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Empirical analysis on the impact of labour market regulations on uninsured employment in Greece

Abstract. The impact of labour market regulations on uninsured employment in Greece between 2014 and 2019 is a crucial exploration in response to the pervasive challenge of undeclared work. With the rise of globalization and evolving labour dynamics, understanding and addressing the complexities of uninsured employment by analysing data from the Greek Ministry of Labour and Social Affairs was the main purpose of this study. Employing a comprehensive examination of key indicators, the study sought to evaluate the effectiveness of measures in curbing undeclared work. The pivotal strategies implemented by the Ministry of Labour and Social Affairs during the specified period were analysed using statistical analysis, focusing on high fines, reduced non-salary costs, the ERGANI information system, and a modernized fines framework. Statistical graphs were utilized to examine trends, providing a solid foundation for evaluating the impact of the implemented strategies. Qualitative assessments were employed to offer a nuanced understanding of the contextual factors influencing the outcomes. The findings reveal a positive trend, showcasing a significant reduction in undeclared workers and non-compliant businesses, underscoring the effectiveness of the implemented measures. An examination of 237,455 businesses in Greece over the period 2014-2019 revealed that 28,044 entities (11.81%) employed undeclared workers. Among 812,460 scrutinized employees, 44,642 (5.49%) were identified as undeclared, leading to fines totalling €468,997,663 in efforts to address non-compliance with labour regulations. This study not only sheds light on the successful strategies adopted by the Greek government but also offers valuable practical lessons for policymakers globally

Keywords: government regulations; undeclared work; ARTEMIS plan; ministry of labour; labour economics; financial crisis

INTRODUCTION

Uninsured employment presents a pressing challenge not only to the Greek economy but also to global societies, critically impacting the stability of social systems and economic prosperity. Uninsured employment refers to the failure to make timely contributions to insurance funds despite active engagement in work. This phenomenon compromises the rights and protection of workers, weakens public revenues, undermines healthy competition among businesses, and fundamentally impedes the developmental trajectory of the Greek economy. As a result, the sustainability of the Greek insurance system is

under threat, necessitating urgent and effective measures to combat uninsured employment.

Uninsured employment and undeclared work in Greece have intricate origins intertwined with the nation's economic and social fabric. According to H. Burke (2020) the aftermath of the 2008 financial crisis significantly amplified unemployment rates, fostering a climate where informal employment became a necessary recourse for many. Economic instability, coupled with stringent labour market regulations, compelled both employers and employees towards undeclared work, perpetuating the cycle

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of informal employment. High taxation rates acted as a catalyst for this trend, encouraging businesses to engage in off-the-record transactions to evade tax burdens and social security contributions. These dynamics led to the emergence of a shadow economy, reflecting the complexities of Greece's labour market.

To combat the challenges of uninsured employment and undeclared work, the Greek government introduced the ARTEMIS operational plan during the period 2014-2019. This multifaceted initiative aimed to curtail informal labour practices through a blend of strict policies and financial incentives, as indicated by OECD (2019). Central to this plan was the imposition of substantial fines, acting as a deterrent against undeclared work. Simultaneously, the reduction of non-salary costs for businesses became a pivotal policy, making formal employment financially viable for employers, as supported by International Labour Organisation (2018) data. The advent of digital solutions, such as the ERGANI information system, played a vital role in policy implementation, enhancing transparency and accountability within the labour market. H. Burke (2020) noted that this system acted as a watchdog, making it increasingly challenging for employers to engage in undeclared work undetected.

A lot of studies have scrutinized the effectiveness of policies aimed at combating uninsured employment and undeclared work. As stated by C. Karakosta & P. Liargovas (2018), the informal labour market in Greece perpetuates a cycle of vulnerability and exploitation, particularly among marginalized populations, such as migrants and low-skilled workers. This exploitation further widens income inequality and exacerbates social disparities, leaving these individuals without social security protection and proper working conditions. Moreover, the unregulated growth of undeclared work distorts the competitive landscape among businesses, leading to unfair competition and hindering overall economic growth. This distortion permeates the socio-economic fabric, impeding the country's overall development. More researchers contributed valuable insights into the socio-economic factors influencing policy outcomes, highlighting the necessity for tailored interventions considering the diverse economic backgrounds and challenges faced by different population segments. Interesting findings emerge from the research conducted by S.M. Dougherty & O.R. Escobar (2019), revealing varying levels of informal employment across Mexico. Their study indicates that reducing the barriers to initiate business operations has a non-linear impact on informal employment, particularly in regions with a high prevalence of microenterprises. These results underscore the importance of implementing a comprehensive set of policies aimed at enhancing labour skills, strengthening tax enforcement, and combating corruption to effectively curb informal employment. Within their study, M. Vlassis *et al.* (2019) have crafted a theoretic model to accounts for firms' decisions to conceal labour without any governmental monitoring or punishment mechanisms, such as penalties or fines, to enforce labour disclosure. However, the numerical outcomes are contingent upon the specific proportional tax system implemented.

No study has yet analysed and evaluated in detail the significant impact of the ARTEMIS operational plan on

undeclared labour in Greece. Therefore, the purpose of the study was to examine and evaluate the efficacy of the Ministry of Labour and Social Affairs' control mechanisms in combating undeclared work through the analysis of the ARTEMIS operational plan, implemented between 2014 and 2019.

■ MATERIALS AND METHODS

The data of this study, collected from the ARTEMIS operational plan, spanning from January 1, 2014, to December 31, 2019, sourced directly from the esteemed Greek Ministry of Labour and Social Affairs. Conducting an analysis, the study concentrated on pivotal variables essential for comprehending the intricacies of uninsured and undeclared employment dynamics. It is important to note that there are no data available beyond 2019, as the ARTEMIS program was implemented from 2014 to 2019. The focus of the analysis concerns the impact of new governmental policies initiated from 2014 onwards. These policies include the high fine policy, reduction in non-salary costs, creation of the ERGANI information system, and modernization of the fines framework. This examination covered a six-year timeframe from the commencement of these policies, which allowed to assess their effects on the dynamics of uninsured and undeclared employment during this period.

The selected six-year timeframe for analysis, spanning from the initiation of these policies in 2014 to 2019, was considered sufficient for observing and evaluating the outcomes of the implemented governmental measures. This duration allows for a comprehensive examination of the impact of the measures taken from the Greek Government to reduce uninsured employment. Furthermore, in this study, statistical analysis served as the primary methodological tool employed for data examination. The use of statistical methods ensured a meticulous exploration of patterns, relationships, and significance within the data. This approach enhanced the reliability of the study's findings. The selected variables are as follows.

Number of Audited Businesses: this variable represents the total count of businesses that underwent inspection as part of the ARTEMIS operational plan. Each audited business was scrutinized to identify compliance with employment regulations and presence of undeclared workers. **Number of Businesses with Undeclared Workers:** this variable indicates the number of businesses where employees were found working without proper documentation or registration. It identifies businesses involved in undeclared work, providing insights into the extent of informal employment practices. **Percentage of Delinquent Businesses:** this variable signifies the proportion of businesses engaged in undeclared work relative to the total audited businesses. It is calculated as a percentage and reflects the prevalence of non-compliant practices among businesses inspected during the study period.

Number of Employees: this variable represents the total workforce within the audited businesses. It includes both declared and undeclared workers, providing an overview of the scale of employment within the businesses subjected to inspection. **Number of Undeclared Workers:** this variable denotes the count of employees found to be working without proper documentation or registration. It specifically focuses on individuals engaged in undeclared

work, revealing the magnitude of informal employment within the audited businesses.

Percentage of Undeclared Workers in Relation to the Total Number of Workers: this variable calculates the ratio of undeclared workers to the total workforce within the audited businesses, expressed as a percentage. It highlights the proportion of informal employment concerning the overall workforce, offering insights into the prevalence of undeclared work within businesses. In this analysis, the variable “Percentage of Undeclared Workers in Relation to the Total Number of Workers” has been abbreviated to “Percentage of Undeclared Workers” for brevity.

Amount of Fines (in euros, €): this variable represents the total monetary penalties imposed on businesses due to undeclared work practices. It quantifies the financial consequences faced by non-compliant businesses, indicating the economic impact of undeclared employment on the business community and the broader economy.

■ RESULTS

The ARTEMIS operational plan was a pivotal strategy crafted to address the intricate challenges posed by uninsured employment and undeclared work in Greece. Its multifaceted approach encompassed several key components. High Fine Policy: the plan introduced substantial fines, including a severe penalty of €10,500 for first-time offenders engaged in undeclared work, acting as a deterrent against illicit employment practices. Reduction in Non-Salary Costs: policies were implemented to alleviate the financial burden on businesses, specifically through a reduction of 6

units in insurance contributions. This reduction aimed to incentivize compliance while easing the financial strain on employers. Creation of ERGANI Information System: it was developed to comprehensively map the labour market for the first time. This system acted as a shield, ensuring transparency and accountability for both employees and compliant businesses. Modernization of Fines Framework: the plan continuously enhanced the fines framework for undeclared and uninsured work. This modernization involved the establishment of an electronic register of offenders and the fortification of the Labour Inspection Corps through technical upgrades and institutional reinforcement, guaranteed by a Presidential Decree.

A pivotal aspect of understanding uninsured employment lies in distinguishing insurance contributions from taxation. Unlike mere deductions, insurance contributions are financial obligations imposed by insurance legislation on both employers and insured individuals. The choice of insurance contributions as the primary financial instrument underscores their vital role in sustaining the national social security system. Uninsured employment manifests in various forms, including the concealment of businesses from the insurance system, underreporting of employees’ working hours, and providing insurance coverage based on lower wages than the actual payment. Undeclared work, the most extreme manifestation, refers to paid employment that remains unregistered with tax authorities and social security organizations, making it a focal point in the literature. Figure 1 shows the total number of audited businesses.

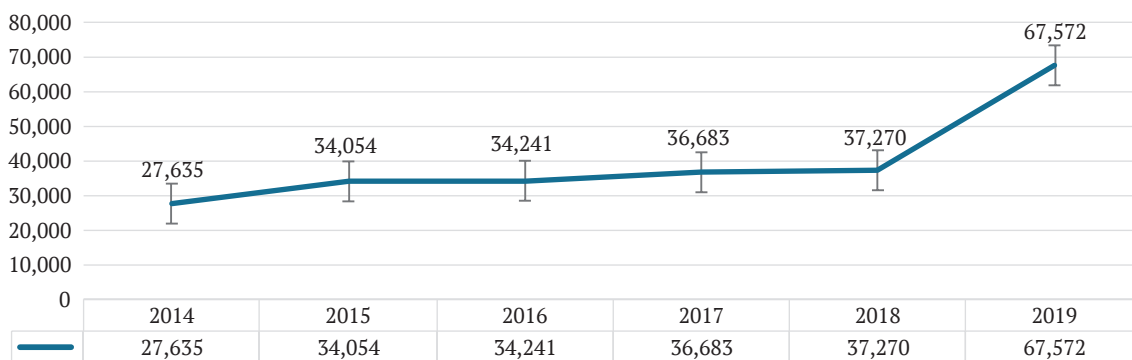


Figure 1. Number of audited businesses, 2014-2019

Source: made by the author

The data illustrates a remarkable increase in the number of audited businesses in Greece over the six-year period. Starting in 2014, the figure steadily climbed, reaching a substantial number in 2019. This upward trend signifies a proactive response from regulatory authorities to combat the challenges posed by undeclared employment and non-compliant businesses. In 2014, the 27,635 audited businesses represented a crucial starting point for regulatory initiatives. As the numbers grew in 2015-2016, it became evident that authorities were expanding their efforts to scrutinize more businesses for adherence to labour regulations. By 2017, the audited businesses had increased showcasing a continuous commitment to monitoring business practices. However, the most notable surge occurred in 2019, where the number of audited businesses nearly

doubled to 67,572. This substantial increase suggests a significant shift in regulatory strategy, potentially indicating the implementation of more sophisticated auditing techniques, targeted sector-specific interventions, or an increased focus on high-risk regions.

The surge in audits in 2019 highlights a heightened determination to enforce labour laws comprehensively. The escalating numbers of audited businesses reflect a robust governmental effort to foster a fair and transparent business environment. The substantial increase in 2019 particularly emphasizes a proactive approach, showcasing a commitment to rigorous enforcement and a drive to curtail undeclared employment practices effectively. The data (Fig. 2) reveals fluctuations in the number of businesses found with undeclared workers in Greece over the six-year period.

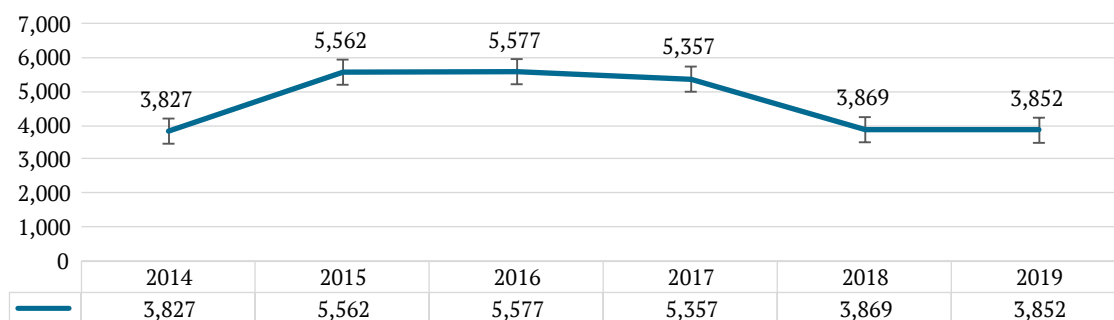


Figure 2. Number of businesses with undeclared workers, 2014-2019

Source: made by the author

Starting at 3,827 in 2014, the number rose to 5,562 in 2015, indicating an initial challenge in tackling undeclared employment. However, in the subsequent years, there was a gradual decrease in non-compliant businesses by 2019. The rise in 2015 possibly signalled an increased focus on enforcement, leading to the identification of a higher number of businesses involved in undeclared employment practices. However, the subsequent years saw a decline, suggesting that regulatory measures and awareness campaigns might have had a positive impact, leading to a reduction in such practices.

The stable figures in 2017 and 2018, followed by a marginal decrease in 2019, indicate that the efforts to curb businesses with undeclared workers remained consistent. The sustained vigilance and enforcement activities

during these years likely contributed to maintaining a relatively low number of non-compliant businesses, demonstrating a commitment to fostering fair and legal employment practices. While the overall trend showcases a decrease, the persistence of some businesses engaging in undeclared employment emphasizes the need for continued vigilance and targeted interventions. The relatively stable numbers in recent years indicate a strategic focus on sustaining regulatory efforts, fostering compliance, and ensuring a level playing field for businesses operating within the legal framework.

The percentage of delinquent businesses, representing the proportion of non-compliant businesses among the audited ones, demonstrates a notable decline over the six-year period in Greece (Fig. 3).

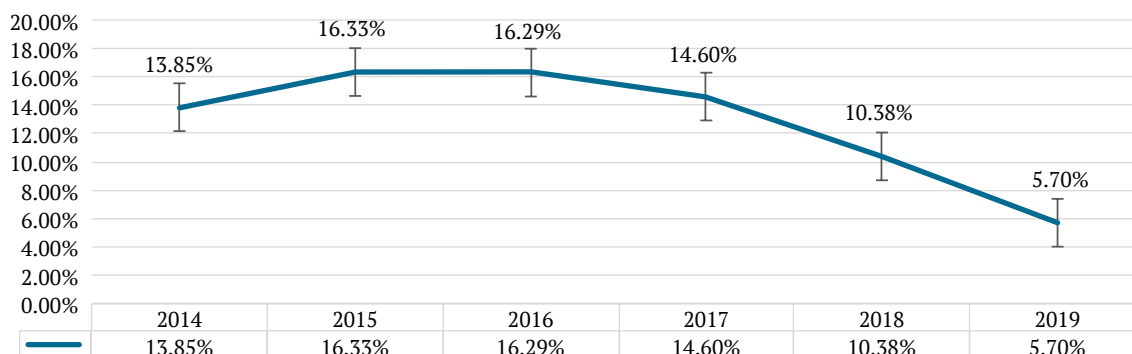


Figure 3. Percentage of delinquent businesses, 2014-2019

Source: made by the author

In 2014, 13.85% of audited businesses were found to be non-compliant, indicating a significant challenge in ensuring adherence to labour regulations. The percentage rose slightly in 2015, reflecting the persistent efforts required to tackle undeclared employment practices. However, in the subsequent years, there was a consistent decrease in the percentage of delinquent businesses. By 2019, only 5.70% of audited businesses were non-compliant, showcasing a substantial improvement in regulatory efficacy. The decline in 2016-2019 signifies a remarkable achievement. This drop suggests the implementation of effective enforcement strategies, including stricter penalties, increased surveillance, and targeted interventions. The substantial decrease in 2019 highlights a significant leap, indicating the successful

implementation of new policies or enforcement methodologies. The decreasing trend underscores the dedication of regulatory bodies in fostering compliance among businesses.

The reduced percentage of delinquent businesses signifies a positive shift in the business landscape, indicating an environment where adherence to labour laws is actively encouraged and non-compliance is met with stringent consequences. The declining percentages reflect a cultural shift in the business community towards legal and ethical employment practices, showcasing the success of ongoing awareness campaigns and robust regulatory actions. The recorded figures in Figure 4 represent the workforce scrutinized for compliance with labour regulations in Greece during the specified years.

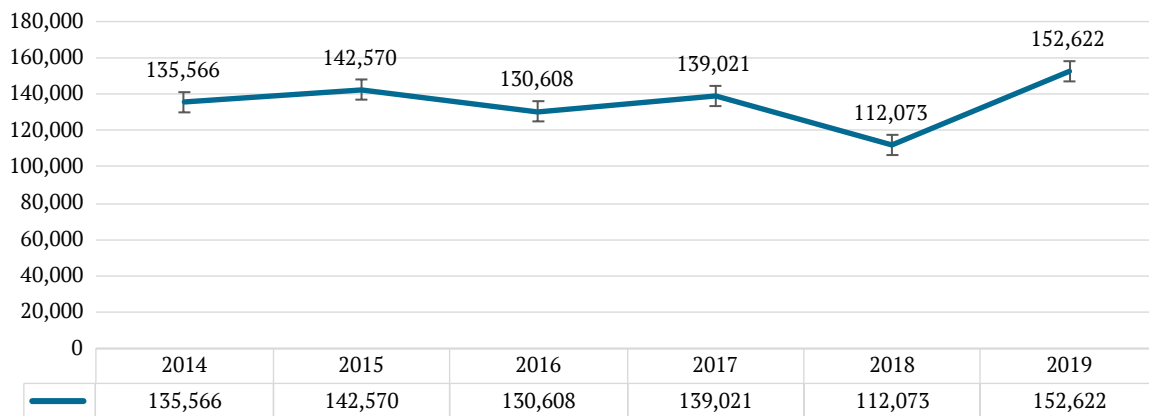


Figure 4. Number of workers checked for compliance, 2014-2019

Source: made by the author

In 2014, 135,566 employees underwent compliance checks, indicating a substantial effort by regulatory authorities to monitor adherence to employment laws. The subsequent year, 2015, saw an increase in the number of checked workers, signifying a proactive approach to ensuring legal employment practices. The following years witnessed fluctuations in the number of workers checked. In 2016, the figure decreased, possibly due to specific sectoral trends or operational focus. A subsequent rise occurred in 2017, indicating a renewed emphasis on compliance evaluation. However, a sharp decline was observed in 2018, potentially reflecting shifts in regulatory priorities or resource allocations. A significant upswing was evident

in 2019, where the number of workers checked surged to 152,622. This notable increase underscores a heightened commitment to regulatory vigilance, potentially driven by policy initiatives, increased enforcement efforts, or sector-specific interventions. These figures emphasize the proactive approach of regulatory authorities in monitoring compliance within the labour market. The fluctuations indicate the adaptable nature of enforcement strategies, tailored to address evolving challenges. The substantial increase in 2019 suggests a response to emerging trends or issues, reflecting effort to maintain a fair and legally compliant employment landscape in Greece. The number of undeclared workers is stated in Figure 5.

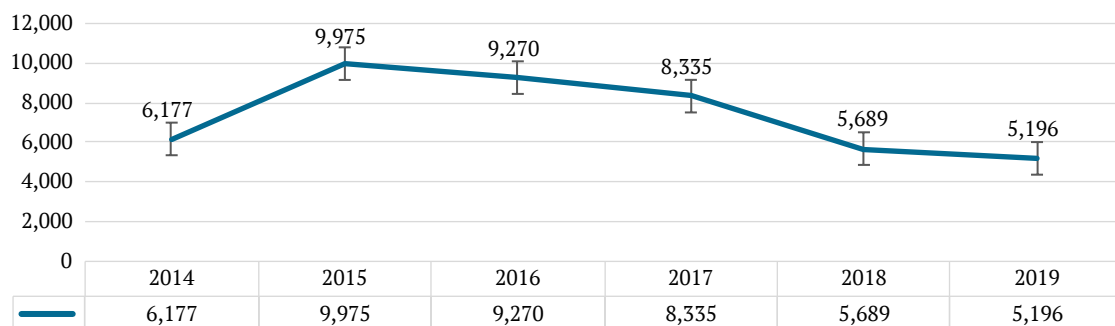


Figure 5. Number of undeclared workers, 2014-2019

Source: made by the author

In 2014, 6,177 undeclared workers were identified, signifying the extent of non-compliance with labour regulations. The number of undeclared workers surged in 2015, indicating a concerning increase in non-compliant employment practices. This rise has prompted regulatory authorities to intensify their efforts to address undeclared work. Subsequent years saw a decline in the number of undeclared workers. In 2016, there were 9,270 such workers, reflecting a concerted effort to tackle informal employment. The downward trend continued in 2017, signifying a positive shift towards regulatory success. A significant decrease occurred in 2018, with only 5,689 undeclared workers. This could be attributed to the effectiveness of enforcement measures, penalties, and regulatory initiatives. The decline persisted in 2019, indicating an ongoing

commitment to curbing undeclared employment practices. This decreasing trend suggests that regulatory efforts were successful in fostering legal and transparent employment practices. The decreasing numbers of undeclared workers underline the effectiveness of regulatory actions in reducing non-compliance and promoting adherence to labour laws. The fluctuations in the data highlight the dynamic nature of the issue and the adaptability of enforcement measures to address emerging challenges. The substantial drop in 2018 and 2019 is particularly noteworthy, indicating a positive trajectory in the fight against undeclared employment practices in Greece. The percentage of undeclared workers, calculated concerning the total number of workers checked, serves as a vital indicator of informal employment practices in Greece (Fig. 6).

