and intellectual development of man. Similarly to needs, the means of satisfying them are also diverse in nature. In general, they can be divided into: material and non-material. Material means include natural resources and things produced by man. Non-material means include, for example, the transfer of knowledge, information, providing entertainment and medical, legal, etc. advice. Although they are referred to as non-material services, their satisfaction requires the use of various material means.

In view of the above, it should be stated that the vast majority of our needs are satisfied by using various material resources, called goods in economics. We obtain them through production, exchange and division, i.e. their distribution among members of a given community (organization), omitting the acts of purchase and sale characteristic of the exchange process. We use these goods to satisfy our needs, i.e. we consume. All of the above processes are referred to by the common concept of management, which we define as continuous human activity aimed at satisfying needs through production, exchange, division and consumption of goods.

Even a cursory observation of everyday life leads ~~us~~ to the conclusion that management processes are the dominant processes occurring in society. It would also not be an exaggeration to say that they shape mutual social relations. The importance of management processes results from a fundamental feature of real economies – the limited resources.

The considerations discussed so far lead to the conclusion that the basic aspiration of each of us is continuous and uninterrupted development realized by satisfying more and more numerous needs that are higher in the hierarchy. Satisfying them requires using material goods. Therefore, development is most often perceived through the prism of the growth of possessed material goods or access to common goods – owned by societies and states. Their acquisition can take place through honest and reliable management or be the result of more or less camouflaged plunder, i.e. depriving other members of society or members of other societies of material goods or the possibility of acquiring them.

4. Efficient allocation of goods and Nash equilibrium

Constant evolution is inscribed in the history of the entire universe, not only the history of humanity, although it is there that it manifests itself in the most dynamic way. Everything that opposes development has always been defeated in a more or less bloody way, with a greater or lesser number of victims. The history of our civilization is saturated with wars, conquests, revolutions resulting from both the need for rapid development and a new division of resources, as well as the aspirations of the rulers.

I would like to draw special attention to the last of the issues raised: the division of resources (material goods), because it lies within the sphere of interest of economics, and is therefore closely related to the title of the article.

According to the concept of the creator of modern economics, Adam Smith, the laws of the free market economy automatically regulate the allocation of goods in the most appropriate way, despite the fact that each participant in this market acts solely with their own profits in mind.

The basic condition for recognizing activities as free market is the lack of coercion and the benefit of all the parties involved. The buyer buys because it is beneficial to him – the seller sells because it is also beneficial to him. In such

transactions, neither party feels aggrieved. Multiple transactions of this type, or in the language of game theory, a multi-stage finite game, lead to an optimum in the Pareto sense. That is, such a division of goods that cannot be improved without worsening the situation of any of the entities. If individual states or social groups (classes) acted ~~in~~ this way, without resorting to violence, coercion and influence on the transactions conducted, today we would be close to this Pareto optimum. This would mean that regardless of whether a given country has natural resources or not, their distribution would still be optimal in the Pareto sense, i.e. the best possible. Any other division would have to take place at the expense of others. Bringing about such a situation would cause the development differences between states (social classes or groups) to be established at a certain level, and further development would only be possible in an even manner. All states (social classes or groups) would develop at the same pace. As we know, this situation seems quite utopian. That is why a different model of development has been functioning for centuries – increasing one's own resources takes place at the expense of others.

A Pareto – efficient allocation of resources or profits means that no state or social group (stratum) would be able to improve its economic situation at a faster rate than others, without exposing others to losses. And who would be willing to suffer losses for the benefit of someone else? This is where a conflict of interests arises, which often leads to hot or cold war. States, using various means of pressure, and they have many of them, try to force competitors at whose expense they want to develop to make concessions – to impoverish their assets. The consequence of such actions is usually war.

There is also another solution to the problem – resource allocation in the Kalder- Hicks sense. While Pareto efficiency assumed the impossibility of changing the allocation without losses to one party, Kalder- Hicks efficiency assumes that resource allocation is also efficient if one party gains more than the other loses, and at the same time there is – at least theoretical – a possibility of compensating losses.

If it were possible to create certain mechanisms of real compensation for losses to those countries (social classes or groups) that suffer them, then efficiency in the Kalder- Hicks sense becomes efficiency in the Pareto sense. That is, despite the change in resource allocation causing some to become richer and others to become poorer, the application of loss compensation mechanisms will make everyone having more resources. However, those who become richer will have much more of them, while the others will have much less. This compensation for losses is nothing more than sharing a part of the profits of those who become richer with those who lose out on the change in allocation. Theoretically, both sides are happy because both gain. However, the gap in the level of civilizational development is widening.

Efficiency in the Kalder– Hicks sense is widely used within states because they have or can construct systems for compensating losses. In such a case,

a well-thought-out compensation system contributes to the development of all social groups, although this development is not uniform.

In the case of international relations, achieving this effect is much more difficult due to the lack of authority that would be able to develop an appropriate compensation mechanism. However, observing international relations, it is increasingly seen in the development of some countries a drive to achieve efficiency in the Kalder- Hicks sense. Some countries, striving for their own development, consciously impoverish other countries, but giving them compensation that exceeds the amount of losses they have suffered. It seems that such a solution is fair. Nothing could be further from the truth, because according to the Kalder- Hicks efficiency criteria, the new distribution of resources causes a much greater gain for the countries that are getting richer than the loss of the remaining countries. Even if part of this gain is given to the countries that are losing in the form of compensation, the development of the countries that are gaining is still more dynamic than that of the countries that are losing. Therefore, the difference in the dynamics of development is growing, and significantly so. And as a result, the relative difference in the level of civilizational development of these countries is growing.

Among other things, globalization in the understanding of the G-8 countries is to lead to the division of resources in an efficient manner in the Kalder- Hicks sense. As it is known, this concept has many opponents. According to their views, globalization will lead to a radical increase in the wealth chimneys of the societies of individual countries. To simplify the problem, it can be illustrated ~~it~~ with the following situation: two gentlemen started working together. As a result, they obtained a profit of one hundred zlotys. However, one of them, being stronger, stated that the above money should be divided in the ratio of three to seven. By repeating this work many times, one of them amassed a fortune, and the other could only live in decent conditions while working. This is the essence of efficient division in the Kalder- Hicks sense.

The society of a given country can protect itself from this effect by applying the right fiscal policy, regional development, preferring certain directions of development and suppressing others. However, in international relations, avoiding or mitigating this effect is practically impossible. The effect of much faster enrichment of some countries leads to the emergence of many new threats that are hard to even imagine today. I am not sure whether the birth of international terrorism is not the first effect of this phenomenon. However, reaching back to history, it is enough to mention the fall of the Western Roman Empire, which at one time was the only power in Europe, Africa and the Middle East and no other country was able to even think about conquering Rome. And yet it fell apart, was destroyed by the “barbarians”.

Nash equilibrium comes to mind, also derived from game theory. It is most simply presented in the film "A Beautiful Mind". In one of the scenes, the actor playing Nash says the following words: *Adam Smith said that everyone*

in a group should do what is best for themselves. That's what he said, but it's not complete. You have to take the correction for the group. Everyone does what is best for himself and the group – simultaneously.

An important conclusion from Nash equilibrium is that a group can achieve such an equilibrium only if no one in the group stands out in a special way. If such a person is in a given group, it will not achieve the equilibrium, which consists primarily of: *I choose what is best for me when you do what you do. You do what is best for you when I do what I do.*

As it results from the last sentence, the Nash equilibrium is the best of the development paths. Because each of the States chooses its own development path, the best and most optimal with equally optimal development strategies of the surrounding states. If there are no dominant States in this environment and none of them wants to develop at the expense of others, the equilibrium achieved will be stable, because none of the participants in this game will have reasons to use a different development strategy.

The fundamental conclusion resulting from the considerations so far can be formulated as follows: *the most stable path of development is that which does not interfere with the paths of development of others*. If this happens, no state will have a reason to change it. Therefore, it will also have no pretext to conduct policy with the help of armed forces. Therefore, threats from other states will disappear.

The same applies to internal safety. If the development strategies of individual social groups do not conflict with each other and none of them tries to develop at the expense of others, a Nash equilibrium will be created, allowing for stable development of all groups, in line with their expectations. However, in order to achieve this, a prudent internal policy of the state must be applied, and for this the state has the right instruments.

Nash equilibrium in international relations is possible. However, it is important to note the previously mentioned conclusion resulting from the analysis of Nash equilibrium. Namely, among the states that can achieve such equilibrium, there cannot be a dominant state, because then achieving such equilibrium is impossible.

Conclusions

Based on the above considerations, there can be put forward the thesis that lasting peace in the world, or in a given region, is possible, while respecting the rights of all states to self-determination and choosing their own path of development, in the absence of a dominant state in the region, or ignored by the other states. Going further, there can be stated that coercion is the worst way to introduce peace.

The conclusions drawn from the analysis of the Nash equilibrium fit very clearly into the policy of the European Union. Internal integration occurs through equalizing the levels of civilization development. So that none of them stands

out in a special way. If this can be achieved, it will be possible to achieve a stable Nash equilibrium in an independent way. Each country will choose its own path of development, not colliding with the development of other members of the Union and at the same time, being the best development strategy for a given country and the entire Union. Therefore, all internal conflicts will lose their meaning and this equilibrium will become stable.

In view of the above, the problem of state safety, both in the external and internal dimension, can be largely reduced to the problem of sustainable development in the international and social dimension within the state.

Of course, this does not eliminate all threats, but it significantly reduces those that come from: society within the country and other countries. So, the range of threats, so to speak, is significantly reduced.

The conclusions drawn from the above theoretical considerations seem quite interesting in the perspective of ensuring peace at least in the regional dimension and reducing social threats within the state. The idea of sustainable social development is not a new idea. It is widely promoted by one of the United Nations agencies established in 1966 – the United Nations Development Programme (UNDP). Since 1990, it has been developing global reports and inspiring the creation of national reports on social development. As part of its activities, it also leads a global debate on sustainable social development, the elements of which were: the UN Conference on Environment and Development in Rio in 1992 and the World Conference on Social Development in Copenhagen in 1995. At the turn of August and September 2002, the World Summit on Sustainable Development was held in Johannesburg, which referred to the Millennium Summit in 2000 and the Millennium Development Goals (Prońko J., 2008).

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ARTICLES

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ANALYSIS OF THE IMPLEMENTATION OF THE NIS2 DIRECTIVE IN THE WEIMAR TRIANGLE COUNTRIES

Abstract

This paper presents a comparative legal analysis of the implementation of the NIS2 Directive (Directive (EU) 2022/2555) in three EU Member States forming the Weimar Triangle: France, Germany, and Poland. These countries were selected due to their distinct legal-administrative models and their significant influence within the European Union. The study examines key elements of the national transposition processes, including legislative frameworks, scope of regulated entities, supervisory structures, enforcement mechanisms, and incident reporting systems.

The analysis reveals considerable divergences in the timing and structure of implementation, largely shaped by national governance traditions, historical approaches to cybersecurity, and institutional readiness. France, with its centralized administrative model, has proposed an extensive regulatory scope including local authorities but faces delays due to political instability. Germany, leveraging its federal expertise and centralized supervisory body (BSI), has developed a coherent though still incomplete framework. Poland, in turn, has revised its initial legislative draft following stakeholder criticism, yet continues to face challenges regarding institutional fragmentation and enforcement clarity.

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The paper concludes that while all three states pursue the same strategic objectives – namely improved cyber resilience and regulatory harmonization – national context significantly impacts both the pace and effectiveness of implementation. The study highlights the critical role of established cybersecurity institutions and coherent legal design in ensuring successful adaptation of EU digital policies.

JEL: K20, L51, P16.

Keywords: NIS2 Directive, cybersecurity, Weimar Triangle Countries.

Introduction

Cybersecurity is currently one of the key challenges faced by the European Union. The dynamic development of information and communication technologies, coupled with an increasing number of cyberattacks, necessitates effective protection of critical infrastructure and key digital services (Lagvilava, 2024). In response, the European Union consistently implements legal and organizational solutions aimed at ensuring a high level of digital resilience. The NIS2 Directive (Directive (EU) 2022/2555 of the European Parliament and of the Council, 2022) represents the EU's most recent response to the escalating digital threats. Compared to the previous NIS (Directive (EU) 2016/1148 of the European Parliament and of the Council of 6 July 2016) Directive of 2016, the NIS2 Directive expands its scope of application, introduces stricter incident reporting requirements, and strengthens risk management obligations. The aim of the Directive is not only to enhance cybersecurity at the national level but also to harmonize cybersecurity standards across the entire Union. In this context, conducting a comparative analysis of the implementation of the NIS2 Directive in various Member States becomes particularly significant. Such an analysis facilitates the identification of discrepancies and good practices in implementing the Directive's requirements, and allows for an assessment of the effectiveness of introduced measures in enhancing digital resilience in individual countries and throughout the European Union (Gaie & Mueck, 2025).

1. Research Methodology

This article employs a comparative legal analysis method, focusing specifically on regulations implementing the NIS2 Directive (Directive (EU) 2022/2555) in three European Union Member States – Poland, Germany, and France – which constitute the Weimar Triangle. The selection of Poland, Germany, and France – countries forming the institutionalized platform known as the Weimar Triangle – is well justified both politically and legally. As emphasized by Fiszer (2019) and Rewizorski & Przybylska-Maszner (2024), the Triangle has historically served as a mechanism for harmonizing diverse

national approaches to European integration, making it a valuable framework for comparative legal analyses.

The primary research tool utilized was qualitative analysis of legislative acts implementing the NIS2 Directive in the selected countries. The analysis encompassed official legislative documents as well as supplementary documents, such as national and European reports and expert analyses. Additionally, relevant literature, including academic publications and sector-specific studies on cybersecurity and EU law, was reviewed. This approach allows for an in-depth comparative analysis of NIS2 Directive implementation, identification of best practices, and recognition of key discrepancies between national approaches.

2. Characteristics of the NIS2 Directive

Directive (EU) 2022/2555 of the European Parliament and of the Council of 14 December 2022, commonly known as the NIS2 Directive, establishes a new legal framework aimed at enhancing a common level of cybersecurity within the European Union. It represents an expansion and refinement of the earlier NIS (Directive (EU) 2016/1148) Directive from 2016, which had shown certain deficiencies and interpretative divergences among Member States during its implementation. To address these issues, the EU adopted this new legal instrument with broader scope and stricter regulatory standards.

The substantive scope of the NIS2 Directive (Directive (EU) 2022/2555) covers a wide range of entities providing services considered essential or important for society and the economy. Specifically, it encompasses sectors such as energy, transport, banking, financial market infrastructures, healthcare, drinking water supply, waste management, public administration, digital services, the chemical industry, and providers of ICT services. This extensive scope reflects the growing dependence of modern societies on digital services and the need to ensure their continuous operation.

Key changes compared to the 2016 NIS Directive (Directive (EU) 2016/1148) primarily include a significant extension of the subject matter scope, covering a larger number of sectors and entities obliged to meet cybersecurity requirements (Schmitz-Berndt, S., & Cole, M. D. 2022). Additionally, the new regulation introduces more precise and stringent security incident reporting standards, specifying clear deadlines and procedures applicable throughout the EU. Another important innovation is the establishment of uniform minimum requirements for risk management and the application of technical and organizational security measures, which aim to harmonize practices at the EU level.

The NIS2 Directive imposes numerous obligations on Member States to integrate into their national legal systems. These obligations include establishing appropriate administrative authorities responsible for overseeing compliance, defining detailed procedures for incident reporting, and specifying

penalties for non-compliance. Entities covered by the regulation are required to implement technical and organizational measures ensuring appropriate cybersecurity levels, regularly assess risks, and fulfill obligations regarding reporting incidents significantly impacting their services (Correia, 2024).

The fulfillment of these obligations aims not only to guarantee an adequate level of national security but also to create a cohesive EU-wide system for responding to digital threats. Applying uniform standards facilitates more efficient international cooperation and more effective management of cross-border threats.

3. Implementation in Weimar Triangle Countries

The selection of Germany, France, and Poland for analyzing the implementation of the NIS2(Directive (EU) 2022/2555 of the European Parliament and of the Council, 2022) Directive stems from their crucial roles in the European Union and their close cooperation within the Weimar Triangle framework. Representing diverse cybersecurity approaches, these three countries offer an insightful basis for examining how EU regulations are adopted for protecting critical infrastructure and digital services.

In Poland, the implementation of the NIS2 Directive (Directive (EU) 2022/2555) is being carried out through amendments to the Act on the National Cybersecurity System (Ustawa o Krajowym Systemie Cyberbezpieczeństwa – Act of 5 July 2018, Journal of Laws of 2018, item 1560) (Rogalski, 2024). The initial draft amendment received substantial criticism from business representatives and industry experts, particularly due to regulatory provisions considered excessively restrictive – even exceeding the requirements of the NIS2 Directive itself (Burczaniuk, 2024). In response, the Ministry of Digital Affairs issued a revised draft reflecting the most significant stakeholder recommendations, especially regarding regulatory proportionality and sector-specific obligations (MC, 2024).

The amendment notably broadens the scope of regulated sectors, now including areas such as water and wastewater management and food production, aligning with the expanded scope of the NIS2 Directive. Furthermore, in terms of incident handling and reporting obligations, the directive introduces clear procedural deadlines and emphasizes executive-level accountability for cybersecurity risk management compliance. Poland's administrative structure responsible for cybersecurity oversight includes the Government Plenipotentiary for Cybersecurity. However, the draft amendment lacks detailed enforcement powers for this body, raising concerns about supervisory effectiveness. In summary, implementing the NIS2 Directive (Directive (EU) 2022/2555) in Poland is complex, requiring not only legislative adjustments but also effective supervisory mechanisms and support for regulated entities. Legislative delays and implementation challenges

highlight the need to intensify efforts for timely and effective implementation (MC, 2024).

The implementation of the NIS2 Directive (Directive (EU) 2022/2555 of the European Parliament and of the Council, 2022) in Germany constitutes a crucial component of the national cybersecurity strategy. Germany, as one of the leading EU member states in the field of information technology, has adopted a centralized model for cybersecurity oversight, assigning the primary role to the Federal Office for Information Security (*Bundesamt für Sicherheit in der Informationstechnik*, BSI). BSI acts as the central authority responsible for coordinating activities related to protecting critical infrastructure and supervising entities obliged to comply with the NIS2 Directive (BSI, 2024a).

In mid-2024, a draft law implementing the NIS2 Directive (Directive (EU) 2022/2555), known as the *NIS2-Umsetzungs- und Cybersicherheitsstärkungsgesetz* (Act on NIS2 Implementation and Strengthening Cybersecurity), was developed. The planned implementation date for these provisions is early 2025, indicating a slight delay compared to the EU implementation deadline of October 17, 2024(BSI, 2024a).

The German model of NIS2 Directive (Directive (EU) 2022/2555) implementation is characterized by centralized oversight (Sillaber and Breu, 2023). The BSI, serving as the central body, supervises key and important entities required to meet minimum cybersecurity standards. This model enables coordinated actions and unified security standards across various sectors, facilitating faster and more effective responses to potential incidents.

German regulations impose an obligation on federal institutions to allocate a minimum of 20% of their information technology expenditures, including cybersecurity. In the future, this requirement may extend to additional sectors. Additionally, the regulations mandate the use of certified products and services to enhance security levels. All entities covered by the law must register with the BSI within three months following the entry into force of the new provisions. Failure to comply allows BSI to independently register the entity and impose sanctions for non-compliance. Nevertheless, the process of implementing the NIS2 Directive (Directive (EU) 2022/2555) in Germany faces certain challenges (BSI, 2024b).

In conclusion, Germany has adopted a proactive approach to implementing the NIS2 Directive (Directive (EU) 2022/2555), focusing on centralized supervision, increased investment in cybersecurity, and rigorous certification requirements. However, legislative delays and the rising number of cyber incidents indicate the necessity for intensified efforts to ensure timely and effective implementation of the directive.

The process of implementing the NIS2 Directive (Directive (EU) 2022/2555) in France is characterized by complexity arising from the need to align the national legal framework with new European Union cybersecurity requirements. France, as one of the key EU member states, has undertaken

a series of legislative and organizational actions aimed at the effective transposition of the directive into national law (ANSSI, 2024a).