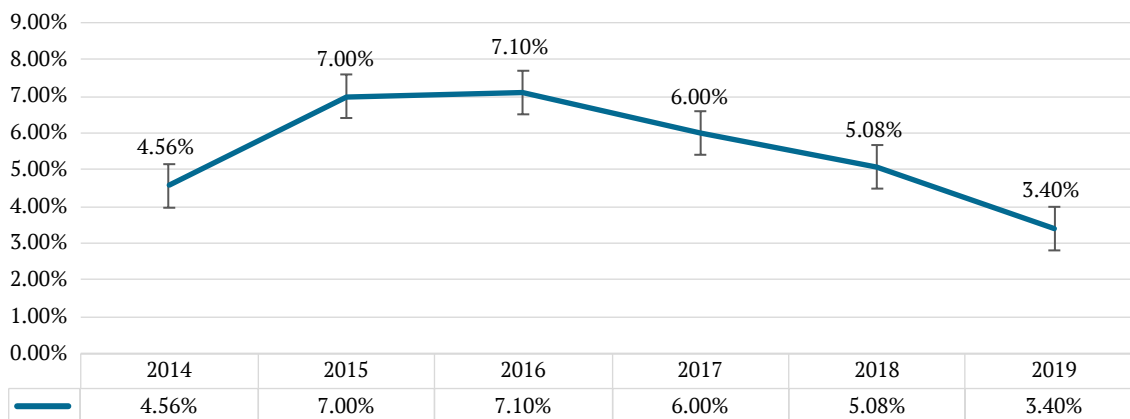


Figure 6. Percentage of undeclared workers, 2014-2019

Source: made by the author

In 2014, 4.56% of the workers examined were found to be undeclared, highlighting a significant challenge in ensuring compliance with labour regulations among the audited businesses. This percentage increased notably in 2015, indicating a concerning rise in undeclared employment practices. The spike likely prompted intensified regulatory efforts and awareness campaigns to address this issue comprehensively. In the subsequent years, there was a gradual decrease in the percentage of undeclared workers among those checked. In 2016, the figure stood at 7.10%, signifying a persistent challenge in enforcing labour laws. However, by 2017, there was a slight improvement. A significant decline occurred in 2018. This decrease signifies a positive shift, driven by stricter penalties, enhanced enforcement measures, and improved compliance from both employers and employees alike. The most substantial drop was observed in 2019, where the percentage of undeclared

workers among those checked fell to 3.40%. This significant decrease suggests a substantial improvement in regulatory effectiveness, due to targeted interventions, increased awareness, and a cultural shift towards legal employment practices among the audited businesses. These decreasing percentages reflect a positive trend, indicating the success of regulatory efforts in curbing undeclared employment practices specifically within the checked businesses. The decline from 7.00% in 2015 to 3.40% in 2019 highlights a remarkable achievement, signifying a shift towards legal and compliant labour practices within the audited sectors. The ongoing efforts to reduce the percentage of undeclared workers among those examined have significantly contributed to fostering a fair and transparent employment landscape in Greece. The fines imposed, expressed in euros, offer insight into the financial repercussions faced by non-compliant businesses in Greece (Fig. 7).

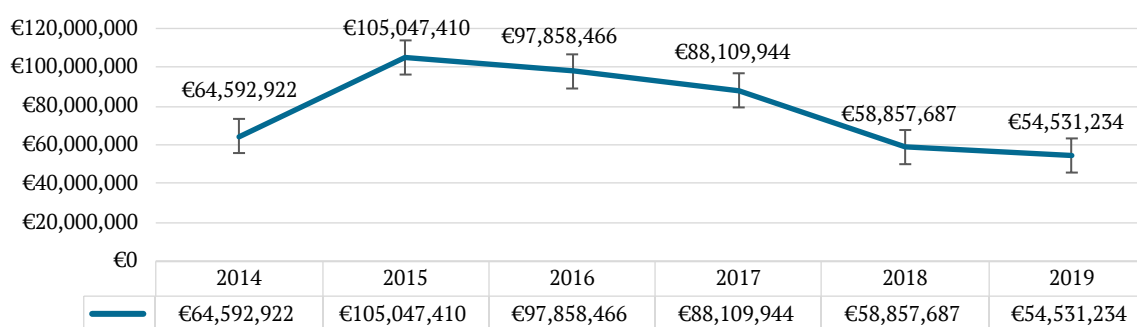


Figure 7. Amount of fines, 2014-2019

Source: made by the author

In 2014, fines totalling €64,592,922 were levied, indicating a substantial financial penalty for undeclared employment practices. The fines escalated significantly in 2015, reaching €105,047,410. This sharp increase might reflect stricter enforcement measures and a determination to penalize non-compliant businesses severely. In the subsequent years, the fines remained relatively high. In 2016, fines showcased the persistent efforts to maintain stringent penalties for offenders. The financial consequences for non-compliance continued in 2017. A notable decrease occurred in 2018, where fines dropped. This reduction

might indicate a shift in enforcement focus, potentially towards preventive measures or alternative strategies to address non-compliance. The trend of decreasing fines persisted in 2019, with penalties amounting to €54,531,234. This decrease could be attributed to improved compliance, deterrence resulting from previous years' strict penalties, or recalibration of the fines system to ensure fairness and proportionality.

The fluctuation in fines imposed reflects the evolving strategies of regulatory bodies in addressing non-compliant businesses. While the decrease in fines might suggest

a positive shift in compliance, it also necessitates continual evaluation to ensure that the penalties remain effective deterrents against undeclared employment practices.

Striking a balance between strict enforcement and fairness is crucial to fostering a legally compliant business environment in Greece. The overall analysis is shown in Table 1.

Table 1. Summarized data, 2014-2019

Number of audited businesses	237,455
Number of businesses with undeclared workers	28,044
Percentage of delinquent businesses	11.81%
Number of employees	812,460
Number of undeclared workers	44,642
Percentage of undeclared workers	5.49%
Amount of fines, €	468,997,663 €

Source: made by the author

In the collective span of 2014-2019, Greece initiated a rigorous campaign to combat undeclared employment, examining 237,455 businesses. Within this extensive audit, 28,044 businesses were found to have undeclared workers, marking a challenge that needed targeted intervention. This constituted 11.81% of the audited entities, underlining the persistent issue faced by the regulatory authorities. During these years, a total of 812,460 employees underwent scrutiny, revealing the magnitude of the labour market under regulatory vigilance. Within this workforce, 44,642 individuals were identified as undeclared workers, constituting 5.49% of the total workforce examined. This percentage, while a notable reduction, still highlighted the need for further efforts to eradicate informal employment practices entirely. The fines imposed throughout these years amounted to a substantial €468,997,663, signifying the financial consequences faced by non-compliant entities. These fines, coupled with stringent regulatory measures, served as deterrents, aiming to create a disincentive for businesses engaging in undeclared labour practices.

In evaluating the measures undertaken by the Ministry of Labour and Social Affairs in combating undeclared employment, several key observations come to light. High Fine Policy: the imposition of substantial fines, including the severe penalty of €10,500 for first-time offenders engaged in undeclared work, has played a pivotal role. By acting as a financial deterrent, this policy has underscored the seriousness of undeclared employment, compelling businesses to reconsider engaging in such practices. Reduction in Non-Salary Costs: the reduction of 6 units in insurance contributions for businesses not only alleviated their financial burden but also incentivized compliance. By easing the cost pressures, this measure encouraged businesses to operate within the legal framework, ensuring timely payment of contributions and declaring their workforce accurately. Development of the ERGANI Information System: the inception of the innovative ERGANI information system served as a protective shield, fostering transparency and accountability. Through a comprehensive mapping of the labour market, this initiative safeguarded the interests of both employees and businesses adhering to compliance. It allowed for real-time monitoring, making it significantly harder for businesses to engage in undeclared employment without facing detection. Modernization of Fines Framework: the continuous enhancement of the fines framework, including the establishment of an electronic register of offenders and fortification of the Labour Inspection Corps,

showcased a commitment to staying ahead of evolving tactics employed by non-compliant entities. These technological advancements ensured that regulatory bodies were well-equipped to combat emerging challenges effectively. Looking ahead, policymakers and stakeholders must remain attuned to the evolving dynamics of the labour market, leveraging the lessons learned from this research to refine existing strategies and formulate targeted interventions.

■ DISCUSSION

The comprehensive analysis of Greece's efforts to combat uninsured employment reveals a nuanced landscape shaped by multifaceted strategies. The dynamic interplay between regulatory initiatives and the challenges presented by undeclared work underscores the complexity of fostering compliance in the labour market. Over the past years, persistent undeclared work has been acknowledged as resistant to economic development. The traditional labour market scheme of standard work forms prevailed in the Greek economy until the turn of the 21st century. According to the findings of the Hellenic Statistical Authority, full-time employment with indefinite contracts was common among the majority of employees, and there was robust collective bargaining and unionization (Labour force (quarterly data), 2023). The institutional framework of the Greek labour market was characterized by significant state intervention. However, the recession that struck Greece in 2009 laid bare structural inefficiencies, necessitating austerity measures for robust and enduring fiscal consolidation and profound structural reforms. According to D. Bunn (2018), the economic downturn also exerted considerable pressure on the private sector, with Greek companies bearing the highest tax burden among OECD countries over the past decade. This situation, coupled with an extraordinary unemployment rate reaching 27.8% in September 2013, as reported by CEIC data (Greece unemployment rate, 2019), created a backdrop for substantial labour market reforms.

The proportion of businesses engaging in undeclared activities is higher when accounting for the unreported segment of registered businesses, which may understate their turnover, number of employees, or employees' wages. Undeclared work creates unfair competition for legitimate businesses. Findings by C.C. Williams & S. Bezeredi (2018) demonstrate that businesses facing significant competition from those operating in the undeclared economy experience lower annual sales growth. Furthermore, their research shows that these businesses also exhibit lower

productivity compared to those not competing with informal counterparts. The researcher M. Dzhulai (2022) conducted a study among the younger generation of the working population of Ukraine on their motivation to work. In addition to the usual needs, such as the level of wages, the prestige of the chosen company, the fact of official employment and a fair labour market proved to be crucial for the respondents. It is crucial to recognize that the fight against undeclared employment is an iterative process, demanding adaptability in enforcement strategies to address evolving challenges. The shift towards a fair and transparent business environment is evident in Greece, which can be seen from this research, yet persistent non-compliance highlights the resilience of informal practices. The intricate relationship between regulatory measures and the complexities of undeclared work necessitates ongoing evaluation and adaptation to ensure sustained success in promoting legal and ethical employment practices.

Despite the common assertion that undeclared work is more prevalent in service industries, there has been a lack of studies evaluating the impact of governmental measures on this issue. Similarly, while addressing undeclared work is a crucial concern for both national governments and supra-national organizations, there is currently a dearth of research on policy measures aimed at reducing undeclared work. There was a widespread belief that undeclared work would naturally diminish with economic development and modernization. However, recent scholarly recognition, as highlighted by A.M. Kedir *et al.* (2018), indicates its persistence not only in developing countries but also in developed ones. The period from 2014 to 2019 witnessed concerted efforts by the Greek government to combat uninsured employment and undeclared work. While significant strides have been made through initiatives like the ARTEMIS plan and the introduction of digital monitoring systems, challenges persist. A holistic approach, grounded in rigorous research, continuous evaluation and international best practices, is imperative. By addressing the root causes, understanding societal implications, and leveraging successful policy strategies from other nations, Greece can move toward a formalized labour market, ensuring economic growth and social security for its citizens. Thus, this paper contributes insights to the field of actuarial science, emphasizing the importance of robust regulatory frameworks in promoting fair, legal, and transparent labour markets.

Quantifying the magnitude and determinants of undeclared work presents methodological challenges, yet it is crucial for designing policy instruments that encourage declaration and deter under-reporting. Undeclared work is prevalent in household-related services, such as cleaning, childcare, and elderly care, as highlighted by the OECD (2021). Moreover, research conducted by the European Commission, Directorate-General for Employment, Social Affairs and Inclusion (2020) indicates that undeclared work is common in construction, hospitality, retail, and repair services, where taxes or social security contributions often go unreported. Various methods exist for estimating the extent of the shadow economy or undeclared work, both at macro and micro levels. Macro approaches, including the monetary transaction method, currency demand approach, income gap method, electricity approach, discrepancy method, and MIMIC estimation procedure, are discussed by

P. Dybka *et al.* (2019). However, it is important to note that macro methods tend to overestimate the size of the shadow economy, as highlighted by F. Schneider (2023), whereas micro approaches provide lower-bound estimates. L. Burgstaller *et al.* (2022) delve into survey techniques alongside experimental expansions of traditional survey approaches. They stress the absence of a single supreme method for gauging and elucidating unreported labour or the entirety of the clandestine economy. Each approach possesses its own set of advantages and drawbacks, advocating for the utilization of multiple methods whenever feasible.

Macro approaches to estimating the shadow economy and undeclared work are sensitive to their underlying assumptions and calculations. These methods often encounter the “double counting problem” because they include legally purchased material, as noted by F. Schneider and A. Buehn (2018). For instance, the MIMIC method only provides relative coefficients rather than absolute values, relying heavily on calibration procedures. It is essential to recognize that while macro approaches offer insights into overall trends of the shadow economy, they struggle to distinguish between the shadow economy and undeclared work. This limitation underscores the need for complementary micro-level approaches to provide more nuanced insights into the dynamics of undeclared work. While the substantial increase in audited businesses in Greece from 2014 to 2019 reflects a proactive regulatory approach, the fluctuations in the number of businesses with undeclared workers indicate the ongoing struggle to eradicate non-compliance entirely. The declining trend in the percentage of undeclared workers and the notable increase in fines imposed underscore regulatory success but also emphasize the need for continuous vigilance.

Furthermore, F. Schneider (2023) emphasizes that the survey technique is particularly effective in distinguishing undeclared work from other activities within the shadow economy. Recent studies, such as those by P. Elek & J. Köllő (2019), have utilized survey-based methods along with administrative data to estimate the fraction of undeclared work. However, it's important to acknowledge that survey data may be susceptible to dishonest answering behaviour, known as social desirability bias. This bias arises from respondents' concerns about self-presentation, leading them to distort their answering behaviour by omitting or lying about socially undesirable decisions. Apart from surveys, questions related to tax compliance are also investigated through laboratory and field experiments. These alternative methods provide additional insights into understanding and addressing issues surrounding undeclared work and tax evasion.

The research conducted by J. Søndergaard (2023) leverages data from the Danish Labour Force Survey combined with individual-level tax information. This methodological approach allows for the calculation of undeclared work estimates consistent with prior investigations in Denmark concerning various facets of undeclared labour. Specifically, the findings indicate that around 29% of employees engage in unreported work hours, comprising 25% of those receiving wages and 37-39% of those not receiving wages. Furthermore, the monetary worth of these unreported hours is estimated to be approximately 2% of Denmark's gross domestic product. N. Gavaille & A. Zasova (2023)

investigate how a significant increase in the minimum wage, coupled with prevalent wage underreporting, impacts employment at the firm level. They find that firms involved in evading labour taxes remain unaffected by the minimum wage surge. Instead, these firms adapt by utilizing wage underreporting as a means of adjustment, converting a portion of their previously unreported cash payments into documented wages. While raising the minimum wage enhances tax compliance, it concurrently leads to adverse employment outcomes for law-abiding firms. The work of I. Koranyi *et al.* (2018) has linked precarious work with occupational accidents, while H. Alali *et al.* (2017) have reported specific indicators of non-standard work arrangements such as shiftwork to be notably correlated with absences due to work-related accidents. These studies collectively underscore the complex interplay between labour practices and workplace safety, emphasizing the need for strategies to address these issues.

The summarized data in this study paints a comprehensive picture of the multifaceted approach adopted by Greece to curtail undeclared employment. It demonstrates the scale of regulatory actions, the prevalence of non-compliance, and the financial penalties imposed, showcasing the complexity of the issue at hand. With these insights, policymakers can continue refining strategies, ensuring a fair, transparent, and legal labour market for Greece's workforce.

■ CONCLUSIONS

In summary, the detailed examination of Greece's endeavours to combat uninsured employment between 2014 and 2019 illuminates a multifaceted terrain marked by regulatory intricacies and persistent challenges in eliminating undeclared work. The substantial upswing in audited businesses underscores the government's proactive regulatory stance, signalling a commitment to fostering equitable and legal labour markets. However, the fluctuations in the incidence of businesses with undeclared workers reveal an ongoing struggle in completely eradicating non-compliance.

While the diminishing trend in the percentage of undeclared workers and the substantial reduction in fines denote regulatory successes, they also underscore the necessity for continuous vigilance. Effectively addressing undeclared employment is an iterative process, demanding

adaptable enforcement strategies to grapple with emerging complexities. The trajectory toward a more equitable and transparent business environment is apparent, yet the resilience of informal practices underscores the persistent challenges faced by regulators. The interplay between regulatory measures and the nuanced nature of undeclared work necessitates perpetual evaluation and adaptation. The period from 2014 to 2019 witnessed a concerted effort by the Greek government to curtail uninsured employment through initiatives such as the ARTEMIS plan and the implementation of digital monitoring systems. Although commendable outcomes have been achieved, challenges persist, necessitating a holistic approach grounded in rigorous research, continuous evaluation, and the integration of international best practices.

As Greece navigates the path toward a formalized labour market, comprehensive strategies addressing the root causes of undeclared work, societal implications, and successful policy frameworks from other nations become imperative. The insights derived from this research not only contribute to the field of actuarial science but also underscore the pivotal role of robust regulatory frameworks in shaping fair, legal, and transparent labour markets. Looking ahead, policymakers and stakeholders must remain attuned to the evolving dynamics of the labour market, leveraging the lessons learned from this research to refine existing strategies and formulate targeted interventions. By doing so, Greece can continue its trajectory toward a labour market characterized by economic growth, social security, and an unwavering commitment to legal and ethical employment practices. Future research endeavours should delve deeper into the intricacies of informal labour markets within specific sectors and demographic groups, providing a nuanced understanding of the complex dynamics at play.

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■ CONFLICT OF INTEREST

None.

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Емпіричний аналіз впливу регулювання ринку праці на незастраховану зайнятість у Греції

■ **Анотація.** Вплив регулювання ринку праці на незастраховану зайнятість у Греції в період з 2014 по 2019 рік є важливим дослідженням у відповідь на поширену проблему незадекларованої праці. Зі зростанням глобалізації, динаміки ринку праці, що розвивається, головною метою цього дослідження було зрозуміти та дослідити особливості незастрахованої зайнятості шляхом аналізу даних Міністерства праці та соціальних справ Греції. Використовуючи комплексний аналіз ключових показників, дослідження мало оцінити ефективність заходів боротьби з незадекларованою працею. За допомогою статистичного аналізу проаналізовано ключові стратегії, реалізовані Міністерством праці та соціальних справ протягом зазначеного періоду, з акцентом на високих штрафах, скороченні витрат, не пов'язаних із заробітною платою, інформаційній системі ERGANI та модернізованій системі штрафних санкцій. Для відстеження тенденцій використовувалися статистичні графіки, що забезпечили ґрунтовну основу для оцінки впливу впроваджених стратегій. Застосовано кількісні оцінки, щоб запропонувати детальне розуміння контекстуальних факторів, що мають вплив на результати. Отримані результати свідчать про позитивну тенденцію, яка демонструє значне зменшення кількості незадекларованих працівників та підприємств, які не дотримуються вимог законодавства, що підкреслює ефективність впроваджених заходів. Перевірка 237 455 підприємств у Греції за період 2014-2019 років показала, що 28 044 суб'єкти господарювання (11,81 %) наймали незадекларованих працівників. Серед 812 460 перевірених працівників ідентифіковано 44 642 (5,49 %) незадекларованих, що призвело до накладення штрафів на загальну суму 468 997 663 євро в рамках боротьби з недотриманням трудового законодавства. Це дослідження не лише проливає світло на успішні стратегії, прийняті грецьким урядом, а й пропонує цінні практичні уроки для політиків у всьому світі

■ **Ключові слова:** державне регулювання; незадекларована праця; план ARTEMIS; міністерство праці; економіка праці; фінансова криза

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The first year's impact of the full-scale war on Ukrainian business

■ **Abstract.** The relevance of the research is stipulated by the need to analyse the impact of military operations on the economic environment of Ukraine, in particular on business, constituting a significant part of the Ukrainian economy. The purpose of the article was to study the first year's impact of the full-scale war in Ukraine on the state of Ukrainian business, to identify the main challenges and opportunities faced by business during the war, and to provide recommendations for stabilizing the economic environment in Ukraine. Methods of secondary information analysis have been used to obtain a generalized picture of the impact of military operations on Ukrainian business by analysing the reports of international and Ukrainian organizations. Statistical analysis has become the basis for evaluating dynamics and key economic indicators. The state of Ukrainian business during the Russian-Ukrainian war has been analysed. The impact of the conflict on business has been studied and recommendations for stabilizing the economic environment in Ukraine have been provided. The dynamics of gross domestic product from 2013 to 2022 and the negative impact of the war on the economy have been analysed. The ways of business adaptation to new conditions, direct losses of the industrial sector and new opportunities for business during the war have been studied. State aid measures to support business and strategic directions for overcoming the crisis and restoring the economy after the war have been described. The results of the study give evidence of a significant negative impact of the Russian-Ukrainian war on Ukrainian business, which

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is traced in a fall in gross domestic product, a decrease in the level of investment, an increase in unemployment and infrastructure destruction. The proposed recommendations and development strategies include the need to strengthen state support for business, stimulate investment, reform the economy to diversify and increase its resistance to external shocks. The recommendations are the result of scientific analysis and can serve as a basis for practical application by enterprises during the war and after its end

■ **Keywords:** adaptation; challenges; economy; entrepreneurship; innovations; martial law; opportunities

■ INTRODUCTION

The first year of the full-scale war hit various spheres of the national economy of Ukraine, which had a direct impact on the state of Ukrainian business. This impact is evident in huge humanitarian and economic losses as well as significant challenges that players in the Ukrainian market had to face. The study of the impact of military operations on Ukrainian business has become the subject of research of many scientists.

V. Dykan & N. Frolova (2022) identified the key directions and tools for ensuring the stable functioning of small and medium-sized business entities in wartime. In their work they looked at various strategies that can be used to ensure business stability in wartime, including various forms of financing and investment. O. Panukhnyk (2022) proved that the complex of realized and potential risks in the Ukrainian business environment is increasing, which cannot be compensated by direct state funding. She studied various risks caused by the war and their impact on the business environment. This research is relevant as it helps businesses better understand the risks associated with military operations.