A draft law titled *"projet de loi relatif à la résilience des infrastructures critiques et au renforcement de la cybersécurité"* (Draft Law on Critical Infrastructure Resilience and Strengthening Cybersecurity) (Sénat, 2025) was presented to the Senate on October 15, 2024. After intensive legislative work, the Senate approved the bill on March 12, 2025. As of March 25, 2025, the bill awaits approval by the National Assembly. Delays in the legislative process were primarily caused by the earlier dissolution of the National Assembly in June 2024, disrupting the original directive transposition schedule.

The NIS2 Directive significantly expands the range of entities subject to regulation compared to the previous NIS directive. In France, the number of regulated entities has increased from approximately 500 critical infrastructure operators to about 15,000 entities categorized as "essential" or "important," including local authorities and organizations under their supervision. These new regulations require entities to implement appropriate technical, operational, and organizational measures to manage cybersecurity risks. Moreover, entities must report significant cybersecurity incidents to the National Cybersecurity Agency (*Agence nationale de la sécurité des systèmes d'information*, ANSSI) (ANSSI, 2024b).

ANSSI plays a critical role in supervising the implementation of the NIS2 Directive (Directive (EU) 2022/2555) in France (Cyber.gouv.fr, 2024). The agency is authorized to conduct inspections, audits, and impose administrative sanctions on entities failing to comply with new obligations. These sanctions include financial penalties and other measures intended to ensure compliance.

The proposed legislation seeks to harmoniously integrate the NIS2 Directive's (Directive (EU) 2022/2555) requirements into existing French law, ensuring a coherent and effective legal framework for cybersecurity. The Senate introduced amendments to clarify definitions, application timelines, and to avoid unjustified disparities in the treatment of businesses. The objective of these changes is to simplify business operations and mitigate the effects of excessive regulation transposition (ANSSI, 2024c). The implementation process in France faces several challenges, including delays due to political instability and difficulties related to the broadened scope of regulated entities. Additionally, debates have arisen regarding the potential burden placed on small and medium-sized enterprises by the new requirements, a topic currently under discussion among legislators and the business community.

In summary, the implementation of the NIS2 Directive (Directive (EU) 2022/2555) in France is a complex process, requiring substantial adjustments to the national legal framework to meet the stricter EU cybersecurity standards. Despite delays and challenges, legislative actions and ANSSI's engagement

demonstrate France's determination to enhance resilience against cyber threats and ensure robust protection for critical infrastructure and other key economic sectors.

4. Comparative Analysis

The implementation of the NIS2 Directive (Directive (EU) 2022/2555) in the French Republic, the Federal Republic of Germany, and the Republic of Poland is a critical element in strengthening national cybersecurity systems within the European Union. The directive, adopted on December 14, 2022, was intended to be transposed into national law by October 2024. Thus, as of March 10, 2025, implementation processes should be advanced or completed. Below is a detailed comparative analysis, highlighting the primary differences and similarities, alongside an interpretation of the reasons behind these differences, based on national, administrative, and historical factors.

Table 1. Comparative table of main differences and similarities

Aspect	France	Germany	Poland
Legal Framework	Draft law: Projet de loi relatif à la résilience des infrastructures critiques et au renforcement de la cybersécurité. Approved by Senate: 12 March 2025, pending vote in National Assembly (Senat.fr – not publicly available, confirmed by ANSSI press releases).	Draft: NIS2-Umsetzungs- und Cybersicherheitsstärkungsgesetz . Presented in mid-2023, delayed due to 2024 elections; expected adoption in early 2025 (BSI, 2024).	Amendment to uKSC (Act on the National Cybersecurity System). Initial draft criticized; revised version released in 2024 (MC, 2024; Rogalski, 2024).
Scope of Regulated Entities	Approx. 15,000 entities: includes essential/important operators, public entities, and local governments (ANSSI, 2024; ENISA reports).	Approx. 29,000–30,000 entities: includes sectors like energy, health, digital infrastructure, public admin (BSI, 2024).	Approx. 29,000 entities: expanded from ~500; covers local governments, food, water, public health, etc. (MC, 2024).
Supervisory Authority	ANSSI (Agence nationale de la sécurité des systèmes d'information): legally mandated to conduct audits, inspections, and impose sanctions (ANSSI, 2024).	BSI (Bundesamt für Sicherheit in der Informationstechnik): central authority with expanded mandate under NIS2 (BSI, 2024).	Government Plenipotentiary for Cybersecurity: coordination role; enforcement fragmented among CSIRTs and sectoral agencies (Rogalski, 2024).
Enforcement Mechanisms	ANSSI empowered to issue administrative sanctions: up to €10M or 2% of global turnover for non-compliance (ANSSI, 2024).	BSI-led enforcement with: mandatory registration, certification obligations, and escalating fines.	Draft law introduces sanctions, but lacks clarity on direct enforcement and supervisory chain (MC, 2024; Rogalski, 2024).
Incident Reporting Framework	3-stage model: early warning, initial (24h), final report (72h). Centralized coordination via ANSSI (ENISA, 2024).	NIS2-based schedule adopted: BSI portal + decision trees for regulated entities (BSI, 2024).	Procedural deadlines introduced, but digital infrastructure and national guidance not yet finalized (MC, 2024).
Special Characteristics	- Delays due to 2024 National Assembly dissolution. - Law covers public and private actors extensively. - Adjustments for administrative proportionality under debate.	- Strong institutional legacy and centralized cybersecurity model. - Support tools for compliance: Betroffenheitsprüfung, reporting templates.	- Revised draft influenced by public consultation. - Regulatory fragmentation and lack of a central enforcement path pose challenges. - Requires coordination among KPRM, NASK, CSIRTs.

5. Interpretation of the Causes of Differences

Differences in the implementation of the NIS2 Directive result from national, administrative, and historical conditions that shape each country's approach to cybersecurity and EU regulations. Each country has its own legal and administrative systems, influencing how EU directives are transposed (ENISA, 2023).

For instance, France, with its centralized governance model, covers a broad spectrum of entities, including local authorities, reflecting its administrative structure (ANSSI, 2024a). Germany, operating within a federal system, exhibits potentially more decentralized oversight, evidenced by the role of the BSI as a national-level coordinator (BSI, 2024a). Poland, with less experience in EU-level cybersecurity regulations, faces criticism regarding proposed drafts, highlighting the need to adapt regulations to local economic and administrative realities (MC, 2024). Organizational structures responsible for cybersecurity differ significantly. In France and Germany, specialized agencies (ANSSI and BSI, respectively) have clearly defined powers, including inspections and sanctions. In Poland, the role of the Government Plenipotentiary for Cybersecurity appears less operational, potentially rooted in historical approaches toward centralized authority and inter-ministerial coordination. This may impact enforcement effectiveness, raising concerns among expert (ANSSI, 2024b; BSI, 2024b)s.

Historical approaches to cybersecurity and critical infrastructure protection also play a role. Germany's long-standing tradition in IT regulation provides established frameworks, facilitating the NIS2 implementation (Kamara et al., 2022). France's experience with centralized governance allowed rapid expansion of regulated entities, possibly linked to earlier regulations, such as the Military Programming Law of 2013 (Tessari & Muti, 2021). Poland, with relatively limited exposure to EU cybersecurity regulations, struggles to balance directive requirements with local business needs, as evidenced by criticism of its initial draft legislation (Rogalski, 2024). A comparative analysis of the implementation of the NIS2 Directive in France, Germany, and Poland reveals common goals, such as broadening the scope of regulated entities and strengthening cybersecurity, yet national contexts produce notable differences. France's legislative process is delayed due to political instability, whereas Germany follows a more centralized model via BSI (BSI, 2024a), and Poland continues to contend with legislative criticisms (MC, 2024). France stands out for its extensive scope, including local authorities, likely attributable to its administrative structure (Sénat, 2025).

Implementation effectiveness in France appears limited by legislative delays, potentially affecting digital resilience, particularly within public sectors such as local governments. Uniformity could be compromised by potential disparities in entity treatment, though the Senate is actively seeking to mitigate this issue. Germany and Poland may have more advanced frameworks in certain respects,

but France holds considerable potential for effective oversight, owing to ANSSI's pivotal role, provided the legislative process is swiftly concluded (ANSSI, 2024b).

6. Summary and Recommendations

The implementation of the NIS2 Directive in France, Germany, and Poland is a complex process, differing significantly in terms of pace and approach, reflecting the unique characteristics of their national legal and administrative systems. In France, the legislative project titled "projet de loi relatif à la résilience des infrastructures critiques et au renforcement de la cybersécurité" was adopted by the Senate on March 13, 2025, but still awaits approval from the National Assembly, indicating a delay relative to the transposition deadline (October 17, 2024). This delay has been complicated by political upheavals, including the dissolution of the National Assembly in June 2024. France's implementation includes approximately 15,000 entities, notably 1,500 local authorities, distinguishing it from Germany and Poland. Germany bases its implementation on the NIS2 Umsetzungs-Gesetz, relying on centralized oversight by the BSI, suggesting a more advanced approach. Poland, via amendments to its Act on the National Cybersecurity System, faces criticism regarding legislative proposals and uncertainties regarding enforcement by the Government Plenipotentiary for Cybersecurity. All countries are expanding their incident reporting and risk management obligations; however, differences in supervisory effectiveness and implementation timelines could impact the uniform improvement of digital resilience within the EU.

Recommendations for National and EU Policymakers

For policymakers in France: Accelerate the legislative process within the National Assembly to finalize implementation by the end of 2025. Introduce support programs for SMEs and local authorities, including grants for cybersecurity measures and employee training, to minimize burdens.

For policymakers in Germany: Maintain coordination through BSI but enhance transparency regarding sanctions and audits to strengthen trust among private sector entities.

For policymakers in Poland: Clearly define the enforcement powers of the Government Plenipotentiary for Cybersecurity and expedite work on the revised draft legislation, considering business sector feedback.

For EU policymakers: Adopt a flexible approach regarding penalties for delays in directive transposition, especially in cases of political disruptions, and establish an EU-wide support fund for SMEs to ensure equitable opportunities for NIS2 implementation across member states.

Directions for Future Research

Future research should focus on:

- Analyzing the impact of NIS2 on the functioning of local authorities in countries with different administrative structures.
- Comparing the effectiveness of supervisory models (ANSSI, BSI, Government Plenipotentiary) in ensuring directive compliance.
- Assessing the long-term implications of regulation on EU digital resilience, particularly in sectors such as food production and water infrastructure.
- Examining the effect of legislative delays on national economic competitiveness within the EU digital single market.