T. Melnyk (2023) singled out financial instability, reduced market demand, increased risks and losses, insufficient access to financial resources and reduced investment attractiveness among the main problems faced by Ukrainian business during the war. The author examined various factors influencing the stability of business in the conditions of war and proposed possible solutions to overcome them. The study provides practical recommendations for businesses facing the challenges of wartime. T. Murovana (2023) concluded that the business sector of Ukraine is vulnerable to war events. Big business shows greater resilience, while small and medium-sized enterprises (SMEs) suffer significant losses. She studied the war impact on different sectors of the economy and concluded that large companies are better adapted to war conditions than SMEs. This research helps to understand how hostilities affect different sectors of the economy. In their scientific works, the above-mentioned authors analysed directions aimed at the recovery and stabilization of business in wartime conditions and pointed out the barriers, preventing the recovery of entrepreneurial activity. Research is important for understanding the impact of military operations on Ukrainian business and finding ways to adapt to these conditions.

Sectoral studies of the war impact on business and economy as a whole have also been conducted. For example, O. Koba (2022) considered the impact of the war on the construction business and pointed out the importance of this industry, which plays a key role in the restoration of the damaged infrastructure. Researcher studied the war impact on the construction sector and suggested strategies for post-war recovery. V. Danylenko-Kulchytska (2022)

examined in detail the changes, taking place in the field of hotel and restaurant business and proposed possible strategies for its recovery. T. Omelchenko (2022) raised an important question of Ukrainian enterprise competitiveness in the conditions of the war and suggested ways to increase it after the victory in the war. This study looked at factors, affecting the enterprise competitiveness in wartime conditions and proposed strategies to overcome them. Y. Zavodnyi & O. Stakhiv (2023) focused on the impact of war on women's entrepreneurship in their study. They examined the war impact on women entrepreneurs, their opportunities and challenges they face and provided recommendations for protecting their businesses in wartime, including adaptation and survival strategies.

Y. Redziuk (2023) focused on the conditions, problems and factors inhibiting the development of business activity in Ukraine. The author analysed the war impact on business environment, obstacles preventing entrepreneurship development and formulated proposals for improving the system of business activity development in the Ukrainian socio-economic environment, including recommendations for policy, legislation and infrastructure. O. Moskalenko (2022) raised the issue of Ukrainian enterprise competitiveness in the conditions of the war and proposed ways to increase the competitiveness of Ukrainian companies after the end of the war. The author considered factors affecting competitiveness in war conditions and proposed strategies to overcome them.

The purpose of this work was to identify main challenges and opportunities faced by Ukrainian business due to the Russian-Ukrainian war and to provide recommendations for the successful stabilization of the Ukrainian economy. Although there is a number of scientific papers on the given topic, the present research focuses particularly on studying the war impact on Ukrainian business and formulating specific recommendations for ensuring stability and development of the economy in the conditions of the conflict as well as giving advice on restoring economic stability according to the analysis. This will help to determine a strategic course of actions for enterprises and Ukrainian authorities in order to reduce negative war consequences and preserve the economic stability of the country. The scientific novelty of this paper is stipulated by the integration of fresh data and expert conclusions in the study of the first year's war impact on Ukrainian business.

■ MATERIALS AND METHODS

The study the first year's impact of the full-scale war on Ukrainian business has been conducted using various materials and methods. The application of secondary data has contributed to a general understanding of the impact of the Russian-Ukrainian war on Ukrainian business. These data

have been gathered from various sources, including reports from international and Ukrainian organizations, the Centre for Economics and Business Research (CEBR), the World Bank, the National Bank of Ukraine (NBU), as well as reports from Ukrainian economic research institutions. The analysis of these reports provided information on the impact of the war on the global economy, including a decline in economic growth, an increase in inflation, an increase in energy and raw material prices, supply chain disruptions and logistics challenges. The consequences of the war for Ukraine have also been identified, including a fall in gross domestic product (GDP), a decline in business investment, an increase in unemployment, the destruction of critical infrastructure and overall changes in the economy structure.

The statistical data obtained from the reports made it possible to analyse changes in production indicators, investments, employment and other macroeconomic indicators. This allowed us to obtain specific digital data for analysing the war impact on the economy. In particular, the reports of the NBU have been used. Such sources provided accurate information about the country's economic state – the inflation rate, GDP indicators and other economic indicators. The report of the Kyiv School of Economics on direct damage to infrastructure from the destruction caused by Russia's military aggression against Ukraine indicates the scale of destruction during the first year of the war (Report on direct damage..., 2022). These reports are valid sources as they provide verified and relevant information. The data are important for understanding the consequences of military conflict and its impact on the country's economy as well as long-term consequences for its development.

The works of other scientists have also been used to analyse the situation. Previous studies and analyses have provided valuable insights and the basis for understanding the impact of military conflicts on the economy. Monitoring of news publications and social editorials made it possible to analyse the reaction of business to the war and its adaptation to new conditions. Analysing the activity of Ukrainian enterprises using the method of wartime analysis made it possible to study certain instances of the war impact on business. As a result, cause-and-effect relationships have been discovered between various events associated with a full-scale war. The abstract-logical method made it possible to gain a deeper understanding of the impact of the Russian-Ukrainian war on Ukrainian business and to provide recommendations for overcoming and optimizing the crisis after the war ends on the territory of Ukraine and to draw major conclusions of this study. Due to a comprehensive approach and the use of various data sources and several methods of analysis, the study made it possible to comprehensively assess the first year's impact of the full-scale war and develop main recommendations for the recovery of the Ukrainian economy.

■ RESULTS

With the beginning of the Russian aggression against the Autonomous Republic of Crimea and the Donetsk and Luhansk regions in 2014, the economy of Ukraine, despite significant losses, was relatively stable and quickly moved from the phase of crisis to the phase of recovery growth. In 2013, during the Revolution of Dignity, it was forecasted that the economic situation in Ukraine would be very

unstable. The growth of the Ukrainian GDP in 2013 was equal to zero. The country's government of that time predicted a reduction of the Ukrainian economy in 2014 by 3%, and in the middle of 2014 new government officials, international financial organizations and experts made a different forecast, which was worse than the previous one: a reduction of Ukraine's GDP by 8-10%. Later the situation began to improve, a fall in GDP to 6-6.5% was calculated. In the third quarter of 2014 the State Statistics Service of Ukraine provided data on the fall in Ukrainian GDP, which amounted to 5.1% compared with the last year. Industrial production fell by 9.4%, whereas agriculture and its output increased by 7.5% (Zanuda, 2014).

In 2022, Russia invaded the territory of Ukraine, which will lead to long-term consequences. According to the NBU, the real GDP of Ukraine decreased by 29.1% in 2022 (NBU commentary..., 2023). The NBU reported this indicator to be the deepest annual decline in the economy in the entire history of Ukraine. However, the indicator turned out to be better than predicted: at the beginning of the invasion experts expected a drop in GDP of 40-50% (Ministry of Economy preliminarily estimates..., 2023). According to data presented by CEBR (2022), due to the confrontation with Russia during 2014-2020 Ukraine did not produce output worth 280 billion US dollars. This is approximately 40 billion dollars in losses every year, which is almost 20% of the country's pre-conflict GDP. As it was reported on the 10th of February 2022, the loss of Crimea in 2014 cost Ukraine 58 billion dollars in GDP, while the ongoing conflict in Donetsk and Luhansk regions resulted in annual losses of 14.6 billion dollars from 2014 to 2020. The annexation of Crimea in 2014 cost Ukraine approximately 8.3 billion US dollars annually.

Despite the difficult circumstances in which Ukrainian companies have found themselves due to military aggression, most of them keep on looking for ways to continue their activities. Kyivstar Business Hub Association has conducted a study of the state of Ukrainian business during the war: How medium, small and large companies feel (2022). Based on the analysis and data collection by the association, the following results were obtained – until August 2022, the majority of micro-companies worked with some restrictions (42%), 20% of them worked without any changes in their activities, 8% were forced to suspend their activities, 17% are resuming their work, and 5% are only planning to do so. 7% of micro-companies had to completely stop their activities. As far as small businesses are concerned, 50% are operating with restrictions, 25% are continuing to operate without any changes in their activities, 15% are resuming their work, 2% are in the planning phase of recovery, 5% have suspended their operations, and 4% have completely ceased operations. More than 50% of medium-sized companies work with restrictions, 33% continue to work in their usual mode, 11% are in the process of resuming their activities. Only 1-2% of them were forced to complete stop or temporary suspend their activities. As for large companies, the operation of about half of them (49%) has not changed, 31% have implemented restrictions, 4% have closed their business, and the other 4% have temporarily suspended their activities. Nevertheless, 7% of companies are resuming their activities and 3% are considering this possibility. Overall, the bigger the company is,

the easier it is to adapt to the crisis. Most companies use a combined mode of operation, including online and offline formats. This model works in 55% of medium-sized, 52% of large, 45% of small enterprises and 41% of micro-companies. A third of companies do business only offline. 20% of micro-companies, 12% of small companies, 10% of medium-sized companies and 20% of large companies work remotely. The smallest number of companies work partly from abroad: 5% of micro-companies, 1% of small companies, 1% of medium-sized companies.

Also, according to the results of the first 6 months of 2023, 12.8% of enterprises have almost ceased operations. In terms of the size of enterprises, 9% of micro-enterprises point out an increase in business results during 6 months of the current year and 22.7% of enterprises indicate compliance with expectations (The state and needs of business..., 2023). Advanter Group and the League of Business Clubs of Ukraine have conducted a study of Ukrainian business during military operations using an online survey method (Kulbachnyi, 2022). Direct losses of small and medium-sized businesses in Ukraine during the first two weeks of the war are estimated from 30 to 60 billion US dollars, including those that suffered losses due to relocation, reduced work volumes and ceasing operations. Losses of Ukraine's GDP due to business relocation are estimated at 9%. At the same time, 9% of SMEs in Ukraine have completely or partially stopped their activities. 2% of Ukrainian enterprises have already relocated, 7% of enterprises are in the process of relocation, 12% have partially relocated, 31% have not managed to relocate and 48% find relocation senseless.

The data given below are calculations of the Kyiv School of Economics (Report on direct damage..., 2022). The data interpret information on direct losses of the industrial sector of Ukraine caused by the war. In the study area, large and medium-sized private enterprises suffered 5,270 cases of damage, while small private enterprises and individual entrepreneurs – 78,060. State enterprises suffered as well and they amount to 1,665. Overall, 14 large and medium-sized private enterprises, as well as 18

state enterprises have been destroyed. Estimated losses in US dollars are 4.7 billion for large and medium-sized private enterprises, 2.1 billion for small private enterprises and individual entrepreneurs and only 0.2 billion for state-owned enterprises. As far as damaged facilities are concerned, 30 cases are registered among large and medium-sized private enterprises and 330 cases among state-owned enterprises. Direct asset losses in US dollars account for 1.6 billion for large and medium-sized private enterprises and 0.7 billion for state-owned enterprises. On the whole, 44 objects of large and medium-sized private enterprises and 348 state-owned enterprises have been damaged. Asset losses amount to 6.3 billion for large and medium-sized private enterprises, 2.8 billion for small private enterprises and individual entrepreneurs, and 0.8 billion for state-owned enterprises.

Ukrainian enterprises affected by the war can be conventionally classified into two categories. The first category – enterprises that were destroyed or damaged as a result of shelling of military facilities and populated areas. The majority of such enterprises are either located in areas adjacent to the front line or are in active combat zones. However, there is a large number of damaged enterprises throughout the territory of Ukraine, which were destroyed on purpose or were damaged by debris. The second category – enterprises that were deliberately hit as part of strategic missile attacks. These are mainly objects of transport and energy infrastructure, as well as military and dual purpose production. These facilities are damaged throughout Ukraine.

The data given in Figures 1 and 2 are calculations of the Kyiv School of Economics, namely the report on the destruction of certain objects (Report on direct damage..., 2022). Open data provides information on the most affected industrial assets. Figure 1 shows that the most affected industries are metallurgy (mostly concentrated in Zaporizhzhia), machine building and oil refining. These industries suffered the largest financial losses. Figure 2 shows the TOP-10 companies that suffered losses resulting from military operations.

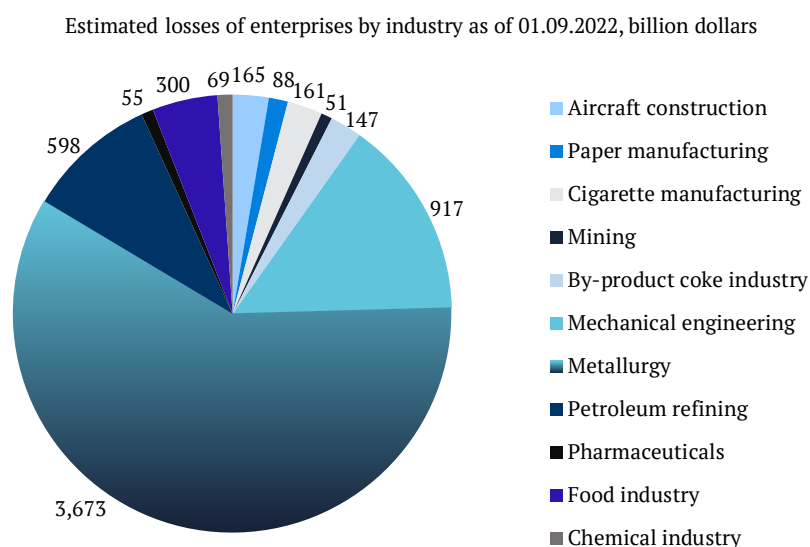


Figure 1. Enterprise cost estimation by industries

Source: developed by the authors based on the Report on direct damage to infrastructure from the destruction caused by Russia's military aggression against Ukraine as of September 1, 2022 (2022)

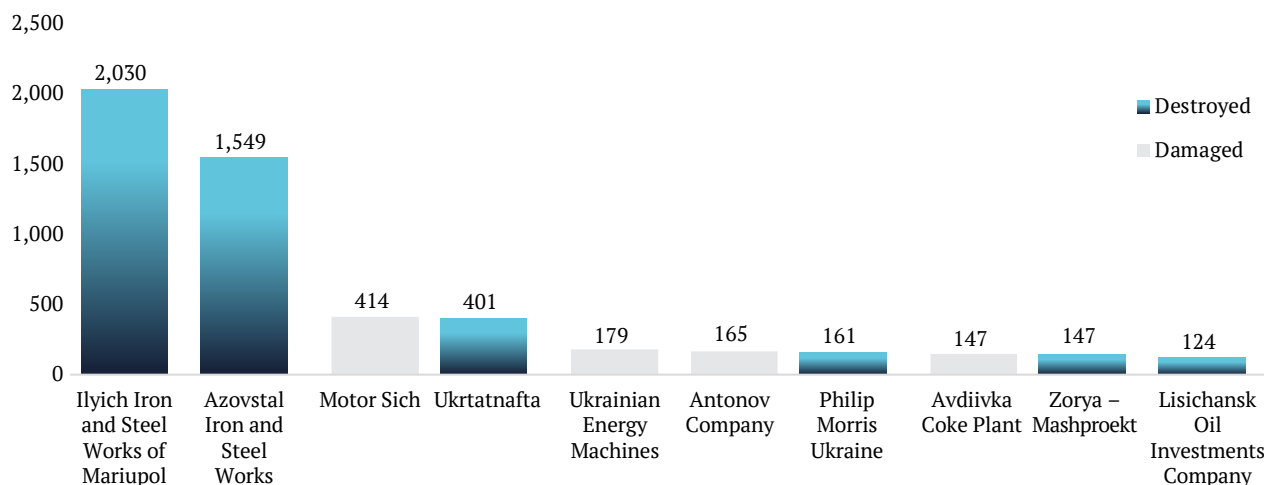


Figure 2. TOP-10 Ukrainian enterprises that suffered the biggest damage, billion dollars

Source: developed by the authors based on the Report on direct damage to infrastructure from the destruction caused by Russia's military aggression against Ukraine as of September 1, 2022 (2022)

The full-scale war in Ukraine caused significant damage to the economy and society. During the war Ukrainian business faced a number of challenges, including reduced production due to limited access to resources and markets, currency instability and increased security costs. Incurred revenue loss and business risk have also increased due to the threat of armed conflicts and the unpredictability of the economic environment. As a result of the military aggression, the infrastructure of Ukraine suffered significant damage, which continues to increase. Logistics problems related to the operation of ports, transport networks and energy infrastructure continue to negatively affect the economy and the daily life of the civilian population. Ukrainian entrepreneurs show extraordinary perseverance and entrepreneurial spirit in wartime. They look for new markets and implement innovative approaches to remain competitive. Restructuring and modernization of enterprises, as well as cooperation with partners and authorities, are becoming important factors for their success.

The loss of critically important seaports, in particular Mariupol, and the blockade of the Black Sea coast have led to the inability of mass export of agricultural and metallurgical goods. Although there was some increase in agricultural exports through seaports in August due to the grain corridor, their volume is approximately 30% lower than in 2021. Most of destroyed and damaged enterprises are concentrated in six regions: Kyiv and Donetsk (17% of the total number), Zaporizhzhia (14%), Kharkiv (13%), Luhansk (10%) and Mykolaiv (8%). According to the report on direct damage to infrastructure from the destruction caused by Russia's military aggression against Ukraine issued on the 1st September 2022, the largest enterprises that suffered direct damage are the Ilyich Iron and Steel Works of Mariupol, Azovstal, Motor Sich.

The recovery of Ukraine's economy after the war will not be an easy task. The government of Ukraine is making efforts to restore destroyed enterprises and find new ways to export goods. However, even if these measures are successfully implemented, the economic consequences of the war will be experienced in Ukraine for many years to come. In 2022 consumer prices rose by 26.6%, and Ukraine's

economy suffered the biggest losses in its independent history due to Russian aggression (Lozova & Popova, 2022). The GDP of the country decreased by 30.4% according to the results of 2022 (Ministry of Economy preliminary estimates..., 2023). In December 2022, annual consumer inflation accounted for 26.6% and remained without particular changes when compared with the rates of price growth in November (26.5%) and October (26.6%). In monthly terms, prices increased by 0.7%. The NBU predicted that despite the war inflationary processes in Ukraine would remain under control and a moderate slowdown in inflation was predicted in 2023 (NBU 2022 inflation update, 2023). This will be facilitated by a consistent economic policy with the support of international partners and a slowdown in world inflation. According to the World Bank (2022), the next indicator of consumer inflation was set for 2023, an approximate indicator at the level of 19%, and 8.4% for the year 2024.

According to the NBU forecast, inflation will decrease to 10.6% in 2023 and real GDP will increase by 2.9%. The inflation report of the NBU claims that inflation will continue to slow down in the coming years and economic recovery will accelerate (National Bank of Ukraine, 2023a). However, the October 2023 inflation report suggests an improvement in the inflation forecast for the end of 2023 from 10.6% to 5.8% (National Bank of Ukraine, 2023b). The main factor in the revision of the inflation forecast is the impact of high harvests on the dynamics of food prices. At the same time, the NBU increased the inflation forecast for 2024 from 8.5% to 9.8%. And in 2025, inflation is predicted to slow down to 6%. The NBU improves the forecast of real GDP growth in 2023 from 2.9 to 4.9%.

However, even under the most difficult circumstances, people are able to find new opportunities for development and new opportunities have opened up for some sectors of the economy. This also applies to business. Such sectors include the defence industry, which is seeing an increase in orders, as well as companies that make public safety goods such as fencing. The defence sector is the one, which can experience a rapid growth. Currently, the need for defence products is growing, so companies working in this field have a unique chance to develop. In wartime there is

a growing demand for products to ensure public safety and health. This applies to goods such as protective clothing, medical equipment and food.

Also, the war led to problems with maritime logistics, which complicates traditional exports. However, it has also created new opportunities for transshipment companies. For example, the construction of a border transshipment terminal has begun on the Ukrainian-Romanian border, which will allow easy transfer of goods, especially grain, from Ukrainian trains to European narrow-gauge trains. Such a terminal will provide an additional opportunity for the delivery of Ukrainian products to Europe, even if sea routes remain blocked (Naumov, 2023). Moreover, the war can be a catalyst for technological progress. It can lead to the acceleration of the development and implementation of new technologies, for example, in the field of cyber security. The crisis can stimulate local manufacturers and suppliers to reorient. This can contribute to the strengthening of local economy. According to research by the COI marketing agency, 10 promising business areas during the war (2022) have been identified: light industry; agriculture; funeral services; construction materials and services; tourist goods; rehabilitation centres; insurance companies, security systems; online stores; stock goods; import substitution.

Martial law provides for the government to take an active position in supporting national business to ensure its stability. One of the ways to do this was the introduction of a program aimed at relocating companies to a safer area away from the war zone. From February to September 2022, 725 companies were able to relocate to the west of Ukraine (Ratushniak, 2022). These figures may not seem high for a six-month period of war but they result from difficulties in logistics, financing, equipment transportation and differences in regional infrastructure. In March 2022 Ukrainian authorities began to actively encourage entrepreneurs to start business and resume operations, which will contribute to the revival of the country's economy (Lozova & Popova, 2022). To execute the order of President Volodymyr Zelenskyi, the government formed a package of measures aimed at supporting Ukrainian business during the war. In his video message, Prime Minister Denys Shmyhal announced that individual entrepreneurs belonging to groups I and II will be exempted from paying the Social Security Contribution (SSC) during martial law and a year after its end (Denys Shmyhal: Government has shaped..., 2022). It was also announced that private enterprises and individual entrepreneurs of the IIIrd group will be exempted from paying SSC for their employees recruited to the Armed Forces of Ukraine and other armed formations financed by the state. Moreover, a new single tax rate of 2% instead of 5% was introduced for the third group of individual entrepreneurs, which can be chosen by both existing and newly created private enterprises. The prerequisite for this rate is an annual income below UAH 10 billion. Payers of this group are exempt from paying value added tax except for import value added tax.

By paying taxes, business provides funding for the state budget, creates jobs and supplies population with necessary goods and services. Thus, business performs an important social function. In order to reduce the financial pressure on companies, the government provides benefits for using state assets, which is especially relevant during the war, since the cost of buying or renting property is high and

real estate prices in the western regions of Ukraine have increased significantly. Since July 2022 the state has offered the "eRobota" program providing for non-refundable grants for opening a private business. From the beginning of the program until October 2022, 1,704 grants were issued for a total amount of about UAH 400 million (eRobota: The state invested..., 2024). This has not only helped to support small business in the current circumstances but has also contributed to the labour market stability as new companies create new jobs, helping to avoid the outflow of labour abroad. An important step was the continuation of the "Affordable loans 5-7-9%" program, which contributed to granting 13,843 soft loans worth UAH 55.26 billion during martial law (Ministry of Finance: During martial law..., 2023). Another decision of the government was to expand this program for companies suffering from the war and being either partially or completely destroyed. Now they can receive the state support in the form of interest reimbursement for loans received for the restoration of production.

Cooperation between business and the government is a necessary prerequisite for the economic growth of the country. A joint effort can contribute to solving problems arisen in Ukraine in 2022. In order to achieve this goal, business must continue to develop and invest in the economy and the government, in its turn, must create optimal conditions for work and constantly help entrepreneurs stay in business. Active interaction between the commercial sector and the government and full support of Ukrainian industry are crucial for Ukraine's victory. Ukrainian companies must adapt to new conditions and opportunities, taking into account the geographical location. Unquestionable support from the government and the international community for the benefit of Ukrainian industry and people is a significant incentive for the victory and creation of a new stage of economic growth of Ukraine as the impact of Russian's full-scale invasion into Ukraine in 2022 has led to significant economic upheavals.

To overcome the post-war crisis, the state should focus its attention on the following strategic directions (Ukrainian Institute for the Future, 2022). Export recovery of major commodities such as grain, ore and metal. First of all, this will lead to an increase in currency inflows to the country, which will have a positive effect on the country's economy. For its recovery, it is necessary to create infrastructural opportunities for exports, in particular, through the involvement of alternative routes, such as rail and road. It is necessary to restore railway tracks that were damaged during the war, as well as to build new railway lines that will connect Ukraine with its partners in Europe and Asia. It is also worth developing road transport to ensure the possibility of exporting goods through Poland, Romania and other countries.

Protection of the domestic producer and fight against imports. The war in Ukraine led to an increase in the prices of imported goods. This had a negative impact on Ukrainian manufacturers, who could not compete with imported goods. Therefore, protecting the domestic producer and fighting against imports provides for the creation of new modern production facilities using advanced technologies, which will allow Ukrainian producers to produce competitive products, as well as the support for Ukrainian food producers. The introduction of import restrictions for

goods produced in Ukraine is not an exception and it will be able to protect Ukrainian production from unfair competition on the market.

Infrastructure restoration. To restore the infrastructure, it is necessary to clear the territories of mines and other explosive objects, as well as restore critical infrastructure in the liberated regions. Clearing the territories of mines and other explosive objects is a priority task as part of the Ukrainian business has lost its territories. These measures are necessary to ensure the population safety and economic recovery as some enterprises were forced to relocate to resume operations, while others ceased their activities. Critical infrastructure restoration also includes: roads, bridges, power grids, water supply and sewerage. These recommendations are important for the recovery of the country's vital activities. Infrastructure restoration will require significant investment, thus international assistance should be attracted and government programs stimulating investment should be introduced.

Financial system renewal. The main task of the banking system after the war is to return to crediting of the economy. It is necessary to introduce a cashless payment infrastructure, develop and implement a strategy for managing non-performing loans, develop mortgage lending and loans for infrastructure restoration, as well as to attract foreign financial institutions. The renewal of the financial system will contribute to the creation of a favourable environment for business by facilitating access to credit and improving financial stability.

The development of the agricultural sector is an important part of preventing global food shortages and rising prices. In order to resume work in the agricultural sector, it is necessary to clear agricultural lands of mines, provide available loans for technical re-equipment of production and development of agricultural products processing, introduce programs to support small agricultural producers and significantly increase quotas for duty-free export of agricultural products to EU countries.

Solving the demographic crisis and labour market problems. First, it will be necessary to retrain personnel, conduct an information campaign to support a profession change with financial incentives from the state, provide state subsidies or interest-free loans for businesses when creating new jobs, as well as implement programs for providing housing to citizens based on the employment contract signed with the enterprise.

Transformation of the IT sector. Ukraine has a significant potential in the IT sphere due to a large number of talented IT specialists. The development of high-tech companies and start-ups indicates the strong growth of this industry. The availability of skilled labour and a high level of technical education contribute to the advancement of the IT industry. There is a noticeable trend of strengthening international cooperation and openness to foreign investments. To this end it is necessary to ensure state investments in IT education, maintain comfortable tax legislation, support the development of food companies and startups, create a comfortable and safe external environment, and adhere to the protection of human rights.

To rebuild a sustainable economy in the country, active actions should be taken in the following directions. **Deregulation of economies:** in wartime and post-war

reconstruction, it is necessary to simplify business activity as much as possible to stimulate entrepreneurship. It can be done by reducing bureaucratic procedures, reducing a tax burden and liberalizing the conditions of foreign economic activity. **Diversification of the economy:** Ukraine needs to diversify its economy in order to reduce its dependence on the export of raw materials. It can be done through the development of high-tech sectors of the economy such as IT, mechanical engineering, as well as agro-industrial complex and others. **International cooperation:** it is worth intensifying international cooperation to obtain financial and technical assistance in the recovery of the economy. It can be done through the cooperation with international financial institutions such as the International Monetary Fund and the European Bank for Reconstruction and Development, as well as with partner countries. **Innovative entrepreneurship:** for the development of Ukrainian business it will be important to focus on the development of innovative entrepreneurship, which is the basis for long-term economic growth. To this end it is necessary to ensure access to financing for startups and small businesses, develop the infrastructure of technology parks and incubators, and create a favourable environment for the introduction of innovations.

Investment growth: in order to increase the number of investments, it is necessary to introduce a favourable investment climate, which provides for the protection of property rights, legislation transparency and access to modern infrastructure. **Focusing attention on regional development:** this, in turn, will help to ensure the even development of all regions of Ukraine in order to avoid increasing disparities. It is necessary to introduce regional development support programs aimed at creating new jobs, developing infrastructure and improving the quality of life in regions. **Increasing the level of public trust in the state:** to ensure the successful implementation of reforms and economic recovery projects, it is necessary to increase the level of public trust in the state. It can be done by ensuring transparency and accountability of the government, as well as protecting the rights of citizens.

The results of the study suggest a sharp drop in Ukraine's GDP, investment reduction trend in business and an increase in the unemployment rate. Many enterprises suffered destruction and loss of fixed assets, others were forced to convert their production to military purposes. At the same time, some industries, in particular the IT sector, were able to successfully adapt to new operating conditions and even increased their export of services. International financial assistance and investments are expected to contribute to a quick recovery of the economy as soon as the active war phase ends. Infrastructure restoration, entrepreneurship stimulation and favourable investment climate creation should become priority tasks for the government. It will also be necessary to provide support to enterprises that survived the war but found themselves in a difficult financial situation due to its consequences.

■ DISCUSSION

The results suggest a debatable question: how will the war in Ukraine affect the development of small and medium-sized businesses in the long term and what are the prospects for business after the war ends. The answer to

this question depends on a number of factors, in particular, on the duration of the war, infrastructure restoration, changes in the geopolitical environment, etc. A large number of scientists conduct research in order to give the most accurate answer to this question.

T. Melnyk (2022) points out the following: stabilization of the business climate and reform of the state regulation system of business activity are the main tools of economic development under martial law. For this purpose it is necessary to do the following: to develop and implement temporary easy requirements and support for business; to continue to provide support to business entities, in particular by creating the appropriate legal framework, financial and credit, material and technical support, scientific and methodological, informational and advisory, human resources support for business; to create equal opportunities for small, medium and large business entities to have access to business support and stimulation programs introduced by the government; to monitor the effectiveness of the use of budget funds provided for the implementation of the specified programs; to ensure openness and transparency of state support procedures. The author's findings correlate with the results obtained in the present article.

The opinion regarding the development of Ukrainian agribusiness aligns with the work of Y. Luchehko & A. Gordiichuk (2023), which focuses particularly on stimulating the country's agricultural complex during the war. The authors suggest conducting active diplomatic activities for successful selling on the EU market. They also make an interesting proposal to develop industries related to agribusiness, i.e. those which are not directly related to the agricultural sector but contribute to the success of agrarian firms. The authors also stress the importance of demining Ukrainian territories for the country's economic recovery. O. Chernysh et al. (2023) point out that the war provides for reconsidering strategic priorities of economic development and formulate major current priorities: ensuring security, mobilizing resources, economy diversification, attracting investments and international cooperation, social events; as well as post-war priorities: restoring the pre-war level of GDP, renewing the economic structure, developing the technological sector of the economy, promoting the opening of new markets for Ukrainian goods and services, improving the efficiency of public administration, developing infrastructure and technologies to support a smart economy. The article is a good basis for understanding the economic situation of Ukraine in wartime and is statistically meaningful.

Summarizing the ideas of the scientific work of O. Zolotova et al. (2023), it is necessary to implement the following steps to overcome the post-war crisis: to introduce effective reforms, in particular in the field of economy deregulation, fight against corruption and protection of property rights; to attract investments, in particular from Europe; to modernize the economy, in particular through the development of digital technologies. O. Kazak & M. Sulyma (2023) have proved that the increase in prices for raw materials and the decrease in demand for products, the increase in the exchange rate of foreign currencies, interruptions in the supply of communal services, difficulties in transportation, dangerous working conditions and staff remuneration are the current key problems for business. A number of scientists share these ideas as they reflect

reality of the year 2024. O. Kniazieva (2022) points out that, first of all, it is worth investing in innovative technologies to strengthen the country's defence and economy. The obtained new technologies could be used to develop new weapons, as well as to improve the standard of living. D. Levchynskiy et al. (2022) believe that the state should provide financial, expert and consulting assistance to business, as well as promote the restoration of supply chains and the search for foreign partners. The present article also emphasizes the importance of providing financial support to entrepreneurs in order to ensure stable functioning and further development of business.

A. Mostova (2023) conducted a study on the main factors affecting the rapid development of electronic business in Ukraine, as well as on current problems and directions of further development of this sector. The study analyzes the invasion and its impact on purchasing power and e-commerce volumes in the country. Taking into account the crisis in the national economy and other factors, the research identifies problems such as the disruption of logistics chains, problems with the digital infrastructure and transport system, internet scam, legislative and legal deficiencies. In addition, the study substantiates the main directions for further development of electronic business in the context of European integration processes. The study suggests one of the promotion channels for the current business and, unlike this article, considers e-commerce.

K. Tomej et al. (2023) in their study of Ukrainian tourism business point out that tourism enterprises, like many others, as a rule are not prepared for such unpredictable challenges as war. However, tourism enterprises can successfully transform their activities and adapt to new conditions if the authorities understand the important role of organization in the society, strengthen relations with interested parties (e.g., employees, customers, partners), see the perspective of business innovation and expansion and as a whole are optimistic about the future. The authors point out that the organizational stability of small and medium-sized tourism enterprises is based on the personal stability of managers, as well as on their relations with the enterprise. This aspect is particularly important for recovery strategies for war-affected areas.

In their study K. Obłój & R. Voronovska (2024) provide four key recommendations on managerial responses to crisis situations. It is recommended to consider every crisis as an opportunity to learn and prepare for future unfavourable circumstances. Emphasis is placed on the use of business continuity plans, which should be considered as an effective means of reducing initial resistance to potential threats. The authors emphasize the importance of prioritizing key actions, initiating quality corrective measures and avoiding irrelevant interventions. The fourth step is to recognize the possibility of long-term crisis effects, which provides for the need to develop long-term plans taking into account both the expected threats and the opportunities for recovery and development. The development of long-term recommendations for business was the basis for the present article.

Considering the examples of other countries, it is necessary to single out Israel as one of the countries at war. V. Kudlai (2018) points out that one out of ten new Israeli businesses remains on the market after one year and no more than 35% of businesses remain on the market after

10 years of starting a business and 60% of new businesses do not employ labour force. The share of small businesses is almost 99% of the total number of enterprises. Taking into account the fact that Israel has been in an armed conflict for more than 75 years, it can be argued that small and medium-sized business operation depends directly on the conditions of the external environment, and such factor as war has a direct and immediate impact on business. Despite the challenges posed by war, businesses can find ways to adapt and continue to operate. However, this requires flexibility, resources and strategic planning.

As a whole, most scientists make the same forecasts. However, it is still impossible to make an exact forecast of the war impact on the development of small and medium-sized businesses in a long-term perspective, as Russian aggression can lead to a new unpredictable negative factor in the macro environment, which in turn can cause damage to enterprises. It is obvious that the Russian-Ukrainian war has already had a significant impact on the Ukrainian economy and will affect all sectors of the economy in the future, including small and medium-sized businesses.

■ CONCLUSIONS

Ukrainian business is a full-fledged part of the country's economy, which has been under the influence of Russian-Ukrainian war since 2014. It has its consequences: the conflict has not only caused a humanitarian crisis and loss of human life but also significant economic losses for the country, which led to significant challenges and risks for various sectors of the economy that had to adapt to new constantly changing operating conditions resulting from the war. The results of the study suggest a significant role of the Russian-Ukrainian war in shaping the economic situation in Ukraine, leading to serious challenges and business risks. Despite this, Ukrainian entrepreneurs have the opportunity to adapt and find new ways of development. It has been discovered that Ukrainian business is able to change its orientation towards increasing the number of domestic consumers and demand for Ukrainian goods, increasing government orders for defence sector enterprises, and reducing dependence on external factors, which is of great importance.

To improve the economic situation of Ukraine it is necessary to constantly monitor data and analyse macroeconomic indicators. The results of the analysis suggest that

among the priority tasks are the restoration of damaged infrastructure and business support to create new jobs and reduce unemployment. It is also important to take into account the experience of other countries in overcoming crisis situations and involve foreign partners in the development of programs to improve the country's economic condition. Attracting international partners, using the experience of other countries and focusing on digitization are key factors for the success. Moreover, it is extremely important to support small and medium-sized businesses and stimulate their development and provide financial resources.

In the conditions faced by Ukraine, it is important not only to respond to challenges, but also to create new opportunities and prospects for Ukrainian business. Entrepreneurs should understand that apart from threats the war has brought about opportunities to change the company's strategy for its better development, identify weaknesses and eliminate them. The war can contribute to the creation of new business models different from the previous ones, as well as the introduction of innovations into existing business systems. Joint efforts of the state, business and the international community are necessary to overcome economic challenges and create a sustainable and prosperous future. Ukrainian entrepreneurs should focus on strategic planning, flexibility and innovation, adapt to changes and look for new opportunities. For a more detailed disclosure of this issue, it is worth conducting future research based on the experience of other countries in overcoming crisis situations and analysing the impact of the crisis on international economic relations in Ukraine. The study of these issues will contribute to providing more detailed recommendations for business and understanding steps to be taken in wartime.

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■ CONFLICT OF INTEREST

None.

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Вплив першого року повномасштабної війни на український бізнес

■ **Анотація.** Актуальність дослідження полягає в необхідності аналізу впливу військових дій на економічне середовище України, зокрема на стан бізнесу, який займає значну частку української економіки. Метою статті було дослідити вплив першого року повномасштабної війни в Україні на стан українського бізнесу та виявити основні виклики та можливості, з якими зіткнувся бізнес під час війни, та надати рекомендації для стабілізації економічного середовища в Україні. Для дослідження використовувалися методи аналізу вторинної інформації, які дозволили отримати узагальнену картину впливу військових дій на український бізнес шляхом аналізу звітів міжнародних та українських організацій. Статистичний аналіз став основою для оцінки динаміки та ключових економічних показників. Розглянуто стан українського бізнесу під час російсько-української війни. Досліджено вплив конфлікту на бізнес і надано рекомендації для стабілізації економічного середовища в Україні. Проаналізовано динаміку валового внутрішнього продукту з 2013 по 2022 рік і негативний вплив війни на економіку. Розглянуто адаптацію бізнесу до нових умов і прямі втрати промислового сектору, нові можливості для бізнесу під час війни. Описано заходи державної допомоги бізнесу і стратегічні напрямки для подолання кризи та відновлення економіки після війни. Результати дослідження вказують на значний негативний вплив російсько-української війни на український бізнес, який проявляється в падінні валового внутрішнього продукту, зниженні рівня інвестицій, зростанні безробіття та руйнуванні інфраструктури. Запропоновані рекомендації та стратегії розвитку включають у себе необхідність посилення державної підтримки для бізнесу, стимулювання інвестицій, реформування економіки з метою диверсифікації та підвищення її стійкості до зовнішніх шоків. Рекомендації є результатом наукового аналізу та можуть служити основою для практичного використання підприємствами під час війни та після її завершення

■ **Ключові слова:** воєнний стан; економіка; підприємництво; можливості; виклики; інновації; адаптація

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Effects of trade and financial openness on inflationary pressure in Nigeria

■ **Abstract.** The continuous rapid upsurge in inflationary pressure in Nigeria amidst the gradual liberalisation of the country's trade and financial market calls for questioning of the role of trade and financial openness in the inflationary trend in Nigeria, which makes the research on this issue relevant. The purpose of this study was to determine the effects of trade and financial openness on inflation in Nigeria. In the estimation of the model built to capture the objective of the study, the fully modified ordinary least squares was employed based on the data collected from the World Development Indicators covering the period of 1981 to 2023. The results showed that trade openness and exchange rate exerted a significant negative effect on inflation in Nigeria while exchange rate showed a significant positive effect. The study concluded that financial openness had a positive significant effect on inflation while trade openness and exchange rate exerted a significant negative effect. The need for government to review their foreign trade policies in such a way that the importation of both finished and intermediate goods and services from the rest of the world can be significantly reduced by boosting local production was recommended. The study offers two-folds contributions. It provides new information on the factors that determine inflation and it specifically shows the nexus among trade and financial openness. The findings therefore revealed that higher trade and financial openness raises inflation implying openness-induced inflation. The findings from the study will be of practical value to policy makers such as those in the fiscal authorities and the Central Bank of Nigeria in devising policies to tame the current inflationary pressure in Nigeria

■ **Keywords:** capital flows; trade liberalisation; financial liberalisation; fully modified least squares

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■ INTRODUCTION

Due to the persistency of inflation as an economic challenge in many countries with Nigeria inclusive, it has continued to be matter of concern for policymakers as it can introduce uncertainty that adversely affects economic growth. Furthermore, high inflation rates can have a detrimental effect on various aspects of the economy, from production and resource distribution to international relations (Guender & McHugh-Smith, 2023; Nguyen *et al.*, 2023). It can erode the purchasing power of money, create uncertainty in financial markets, and impede long-term economic planning. Understanding the determinants of inflation volatility and its relationship with trade openness is vital for policymakers and researchers alike. Thus, it is necessary to delve into the impact of inflation on the Nigerian economy.

In the literature, several authors have explored the link among trade, financial openness, and inflation. For example, C. Lidiema (2020) investigates the relationships between trade openness, crude oil prices, and food inflation in Kenya. The author employs the autoregressive distributed lag (ARDL) model to estimate both short- and long-run effects between the variables. The finding indicates the existence of long-run relationships. The study's empirical results indicate that trade openness significantly reduces food inflation, affirming the presence of Romer's hypothesis in Kenya. In contrast, crude oil prices are found to exert a positive and significant influence on food inflation. It is interesting, that the study did not find a significant impact of money supply on food inflation. P.-C. Lin *et al.* (2020) explores the relationship between trade openness and inflation in different monetary regimes. The authors utilize an endogenous switching regression model. In nations that employ a flexible exchange rate system and lack widespread adoption of information technologies (IT), the degree of openness in trade exerts a notable adverse influence on inflation. In contrast, within countries that have integrated information technology, the level of trade openness does not demonstrate a statistically significant influence on inflation. This divergence between the effect of trade openness and inflation is predominantly observed in developing countries with a flexible exchange rate system, not in developed nations. The impact of financial openness on inflation is positive in developing countries without IT, but not significant in developing countries with IT. Trade openness is associated with reduced inflation volatility in countries without IT, regardless of their development status.

A. Khana *et al.* (2021) investigates the effects of trade and financial openness on financial development in the Gulf Cooperation Council region. The research utilizes a dataset encompassing 43 Islamic and 49 conventional banks, spanning the years 2007 to 2015. The study's empirical findings indicate that trade and financial openness have a positive effect on the profitability of both banks. However, the interaction term of openness is negative for the profitability of Islamic banks, suggesting that excessive financial openness reduces their profitability. Trade and financial openness affect Islamic banks differently, with trade openness decreasing the loan volume of Islamic banks. Conversely, the interaction effect of trade and financial openness is positive, indicating that Islamic banks are positively affected. Similarly, M.N. Nasrat (2020) investigate the relationship between trade openness and inflation in six South

Asian countries from 1980 to 2016. The study employs panel data analysis, specifically fixed effects and random effects models. The research findings indicate a significant and positive effect of trade openness on the inflation rate in the selected South Asian countries. This outcome is contrary to Romer's hypothesis, which suggests a negative relationship between trade openness and inflation.

Although the previous studies have documented the relationship among these variables, the specific mechanism through which trade affects inflation remains unclear specifically as it relates to how both trade and financial openness affect inflation in Nigeria, considering the country's specific dynamics in this context. The goal of this study was to investigate the nexus among trade, financial openness and inflation in Nigeria. The specific objectives were: to analyse the trend of trade, financial openness and inflation in Nigeria; to evaluate the effect of trade on inflation in Nigeria; to evaluate the effect of financial openness on inflation in Nigeria.

■ MATERIALS AND METHODS

This study employed an ex-post facto research design, which is a type of quasi-experimental study used to explore how an independent variable, existing before the study, impacts a dependent variable. To unravel the effect of trade openness on inflation in Nigeria, as stated in the research objectives, this study adopted a model used in prior research conducted by O.E. Ada *et al.* (2014). In this current study, the model was adjusted to make inflation the dependent variable, with trade openness, capital flow, and exchange rate as the explanatory variables, aligning with the study's objectives and simplifying the analysis. The model formulated for this study in a fictional relationship is stated as follows:

$$INF = F(TOP, CFL, EXR), \quad (1)$$

where *INF* is inflation; *TOP* is trade openness measured by [exports + imports/(gross domestic product)]; *CFL* is capital flow; *EXR* is exchange rate; and *F* is functional identifier. The transformation of the functional relationship gives:

$$INF = \beta_0 + \beta_1 TOP + \beta_2 CFL + \beta_3 EXR + e, \quad (2)$$

where β is the slope coefficient of the explanatory variables. The theoretical positions on the expected signs of parameters of the variables are highlighted as shown below. Trade openness is expected to exert a negative effect on inflation in Nigeria. That is:

$$\frac{\partial INF}{\partial TOP} < 0, \quad (3)$$

where ∂ is partial derivative identifier. In line with theoretical position capital flow is expected to exert a negative effect on inflation in Nigeria. Given as:

$$\frac{\partial INF}{\partial CFL} < 0. \quad (4)$$

In line with theoretical position, exchange rate is expected to exert a negative effect on inflation in Nigeria. That is:

$$\frac{\partial INF}{\partial EXR} > 0. \quad (5)$$

Considering the nature of the models used in this research, it is essential to have access to data that allows for the estimation of the stochastic equations. The dataset used in this study covers the period from 1981 to 2023 and was sourced from reputable database, specifically the Central Bank of Nigeria Statistical Bulletin (n.d.). In the estimation process, this study employs the fully modified ordinary least squares (FMOLS) approach. The choice of FMOLS as the estimation technique was made because this method adapts the ordinary least squares to take care of serial correlation effects and the endogeneity in the independent variables due to the prevalence of cointegration in the data. In the process of analysing and estimating the model, this study employs several evaluation methods. These include a priori criteria, statistical tests,

such as the Jarque-Bera test for normality, examinations for multicollinearity, and trend analysis facilitated by the use of line graphs. These methods collectively contribute to the comprehensive assessment and understanding of the estimated model's validity and outcomes.