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ARTICLES

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COMPREHENSIVE ASSESSMENT OF THE FINANCIAL SUSTAINABILITY OF LOCAL BUDGETS IN CONDITIONS OF DECENTRALIZATION

Abstract

Initially the global financial and economic crisis, decentralization processes in many countries, and further the coronavirus pandemic, as well as the war in Ukraine have increased interest in the concept of financial health, financial condition and, more specifically, in the financial stability of local authorities. A system of indicators for a comprehensive assessment of the financial stability of local budgets has been proposed and substantiated in this article based on the previously conducted analysis of existing scientific approaches to assessing the financial stability of budgets. The determined methodology was tested on the basis of the data of territorial communities of Transcarpathian Region (Ukraine) for 2021.

Keywords: financial stability, local budget, independence of local budget, budget revenues, subsidy, budget provision.

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Introduction

Initially the global financial and economic crisis, decentralization processes, and further the coronavirus pandemic have increased interest in the concept of financial health, financial condition and, more specifically, in the financial stability. This is mainly defined as the ability to cover current and future costs as they arise and respond to foreseeable changes and emerging risks. Today, it is becoming increasingly important to assess the vulnerability of local governments and promote their resilience to exogenous crises, such as the 2008 credit crisis or the 2020 pandemic (Ahrens and Ferry, 2020; Hruza, 2015).

The concepts of financial sustainability, fiscal resilience, financial equilibrium, financial health or fiscal health, financial stability or financial viability, financial condition, financial balance or sustainable finance are used to define the phenomenon of availability of adequate resources for future services and financial obligations (Sinervo, 2020). In general terms, "sustainable" means that a person is able to continue his or her current practices. In local governments, the question is whether current activities may impede the future ability of local governments to provide services (Burrit and Schaltegger, 2010). Further to that, opposing conditions such as financial stress and its drivers are often used to define financial sustainability (Garmini and Grossi, 2018).

Sustainability refers to a process or state that can be maintained over time and fiscal sustainability is commonly used to describe the long-term fiscal policy pursued by a government (Zhang and Liu, 2021).

There are a large number of research and assessment methods for the financial stability of local budgets. Usually, scientists propose to study sustainability based on a certain system of indicators. Although there is no consensus among researchers, expenses, income, and debt are included in every quantitative methodology for determining financial sustainability.

Silvia Iacuzzi (2021) conducted a large-scale structured overview of publications in English on the financial performance of local governments in 2021. Her findings showed that the number of publications related to financial performance indicators has increased over the past ten years. However, instead of focusing on a set of common indicators, the literature reports on a variety of different indicators used for four main purposes: transparency and accountability, performance monitoring and benchmarking, assessing the financial health of local governments, and helping to overcome exogenous crises. Liquidity and solvency being the most popular measures studied by researchers, there is no evidence of convergence to a common set of indicators.

1. Main part

Analyzing the existing systems of indicators for assessing the financial stability of local budgets, being popular in Ukraine, the following disadvantages can be highlighted:

1. The method suggested by Kostyrko and Valenteychyk (2016) is the most popular among Ukrainian scientists. This approach involves the calculation of an integral indicator, which takes into account the cumulative effect of integral assessments according to defined blocks of analysis: equilibrium, financial independence, budget efficiency. However, when calculating the indicators, the authors do not specify which data are used for this or that indicator. In this regard, different indicators may be taken as a basis in different works with the approbation of the same methodology. Since there are general and special funds in the budget, transfers are divided into subsidies and subventions, and are provided from both state and local budgets. And for individual coefficients, it is more appropriate to use different refined indicators.
2. Most of the methods described in works from 2014-2015 have not been adapted considering the basics of budget decentralization. For example, "subsidies of the alignment" continue to be featured in the works. Also, the concept of "own budget revenues" is currently no longer standardized. This concept appears to be obsolete as it was used with the previous system of horizontal alignment, where there were two income baskets – fixed and own. And now this concept is rather consonant with the concept of "own revenues of budgetary institutions", so contradictions may also arise in this regard.
3. A significant part of the indicators used in one methodology are interdependent or complementary. For example, the budget coverage ratio (the ratio of budget revenues without transfers to budget expenditures) and the ratio of expenses coverage by inter-budget transfers are equal to 1. When multiplying the coefficient of budget coverage by the coefficient of tax autonomy (the ratio of tax revenues to budget revenues), we obtain the coefficient of general tax sustainability (the ratio of tax revenues to budget expenditures). Such interdependence of indicators means that: 1) certain characteristics or relationship have multiple effects on the integral indicator; 2) the method is overloaded by using the same budget characteristics.
4. It is not clear on what basis the limits for the recommended or normative values of indicators are determined in individual methods. And in certain assessment methods, for example, using a matrix of parameters with a binary approach relative to the normative value (Liuta, Boiarko & Pigul, 2012), such normative values play a crucial role. After all, if there will be fewer controversial issues regarding the definition of the nature of the indicator for the subject of the stimulant/destimulant, then it would

be hard to say regarding more specific standards. We believe that such standards will be different for each community.

5. When determining an integral indicator we should consider determining weighting factors for indicators. Many scientific works do not indicate on which basis such indicators are being determined. Some scientists use the weighting factors proposed by other scientists, which were determined on the basis of the expert assessment of financiers at the regional level, to calculate the financial stability of the budgets of cities and local communities. We believe that, taking into account budget decentralization, it is important to conduct a survey among representatives of financial bodies of local communities as well.
6. Most methods do not take into account such factors of financial stability as tax obligations, lending, local loans, flexibility of the expenditure part.

We tried to take into account the mentioned shortcomings in the proposed methodology. In addition, it was important to include only such indicators, regarding which there will be no doubts about the positive or negative impact on the financial sustainability of the budget. For example, an indicator was considered that would characterize the use or accumulation of remaining funds for the year. However, the accumulation of balances can have both a positive character – in the case of a significant increase in the revenue part or cost savings, and a negative one – in the case of non-utilization of subventions, non-implementation of planned measures, etc. Therefore, such an indicator was not included, because it is not possible to clearly comment on its impact on financial stability.

Thus, the formed complex for assessing the financial stability of the budgets of local communities includes 11 indicators (Table 1).

Table 1. Indicators of financial sustainability of the local budget*

№	Indicator	Calculation algorithm	Indicator characteristics
1.	Indicator of the local budget independence.	The ratio of general and special fund revenues (without transfers) to total revenues (including transfers).	Shows the degree of independence of local budget revenues from the transfer system.
2.	Indicator of budget security.	The ratio of revenues of the general fund (without transfers) and expenditures of the general fund (excluding transfers to the state budget).	Shows the correspondence between the revenues of local budgets and the powers assigned to the local government.

Continued Table 1.

№	Indicator	Calculation algorithm	Indicator characteristics
3.	Budget efficiency indicator.	The ratio of the amount of income of the general fund (without transfers) and the number of inhabitants of the relevant local community.	The indicator determines the amount of income of the general fund per inhabitant.
4.	Indicator of budget subsidy.	The ratio of the volume of subsidies received at the expense of transfers from the state budget to the revenues of the general fund of the budget (without taking into account subventions from the state budget).	The indicator reflects the level of dependence of the loal community on subsidized resources from the state budget.
5.	Indicator of budget revenue planning accuracy.	Module on the difference between the ratio of the actual and initial planned indicators of the volume of revenues of the general fund of the budget (without transfers) and the 1.	The indicator shows the quality of budget planning.
6.	Indicator of independence for local taxes and fees.	The ratio of revenues from local taxes and fees to the revenues of the general fund of local budgets (without transfers).	Allows to estimate the volume of filling the budget of the local community at the expense of local taxes and fees.
7.	Indicator of the population provision of capital expenditures.	The ratio of the volume of capital expenditures of the budget of the territorial community to the number of inhabitants of the corresponding local community.	The indicator characterizes the amount of money spent on the development of the local community.
8.	Indicator of the specific weight of wages in expenses.	The share of expenditures for wages and salaries carried out from the general fund with accruals in the amount of expenditures of the general fund of the budget without transfers.	The indicator characterizes the level of flexibility of the expenditure structure of the local community, the possibility of the local community to redistribute and direct funds for development and other purposes.

Continued Table 1.

№	Indicator	Calculation algorithm	Indicator characteristics
9.	Tax obligation indicator.	The ratio of arrears of taxpayers' tax obligations to tax revenues of the general and special funds.	Characterizes the state of tax policy and the attitude of taxpayers to the obligation to pay taxes.
10.	Indicator of local borrowings.	The ratio of the difference between received and repaid loans to the annual volume of budget revenues (without transfers).	Shows the value of local debt for the revenue base of the budget. According to Article 16 of the Budget Code, only regional and city councils can carry out local borrowing.
11.	Lending indicator.	The ratio of the difference between granted and returned loans to the volume of budget revenues (without transfers).	Shows the share of budget funds allocated for lending, with which there is a risk of difficulties in returning.

** developed and arranged by the authors*

The indicator of the local budget independence characterizes the level of independence of the financial capabilities of local government during the financing of expenditures from transfers from the state budget. It determines the community's ability to fulfill its spending powers through the use of so-called own funds, its independence from other sources.

The indicator of budget security shows the adequacy of local budget revenues at the expense of own sources and powers entrusted to local authorities. The higher this indicator is, the more effective is the management of the local community and its resources.

The budget efficiency indicator determines the amount of income of the general fund per each resident. This indicator characterizes the financial potential of the local community, the ability to provide for the community at the expense of resources generated on its territory.

The indicator of budget subsidy reflects the level of dependence of the local community on subsidy resources of the state budget. The largest share of subsidy resources is the basic subsidy, and in addition to it, local communities receive a subsidy for carrying out expenses transferred from the state budget for the maintenance of educational and health care institutions and a subsidy for carrying out calculations during the heating period for communal services and energy sources consumed by institutions and organizations, enterprises maintained at the expense of the relevant local budgets.

The indicator of budget revenue planning accuracy gives a generalized description of the quality of budget planning, gives a description of the extent to which the total revenue plan was implemented, without revealing the reasons why this happened. Surely, this indicator does not fully characterize

the quality of planning. The indicator being lose to zero does not mean that the revenues were planned as precisely as possible, because the non-fulfillment of the planned indicators for some sources of income could be covered by the over-fulfillment of others. That is, deviations in the plans could occur, but this did not affect the total amount of income. Therefore, such an indicator is important for a generalized assessment of planning.