■ RESULTS AND DISCUSSION

The focus here was on investigating how trade, financial openness, and related factors influence inflation in Nigeria, utilizing quantitative data analysis. In the section, as a preliminary evaluation, the result of the Jarque-Bera tests of normality for the descriptive analysis of the dataset with the aim to ascertain the nature of the distribution of the variables in the model are presented as follows (Table 1).

Table 1. Descriptive statistics

	<i>INF</i>	<i>TOP</i>	<i>CFL</i>	<i>EXR</i>
Mean	18.94662	0.399350	1.440092	115.6556
Median	12.94178	0.360670	1.078745	114.8990
Maximum	72.83550	1.067601	5.790847	425.9792
Minimum	5.388008	0.162482	-0.039130	0.617708
Standard deviation	16.45496	0.182918	1.242847	119.1827
Skewness	1.877082	1.571041	1.737520	1.025345
Kurtosis	5.437063	6.142320	6.157231	3.230143
Jarque-Bera	35.05778	34.55701	38.57702	7.452019
Probability	0.000000	0.000000	0.000000	0.024089
Sum	795.7582	16.77271	60.48388	4857.537
Sum square deviation	11101.40	1.371813	63.33140	582385.6
Observations	42	42	42	42

Source: created by the authors

As shown in Table 1, the descriptive analysis indicates that Nigeria's inflation rate, on average, stood at nearly 19% over this time frame. The minimum and maximum values exhibited substantial variation, ranging from 5.39% to astounding 72.84%. This suggests that Nigeria's economy experienced considerable price fluctuations during the last four decades. The standard deviation of 16.45% indicates a moderate level of volatility in inflation rates. The positive skewness (1.88) and kurtosis (5.44) values reveal a right-skewed distribution with heavy tails, implying the presence of high inflation periods. The Jarque-Bera statistic of 35.06 and a probability of 0.00 suggest that the inflation data does not adhere to a normal distribution. Such significant variations in inflation rates are indicative of economic instability and pose a challenge to maintaining the purchasing power of the currency.

The mean trade openness of 0.40 underscores Nigeria's relatively open economy. The range of trade openness, from 0.16 to 1.07, showcases fluctuations in the nation's trade engagement. The standard deviation (0.18) points to moderate volatility, while a positive skewness (1.57) and kurtosis (6.14) signify a right-skewed distribution with heavy tails. The Jarque-Bera statistic of 34.56 and a probability of 0.00 highlight the deviation from a normal distribution. This result suggests that maintaining a relatively open economy is crucial for economic growth

and diversification, but it also exposes Nigeria to external economic factors. The average capital flows were 1.44, signifying a moderate level of capital inflow and outflow. Capital flows ranged from -0.04 to 5.79, indicating substantial fluctuations. The standard deviation of 1.24 demonstrates moderate volatility. Positive skewness (1.74), high kurtosis (6.16), and a Jarque-Bera statistic of 38.58 with a probability of 0.00 suggest non-normal distribution of capital flows data. The substantial fluctuations in capital flows can impact the investment climate and overall economic stability.

The mean exchange rate was 115.66 Naira to the US Dollar, reflecting the average Naira value. Exchange rates ranged widely from 0.62 to 425.98, indicating substantial fluctuations. A high standard deviation of 119.18 underscores significant volatility. Positive skewness (1.03) and a kurtosis of 3.23 suggest a right-skewed distribution with less pronounced tails. The Jarque-Bera statistic of 7.45 and a probability of 0.02 reveal some deviation from a normal distribution. This suggests that Nigeria's sensitivity to external factors like oil price fluctuations and foreign exchange reserves requires careful management. As illustrated in Table 2, the negative correlation between inflation rate and trade openness suggests that as trade openness increases, inflation tends to decrease. This could be due to increased competition from foreign markets, which can lower prices.

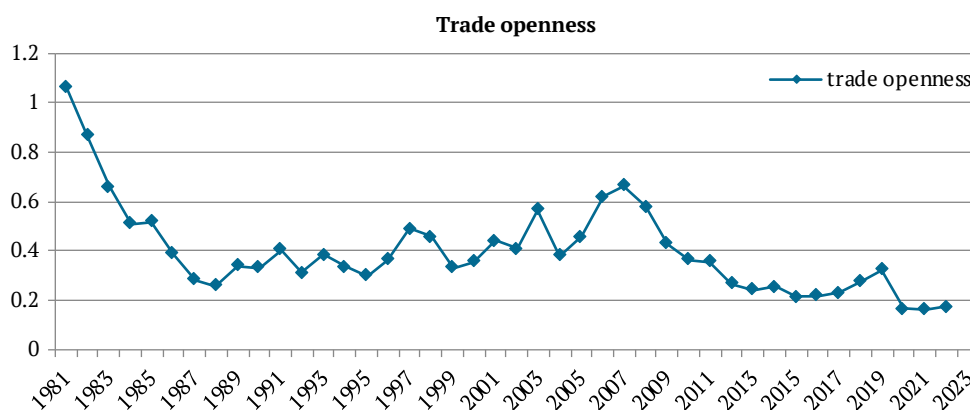
Table 2. Correlation analysis

	<i>INF</i>	<i>TOP</i>	<i>CFL</i>	<i>EXR</i>
<i>INF</i>	1.000000	-0.148496	0.447226	-0.289572
<i>TOP</i>	-0.148496	1.000000	-0.006144	-0.494094
<i>CFL</i>	0.447226	-0.006144	1.000000	-0.241304
<i>EXR</i>	-0.289572	-0.494094	-0.241304	1.000000

Source: created by the authors

On the other hand, the positive correlation between inflation rate and capital flows indicates that when capital flows into the country, inflation tends to rise, possibly due to increased demand for goods and services. The negative correlation with exchange rate means that a stronger exchange rate is associated with lower inflation. Trade openness shows a negative correlation with both inflation rate and capital flows. A decrease in trade openness is associated with higher inflation, possibly indicating that protectionist trade policies can lead to rising prices. The negative correlation with capital flow suggests that reduced capital inflows can lead to increased trade protectionism. The strong negative correlation with the exchange rate means that a stronger exchange rate is linked to reduced trade openness, possibly due to reduced export competitiveness. Capital flows have a positive correlation with inflation rate, indicating that increased capital inflows can contribute to

higher inflation. The negative correlation with trade openness suggests that when trade openness declines, capital flows will increase, possibly due to investors seeking higher returns in a less open economy. The negative correlation with the exchange rate suggests that a stronger exchange rate is linked to reduced capital flows, possibly due to a less attractive investment environment. The exchange rate shows negative correlations with all other variables. A stronger exchange rate is associated with lower inflation, reduced trade openness, and fewer capital flows. This could be due to a strong currency making exports more expensive and imports cheaper, which may negatively impact trade and capital inflows. In conclusion, it's important to note that there is no potential multicollinearity in the dataset, as several correlation coefficients are far or below the 0.8 rule of thumb for multicollinearity. The trend of trade openness in Nigeria is shown below (Fig. 1).

**Figure 1.** Trend of trade openness in Nigeria, 1981-2022

Source: created by the authors

The trend of trade openness shown in Figure 1 demonstrates that in 1981, Nigeria's trade openness was relatively high at 1.067601, indicating that a significant portion of its economic activity was linked to international trade. However, over the years, this figure declined steadily, with a few fluctuations along the way. By 1987, trade openness had dropped to 0.284864, reflecting a significant reduction in Nigeria's reliance on global trade. The late 1980s and early 1990s saw a modest recovery in trade openness, reaching 0.403917 in 1991, but it then declined again. The subsequent years witnessed fluctuations, with the figure oscillating between 0.25 and 0.45. There was a notable dip in trade openness in 2009, possibly due to the global economic crisis, and it gradually recovered but remained

relatively modest until 2013. From 2014 to 2018, there was some stability, with trade openness staying around 0.25 to 0.33. The years 2019 to 2020 saw an increase, suggesting a slight resurgence in international trade activity. However, in 2020, there was a sharp decline to 0.167631, indicating a significant reduction in trade openness, which could be attributed to various factors, including the COVID-19 pandemic, which disrupted global trade. In 2021 and 2022, trade openness remained at a low level, with values of 0.162482 and 0.1743, respectively. These low values might be influenced by ongoing global challenges and Nigeria's economic circumstances. As shown in Figure 2, from 1981 to 1987, Nigeria experienced high inflation rates, peaking at 54.51122% in 1988.

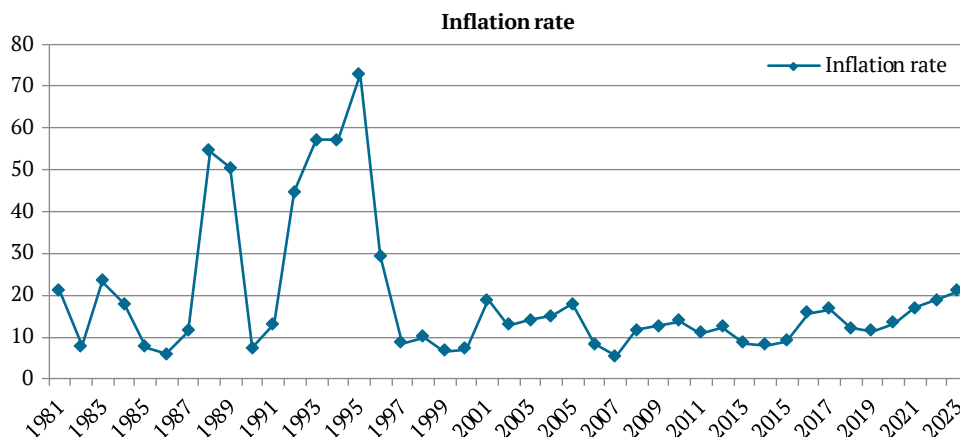


Figure 2. Trend of trade inflation in Nigeria, 1981-2023

Source: created by the authors based on World Development Indicators (2023)

These high inflation rates during this period indicate a period of economic instability. High inflation erodes the purchasing power of the currency, making it more challenging for people to afford basic goods and services. In the late 1980s and early 1990s, inflation rates continued to be relatively high, with a peak of 57.16525% in 1993. These high inflation rates were indicative of a lack of economic stability and could have been driven by factors such as government mismanagement, fiscal deficits, and economic uncertainties. From the mid-1990s to the early 2000s, there was a gradual decline in inflation rates, with a few fluctuations. However, inflation rates remained in the double digits, indicating that Nigeria was still grappling with inflationary pressures. The period from 2007 to 2016 saw relatively lower inflation rates, which could be attributed

to more stable economic conditions, better fiscal management, and prudent monetary policies. However, inflation rates started rising again from 2016, reaching 16.95285% in 2021 and 18.84719% in 2022. This recent surge in inflation rates from 2016 to 2022 could be influenced by various factors, including currency devaluation, supply chain disruptions, and fiscal deficits.

In conclusion, the historical trend of inflation rates in Nigeria reveals a history of economic instability and fluctuation. Recent years, specifically between 2016 and 2022 have seen resurgence in inflation, and addressing this issue is crucial for maintaining economic stability, ensuring the well-being of the population, and attracting investments. The estimates of the ordinary least square regression are presented in Table 3.

Table 3. FMOLS regression estimates

Dependent variable: LOG(INF)				
Variable	Coefficient	Standard error	t-statistic	Probability
TOP	-1.695081	0.705493	-2.402692	0.0214
CFL	0.231360	0.075583	3.061000	0.0041
LOG(EXR)	-0.165877	0.055038	-3.013850	0.0046
C	3.674268	0.419603	8.756534	0.0000
R-squared	0.630536			
Adjusted R-squared	0.576255			
Long-run variance	0.345726			

Source: created by the authors

The negative coefficient of trade openness -1.695081 suggests an inverse relationship between trade openness and inflation. In simpler terms, as the degree of trade openness increases, inflation tends to decrease. This is an interesting finding that aligns with economic theory. When a country opens up to international trade, it often experiences heightened competition, leading to lower prices for consumers. This result means that as Nigeria engaged more with global markets, there was an inhibiting effect on inflation. Moreover, the relatively large magnitude of the coefficient indicates that changes in trade openness have a significant effect on inflation in Nigeria. Importantly, the statistical significance at the 5% level (p -value: 0.0214) assures us that this negative relationship

is not merely the result of random fluctuations but carries economic meaning.

The positive coefficient of capital flows 0.231360 implies a positive relationship with inflation. In other words, when capital flows increase, inflation tends to rise. This outcome can be understood through the lens of economics as well. When foreign capital flows into a country, it often stimulates investment and spending, which can drive up prices. This suggests that increased capital inflows in Nigeria during the study period contributed to higher inflation there. The size of the coefficient is of average magnitude, indicating that changes in capital flows have a moderate effect on inflation. Nevertheless, the fact that this coefficient is statistically significant at the 5%

level (p -value: 0.0041) signifies that this relationship is not random but carries economic importance.

Finally, considering the Exchange Rate, the negative coefficient of -0.165877 reveals an inverse relationship between the exchange rate and inflation. In practical terms, when the exchange rate is stronger, inflation tends to be lower. A stronger currency makes imports cheaper, potentially reducing inflationary pressures. The average magnitude of the coefficient implies that exchange rate changes have a moderate impact on inflation. Additionally, its statistical significance at the 5% level (p -value: 0.0046) emphasizes that this relationship is not a random occurrence but rather a significant factor. In conclusion, this regression model with an R -squared value of 0.630536 suggests that these variables – trade openness, capital flows, and exchange rate – together account for a significant portion of the variation in inflation in Nigeria.

The result of the analysis as presented in the previous sections revealed that there is a significant inverse relationship between trade openness and inflation implying that as the degree of trade openness increases, inflation tends to decrease. This means that as Nigeria engaged more with global markets, there was an inhibiting effect on inflation. Also, it was found that capital flows have a significant positive relationship with inflation implying that as capital flows increases, inflation tends to rise. Finally, the study established a significant inverse relationship between exchange rate and inflation implying that when the exchange rate is stronger, inflation tends to be lower but weaker exchange rate as in the case of Nigeria is associated with higher inflation.

The findings of the analysis align with existing studies. The study's finding that increased trade openness is associated with decreased inflation is supported by M.N. Nasrat (2020), who emphasizes the transformative impact of economic globalization on countries. According to him, trade openness, characterized by reduced trade barriers and increased cross-border trade, is a fundamental aspect of globalization. While there is a consensus that trade openness brings economic benefits, the researcher notes that it also affects inflation rates. The study aligns with this perspective, suggesting that as Nigeria engages more with global markets, there is an inhibiting effect on inflation. It also corroborates the findings of K. Ben Jedidia *et al.* (2019) and X. Yang & M.N. Shafiq (2020) that trade openness has a negative effect on the economy.

In contrast, C. Raghutla (2020) and H. Becha *et al.* (2023) established a positive effect of trade openness on the economy. The result is supported by M. Chhabra & Q. Alam (2020) findings on the relationship between trade openness and inflation in India from 1974 to 2016. The authors employed the ARDL model with a bounds testing approach to co-integration. The findings of the study revealed that there is a positive relationship between inflation and trade openness in India. This contradicts Romer's hypothesis, which suggests an inverse association between trade openness and inflation. Similarly, the study conducted by T.G.E. Elhassan (2020) on the asymmetric impact of trade openness on inflation in Sudan during the period from 1970 to 2018 also gave credence to the study findings. The research applies the nonlinear auto-regressive distributive lag (NARDL) model. The findings reveal an asymmetric

impact of trade openness on inflation in Sudan. Positive shocks in openness, both in the short and long terms, result in an increase in the inflation rate. Conversely, negative shocks in openness in the short term lead to a decrease in the inflation rate. However, negative shocks in openness in the long term do not have a significant effect on the inflation rate.

The study's identification of a positive relationship between capital flows and inflation is substantiated by A. Khana *et al.* (2021). They discuss how higher financial openness, including increased capital flows, can introduce external funding sources but also pose risks. They point out that in scenarios where banks lower credit standards and increase financing, overall bank risk may rise, potentially reducing stability. This aligns with the study's finding that as capital flows increase, inflation tends to rise, indicating potential challenges associated with external funding and its impact on inflation. This finding also corroborates the findings of T.Y. Hong & D.H.A. Ali (2020) and D.-H. Kim & S.-C. Lin (2023) that capital flows and inflation have a positive relationship.

The study's conclusion regarding the inverse relationship between exchange rates and inflation finds support in the context of Nigeria's economic liberalization efforts. A. Sule *et al.* (2023) noted that Nigeria has been moving towards greater economic liberalization and openness, including reducing restrictions on capital flows. As the exchange rate strengthens, the study suggests that inflation tends to be lower, while a weaker exchange rate, as observed in Nigeria, is associated with higher inflation. This is consistent with the challenges posed by increased openness, capital flows, and fluctuations in inflation rates in the country. This result also corroborates the findings of E. Özen *et al.* (2020), Y. Turna & A. Özcan (2021) and R.S. Gürkaynak *et al.* (2023) that exchange rate and inflation have a positive relationship. A. Watson (2016) notes that increased competitive pressure amplifies the relevance of the price ratio between imported and domestic goods when determining domestic inflation.

To mitigate the vulnerability of Nigerian economy, trade policies should incentivize the growth non-oil sectors such as agriculture, manufacturing, and technology that can contribute to a more resilient and balanced export portfolio, including providing export subsidies, reducing trade barriers, and facilitating access to global markets. Also, the government can employ strategic tariff and import policies to regulate the inflow of goods and services to protect domestic industries while ensuring that essential goods remain affordable. Additionally, the government can consider using tariff revenues to fund strategic sectors or provide support to industries vulnerable to international competition. To manage speculative capital flows, Nigeria can consider implementing targeted capital controls and prudential measures. These may include restrictions on short-term capital inflows, reserve requirements on foreign currency deposits, and regulatory measures to discourage speculative activities in financial markets. These controls aim to stabilize financial markets and prevent abrupt movements in capital that could disrupt the overall economy. The Securities and Exchange Commission and the Central Bank should collaborate to monitor and regulate financial instruments, ensuring that they align with the broader economic goals. Periodic reviews of capital market

regulations and the introduction of measures to prevent market manipulation can contribute to a stable financial environment. These policy measures could contribute to more stable inflation in Nigeria.

■ CONCLUSIONS

This study explored the effect of trade and financial openness on inflation in Nigeria. The motivation for this study is the continued rapid upsurge in inflationary pressure in Nigeria amidst the continued gradual liberalization of the country's trade and financial market which call for questioning the role of trade and financial openness in the inflationary trend in Nigeria. To establish the effect of trade and financial openness in the inflation in Nigeria, time series data collected from World Development Indicators over the period of 1981 to 2023 was analysed using the FMOLS estimation technique. The study from the result submitted that the increasing trend of openness in Nigeria contributes to the high level of inflation, potentially due to imported inflation. This suggests that as the country opens up to international trade, the heightened competition leads to high inflationary pressure. Similarly, capital flows were also found to mount upward pressure on inflationary trend in the country while as Naira exchange rate depreciates, the level of inflation reduces. Thus, this result suggests the need for serious caution in the area of liberalisation of trade and financial market due to the negative implication of such policy on inflationary trend in Nigeria.

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This calls for the need for regulation of the flow of trade and foreign capital in Nigeria in a way that will minimise the inflationary pressure.

To address this issue, the study recommends implementing non-monetary and non-fiscal measures to control inflation, such as increasing production volume, implementing rationing policies, and enhancing the managerial and financial systems. Additionally, reducing dependence on oil and exploring alternative energy sources like renewables could help mitigate the impact of external oil shocks resulting from international trade. To contribute valuable insights to the ongoing discourse on the effect of trade and financial openness on inflation further studies can assess the impact of trade diversification policies on Nigeria's economic resilience and inflation dynamics; investigate how specific trade policies, such as export subsidies or preferential trade agreements, influence the diversification process, and investigate the role of capital controls and prudential measures in managing speculative capital inflows. They can also evaluate the effectiveness of these policies in promoting sustainable economic growth, reducing dependency on oil, and controlling inflation.

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■ CONFLICT OF INTEREST

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Вплив торговельної та фінансової відкритості на інфляційний тиск в Нігерії

■ **Анотація.** Тривале стрімке зростання інфляційного тиску в Нігерії на тлі поступової лібералізації торговельного та фінансового ринку країни змушує поставити під сумнів роль торговельної та фінансової відкритості в інфляційному тренді в Нігерії, що робить дослідження цього питання актуальним. Метою даної роботи було визначення впливу торговельної та фінансової відкритості на інфляцію в Нігерії. Для оцінки побудованої для досягнення мети дослідження моделі було використано повністю модифікований метод найменших квадратів на основі даних Індикаторів світового розвитку, що охоплюють період з 1981 по 2023 рік. Результати показали, що відкритість торгівлі та обмінний курс мали суттєвий негативний вплив на інфляцію в Нігерії, тоді як обмінний курс мав значний позитивний вплив. Дослідження показало, що фінансова відкритість мала значний позитивний вплив на інфляцію, тоді як відкритість торгівлі та обмінний курс мали значний негативний вплив. Уряду рекомендовано переглянути свою зовнішньоторговельну політику таким чином, щоб імпорт як готових, так і проміжних товарів та послуг з інших країн світу міг бути значно зменшений за рахунок стимулювання місцевого виробництва. Дослідження надає подвійний внесок. Надано нову інформацію про фактори, що визначають інфляцію, і конкретно показано зв'язок між торгівлею та фінансовою відкритістю. Таким чином, результати дослідження показали, що вища торговельна та фінансова відкритість призводить до зростання інфляції, що означає інфляцію, спричинену відкритістю. Результати дослідження матимуть практичну цінність для політиків, таких як працівники фіскальних органів та Центрального банку Нігерії, при розробці політики, спрямованої на стримування поточного інфляційного тиску в Нігерії

■ **Ключові слова:** потоки капіталу; лібералізація торгівлі; фінансова лібералізація; повністю модифікований метод найменших квадратів



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Peculiarities of the impact of learning losses on the formation of human capital in Ukraine under martial law

■ **Abstract.** During the period of the pandemic and martial law, Ukraine has lost a significant part of its human capital: assessing these losses and developing proposals for their restoration is especially relevant in the context of the need to restore Ukraine's economy in the post-war period. The purpose of the article was to study and systematize the causes of human capital losses and their structure, to determine the impact of learning losses on the formation of human capital, as well as to summarize proposals for compensation for learning losses and restoration of human capital. As a result of the analysis of the scientific works, a number of factors have been identified that affect the level of learning losses and learning gaps due to quarantine restrictions in various countries of the world, namely, Germany, Spain, Belgium, China. The systematization of information made it possible to group the factors that affect learning losses in Ukraine, with the allocation of groups of factors that are due to the restriction of opportunities to attend educational institutions, and groups of factors that have arisen as a result of hostilities in Ukraine. The paper substantiates the existence of regional differences in the occurrence of learning losses and their impact on the formation of human capital. The clustering of regions has been carried out on the basis of losses of entrants in educational institutions and the region's contribution to the creation of the gross domestic product of Ukraine. The results of the clustering made it possible to determine the priority directions for the restoration of human capital. Based on the research results, measures to eliminate learning losses and learning gaps for educational institutions of various levels are proposed, which can be applied in practice in the post-war reconstruction of the country's economy

■ **Keywords:** economic development; educational institutions; gross domestic product; human capital index; productivity of the next generations; quality

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■ INTRODUCTION

Human capital is one of the key factors in the development of the country's economy, it determines its potential, competitiveness, and ensures the formation of national income. The pace of economic development, the scope of innovation and innovative solutions in various socio-economic spheres of the country, the level of social development are determined by the quality of human capital. The deterioration of the educational component of human capital formation as a result of the restrictions caused by the COVID-19 pandemic in Ukraine has intensified due to hostilities. Active military actions on the territory of Ukraine have had a negative impact on the country's economy, on all its basic components. The problems of the formation of high-quality human capital for the post-war recovery of Ukraine are becoming especially urgent.

As of 2024, learning losses and learning gaps in Ukraine are part of a broader economic problem – significant losses of human capital. This is a real problem of the post-war recovery of Ukraine's economy, since the number of “carriers” of human capital – the number of working-age population and the population of Ukraine as a whole – is significantly decreasing. The question of human capital and its influence on the development of countries is discussed on the sidelines of the World Economic Forum (2017) summit. It is human capital that acts as one of the driving forces of economic development and forms the potential for the prosperity of society. In the report of the Ukrainian Institute for the Future, human capital is defined as the totality of everything on which labour productivity depends in combination with its contribution to achieving the development of all spheres of social and economic life (The importance of human capital..., 2021). That is, human capital is one of the active factors that contributes to the development of society and acts as a potential for such development. Summarizing the results of research by Z. Liu *et al.* (2024) on human capital structure and K.G. Abraham & J. Mallatt (2022) regarding its main components, the following elements can be distinguished: abilities, education, skills, motivation. The specified constituent elements are basic, which largely determine human capital. Among other constituent components, scientists distinguish: qualification, which is highlighted by Y. Honjo (2021), health, experience, self-organization, self-improvement, as noted by M. Wang *et al.* (2021), psychological characteristics, talent, development of non-standard thinking and cultural development.

One of the criteria for measuring the level of human capital development is the determination of the human capital index for the countries of the world. At the initiative of the World Bank, the global Human capital project was introduced (n.d.). The project was introduced under the auspices of actualizing the problems of inequality in the world, focusing attention on the need to invest in human capital as the main driver of socio-economic development and highlighting the most effective directions of such investment. The calculation of the human capital index is an integral indicator that allows comparing different countries of the world with each other in terms of individual elements and the overall level of development. Also, this index serves as a kind of indicator to determine the standard of living in a certain country of the world. The human

capital index makes it possible to determine not only the current standard of living, but also is aimed at forecasting the future indicators of such a specific asset as human capital, as it is a kind of assessment of the productivity of the next generations. According to the calculation methodology of the World Bank (2020), the human capital index can indirectly characterize the forecast indicators of profitability both for a specific person and for the country as a whole. The effectiveness of attracting such human capital relative to a possible reference value is determined through the result, namely the profitability and efficiency of the production process, through the potential volume of gross domestic product (GDP).

The main components of human capital are characterized by three groups of indicators. The first group is demographic, including birth rate, death rate, migration processes, etc. The second group is educational, namely, the quality of the education received and the provision of population with different levels of education. The third is health, due to the quality of the environment, life expectancy, availability of health care services. In this triad, it is the quality of education that becomes an important component of the formation of human capital due to its direct connection with obtaining economic results in the future. The first global study of the level of development of the countries through the index of human capital covered 130 countries and was conducted by the World Bank with the publication of the corresponding report (Human capital project, n.d.). The results of the research in the context of different countries highlighted the deep crisis of human capital on a global scale due to underestimation of the role of human capital in the modern world and its impact on economic development, underfunding of certain sectors of the economy, insufficient investment in human capital, etc. According to World Bank (2020) forecasts, such a poor state of human capital will have a negative impact on future economic development, which requires immediate reaction.

Taking into account the world trends, the study of issues related to the restoration of human capital is extremely relevant both at the global level and for ensuring Ukraine's development potential. The purpose of the work was to analyse learning losses that occurred as a result of restrictive measures during the COVID-19 pandemic and military aggression, and to determine the main directions for overcoming such losses at different levels of education in Ukraine.

■ MATERIALS AND METHODS

The research was accompanied by the use of a wide range of scientific research tools. The use of tabular and graphical methods provided a visual representation and visualization of the obtained results. The paper uses the methods of statistical research, namely, the method of mass observations and the method of groupings are used to identify and systematize the factors that influenced the organization of the educational process of schools, as well as higher education institutions (HEIs) and professional pre-higher education institutions (PPHEIs). The occurrence of learning losses and learning gaps is due to the presence of various prerequisites, including the peculiarities of the organization of the educational process, technical equipment,

resource availability, and other factors that affect the quality of training, so the analysis made it possible to identify regional features, as well as differences inherent in different levels of education.

Statistical observation tools were used to analyse demographic indicators and identify trends in quantitative estimates of the population. The country's population acts as a carrier of human capital. Therefore, the analysis of the dynamics of the country's population, trends of change, identification of factors influencing the dynamics of indicators and determination of the degree of their influence, with the help of statistical observation, occupies an important place in the study of processes that form human capital in the context of the country's post-war recovery. On the basis of this, the impact of irreversible losses of current human capital as a result of forced migration processes on the educational component of human capital formation and on quantitative indicators of human capital has been determined. An analysis of the theoretical basis of the categories of human capital and its main indicators, namely, the human capital index, learning losses and learning gaps using the method of analysis, is also carried out.

The analysis of scientific developments of Ukrainian and foreign authors was used in the study of simulation models on the impact of migration processes on human capital and the country's development potential. Military operations on the territory of Ukraine, different degrees of active involvement of each of the regions and proximity to the zone of active hostilities, have led to objectively different conditions that have developed in different regions, therefore, with the help of the index method, the loss coefficient of entrants to HEIs and PPHEIs for each of the regions of Ukraine has been determined, followed by the ranking of regions by the level of losses of entrants and the correlation of the regional level with the average value of Ukraine. Thanks to this, it was possible to determine the effect of the loss of entrants to educational institutions that provide training at a high level.

The use of the clustering method made it possible to group regions taking into account learning losses and the contribution of the region to the creation of GDP. The results of the clustering became the basis for identifying regions that need special support for the preservation and development of educational potential, support for educational institutions of certain regions, taking into account their contribution to the formation of national income and high-quality human capital. The results of clustering are the basis for determining the directions for the formation of human capital in the context of Ukraine's recovery.

■ RESULTS AND DISCUSSION

The essence and peculiarities of human capital formation

In its essence, human capital is an economic value for the country. The quality of human capital becomes the key to the country's development and its positioning in the world economic space. In their research, V. Antonyuk (2022) determines that human capital is a key resource for the production of economic goods and the formation of the country's national income. It is the productive abilities of a person formed through a combination of knowledge, skills and experience, that become the basis of the quality of

human capital. In their studies V. Rodchenko *et al.* (2021), as well as M.T. Ballestar *et al.* (2020) share the similar point of view that it is the quality of human capital that becomes a determining factor in the economic growth of the economy. In turn, the authors single out labour productivity among the indicators of the quality of human capital. According to estimates of the World Bank (2020) in the pre-war period of 2020 in Ukraine, human capital accounts for only 30% of national wealth. On the other hand, for developed countries, this indicator reaches 70%, including Austria – 75%, Denmark – 76%, Italy – 73% (Gresham & Ambasz, 2019). The ultra-low level of Ukraine's indicators requires identifying and eliminating the reasons for this result. The work of G. Nazarova & V. Rudenko (2022) focuses on the fact that the formation of human capital, the impact on its qualitative characteristics, and continuous improvement should be systemic. Investing in all components of human capital contributes to the growth of the national economy (Dziamulych & Grudzevych, 2020). The active involvement of the education system at all its levels, the involvement of subjects of economic relations, institutions in the creation of a "smart society", should increase the quality of human capital of modern society.

Military operations are causing destruction in the country, there is a significant decline in the economy, the destruction of infrastructure, and the disruption of established socio-economic ties. In the conditions of military operations, human capital suffers significant losses in all its components both at the current moment, due to a significant reduction and structural changes of the available human capital, and in the future. Losses that arise at different stages of human capital formation have a long-term negative impact on its quality and on the prospects for the country's development. As mentioned, among the factors that influence the formation of human capital, there is a group of indicators that describe demographic processes in the country. Figure 1 shows the demographic indicators of Ukraine in the period from 1991 to 2022 in terms of the dynamics of births, deaths and population size.

The main indicator of the natural movement of the population is the difference between the birth rate and the death rate, which can be positive (growth) or negative (depopulation). In the period from 2014 to 2022, the birth rate decreased more than twice, while the number of deaths increased from 632.3 thousand people to 714.3 thousand people in 2021. The intensification of hostilities on the territory of Ukraine causes an even greater increase in the death rate in 2022-2023. According to statistical data (Fig. 1), it is necessary to state that since 1994 there has been a steady downward trend in the population. A significant reduction occurred in 2014 and during 2022. As of 2023, according to the UN Population Fund, the population of Ukraine is 36.7 million people (World Population Dashboard. Ukraine, 2023). Indicators of natural migration increase significantly as a result of the influence of the forced migration factor. Waging active hostilities on the territory of Ukraine is reflected in a significant reduction of the population. However, the information cannot be statistically significant without the presence of other indicators, that is why the dynamics are considered for 2022 inclusive. The negative trends in the demographic component of human capital are exacerbated by the fact that a large number of

people became refugees during the hostilities. According to the Operational Data Portal on the Ukraine refugee situation (2023), as of June 6, 2023, 6,280,000 refugees were

recorded worldwide, of which 5,935,300 were in Europe and 344,700 people outside Europe. These are official data that do not cover all people who were forced to leave Ukraine.

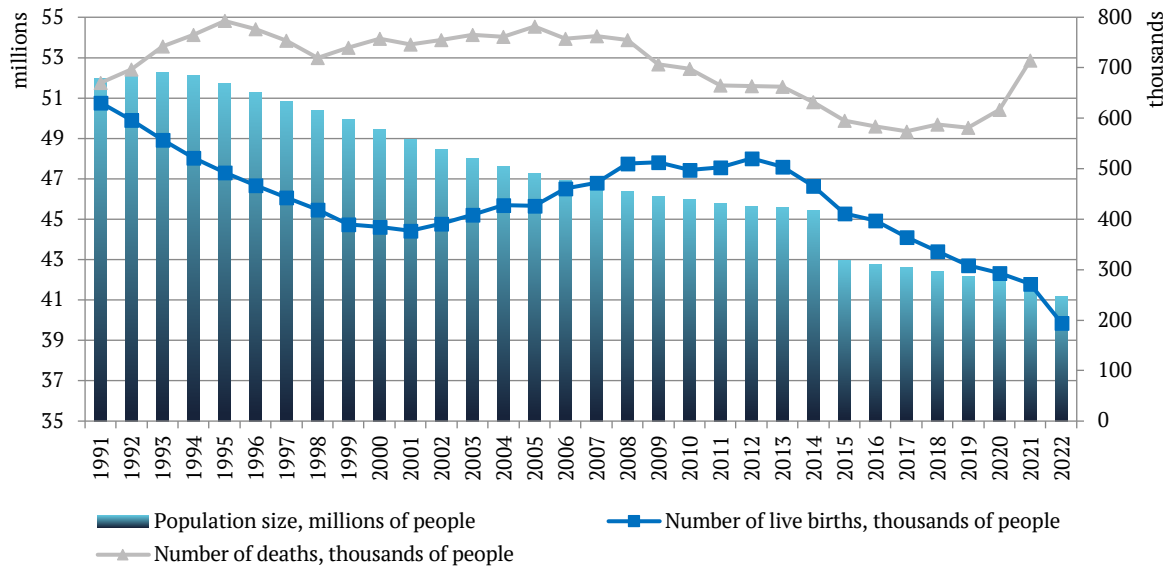


Figure 1. Dynamics of Ukraine's population and the number of births and deaths

Source: compiled by authors based on Live births and deaths by region (n.d.)

However, even these data show the impressive size of the demographic crisis, which will be fully manifested after the end of hostilities. Not all refugees will return to Ukraine, as some of them found work during the period of hostilities, and their children began to study at schools and universities. As a result of hostilities in Ukraine, military and civilians are killed and seriously wounded, the vast majority of whom would be active participants in the reconstruction of Ukraine. Such losses also have a significant negative impact on human capital.

In their work, P. Ueffing *et al.* (2023) modelled four research "what-if" scenarios that combined assumptions about the scale of war-induced refugee movements, return migration in the context of future recovery, reconstruction, and a set of long-term migration trends. The proposed scenarios try to cover a wide but realistic range of possible future development options, from the pessimistic scenario of a long war, protracted conflict and slow post-war economic recovery to the optimistic scenario of a short war and rapid post-war recovery, ensuring long-term social and political stability and economic growth. However, in all scenarios, it has been proven that migration is as important a factor as mortality and birth rates for the long-term future of Ukraine's population.

The authors believe that long-term population decline over the coming decades seems irreversible, even if Ukraine recovers quickly from the short war and becomes a host country for international migrants. This is accompanied by the problem of a rapidly aging population and a shrinking workforce. Reconstruction efforts, long-term recovery support, and socio-economic and political developments in the context of possible EU accession will affect return migration and future migration patterns, which could result in the country losing a quarter to a third of its population

by mid-century. The projected volume of population decline in Ukraine will have a significant impact on the quality of human capital.

Assessment of human capital is carried out through a set of quantitative and qualitative characteristics that describe its components. In addition to indicators that determine the demographic aspect, namely, indicators of population size, its dynamics, migration processes, an important role in the formation of human capital belongs to the educational component, namely, the level of education development, the quality of education, science, the share of expenditures on scientific developments in the structure of the country's GDP, etc. Education, its quality, the level of population coverage is the dominant factor in the formation of human capital and its quality.

Active hostilities in the country affect the educational component of the formation of human capital both through the destruction of the educational infrastructure and the material base, and through the limitation of opportunities for a full-fledged educational process, obtaining relevant knowledge, and acquiring competencies. All this leads to the emergence of the concept of learning losses. Thus, it is necessary to investigate learning losses and propose ways to eliminate them in the context of the need to preserve and restore the human capital of Ukraine.

The global scientific community began to take intensive care of the problems of learning losses and learning gaps with the onset of the COVID-19 pandemic. Different interpretations of the "learning losses" and "learning gaps" concepts are used in literature. The legislation of European countries, in particular of Ukraine, does not contain the specified definitions, but the relevant concepts are usually used in analytical materials, monitoring studies, reports, scientific articles presented at the level of academic

developments or the results of the activities of international organizations in the field of education quality assessment (Hearings in the committee ..., 2023).

The most acceptable are the definitions given in The Glossary of Education Reform: learning loss is understood as any specific or general loss of knowledge and skills or regression in education, most often due to long gaps or interruptions in education. Achievement gap refers to outputs – unequal or unfair distribution of educational results and benefits (Achievement gap, 2013). It should be clarified that the specified gaps occur when students have unequal access to educational processes. Inequality can be caused by a combination of social, economic and other factors.

Differences in access to quality education in different population groups have always existed. Educational inequalities have been significantly exacerbated and manifested as a result of school closures due to the COVID-19 pandemic. Martial law in Ukraine, as well as active hostilities in some regions, only exacerbate the problems of inequality in the educational process and knowledge acquisition. The emergence of restrictions on attendance at educational institutions, namely, schools, colleges, universities, as a result of quarantine or martial law, leads to significant differences in the learning outcomes of students. Firstly, these are differences in results among students within a certain group, they are due to a number of factors. Secondly, these are differences in comparison with a similar group of students who receive education without these restrictions.

Among the factors that influence the occurrence and size of learning losses, the following are identified. The first is a group of factors of a personal nature, which is determined by the totality of personal traits of students, their individual characteristics. The effectiveness of assimilating certain knowledge, acquiring skills, competences while working in groups, during face-to-face contact, as well as during individual work remotely or independently is different for each person. The level of perception of information obtained by different forms of organization of the educational process and for different age groups has significant differences. Ability to self-organization, self-discipline, etc.

The second group of factors is determined by the characteristics of the students' family. The level of education of parents and their motivation to provide a certain level of quality education to children, as well as the financial capabilities of parents to provide the technical support for the implementation of the educational process using means of communication, software, etc. are very much important. However, the remote access cannot fully replace the capabilities of educational and scientific centres and the implementation of the educational process directly using advanced equipment. A significant weakening of the practical component of the educational process is also reflected in learning outcomes as learning losses, which in the future will have to be compensated through additional training to ensure the full performance in this or that job in the real sector of economy.

This, in turn, is additional expenditure of resources and lack of income. The third group of factors generally includes infrastructural ones. These include the availability of the Internet and its capacity, the availability of means of communication and the effective system that makes it possible to carry out an effective educational process in

various forms. The impact on the mentioned factors can only level the volume of losses as a result of the disruption of the educational process.

The moment at which learning losses occur, that is, at what level of education there is a shortage of learning outcomes, directly affects the amount of additional resources that need to be spent to compensate for such losses, as well as the amount of lost income in the future. Failure to obtain a certain set of knowledge affects the quality of human capital that is being formed at the current time, and will have a long-term negative economic effect in the future, due to the lack of economic benefits from such human capital during its active activity in the creation of national income, as well as due to the need for additional costs of financial, time and other types of resources for their additional training.

The obtained results are confirmed by studies that were conducted in various countries following the closure of educational institutions due to quarantine restrictions. A study by S. Zinn & M. Bayer (2021) conducted in Germany shows that parents with a low level of education and socio-economic status could not provide their children with the necessary level of educational activity.

Similar results were obtained by X. Bonal & S. González (2020) based on the study of learning outcomes in Spanish schools, confirming impact of the role of the family, their material wealth, and cultural level on learning outcomes. This paper and S. González & X. Bonal (2021) argue that middle-class families were able to maintain higher standards of educational quality in a critical context, while children from socially disadvantaged families had few opportunities for learning both in terms of time and learning experience (school work and provision of extracurricular activities). Missed opportunities to visit institutions for schoolchildren from socially disadvantaged families affect the deterioration of learning outcomes, the lack of a certain set of skills, competencies at the current point in time. In the case of continuing education at the next levels without making additional expenditure of resources to compensate for previous learning losses, the learning outcomes of such graduates will be much worse, which ultimately affects the quality of human capital formation.

In their article, N. Duroisin *et al.* (2021) presented the results of a study on the impact of the pandemic on the quality of education in Belgium. Learning losses caused by quarantine restrictions have an impact on learning outcomes and, accordingly, on the quality of human capital being formed. The authors also emphasize the great role of technological equipment and advanced pedagogical practices and the access of pupils and students to them. Of course, ultimately, access to advanced technologies is ensured by the level of family income.

Similar conclusions were made by H. Liao *et al.* (2022) in their work based on the results of a study of the academic performance of students in the Chinese province Shaanxi with different socio-economic statuses of parents during the pandemic. They demonstrate that students with more educated parents performed better in relative test scores after full-time education resumed. It is claimed that this is due to the involvement of parents in homeschooling their children. Ultimately, such graduates ensure the formation of human capital of higher quality compared to their peers.

Thus, research into the causes of learning gaps among schoolchildren as a result of the pandemic in Germany, Spain, Belgium and the China showed their significant dependence on the material wealth of families and the level of education of parents. It can be stated that the additional costs of compensating for learning losses that arise actually fall on parents. Otherwise, there is a growing gap in the level of education of different segments of population. The increase in the share of the population with a low level of education affects the quality of human capital that is formed today and a decrease of potential income from such human capital in the future.

Learning losses as a result of military operations

In Ukraine, the problems of the pandemic have entered a new dimension, which is caused by military aggression. The impact of hostilities on educational processes in Ukraine, in addition to the negative consequences that were inherent during the pandemic, is significantly exacerbated by a considerable number of various additional factors. Included are psychological, regional and irresistible factors due to destruction and air alarms. Thus, such conditions could not help but affect learning outcomes at all levels of education, which directly affects the quality of human capital.

In many regions, infrastructure was damaged, in particular, there was partial or complete destruction of educational institutions. The hostilities have led to the destruction of housing, which, together with threats to life, have forced millions of people to migrate abroad or become internally displaced persons. Economic restrictions have worsened, so many families are unable to pay for their children's education and continue their own education.

Air raids and military operations do not make it possible to carry out a full-fledged educational process at all levels of education and transfer it to a distance form. The war leads to an aggravation of neuropsychological problems, including an increase in psychological stress among children, young people and their parents. This has a direct impact on their ability to learn and their parents' provision of learning environments. Internal displacement and migration did not bypass teachers and other educators, which only exacerbated problems.

Subjects of the educational process, both pedagogical workers, scientific-pedagogical workers, and students and their parents, to various degrees change the priorities that require an urgent solution. This is due to the factors that ensure the conditions of own safety, with the need to adapt to a new place of residence through the minimization of linguistic, cultural and other barriers, the availability of necessary conditions to continue educational process. There is a high dependence of the learning outcomes of primary and secondary school children on the teaching skills of their parents, and not only on the availability of means of communication. Emotional perception of the learning process, formed at a young age, will have a delayed effect on the effectiveness of further learning throughout life.

All this has led to the limitation of access to quality education in high school, vocational and technical institutions, pre-higher and higher education and caused significant learning gaps in different categories of citizens, depending on their economic and organizational capabilities.