It should be noted that when evaluating budget execution, budgets with the highest level of over-execution of the revenue plan are often more favorably evaluated. But in fact, as the former Minister of Finance of Ukraine Oksana Markarova once noted – "The ideal budget is not the one that is significantly overrun, but the one that is 100% met" (Ruda & Kalachova, 2019).

An important point: to evaluate this indicator, one should take exactly the approved planned amount of income, without taking into account the changes made during the year.

The indicator of independence for local taxes and fees allows to review the amount of filling the budget of the local community at the expense of local taxes and fees and indicates the level of independence of local authorities in making decisions about the size of rates and tax benefits.

The indicator of the population provision of capital expenditures reflects the amount of funds spent on the development of the local community. The indicator determines the amount of funds allocated to the purchase of equipment and items of long-term use, taking into account land resources, intangible assets, capital investments, capital repairs, etc. per resident of the community (Methodological recommendations for assessing the level of financial capacity of local communities (project), 2021). According to this indicator, it is possible to analyze the stability of the budget in relation to development expenditures, in particular by comparing the dynamics. Volumes of capital expenditures reflect the ability of the local community to provide socio-economic development, opportunities for the implementation of infrastructure development projects, the creation of material assets or obtaining the corresponding social effect.

The indicator of the specific weight of wages in expenses demonstrates the level of flexibility of the territorial community's expenditure structure, the possibility of the local community to redistribute and direct funds for development and other purposes (Methodological recommendations for assessing the level of financial capacity of local communities (project), 2021).

Tax obligation indicator. The tax debt is one of the main problems of the effective functioning of the local finance system and the ability of local government to fulfill its obligations to citizens. This indicator is also an evidence of imbalances in the domestic tax system and significant contradictions in tax relations that have developed between the state, local government and taxpayers. The origins of the problem lie in the limitation of financial resources, in the imbalance of the interests of the state and taxpayers,

inconsistency of their views on the volume and types of public goods and services that the state should provide. The size of the tax debt and its dynamics are important indicators that influence and characterize the state of socio-economic processes, and are indicators of its external competitiveness and investment attractiveness (Podik, 2017).

The indicator of local borrowings. According to the Budget Code of Ukraine, the Verkhovna Rada of the Autonomous Republic of Crimea and city councils have the right to carry out local internal borrowing. Local external borrowing can be carried out only by the Verkhovna Rada of the Autonomous Republic of Crimea, Kyiv, Sevastopol city councils, city councils of cities of regional significance. At the same time, local external borrowing by obtaining credits (loans) from international financial organizations can be carried out by all city councils. Taking this into account, the impact of local borrowing on the financial stability of budgets can occur only in urban local communities.

Lending indicator. Budget lending is one of the types of credit relations, which involves granting loans from the budget based on the principles of term, return, and payment. It is an effective tool for stimulating the socio-economic development of the state and regions, which ultimately requires less expenditure of budget funds compared to budget financing, because credit resources are subject to return to the budget after a specified period of time. Funds from the budgets of local communities are mainly allocated to provide long-term loans to individual developers of housing in the countryside and preferential long-term loans to young families and single young citizens for the construction/reconstruction/purchase of housing, i.e. social lending. Features of the social sphere functioning can lead to potential difficulties in returning loans aimed at social goals, while the sector of the real economy is able to more efficiently master budget credits and fulfill credit obligations to the budget. Therefore, due to the existing risk of non-return of funds, as well as inflation, the lending indicator has a negative impact on the financial stability of local budgets (Lubkei & Kramarchuk, 2012).

The next stage of the research was the calculation of the determined indicators for the local communities of the Transcarpathian region based on data for 2021, received from the finance department of the Transcarpathian Regional State Administration (Table 2).

The most thorough conclusions and the most effective proposals for increasing the financial stability of an individual community can be made only by analyzing in detail all indicators of financial stability.

Table 2. Calculation of indicators of financial sustainability of the budgets of local communities of the Transcarpathian region for 2021 *

Local community	Indicator of the local budget independence	Indicator of budget security	Budget efficiency indicator	Indicator of budget subsidy	Indicator of budget revenue planning accuracy	Indicator of independence for local taxes and fees	Indicator of the population provision of capital	Indicator of the specific weight of wages in	Tax obligation indicator	Indicator of local borrowings	Lending indicator
Baranynska	0,649	0,692	6,579	0,108	0,182	0,267	0,633	0,820	0,084	0,000	0,004
Bativska	0,389	0,520	3,550	0,328	0,366	0,570	0,298	0,920	0,064	0,000	0,002
Bedevlianska	0,285	0,309	2,081	0,507	0,095	0,383	0,188	0,907	0,053	0,000	0,000
Berehivska	0,640	0,589	4,770	0,086	0,121	0,272	1,767	0,858	0,039	0,000	0,000
Bilkivska	0,221	0,215	1,528	0,553	0,106	0,383	0,212	0,917	0,027	0,000	0,000
Bohdanska	0,334	0,358	3,896	0,315	0,192	0,457	0,524	0,874	0,005	0,000	0,000
Bushtynska	0,226	0,237	1,449	0,574	0,167	0,325	0,934	0,905	0,058	0,000	0,009
Velykobereznianska	0,587	0,559	4,563	0,010	0,154	0,251	0,495	0,847	0,350	0,000	0,000
Velykoberezka	0,342	0,386	2,913	0,380	0,539	0,396	0,175	0,904	0,014	0,000	0,000
Velykobyihanska	0,433	0,511	2,689	0,356	0,125	0,252	0,497	0,807	0,012	0,000	0,000
Velykobychkivska	0,258	0,256	2,067	0,450	0,059	0,272	0,234	0,891	0,037	0,000	0,000
Velykodobronska	0,306	0,337	2,169	0,473	0,601	0,264	0,246	0,873	0,030	0,000	0,000
Velykoluchkivska	0,334	0,350	2,285	0,396	0,203	0,284	0,251	0,916	0,055	0,000	0,000
Verkhnokoropetska	0,392	0,405	3,390	0,335	0,064	0,210	0,359	0,860	0,406	0,000	0,000
Vylotska	0,321	0,319	2,234	0,441	0,012	0,313	0,182	0,892	0,046	0,000	0,002
Vynohradivska	0,472	0,504	4,016	0,110	0,078	0,218	1,232	0,809	0,024	0,000	0,001
Vyshkivska	0,246	0,309	1,996	0,442	0,013	0,337	0,905	0,915	0,047	0,000	0,002
Vilkhovetska	0,209	0,222	1,678	0,548	0,010	0,317	1,805	0,856	0,040	0,000	0,000
Volovetska	0,505	0,554	5,513	0,104	0,062	0,388	0,915	0,790	0,032	0,000	0,002
Horinchivska	0,202	0,182	1,371	0,595	0,054	0,285	0,221	0,940	0,043	0,000	0,002
Horondivska	0,288	0,314	1,988	0,484	0,059	0,454	0,531	0,833	0,062	0,000	0,002
Dovzhanska	0,207	0,214	1,359	0,581	0,091	0,279	0,243	0,893	0,041	0,000	0,010
Drahivska	0,147	0,204	1,243	0,611	0,289	0,209	0,431	0,913	0,020	0,000	0,000
Dubivska	0,225	0,244	1,759	0,508	0,073	0,295	0,395	0,913	0,138	0,000	0,000
Dubrynytsko-Malobereznianska	0,384	0,452	3,665	0,319	0,255	0,398	1,579	0,887	0,058	0,000	0,013
Zhdeniivska	0,281	0,307	2,844	0,426	0,446	0,369	1,393	0,871	0,035	0,000	0,000
Zarichanska	0,457	0,571	4,202	0,293	0,196	0,607	0,935	0,847	0,027	0,000	0,000
Ivanovetska	0,490	0,514	4,487	0,247	0,227	0,221	0,206	0,766	0,033	0,000	0,000
Irshavska	0,394	0,408	3,152	0,238	0,110	0,218	0,366	0,862	0,039	0,000	0,000
Kamianska	0,161	0,221	1,672	0,562	0,442	0,279	2,266	0,906	0,013	0,000	0,001
Keretskivska	0,204	0,209	1,252	0,624	0,169	0,347	0,325	0,885	0,037	0,000	0,000
Kolochavska	0,130	0,141	1,352	0,623	0,235	0,183	1,131	0,950	0,008	0,000	0,002
Kolchynska	0,522	0,521	4,164	0,180	0,107	0,332	0,502	0,815	0,120	0,000	0,000
Korolivska	0,275	0,263	1,606	0,541	0,131	0,429	0,359	0,884	0,030	0,000	0,010
Kosonska	0,455	0,447	2,595	0,181	0,015	0,337	0,066	0,924	0,074	0,000	0,000
Kostrynska	0,235	0,232	1,984	0,537	0,281	0,428	0,233	0,933	0,081	0,000	0,000
Mizhhirska	0,336	0,368	3,293	0,260	0,160	0,206	0,717	0,870	0,022	0,000	0,001
Mukachivska	0,762	0,847	7,624	0,005	0,116	0,212	1,390	0,654	0,051	0,046	0,000
Nelipynska	0,523	0,616	4,391	0,049	0,055	0,254	0,505	0,891	0,011	0,000	0,002
Neresnytska	0,216	0,213	1,579	0,545	0,179	0,325	0,135	0,923	0,116	0,000	0,000
Nyzhnovoritska	0,233	0,229	2,127	0,488	0,258	0,225	0,633	0,893	0,019	0,000	0,002
Onokivska	0,603	0,764	8,891	0,003	0,070	0,325	2,146	0,797	0,024	0,000	0,005
Perechynska	0,604	0,643	4,974	0,010	0,136	0,258	1,005	0,827	0,046	0,000	0,001
Pyiterfolvivska	0,391	0,296	1,977	0,472	0,189	0,285	0,932	0,901	0,035	0,000	0,001
Pylypetska	0,235	0,246	2,040	0,506	0,139	0,398	1,833	0,899	0,070	0,000	0,000
Polianska	0,536	0,579	4,958	0,159	0,167	0,424	0,829	0,815	0,058	0,000	0,003
Rakhivska	0,384	0,376	3,858	0,214	0,174	0,227	1,405	0,844	0,020	0,000	0,001
Svaliavska	0,478	0,495	3,919	0,165	0,065	0,258	0,205	0,821	0,042	0,000	0,000
Serednianska	0,248	0,319	2,444	0,363	0,076	0,294	1,348	0,853	0,112	0,000	0,003
Synevyrska	0,192	0,205	1,667	0,552	0,053	0,163	0,476	0,901	0,026	0,000	0,000
Solotvynska	0,272	0,277	1,554	0,554	0,140	0,352	0,713	0,847	0,202	0,000	0,000
Stavnenska	0,268	0,272	2,356	0,466	0,261	0,495	0,712	0,913	0,016	0,000	0,003
Siurtivska	0,568	0,643	4,563	0,116	0,506	0,312	0,501	0,832	0,030	0,000	0,001
Teresvianska	0,272	0,281	1,791	0,523	0,171	0,447	0,525	0,858	0,078	0,000	0,001
Turie-Remetivska	0,214	0,217	1,786	0,510	0,220	0,294	0,870	0,906	0,059	0,000	0,000
Tiachivska	0,543	0,796	8,144	0,006	0,401	0,160	3,680	0,711	0,038	0,000	0,000
Uhlianska	0,224	0,237	1,880	0,519	0,307	0,478	0,101	0,927	0,029	0,000	0,000
Uzhhorodska	0,791	1,057	10,914	0,004	0,145	0,227	2,304	0,755	0,048	0,028	0,000
Ust-Chornianska	0,436	0,475	5,633	0,173	0,365	0,185	0,899	0,916	0,035	0,000	0,000
Kholmkivska	0,820	1,468	12,980	0,002	0,229	0,230	3,316	0,768	0,078	0,000	0,003
Khustska	0,401	0,461	3,612	0,242	0,117	0,278	1,643	0,840	0,042	0,000	0,001
Chynadiivska	0,385	0,382	2,705	0,366	0,126	0,284	0,250	0,840	0,236	0,000	0,000
Chopska	0,746	1,003	8,008	0,004	0,079	0,272	1,905	0,781	0,114	0,000	0,000
Yasinianska	0,324	0,325	3,159	0,337	0,188	0,361	0,112	0,879	0,047	0,000	0,000

** Calculated by the authors based on the data of the Department of Finance of the Transcarpathian Regional State Administration.*

However, in the future, the implementation of a single integrated comprehensive assessment will make it possible to make a general assessment of the state of financial stability of communities, to make generalized comparisons of different local communities, and will be more informative for the average citizen. Formed ratings of financial stability can be those tools that managers at the regional or state level may use when making decisions, for example, when allocating additional resources. Also, such ratings can be useful for public organizations, businesses or other organizations that are looking for partners among local government for mutually beneficial projects. As for the development of proposals, steps to solve problems related to individual indicators will, as a rule, have a positive impact on other indicators of financial sustainability.

The calculation of the overall integral indicator of the financial stability of the budgets of the local communities of the Transcarpathian region is planned to be carried out on the basis of the taxonomic method, taking into account the weighted coefficients determined on the basis of the expert method.

Conclusions

The formed complex for assessing the financial stability of the budgets of local communities includes 11 indicators: indicator of the local budget independence, indicator of budget security, budget efficiency indicator, indicator of budget subsidy, indicator of budget revenue planning accuracy, indicator of independence for local taxes and fees, indicator of the population provision of capital expenditures, indicator of the specific weight of wages in expenses, tax obligation indicator, indicator of local borrowings, lending indicator.

On the basis of the data received from the Department of Finance of Transcarpathian Regional State Administration, calculations of these indicators were carried out as well as each indicator has been analysed. There is a significant similarity between the local communities with the best and worst values of 4 indicators (depending on the nature of the impact on financial stability – positive or negative), which are the basis of the existing studies of domestic scientists, namely, on the indicators of local budget independence, budget security, budget effectiveness and budget subsidization. These indicators are most dependent on the volume of budget revenues (without transfers) and, accordingly, the best results for them are in local communities centered in cities of regional importance, former district centers, as well as in local communities adjacent to the regional center. The worst indicators are in rural local communities, which are formed to a greater extent from mountain settlements, including many communities of the Khust district.

According to other indicators, no clear regularity was found regarding the types or location of local communities, as other indicators depend to a greater extent on the nature of resource management in the local community.

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ARTICLES

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ARTIFICIAL INTELLIGENCE AS A NEW DIMENSION OF THE LABOR MARKET

Abstract

This article explores the dynamic development of artificial intelligence (AI) in various aspects of social and economic life. It analyzes how AI implementation is transforming the labor market, considering its rapid growth within contemporary society while addressing both its benefits and concerns related to job displacement. The study employs an integrated research approach, combining descriptive, comparative, and analytical analysis to ensure an in-depth understanding of AI's role. Desk research was also conducted to analyze existing data and literature, and inductive reasoning was applied to draw general conclusions. The article forecasts the automation of certain professions while also highlighting the creation of new job opportunities, identifying sectors most and least susceptible to automation. AI is expected to continue its dynamic expansion, offering new possibilities across various fields. The study contributes to the discourse on AI's role in the labor market, encouraging reflection on its long-term impact. It emphasizes the necessity of an ethical approach to AI development and the establishment of appropriate legal and ethical frameworks. Furthermore, it underscores that managing labor market transformations and addressing ethical dilemmas related to AI remains a challenge. The article highlights the need for AI-driven innovations and the importance of analyzing the potential effects of automation on different labor market sectors.

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Keywords: artificial intelligence (AI), AI in the labor market, ethical aspects of AI, automation, AI benefits in the labor market, AI risks in the labor market.

JEL classification: O33.

Introduction

In today's world, dominated by digital technology, artificial intelligence (AI) is evolving and gaining increasing significance. Despite its ability to adapt and learn, it still does not match the human brain in terms of memory, which limits its capacity to fully replace humans in the workforce. The development of AI has a significant impact on business, the economy, and institutions, highlighting the need to understand and appropriately shape its role in society.

These changes lead to transformations in the labor market, raising questions about the future role of humans in the professional world as well as the ethical and social challenges associated with further AI advancements (Kuciński, 2021, pp. 213).

This article explores the dynamic development of artificial intelligence (AI) in various aspects of social and economic life. It analyzes how the implementation of AI is transforming the labor market, considering both its dynamic development in the context of modern society and the associated concerns about job losses. The main objective of the article is to examine artificial intelligence (AI) as a determinant of labor market transformations.

The article adopts an integrated research approach, combining descriptive, comparative, and analytical methods to provide an in-depth understanding of AI's role. Desk research was used to analyze existing data and literature, while inductive reasoning was applied to draw general conclusions.

1. Artificial Intelligence – An Epistemological Analysis

The history of AI began in 1637 when the philosopher and scientist René Descartes stated that one day machines would take significant initiative, make decisions, and act in an "intelligent" manner. Although his vision sparked considerable controversy, it laid the foundation for the later emergence of the term Artificial Intelligence (AI) (Miernik, 2023). The initial goal of AI research was to create an intelligent robot that resembled a human in appearance and could think like *Homo sapiens* (Radomski, 2022, pp. 315).

It was not until 1959 that John McCarthy, an American computer scientist, introduced the term "artificial intelligence" during a scientific conference at Dartmouth (Xu et al., 2021, pp. 2). It was there that AI was first defined as "the science and engineering of creating intelligent machines" (Utracki, 2021). However, the true breakthrough came in 1966, when the first chatbot, Eliza, was developed. The work of Joseph Weizenbaum from the Massachusetts Institute of Technology (MIT) was based on a code that enabled responses to questions and reported issues. Modern AI assistants

such as Alexa and Siri are direct successors of Eliza. These discoveries were so significant that the period from 1956 to 1973 became known as the "era of artificial intelligence" (Miernik, 2023). Another milestone in AI history was the year 1988, when IBM published a groundbreaking study introducing probability-based principles for automatic translation from French to English. This approach was soon replaced by a method based on calculating the probability of outcomes, which more closely resembled the cognitive processes of the human brain. This shift laid the foundation for modern machine learning technologies (Portal Przemysłowy, 2019).

Artificial intelligence is expected to be one of the most important technologies of the future. In 2020, the Committee of the Council of Ministers for Digitization adopted the "Artificial Intelligence Development Policy in Poland". This document outlines Poland's short-term (until 2023), medium-term (until 2027), and long-term (beyond 2027) objectives and actions for AI development (Fazlagić, 2022b, pp. 26).

In June 2023, the European Parliament adopted the world's first comprehensive AI regulations, known as the Artificial Intelligence Act. As part of the digital transformation strategy, efforts have been made to regulate AI implementation by setting standards that ensure better conditions for the development and use of this technology. In guiding the digital transformation of the European Union, a program called "Europe's Digital Decade" has been developed. It sets technological transformation goals for 2030 in areas such as secure and sustainable digital infrastructure, digitization of public services**,** digital transformation of enterprises, and digital skills. This document was preceded by the Declaration on Digital Rights and Principles, signed on December 15, 2022, which regulates the processes of safe and sustainable digital transformation, emphasizing the need to protect human rights (Jaskuła, 2023, pp. 18).

Artificial intelligence is a field of computer science aimed at facilitating the development of computers capable of performing tasks traditionally associated with human intelligence. Its focus is on studying and defining the rules that govern intelligent human behavior and incorporating them into algorithms and programs (Stylec-Szromek, 2018, pp. 502). Without delving into the technical details of specific AI methods, it is important to note that we are currently witnessing significant advancements in the development of sophisticated learning algorithms, which often achieve results equal to or surpassing human capabilities. A prime example of this is computer programs utilizing these algorithms (Kowalczewska, 2021, pp. 29).

This progress is linked to the emergence of intelligence in machines, particularly computers, which are no longer just advanced calculators but devices capable of autonomously executing a range of processes previously considered exclusive to human cognitive functions (Stefanowicz, 2006, pp. 83). Advances in artificial intelligence are attributed to broader access to data

and its accumulation (*big data*), increased computational power, and improved modeling approaches, such as neural networks (Selenko et al., 2022, pp. 273).

Artificial intelligence (AI) is a term that takes on various meanings depending on the context and perspective, making it a subject of extensive research, discussion, and interpretation among numerous scientists and theorists. AI definitions are as diverse as its applications.