Children from low-income families, refugees, internally displaced persons and other vulnerable groups are particularly affected by limited access to education.

In December 2022 – January 2023, as part of the implementation of the SURGe (Support for Government Reforms in Ukraine) project, a study of learning losses at the school level (One third of students..., 2023) was conducted. The results of the study made it possible to identify the following factors. Lack of access to the educational process: more than 30% of schoolchildren did not have permanent access. Migration processes had a significant impact on the contingent of schoolchildren and the contingent of teaching staff. The relocation of schoolchildren and teachers mainly from the eastern and northern regions to safer places covered more than 20%. Violations of stable social groups and social ties have a negative psychological impact on the participants of the educational process. Not the last place is occupied by the problems of technical equipment of teachers and students. The vast majority of schoolchildren, almost 74%, use smartphones for studying, due to the lack of laptops or computers. The provision of teachers with working access to the Internet and computers remains unsatisfactory. Almost 20% remain unsecured.

Thus, in Ukraine, the factors that cause learning losses and learning gaps among schoolchildren are much stronger than in the countries discussed above. These were compounded by the destruction of educational infrastructure, air raids, lack of electricity, lack of Internet, and the displacement of students and teachers, both within the country and abroad. These factors increased the dependence of the size of learning losses and learning gaps on the material wealth of families and the level of education of parents. Moreover, it can be assumed that they also depend on the psychological stability of parents and their motivation to raise and educate their children.

This combination of factors has a negative impact on the organization of the educational process and its result, creating the prerequisites for the formation of human capital of inadequate quality. Children who had limited access to education from the eighth to the eleventh grade leave school into adulthood. Only a small number of them have mastered the necessary amount of knowledge, skills and abilities to continue their studies in HEIs or PPHEIs. This was achieved due to the high motivation of both children and their parents. Moreover, such preparation had to be based on the powerful economic and organizational capabilities of families and the child's cognitive abilities.

These characteristics influenced not only school education, but also the educational process in Ukrainian HEIs. However, this impact is not catastrophic. In the world, there are examples of the development of education at all levels, including higher education, during the period of military operations. In the article by S. Milton (2019), it is argued that Syrian higher education continues to function despite the long-term war raging in the country. Based on interviews with Syrian students and academics, it was found that while the system has survived quantitatively, it has suffered significant qualitative losses in learning outcomes. However, it is not about the collapse of the system, as is sometimes portrayed in the media. Instead, it is about the need to support Syrian refugees in obtaining secondary education with the prospect of their return to the country

to obtain higher education. Such an approach can be an example for Ukraine when it comes to the need to preserve and increase human capital.

In Ukraine, it is not about a catastrophic situation in higher education. Apart from the indicators of the impact on learning losses and gaps, which have been identified in general for all levels of education, the following is characteristic of higher education. A significant number of armed forces, mainly from the regions of active hostilities, suffered destruction of the material and technical base.

The level of education of entrants has significantly decreased, not all HEIs were ready for distance learning. The effectiveness of scientists' work has decreased significantly, not only as a result of the loss of the material base, but also due to an unstable psychological state. Professional relations with enterprises, organizations and business as a whole have significantly weakened. This applies not only to the field of scientific and project development, but also to the provision of practice bases for course and diploma design. The practical component of the educational process in HEIs has weakened to a large extent due to the lack of opportunities to conduct laboratory work.

In HEIs located in the most dangerous territories, the implementation of a number of projects with external stakeholders, which were aimed at improving the quality of education (dual education, implementation of joint projects with foreign partners, as part of their implementation on the territory of Ukraine), was interrupted. As a result of the psychological stress of higher education students, their ability to study decreases and the level of emotional intelligence suffers. There is a strong differentiation in the size of the contingent of higher education seekers, depending on the distance from the combat zone. The determining factor for those seeking education when choosing a HEI for study is not the quality of training, not the rating indicators of the HEI, or the preference for one or another HEI, but the territorial distance from the zone of active hostilities.

HEIs from the regions close to the places of hostilities lose not only the contingent, but also the income from the special fund. These HEIs are forced to significantly reduce the cost of educational services, as there is a decrease in business activity in these regions. That is why HEIs from these regions need financial support through the general fund. A significant decline in business activity, according to the European Business Association, which is observed in the eastern regions of the country, affects the solvency of the region's population, reducing the ability to plan their own expenses for 4-6 years (Reservation, mobilization..., 2023). The lack of stable income, a high level of risk lead to the fact that entrants choose not those specialties for which they have abilities and talent, but those where they can enter to study under the state order, even if after graduation they plan to work not in their specialty. On the one hand, this significantly affects the formation of human capital, has a negative impact on its quality, and on the other hand, it exacerbates the problem of irrational use of budget funds. There is a significant change in the scale of priorities for choosing a specialty and an educational institution. The "safety" factor comes first for entrants and their parents. Even the entrant's choice regarding HEI can be adjusted by parents in order to reduce the levels of risks and safety of children.

It should be noted that there are significant regional differences in the functioning of educational institutions. HEIs that are or were in the zone of active or potentially active hostilities will have a significantly underestimated number of people wishing to receive education in these regions, even with high ratings, high quality of training, high-quality staffing, etc. At the same time, HEIs located in other territories will have a relatively increased number of potential entrants and students. The calculation of the loss coefficient of entrants in 2022, which was a consequence of the start of active hostilities on the territory of Ukraine, was carried out by comparing the data of 2021 and the first intake after the start of hostilities. The calculation of the loss coefficient of entrants clearly reflects this in the context of the regions of Ukraine (Fig. 2).

The loss coefficient of entrants is estimated as the ratio of the delta of the number of applications in 2022 and the number of applications in 2021 to the number of applications submitted in the pre-war 2021. A negative value of this ratio indicates the level of losses, i.e. a drop in the number of those wishing to obtain education at the appropriate level, higher or professional pre-higher education in a certain region (the calculation was made based on the number of applications for the "Bachelor" degree on the basis of complete secondary education and "Professional Junior Bachelor" degree). The number of applications submitted by entrants is an estimated value and a certain indicator of the distribution of entrants' wishes regarding further education. The situation in 2023 does not compensate for the losses that occurred in 2022. The year 2022 is an indicator of "failure" and reflects the impact of the start of hostilities.

In general, according to USEDE (2023) data (Unified State Electronic Database on Education), there was a drop in the number of people wishing to study in educational institutions of Ukraine. The loss coefficient of entrants to HEIs is -0.437 (Fig. 2), and the loss coefficient of entrants to PPHEIs is -0.36 . The largest decrease is observed in Kharkiv (-0.66 of HEIs losses and -0.51 of PPHEIs losses), Mykolaiv (-0.55 of HEIs losses and -0.46 of PPHEIs losses) and Zaporizhzhia (-0.49 of HEIs losses and -0.49 of PPHEIs losses) regions. These are the areas that are the most dangerous and closest to the war zone.

According to Resolution of the Cabinet of Ministers of Ukraine No. 179 "On Approval of the National Economic Strategy for the Period up to 2030" (2021), the specified areas are assigned to the 1st group, namely the territories where hostilities are (or were) taking place. In some regions (Odesa, Zhytomyr, and Kyiv), the level of the loss coefficient does not significantly differ from the national average. In all other areas, there is either a slight decrease in potential entrants or even an increase (the coefficient is greater than 0).

A visual representation of the distribution of the loss coefficient of entrants by region confirms the internal movement of potential education seekers and the priority of their choice in favour of security and safe territories. E. Hanushek & L. Woessman (2020) studied the economic consequences of learning losses in the long term. The authors provide calculations of projected long-term GDP losses for G20 countries that were caused by pandemic learning constraints and estimate expected GDP over 50 years.

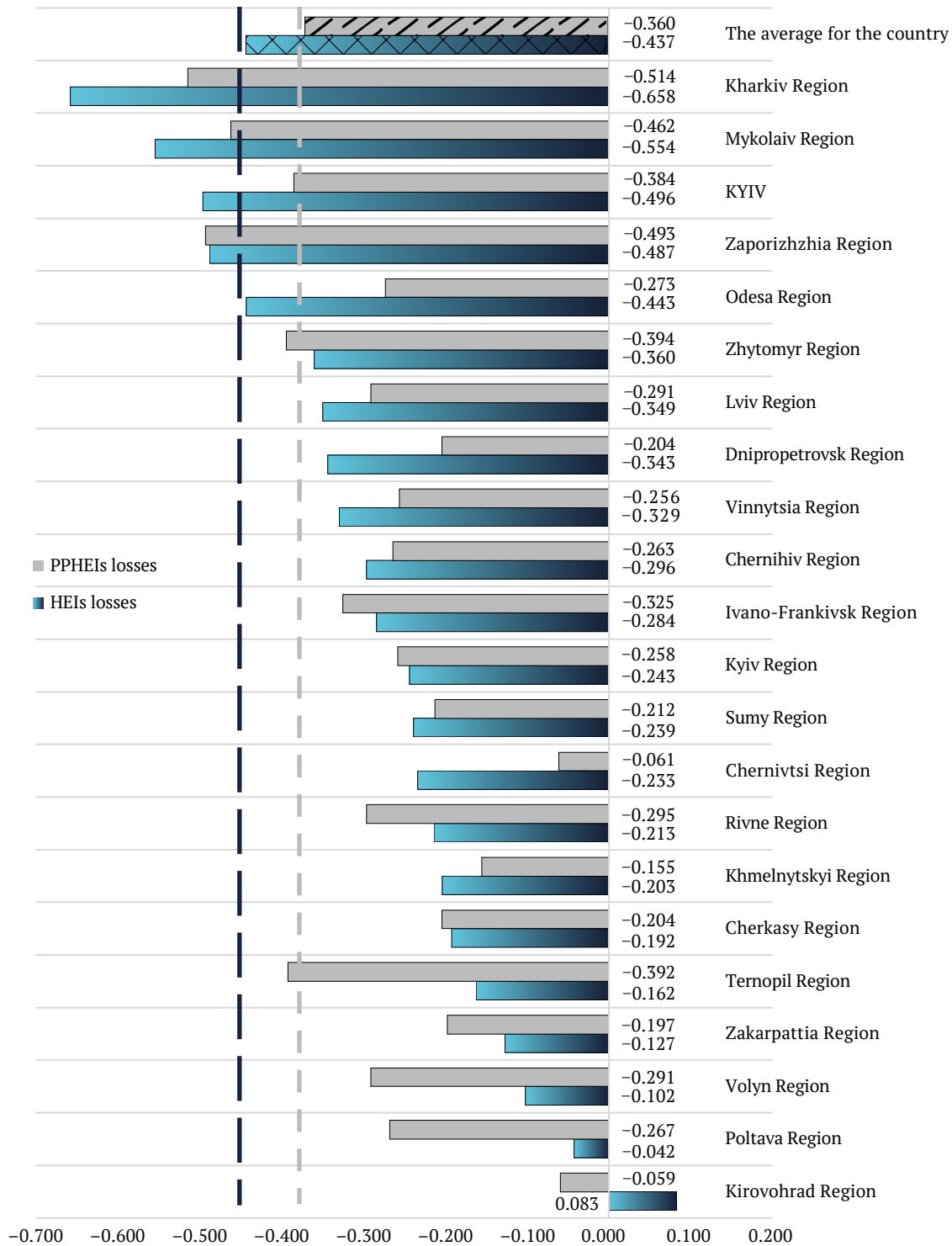


Figure 2. Regional distribution of the loss coefficient of entrants to HEIs and PPHEIs in 2022 in relation to 2021
Source: made by authors based on USEDE (2023)

The quality of education, the level of education in society correlate not only with a person’s personal income, but they are also projected on the dynamics of the well-being of society, the country, and the dynamics of the main macroeconomic indicators. Entering the labour market of human resources with a lower level of education leads to a comparatively lower level of productivity and profitability of such labour. Within

the country’s economy, the gradual replacement of workers who leave active labour relations by graduates of educational institutions of various levels who lacked certain skills, will affect the long-term dynamics of the country’s GDP during the period of work of workers with learning losses until their retirement. In the knowledge economy, the influence of human capital on the creation of GDP significantly increases.

Regional peculiarities of human capital formation

It should be noted that there is a close connection between human capital and the country's GDP. Learning losses in Ukraine, which significantly worsen human capital, will also have an impact on the creation of GDP, as one of the main indicators of economic development. Analysis of information data for 2021 showed uneven contribution of each region of Ukraine to GDP (Gross regional product,

n.d.). The results of the analysis are correlated with the data of the Public report State Tax Service of Ukraine 2022 (2023) regarding the regional distribution of the main taxpayers who are registered with the territorial body of the State Tax Service. The list of regions of Ukraine that fall into each of the quadrants in the following matrix of the distribution of regions of Ukraine, as well as the calculated values of the indicators are given in Table 1.

Table 1. Distribution of Ukraine's regions in quadrants by contribution to GDP and loss coefficient of entrants

No.	Region	Loss coefficient of entrants		GDP, billion UAH	Quadrant	
		HEIs	PPHEIs		HEIs	PPHEIs
1	Kharkiv Region	-0.658	-0.514	320	1	1
2	KYIV	-0.496	-0.384	1,196	1	1
3	Zaporizhzhia Region	-0.487	-0.493	229	1	1
4	Odesa Region	-0.443	-0.273	272	1	2
5	Dnipropetrovsk Region	-0.343	-0.204	582	2	2
6	Lviv Region	-0.349	-0.291	296	2	2
7	Kyiv Region	-0.243	-0.258	292	2	2
8	Poltava Region	-0.042	-0.267	267	2	2
9	Vinnitsia Region	-0.329	-0.256	174	3	3
10	Cherkasy Region	-0.192	-0.204	131	3	3
11	Khmelnitskyi Region	-0.203	-0.155	120	3	3
12	Ivano-Frankivsk Region	-0.284	-0.325	120	3	3
13	Chernihiv Region	-0.296	-0.263	113	3	3
14	Sumy Region	-0.239	-0.212	105	3	3
15	Kirovohrad Region	0.083	-0.059	100	3	3
16	Volynsk Region	-0.102	-0.291	93	3	3
17	Rivne Region	-0.213	-0.296	89	3	3
18	Zakarpattia Region	-0.127	-0.197	76	3	3
19	Chernivtsi Region	-0.233	-0.061	55	3	3
20	Ternopil Region	-0.162	-0.392	81	3	4
21	Zhytomyr Region	-0.360	-0.394	114	3	4
22	Mykolaiv Region	-0.554	-0.462	124	4	4
	The average for the country	-0.437	-0.360	218		

Source: developed by authors based on USEDE (2023) and Gross regional product (n.d.)

Figures 3-4 show the distribution matrix of Ukraine's regions by indicators: gross regional product, as an indicator of the share of each region's contribution to the creation of GDP, billion UAH, vertical axis; loss coefficient of entrants by the relevant level of education (bachelor, professional junior bachelor) by region horizontal axis. The point of intersection of the axes corresponds to the national average. The given matrix of regional distribution consists of four clusters (quadrants).

Quadrant I: regions whose educational institutions need special support. Significant losses of entrants, the loss coefficient of entrants is much worse than the average for Ukraine, and the contribution to the country's GDP of each of these regions exceeds the average for Ukraine. Quadrant I includes Kharkiv, Zaporizhzhia Regions and the Kyiv city. Odesa Region is included in the first quadrant in terms of losses in HEIs. Learning losses in the regions of the Quadrant I have the most significant impact on human capital, on the country's economy, its recovery and development potential. In these regions, the activities of business entities and the relevant infrastructure are concentrated ensuring the creation of the country's GDP. According to

2021 data, the regions of the Quadrant I account for almost 37% of the GDP of Ukraine (Gross regional product, n.d.) and 37% of the main taxpayers (Public report..., 2023). The capital occupies a special place. The largest contribution to the creation of GDP falls on the Kyiv, since the legal addresses of the main representative offices are registered in the city of Kyiv, regardless of the actual territorial location of production facilities. The negative impact of the high level of loss of entrants is aggravated by the factor of the territorial location of these regions. The territorial proximity of the region to the zone of active hostilities is reflected in the financial and economic activity of the region, the activity of business in this region, and the change in priorities of financial investments.

Quadrant II: regions whose educational institutions need support. Insignificant loss of graduates, the rate of loss of entrants is better than the average for Ukraine; and the contribution to the country's GDP of each of these regions exceeds the average indicator for Ukraine. Quadrant II includes: Odesa Region only by PPHEIs losses, as well as Dnipropetrovsk, Kyiv, Lviv, and Poltava Regions. Despite the fact that the level of learning losses in the regions of

the Quadrant II is insignificant, these losses will also have a significant impact on the dynamics of GDP generated in these regions. The contribution of the four regions of the

Quadrant II to the creation of GDP is more than 26%. And 22% of the main taxpayers are registered with the territorial bodies of the State Tax Service of these regions.

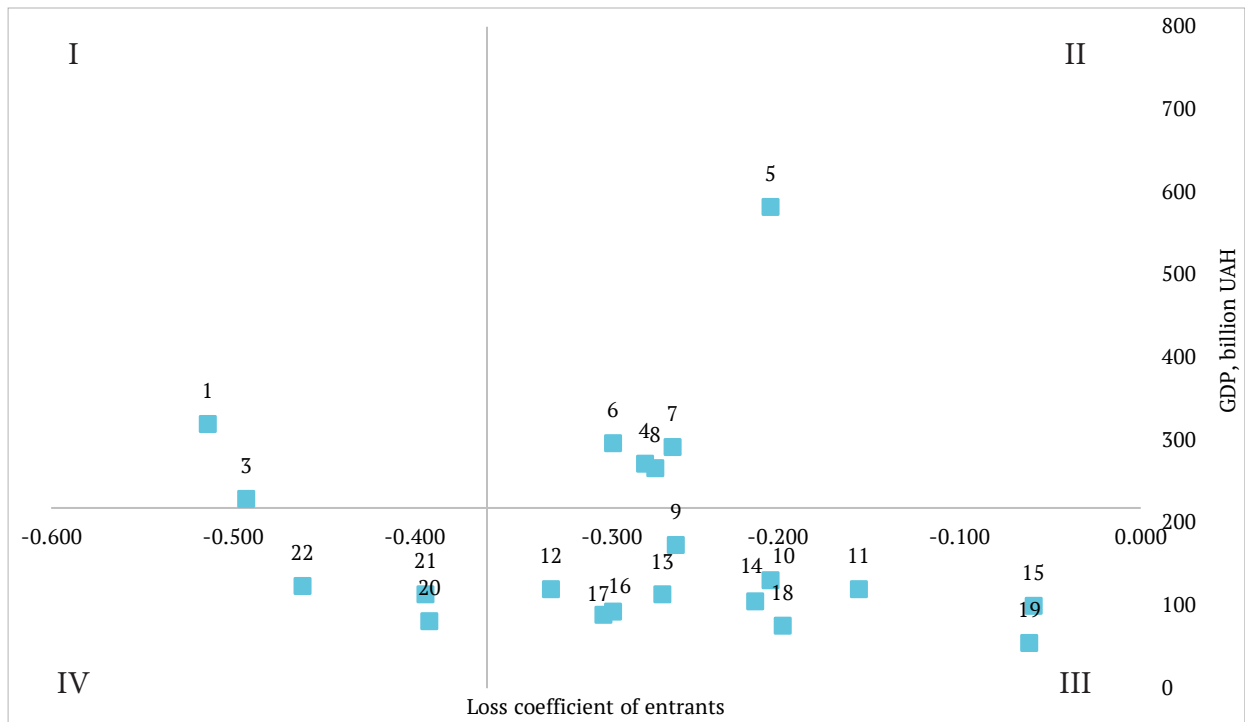


Figure 3. Results of the clustering of Ukraine's regions by the volume of contribution to GDP and the loss coefficient of entrants to PPHEIs

Source: made by the authors

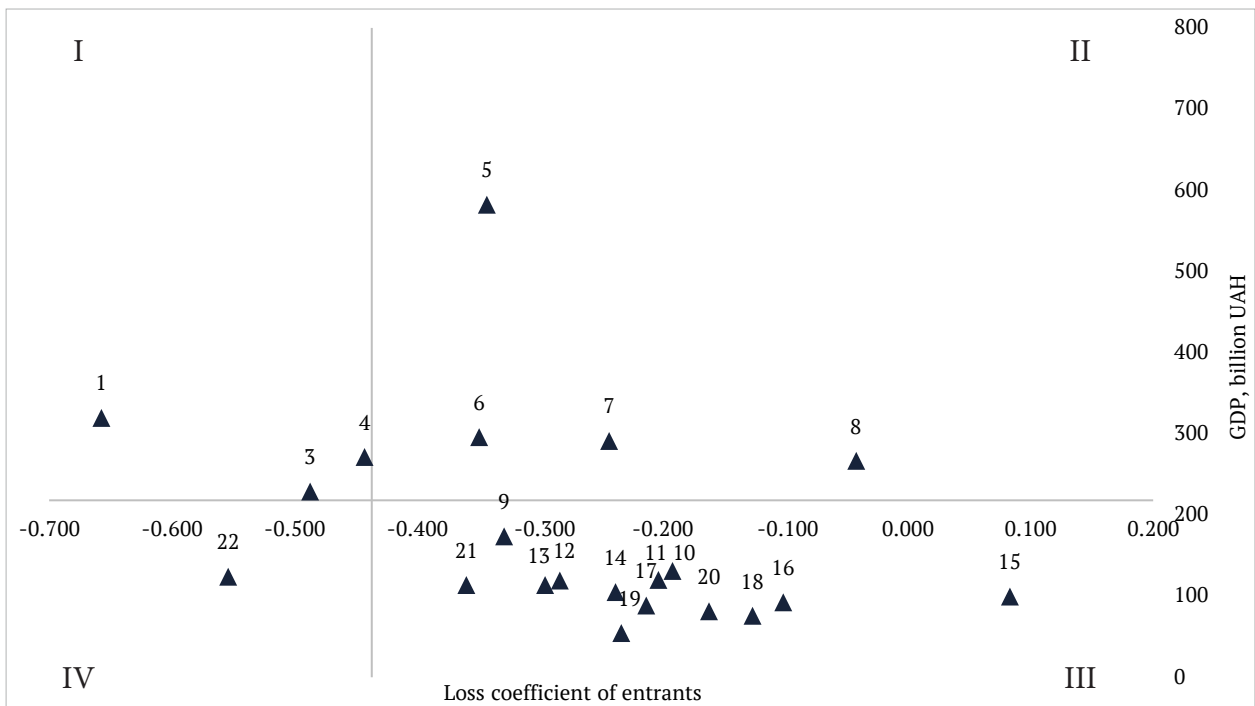


Figure 4. Results of the clustering of Ukraine's regions by the volume of contribution to GDP and the loss coefficient of entrants to HEIs

Source: made by the authors

Quadrant III: regions whose educational institutions do not need support, based on the indicators under consideration. Insignificant loss of graduates, the rate of loss of entrants is better than the average for Ukraine; the contribution to the country's GDP of each of these regions is below the average for Ukraine. Quadrant III includes other regions of Ukraine except Mykolaiv Region, which is included in Quadrant IV, and Zhytomyr and Ternopil Regions, in relation to the PPHEIs entrant losses. The total contribution of 13 regions of Ukraine in the III quadrant to the country's GDP is only 25%, with almost 30% of taxpayers registered. The learning losses of these regions will have a relatively smaller impact on future economic development in the context of human capital, given the reduced level of entrant losses and the insignificant contribution of these regions to the creation of GDP and, in fact, the country's recovery and development potential.