S. Koziej believes that "artificial intelligence is the ability to solve problems, make decisions, learn from data, understand natural language, process images and sounds, and perform many other tasks that were previously reserved for the human mind" (Koziej, 2023, pp. 12).

Stuart Russell and Peter Norvig, in their book *Artificial Intelligence: A Modern Approach*, one of the most well-known textbooks in the field of artificial intelligence, define AI as "a field of computer science concerned with creating computer programs capable of performing tasks that, if carried out by a human, would require intelligence. This field encompasses various domains such as machine learning, natural language processing, pattern recognition, planning, and reasoning" (Russell & Norvig, 2021, pp. 19).

This definition emphasizes that artificial intelligence includes diverse techniques and approaches, with the goal of developing computer programs capable of mimicking certain aspects of human intelligence.

Similarly, Ian Goodfellow, Yoshua Bengio, and Aaron Courville state that "artificial intelligence (AI) is a specialization within computer science that focuses on generating computer systems capable of autonomously making decisions and solving complex tasks based on input data analysis. In AI implementations, the application of probability theory plays a crucial role, allowing for modeling uncertainty and predicting various potential outcomes of system actions" (Goodfellow, Bengio et al., 2018, pp. 53).

A different perspective is presented by Ray Kurzweil, who argues that "artificial intelligence is a process that enables machines to think, perceive, understand natural language, and learn, while also providing them with the ability to adapt to new situations" (Kurzweil, 2005, pp. 115).

Meanwhile, Nick Bostrom defines artificial intelligence as "any inorganic systems capable of goal-directed actions" (Bostrom, 2014, pp. 56).

According to the OECD, an artificial intelligence (AI) system is "a machine-based system designed to operate at various levels of autonomy and capable of generating outputs – such as predictions, recommendations, or decisions – that influence physical or virtual environments based on defined or inferred objectives" (Russell, Perset et al., 2023).

Artificial intelligence (AI), as a dynamic and continuously evolving field, is subject to various research interpretations. Each proposed definition highlights different aspects of AI, such as its learning ability, decision-making capacity, simulation of human intelligence, or adaptation to new situations. The diversity of these definitions reflects the complexity and evolving nature

of artificial intelligence. Depending on the adopted perspective, definitions may emphasize different AI characteristics, ranging from the imitation of human thinking to specific applications. This variety underscores the evolution of artificial intelligence and its growing significance across many areas of life and work.

2. Transformations of the Labor Market in the Age of Artificial Intelligence

In the current era of rapid AI development, tools based on this technology are increasingly being applied in everyday life, offering remarkable potential to support people in the future (Żulicki, 2022, pp. 14). Frey and Osborne from the University of Oxford developed forecasts on the risk of job automation, contributing to the creation of willrobotstakemyjob.com, a website that allows users to assess the likelihood of AI replacing specific jobs (Frey & Osborne, 2017, pp. 260). It is estimated that AI will surpass human capabilities in performing all tasks within 45 years from 2016, and complete automation of work may be possible within 120 years (Grace, Salvatier et al., 2018, pp. 729).

Regarding AI's impact on the Polish economy, the Polish Artificial Intelligence Strategy, part of the Responsible Development Strategy and the European Commission's Plan, plays a strategic role. AI development in Poland could increase GDP growth dynamics by 2.65 percentage points annually, primarily through process automation, leading to greater efficiency and cost reduction. Forecasts suggest that by 2030, AI will automate approximately 49% of working hours in Poland (Fazlagić, 2022a, pp. 5).

Globally, the United States is the leader in AI investments, with $47.4 billion invested in 2022. Meanwhile, China stands out with the highest average corporate investment in AI (The Future of Work Report, 2024, pp. 8). Poland ranks seventh in the EU in terms of the number of AI specialists, making it the regional leader in Central and Eastern Europe (EY Polska, 2021).

In response to the growing importance of artificial intelligence (AI) in the labor market, the data presented in Table 1 highlights various potential benefits of AI integration across different labor market aspects. The table emphasizes how AI transforms both work environments and management structures within organizations. It focuses on analyzing AI-driven efficiency improvements, precision, career development opportunities, human resource management, recruitment processes, and the broader impact of AI on business operations.

Table 1. The Impact of Artificial Intelligence on Efficiency, Career Development, and Innovation at Work from the Perspective of Employees and Employers

PROSPECTS AND BENEFITS OF ARTIFICIAL INTELLIGENCE IN THE LABOR MARKET FROM THE EMPLOYEE'S PERSPECTIVE	
Improvement in Efficiency and Precision in Task Execution	The application of artificial intelligence in business processes enables the reduction of human errors and the automation of various tasks. AI algorithms, by analyzing large datasets, allow for more precise forecasts, faster decision-making, and improved work quality.
Creation of New Career Development Opportunities	AI technologies not only enhance existing tasks but also create opportunities for the development of new skills, such as data analysis, programming, and the use of advanced technological tools, facilitating the acquisition of new competencies and career advancement.
Time Savings through Automation of Routine Tasks	Artificial intelligence, by taking over routine tasks, allows employees to focus on the creative aspects of their work, increasing efficiency and job satisfaction.
More Effective and Efficient Employee Management	The implementation of AI in employee management enhances efficiency in human resource management by enabling a personalized approach through the analysis of employee behavior and needs using advanced algorithms.
Automated Recruitment Processes	AI effectively analyzes resumes and cover letters, optimizing the recruitment process by identifying suitable candidates and reducing hiring time and costs. Additionally, AI systems can predict employee attrition risks, allowing for early interventions to retain talent.
Support for Complex and Time-Consuming Tasks	Artificial intelligence enhances operational efficiency in the workplace by automating routine tasks and allowing employees to focus on strategic and creative activities, leading to higher job satisfaction and productivity. Additionally, AI supports early identification and resolution of technical issues, further optimizing business processes.
Real-Time Monitoring and Analysis of Work Performance	AI aids in identifying patterns in employee behavior, enabling the optimization of workload distribution, support, and training, which translates into increased team productivity.
AI Can Support Employee Development Through Career and Skill Personalization	AI systems analyze employees' skills and interests, suggesting appropriate training and development opportunities, contributing to greater engagement and job satisfaction.
PROSPECTS AND BENEFITS OF ARTIFICIAL INTELLIGENCE IN THE LABOR MARKET FROM THE EMPLOYER'S PERSPECTIVE	
Ability to Quickly Redesign Internal Processes	AI enables companies to quickly optimize and adapt internal processes, increasing efficiency and reducing losses. This allows for continuous business process improvements and better resource utilization.
Generation of Attractive Offers	The use of AI in customer preference analysis allows for the creation of personalized and attractive offers, enhancing a company's competitiveness. AI also helps quickly adjust offerings to changing market conditions.
Improvement in Department Efficiency and Profitability	AI increases departmental efficiency through process automation and better resource management, leading to higher profitability. It also facilitates better decision-making and helps identify areas that require improvement.
Ensuring Greater Security and Optimizing Production	AI enhances security by enabling early threat detection and optimizing production processes, reducing raw material losses. It also assists in machine maintenance and introduces flexible production methods tailored to market demands.
Better Forecasting of Progress and Results	With AI, companies can accurately forecast business performance, which is crucial for planning and strategy. AI enables progress monitoring in goal achievement and allows for quick adaptation to changing conditions.
Making Investment Decisions	AI supports companies in making informed investment decisions by analyzing data and minimizing risks. It also allows for real-time market monitoring and the adjustment of investment strategies.

Source: Own elaboration based on: (Miernik, 2023), (WSB, 2023), (Wilczyńska-Baraniak, Rentflejsz, et al., 2022), (Kosiński, Orłowski, 2023)

Figure 1 presents the percentage of artificial intelligence (AI) applications across various service sectors, with the IT and telecommunications sector showing the highest AI saturation, reaching 58%**.** The finance and banking sector also extensively utilizes AI, reaching 41%**.** At the opposite end, sectors with the lowest AI adoption include environmental protection**,** agriculture, forestry, fisheries, and tourism**,** each with a 3% share. These data illustrate that AI is primarily implemented in sectors that rely heavily on data processing and automation, whereas industries more dependent on physical labor and direct interaction with nature utilize AI to a significantly lesser extent.

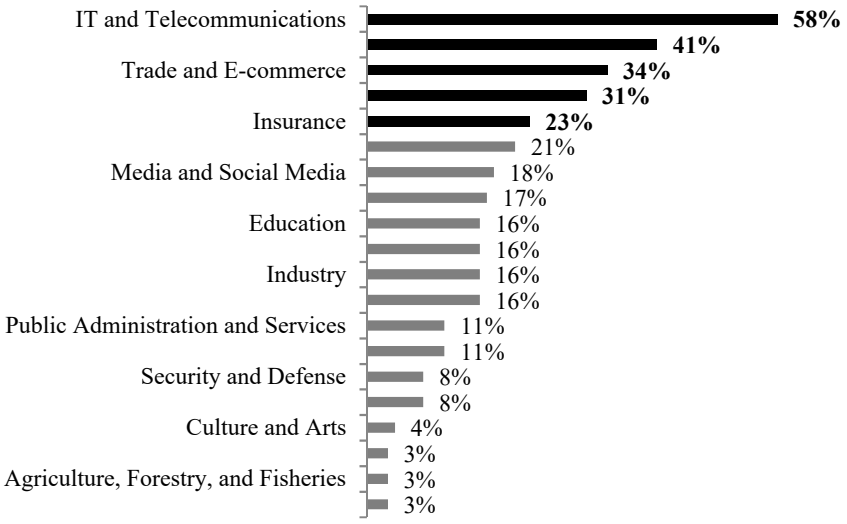

Figure 1. Applications of Artificial Intelligence in Economic Sectors
Source: Own elaboration based on: (FDP Report, 2021)

The development of artificial intelligence (AI) will lead to significant changes in the labor market, where certain jobs currently performed by humans may become obsolete and unnecessary, while others may be replaced by AI. There are indications that AI will be able to perform some jobs and functions at least as well as, if not better than, humans (Ferdynus, 2023, pp. 67). This highlights the potential efficiency and adaptability of artificial intelligence across various professional sectors, which may lead to a transformation in both the structure of the labor market and the competency requirements for employees**.**

From a technological advancement perspective, artificial intelligence is becoming increasingly sophisticated and has a profound impact on how people work and live. One of AI's defining characteristics that sets it apart from other technologies is its ability to learn from collected data and continuously improve its capabilities (Sira, 2022, pp. 34).

According to the World Economic Forum (WEF) 2023 report, it is projected that while approximately 83 million jobs will be eliminated by 2027, around 69 million new jobs will be created, primarily driven by the growing sectors related to artificial intelligence (AI) (Sabreena Basheer, 2023b). On the European labor market, the demand for skills such as critical thinking, emotional intelligence, advanced problem-solving, and creativity is expected to increase (The Future of Jobs Report, 2023). New job opportunities will emerge in AI-related fields, including AI specialists, robotics engineers, and machine learning programmers**.** The AI services sector will also expand, increasing demand for AI implementation consultants, data analysis experts, and cybersecurity specialists (Fazlagić, 2022a, pp. 5). AI education will be crucial, with a growing need for teachers and lecturers specializing in artificial intelligence to meet the demands of this rapidly evolving field.

The highest risk of AI exposure includes clinical laboratory technicians, chemical engineers, optometrists, power plant operators, and dispatchers, as well as graphic designers and professionals in visual arts (PulsHR, 2024). These professions face a high probability of being replaced by advanced technologies due to the automation of processes and procedures**.** On the other hand, occupations with the lowest risk of AI exposure include animal caregivers, food preparation workers, postal workers, subject lecturers, artists, and entertainers. Additionally, this group includes doctors, engineers, cleaning staff, hairdressers, plumbers, electricians, psychologists, and therapists (Personnel Service, 2023). These jobs rely heavily on human interaction, creativity, situational assessment, and decision-making based on non-standard or complex information, which, given the current state of technological development, makes them difficult to automate (Webb, 2019, pp. 40).

The OECD estimates that 27% of jobs worldwide are at risk of automation, with this percentage rising **to** 34% in Poland (PulsHR, 2024). According to employees in Poland, AI is most likely to replace humans in translation and copywriting (over 80%), as well as in graphic design and customer service (over 65%)**.** Photo editing and data analysis & processing were also cited as highly automatable sectors (over 55%)**.** Fewer respondents (around 35%) believe AI could replace humans in programming and consulting, such as legal advisory services. Notably, only 1.5% of respondents think that no job will be automated by AI (Figure 2).

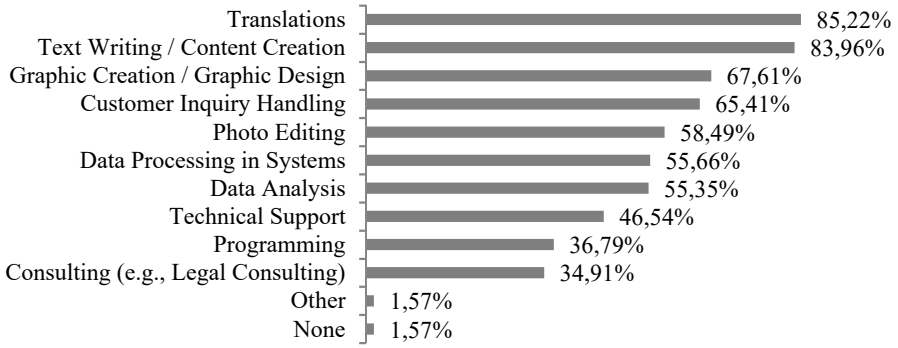

Figure 2. The Impact of Artificial Intelligence on Job Restructuring
Source: Own elaboration based on: (Report, 2023, pp. 11)

Polish society holds a pessimistic view on the impact of artificial intelligence on the labor market. 42% of people fear that AI will cause more layoffs than it will create new jobs, with this concern being more prevalent among people with higher education (43%) than those with primary education (31%). On the other hand, only 18% of people believe AI will have a positive effect on the job market**.** Those with an optimistic outlook on AI tend to be younger individuals (26% vs. 10%), metropolitan residents (21% vs. 14%), and people with some knowledge of AI (22% vs. 13%). However, 40% of respondents have no formed opinion on the matter (Digital Poland Report, 2023, pp. 15 & 102).

When employees were asked about their opinions on the ongoing AI-driven revolution, the results revealed diverse perspectives. The majority of respondents acknowledged that artificial intelligence presents both opportunities and risks for the labor market. A significant portion of respondents sees AI primarily as an opportunity, while a smaller group perceives more risks than benefits. A small percentage of employees do not expect significant changes due to AI implementation, and a minimal portion remains undecided on the issue (Figure 3). Overall, it can be inferred that employees are aware of the potential changes AI may introduce to the work environment, though their opinions on the scale and nature of these changes vary.

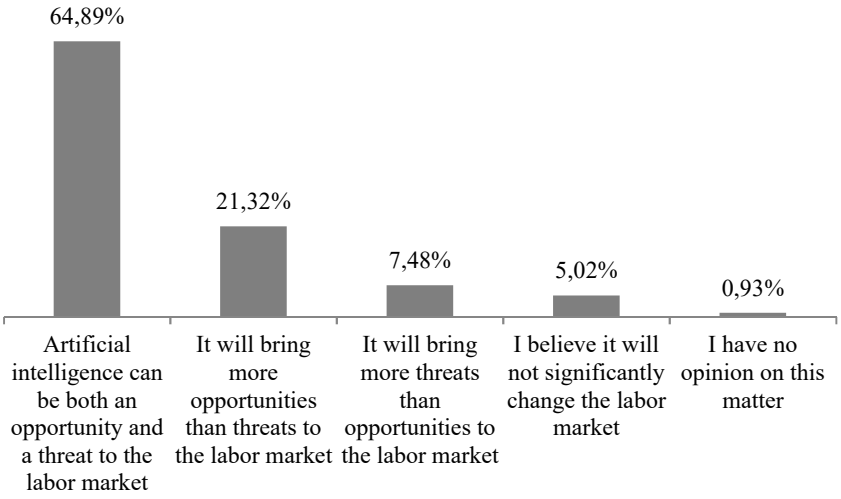

Figure 3. Artificial Intelligence in Employees' Opinions
Source: Own elaboration based on: (Report, 2023, pp. 12)

From the employers' perspective**,** one-third of them believe that human labor remains irreplaceable despite advances in AI. However, one in four employers expresses uncertainty about the consequences that the AI revolution may bring to their businesses. Approximately 5% of employers think that AI will eventually replace some employees, though they anticipate this shift will happen in the future, rather than immediately. Less than 2% believe this transition will occur within the current year. Meanwhile, 21% of employees hope that upcoming changes will offer them new opportunities, while 8% hold the opposite view (Borkowska, 2023).

Sam Altman, CEO of OpenAI, has shared significant insights regarding the future of AI and its impact on the job market. He challenged the widespread belief that AI will primarily serve as a tool to assist human workers, emphasizing instead that technological advancements in this field will inevitably lead to the disappearance of certain jobs. According to Altman, the real debate should not be about whether these changes will occur but rather about how soon they will happen (Sabreena Basheer, 2023a).

In her book, Susan Schneider (Schneider, 2021, pp. 20) highlights the future potential of AI to integrate knowledge from various disciplines and exhibit common sense reasoning**.** She suggests that such a level of AI advancement is not a distant reality.

3. Artificial Intelligence and Ethics

The widespread adoption of artificial intelligence (AI) should be accompanied by regulations that promote its ethical use (Jarosz, 2023, pp. 470). The rapid digitalization of industries raises critical questions regarding fairness, discrimination, and potential risks associated with AI. It is crucial to consider how to minimize ethical violations in AI applications, especially given challenges such as technological bias, which could have far-reaching negative consequences for the future of organizations (EY Polska, 2021). It is already essential to reflect on what measures are necessary to ensure that future autonomous, self-learning, and self-replicating AI systems, capable of operating independently across diverse external conditions**,** are equipped with a specific form of ethical intelligence (Wieczorek, 2021, pp. 15).

These concerns emphasize the need to develop and implement ethical and legal frameworks that regulate AI usage in the workplace, ensuring sustainable technological development while respecting employees' rights and dignity.

Changes in the labor market require a holistic and ethical approach, taking into account both the impact of technology on employment and the well-being of employees. Employers should be aware of the risks associated with replacing human workers with machines and the pressure for continuous skill development**.** The responsible implementation of technology should focus not only on efficiency but also on the humanitarian aspects of work. The challenge lies in developing management strategies that balance technological progress with human needs, fostering a work environment that promotes flexibility, creativity, and professional development while maintaining ethical standards**.** This approach is crucial for building a healthy organizational culture in an era of rapid technological transformation (Wolski, 2019, pp. 66).

There is significant diversity of opinions regarding the ethics of artificial intelligence (AI) development. While 28% of respondents believe that AI is being developed ethically, 24% hold the opposite view, suggesting that AI development does not align with ethical principles. A considerable proportion – nearly 50% – has no clear stance on the issue (Digital Poland Report, 2023, pp. 16 & 85). These discrepancies in the perception of AI ethics highlight the need for further research and discussion to better understand the social and moral implications of AI applications.

At the same time, there are ongoing efforts to teach AI to apply ethical principles by designing systems capable of making morally sound decisions. However, these initiatives face significant challenges due to the lack of universally accepted "absolute moral truths," which makes it difficult to implement clear ethical criteria in AI operations (Szulczewski, 2019, pp. 23).

Conclusions

The history of artificial intelligence (AI) dates back to the 17th century when René Descartes envisioned machines capable of intelligent behavior. The development of AI gained momentum in the 20th century, especially after John McCarthy formally introduced the term in 1956. Over time, AI has evolved from simple machines to advanced systems, now widely applied across various economic sectors, bringing transformations to the way people work and live**.**

In Poland, the AI development strategy focuses on **e**ducation and integrating AI into different areas of the labor market. Meanwhile, the European Union has taken steps toward AI regulation, emphasizing its growing significance. In the job market, AI has the potential to replace human workers in data processing and automation-heavy roles, whereas professions requiring creativity and social interaction are less vulnerable to automation.

The ethical use of AI is a crucial issue, necessitating the establishment of proper legal and ethical frameworks. Balancing technological progress with human rights and needs is essential to ensure responsible AI development.

Looking ahead, AI will likely drive further innovations and transformations across many fields, including medicine, business, and education. However, it is crucial that these changes are implemented responsibly and ethically, considering their social and professional impacts. AI has the potential to significantly enhance human experiences, but its development requires a thoughtful and responsible approach**.**

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