Quadrant IV: regions whose educational institutions do not need support, based on the indicators under consideration. Significant losses of entrants (the coefficient is worse than the average for Ukraine); the region's contribution to the country's GDP is below the average for Ukraine. The significant level of losses of entrants is compensated by a small share of the region's contribution (less than 2.5%) to the creation of Ukraine's GDP. Learning losses are a negative phenomenon, however, for the regions of the IV quadrant (Table 1), their influence on the dynamics of economic development indicators of the country is almost insignificant. The clustering of regions can be the basis for determining the directions of priority investment in education to overcome learning losses and gaps in the context of strengthening human capital and future economic growth.

The given characteristics of learning losses by educational institutions in the regional aspect, and the role of a certain region in the formation of human capital are the initial conditions of the post-war recovery of Ukraine. The only conditionally positive consequence of the transition to a distance form of education in such conditions is the acquisition of experience in choosing digital technologies. The article by M.C.D. Villasol (2021) examines the changes in the use of digital technologies during the transition of students from face-to-face learning to online learning, which was due to the COVID-19 pandemic. Adaptation to study in a new format allowed students to evaluate all aspects of this process, identify advantages and disadvantages. This experience will be very useful when choosing digital technologies after the lifting of pandemic restrictions and the transition to face-to-face learning. During the pandemic, the global educational community was forced to conduct an audit of various software products for the educational process. For example, the article by S. Sriworapong *et al.* (2022) presented the results of the assessment of the quality of online education in higher education in Thailand. The authors gave comparative characteristics of various educational platforms. Leaders turned out to be those who enable the implementation of a game component in the educational process. These are the only conditionally positive consequences of the prolonged pandemic and war for the current state of the economy and the formation of human capital.

To overcome the negative consequences, a system of organizational and economic measures is proposed to

equalize access to quality education for different segments of the population, which will create an objective basis for eliminating learning gaps and restoring human capital. These include the creation of attractive conditions for the return of children with their parents from abroad and internally displaced families, such as: development and introduction of a temporary housing fund system; financing the restoration of the housing stock, educational, cultural and sports infrastructure, health care system; provision of a safe and accessible learning environment (shelters, bomb shelters). It is important to create acceptable conditions for employment and business development: to improve the organization of the labour market taking into account the needs of returning families; to simplify obtaining permits as much as possible. After the end of hostilities, it is necessary to return to the pre-war version of Resolution of the Cabinet of Ministers of Ukraine No. 179 "On Approval of the National Economic Strategy for the Period up to 2030" (2021). It provides significant tax incentives for business development. In the field of monetary regulation, in order to stimulate economic activity and economic growth, the National Bank of Ukraine (NBU) should also use various tools, such as regulating the level of banks' required reserves (to stimulate economic activity and economic growth, the NBU reduces banks' reserves); regulation of the discount rate (in order to stimulate economic activity and economic growth, the NBU lowers the discount rate), etc. Accordingly, under certain programs, banks can introduce preferential lending to certain business entities.

The system of measures to eliminate learning losses includes the following components. The development of a system for eliminating learning losses in basic and specialized high schools should include methods for assessing learning losses for each year of study and methods for compensating for these losses based on adjusting the content of academic disciplines and curricula. The system of vocational education and training is currently in decline, which is unacceptable, especially given the need to restore Ukraine's economy. A significant expansion of the system of vocational training is needed to meet the needs of the labour market. Economic recovery processes require the availability of skilled workers in all areas. In construction – master builders, carpenters, masons, electricians, plumbers and other specialists will be needed for the restoration and construction of new residential buildings, roads, bridges, schools, hospitals and other infrastructure facilities. In agriculture – farmers, agronomists, veterinarians and other specialists in the field of agriculture will be necessary to restore the agricultural sector, which may be affected by the conflict. In industry – workers from metallurgy, chemical industry, light industry and other industrial workers will help to restore and raise production. In medicine – nurses, pharmacists and other medical professionals play a critical role in providing medical care to the public, in disease prevention and control programs, and in the rehabilitation of victims. Workers in the hotel business, restaurants, transport and other workers in the field of tourism can help restore and develop the tourism industry of Ukraine, which in turn will help attract foreign investment and create jobs. In general, vocational training should prepare a wide variety of workers who will work together to restore and develop the economy and infrastructure of Ukraine.

The need to eliminate learning losses in higher education is no less urgent than at previously mentioned levels. Economic recovery is impossible without specialists with higher education diplomas, so it is necessary to develop and implement a system for eliminating learning losses in training specialists in higher education, which should include a methodology for assessing learning losses and a technology for drawing up an individual learning trajectory for each student. It is necessary to ensure the flexibility of learning on the basis of increasing the ability of students to choose their own learning pathway, particularly through individualized learning, interchangeable module curricula, Massive Open Online Courses programs, and flexible learning schedules. It is worth continuing the digitization of education based on the growing use of technologies and information systems in the educational process, including online courses, electronic textbooks, and distance learning. Developing lifelong learning based on the development of adult education programs, vocational training and retraining. Streamlining the network of HEIs in order to improve the quality of training of specialists in higher education in the conditions of recovery of Ukraine's economy (Ponomarenko, 2021).

In the post-war period, the role of universities that have close professional relations with enterprises and organizations of a particular industry increases significantly at the micro level. This gives them the opportunity to train specialists for specific jobs with a certain range of professional competencies. In the learning process, it is necessary to strengthen the emphasis on the development of the following personal competencies: critical thinking, creativity, communication and social competence. Economic recovery requires not only skilled workers, but also professional, practice-oriented engineering, technological, economic and managerial personnel with higher education diplomas for the micro level. Engineering, technological, economic and managerial specialists should be trained with a focus on the business of a particular industry so as not to waste time on retraining. In the post-war period, at the micro level, there is no place for economists, managers, technologists, engineers for all branches at the same time. In the process of forming a competent specialist, the entire educational process in the professional component should focus on a specific industry. At the micro level, economists, managers, engineers, technologists are needed separately for construction, mechanical engineering, metallurgy, transport, trade, etc. On average, the retraining of economists and managers with higher education diplomas, who were trained without reference to a specific industry, takes from one to three years to be able to work at a specific enterprise.

In this context, the role of the dual form of education is significantly increasing, which requires improvement of the legislative framework. A considerable increase in the practical component of the educational process in HEIs is impossible without a radical restructuring of the state order system for specialists with higher education diplomas. At the meso-level and macro-level in the post-war period there will be other trends, with the focus on interdisciplinary education. After the war, there will be a need for specialists able to work in interdisciplinary teams to solve the complex problems associated with the recovery and development of regional and macro economies. The trend

towards interdisciplinary forms an objective need for advanced training with the help of microcredit training (4-6 credits). For example, "Entrepreneurship".

The structure of Ukraine's needs for specialists with higher education diplomas in relation to specialties should be determined by the labour market. However, as research by V. Ponomarenko (2020) showed, the choice of specialty made by entrants often depends neither on the needs of the labour market nor on the cost of education. Therefore, the state should regulate the demand of entrants in relation to specialties through the state order system. The existing system is formally student-oriented, but in practice it does not ensure the necessary quality of training, since the state order for the training of specialists in a certain specialty is often given to HEIs, which do not have the opportunity to conduct high-quality training of relevant specialists. Dispersion of the state order in a certain specialty among HEIs, which from year to year enrol less than 10 entrants collectively for budget and contract forms of education, nullifies both practical and theoretical training of specialists. The state order should be given to HEIs of a certain specialization, which is confirmed by the enrolment of entrants according to data from USEDE for the previous 3-4 years (Ponomarenko, 2020).

The application of the proposed approach is one of the regulatory aspects of the formation of human capital, in accordance with the strategic needs of the country's economy. In the post-war period, the social responsibility of HEIs should increase. They should actively support initiatives aimed at helping war victims, internally displaced persons and veterans. This may include the creation of assistance programs, conducting research and implementing projects aimed at improving the socio-economic situation of affected groups, including disabled war veterans.

Agreeing with the statement of D. Shyian & Ye. Sevrukova (2021) on the importance of the level of education, its quality for the formation of human capital, it should be noted that in the study, the authors focus on the existence of differences in opportunities for people from large cities and small towns and the desire to use these opportunities. It is the level of education that determines the readiness and practical actions of individuals for self-development and ensuring the improvement of their own qualities. The authors determine the quality of human capital through the impact of the level of education and place of residence on the level of human income, and therefore on the share of the generated national income. The study presents the identified differences in certain socio-economic characteristics of human capital, depending on the level of education and place of residence of the person.

It should be noted that the problem of human capital losses due to the migration of the able-bodied educated population has worsened. Confirmation of the thesis that the safety factor is of paramount importance for "carriers" of human capital is reflected in the Deloitte report (Survey: Attitudes of Ukrainian refugees, 2023). According to Deloitte's conclusions, among the persons who were forced to leave the territory of Ukraine, the majority (more than 75%) have a high level of education: 47% have higher, university education, and 29% have professional (vocational and technical education). At the same time, according to the age structure of adults, the share of the active

population of non-retirement age from 18 to 59 is 82%, that is, these are the most productive human resources that could potentially work to create the GDP of Ukraine in the current time period. Costs for the formation of this human resource, i.e., education and health care costs, were incurred in the past in order to obtain an economic effect today. Deloitte's profile of refugees from Ukraine found that 86% of migrants have some concerns about returning to Ukraine, and almost 50% identified security as the main reason for staying in another country.

Quarantine due to the pandemic had a significant impact on young people. In their article, T. Ebert *et al.* (2022) presented the results of a study of the impact of quarantine on Israeli students physically, socially and psychologically, how the number of children suffering from anxiety and depression has changed. It has been found that many children experienced learning, social, emotional, and behavioural gaps during the lockdown and lost the skills to cope with everyday challenges due to social isolation. It is clear that the war will leave much more serious psychological effects on the population, particularly on the students, so HEIs should develop psychological support and counselling for students who have experienced war or witnessed violence. In addition, they should initiate and develop various forms of assistance in psychological support of the population.

In the post-war period, against the background of negative psychological consequences, the formation of a high-quality individual emotional and intellectual portrait becomes extremely important. The components of this portrait are: emotional awareness, emotional intelligence, self-motivation, empathy, recognition of other people's emotions. These components de facto are the basis for the formation of high-quality personal competencies. Psycho-emotional state is one of the important components of human capital. Along with education, the psycho-emotional component of human capital has a significant impact on its effectiveness in generating national income. In general, the proposed systematic measures to eliminate learning losses and learning gaps will certainly contribute to the restoration and increase of Ukraine's human capital.

■ CONCLUSIONS

The paper analysed the categorical basis of learning losses and learning gaps, and their impact on the current state of economic development, on the formation of human capital, and the impact on prospective indicators of the country's economic condition. The work summarizes the main factors that influenced the organization and implementation of the educational process during the pandemic and military actions at various levels of education. In combination with the data on migration processes, the structure of refugees, the predictive assessment of their return and the terms of return, it was possible to reveal the extent of the loss of human capital in Ukraine over the past year. Clustering of regions has been carried out depending on the size of educational losses, due to the volume of losses of entrants, and the share of a certain region's contribution to

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the creation of national income. The results of clustering made it possible to identify four clusters of regions. The regions of the first and second clusters need the greatest support, namely, the first cluster includes Kharkiv, Zaporizhzhia, Odesa Regions and the Kyiv city, and the second cluster includes Dnipropetrovsk, Lviv, Kyiv and Poltava Regions. These are the regions in which the largest economic potential of the country is concentrated, the share of entities that are the basis for the formation of GDP and national income of Ukraine. The role of human capital, the quality of human capital and its availability in these regions becomes crucial in the context of Ukraine's post-war recovery. The four regions of the first cluster account for almost 40% of Ukraine's total GDP, at the same time, these regions suffered the greatest learning losses due to the loss of entrants to regional HEIs as a result of the outbreak of active hostilities on the territory of Ukraine. Educational institutions in these regions need special support. This will contribute to faster compensation for learning losses and the restoration of human capital.

The paper also formulated the main measures for secondary and higher schools aimed at eliminating learning gaps and minimizing learning losses. Expanding the possibilities of a dual form of education in combination with the introduction of relevant legislative changes, actual individualization of education, strengthening of the practical component of training at all stages of the educational process with real integration of education and business, encouraging business to invest in education and science, including through the levers of preferential regimes. Providing psychological support and psycho-emotional restoration of human capital through restoration of emotional, social, psychological, behavioural, communication gaps. Implementation of an effective government policy in the field of ensuring the training of personnel needed for the post-war recovery of the country, including through the modernization of the state order system for the training of specialists in higher and professional pre-higher education. The implementation of a set of measures in the education system in combination with government policy and support for educational and business institutions is aimed at restoring human capital and developing the economy of Ukraine. A detailed study of the current and delayed impact of factors of a psycho-emotional nature on the quality of human capital, on the possibilities of its restoration, etc., can be the direction of further research into the problems of human capital formation. Among the directions of further research, it is also possible to determine the development of specific mechanisms for the development of regions and relevant educational institutions, taking into account the peculiarities of their territorial location.

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■ CONFLICT OF INTEREST

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Особливості впливу освітніх втрат на формування людського капіталу в Україні в умовах воєнного стану

■ **Анотація.** За період пандемії та воєнного стану Україна втратила значну частину людського капіталу: оцінка цих втрат та розробка пропозицій їх відновлення є особливо актуальною в контексті необхідності відновлення економіки України в повоєнний період. Метою статті було дослідження та систематизація причин втрат людського капіталу та їх структури, визначення впливу освітніх втрат на формування людського капіталу, а також узагальнення пропозицій щодо компенсації понесених освітніх втрат та відновлення людського капіталу. У результаті аналізу наукових праць було виявлено низку факторів, які впливають на рівень освітніх втрат та освітніх розривів внаслідок карантинних обмежень у різних країнах світу, таких як: Німеччина, Іспанія, Бельгія, Китай. Систематизація інформації дозволила здійснити групування факторів, які впливають на освітні втрати в Україні, з виокремленням груп факторів, які обумовлені обмеженнями можливості відвідування освітніх закладів, та груп факторів, що виникли внаслідок воєнних дій в Україні. В роботі обґрунтовано наявність регіональних відмінностей виникнення освітніх втрат та їх впливу на формування людського капіталу. Проведено кластеризацію регіонів за ознаками втрат вступників у закладах освіти та внеском регіону в створення валового внутрішнього продукту України. Результати кластеризації дозволили визначити пріоритетні напрямки відновлення людського капіталу. За результатами досліджень запропоновано заходи усунення освітніх втрат та освітніх розривів для закладів освіти різних рівнів, які можуть бути застосовані на практиці в повоєнній відбудові економіки країни

■ **Ключові слова:** економічний розвиток; заклади освіти; валовий внутрішній продукт; індекс людського капіталу; продуктивність наступних поколінь; якість

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Strategy to increase the share of sales in the pharmaceutical market

■ **Abstract.** The topic of sale of medical products is relevant, as the pharmaceutical industry is continuously transforming in accordance with new requirements, which forces companies and organisations to constantly adapt to changes in the environment and pay more attention to strategies for selling medical products. The purpose of the study was to analyse current trends and challenges in the healthcare sector, with a focus on increasing sales. The applied approaches include analytical, statistical, functional, system analysis, deductive, synthesis, comparison, and modelling. Research on this topic included an analysis of current practices covering strategies for increasing sales in the pharmaceutical market using the example of AstraZeneca. The main factors influencing the growth of competition in this area and the need to develop effective methods to increase the share of companies' products in this market are analysed. The market trends, consumer preferences, and marketing strategies used in this industry are analysed. A variety of strategies were identified while analysing different approaches to increasing sales in the pharmaceutical sector. These strategies cover various aspects, such as marketing techniques, adapting to market dynamics, and strategies for attracting new customers. Based on the review of the market situation and the needs of the target audience, a comprehensive strategy was developed aimed at increasing the share of sales of specific pharmaceutical products. The main obstacles faced by pharmaceutical companies in their quest to increase their market share were identified. This study is of practical significance in using the results obtained to develop and apply strategies to increase sales of pharmaceutical products

■ **Keywords:** healthcare; digital marketing; competition; consumer behaviour; sales optimisation

■ INTRODUCTION

In the modern world, the pharmaceutical sector is one of the most dynamically developing industries, constantly adapting to changes in external factors and market requirements. This segment is waging its own vigorous battle for attention, innovation, and leadership in the face of increasing competition among companies. In the pharmaceutical industry, where every step requires elaboration, the development of effective strategies to increase sales is becoming an integral success factor for enterprises. This topic is becoming especially important, since often the success of companies depends not only on the quality of

the products offered, but also on the ability to understand, anticipate and meet the requirements of an ever-changing market. The dynamics of consumer behaviour in the field of healthcare is constantly evolving, emphasising the importance not only of the product itself, but also of understanding it from the consumer's standpoint. Patients are increasingly informed and actively involved in their medical choices. This creates new challenges for pharmaceutical companies – they must not only offer high-quality products, but also approaches to their presentation, communication, and meeting the needs of patients.

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Research and development of effective strategies to increase sales of pharmaceutical products are of significant importance not only to achieve a competitive advantage, but also to better meet the needs of patients and customers. Ensuring effective interaction between companies and their customers is becoming an important factor for the successful promotion of products in the healthcare market. Penetration into the pharmaceutical market, its growth and sustainability become possible only through the development of innovative marketing approaches, strategies, and adaptation to market requirements. This allows companies to compete by providing not only high-quality products, but also meeting the increasingly diverse needs of customers in the field of healthcare.

The expert opinions of researchers in the pharmaceutical field emphasise the inevitability of strong competition in this industry and the need for companies to develop strategies aimed at increasing sales. The medical market is becoming more competitive, requiring pharmaceutical organisations to constantly develop and attract new customers. L.B. Bogatyreva & B.A. Taitorina (2022) in their research emphasised the need to invest in advanced technologies and innovations to maintain leadership positions in the medical products market. This is becoming an important component of the strategy to increase the share of sales, allowing companies to remain competitive. It will also provide an incentive for innovation and development, which will ultimately help companies remain among the leaders in this industry. E.M. Suleimenov (2021) discussed the importance of creating a unique style of medical services and developing a strong brand for companies in the pharmaceutical market. This becomes a key element of the strategy, as highlighting competitors and emphasising advantages helps to attract more customers and, consequently, increase sales.

According to M.V. Shugurov (2021), active cooperation between medical institutions, insurance companies, and medical equipment manufacturers is an important strategic approach to develop integrated solutions that increase competitiveness and improve the patient experience. Such a partnership plays a key role in developing a strategy to increase the share of sales in the pharmaceutical market. J. Abdrakhmanova *et al.* (2022) highlighted that improving the quality of medical services is a fundamental aspect for customer satisfaction and a successful strategy to increase sales. In a rapidly changing healthcare environment, the pursuit of education and staff development is becoming an important element of a competitive strategy. A.V. Lokshina (2020) emphasises the importance of understanding the needs of the target audience in order to develop a successful strategy for attracting and retaining customers in the pharmaceutical market. The researcher notes that active market research and feedback from consumers allow companies to remain leaders and achieve an increase in market share in highly competitive environment. E.B. Orazgalieva & M.R. Smykova (2023) emphasise that the development of personalised medical solutions is becoming a key element of the strategy to increase sales in the pharmaceutical market. The personalisation of services based on the individual needs of patients not only strengthens the trust and loyalty of customers, but also contributes to an increase in demand for the products and services offered.

Thus, the combination of opinions of researchers and experts emphasises the importance for medical institutions to develop innovative strategies that focus on the uniqueness of the services provided, cooperation with other industry participants, and continuous improvement of the quality of service to meet customer needs in an ever-changing medical environment. Previous studies have not considered the potential of using modern digital marketing tools to promote pharmaceutical products and services. The focus on the analysis of digital strategies such as Internet marketing, social networks, data analytics and machine learning technologies, their effectiveness in attracting and retaining customers in the pharmaceutical industry, remains insufficiently covered in previous studies. The purpose of this study was to explore, analyse, and evaluate the potential of applying advanced and effective digital marketing strategies in the pharmaceutical sector to improve practices in the industry. The objectives of this study were: to analyse the effectiveness of various types of marketing tools in attracting and retaining customers in the pharmaceutical industry; to investigate the most effective methods of optimising strategies to increase the share of sales in the pharmaceutical industry; to conduct a statistical analysis of the pharmaceutical market in Kazakhstan.

■ MATERIALS AND METHODS

A review of research papers and studies focusing on the pharmaceutical market has been carried out, including aspects on tools and strategies to expand the market share of product sales. The official documents and reports of the Bureau of National Statistics of the Agency for Strategic Planning and Reform of the Republic of Kazakhstan (Industrial production statistics, 2023), the Ministry of Health of the Republic of Kazakhstan, and the TradingView web service for determining indicators were studied. The research was carried out using such methods as analytical, statistical, functional, system analysis, deductive, synthesis, comparison, and modelling.

The analytical method was used to comprehensively investigate the factors influencing the volume of sales of medical services. With its help, it was possible to identify both the strengths and weaknesses of medical organisations. The use of the statistical method helped to investigate the volume of data and get an objective idea of the impact of various factors on sales in the pharmaceutical market. The functional method was aimed at studying and describing the roles of various participants in the medical industry, including medical institutions, patients, insurance companies, and other participants. The system analysis was used to consider the medical industry as a complex system, helping to identify the main factors and interactions affecting the sale of medical products.

The application of the deduction method helped to identify general patterns based on specific cases and data, contributing to the study of general principles and approaches applicable to increase sales in various competitive conditions. The synthesis was used to combine various elements and factors into a single structure, contributing to the development of integrated solutions in the field of increasing sales in the pharmaceutical market. The comparison was used to contrast various medical organisations and their approaches to attracting customers, highlighting

best practices and successful strategies based on the experience of leading market participants. The modelling was used to evaluate strategies for increasing sales using available data and tools that allow making informed decisions based on numerical data and development scenarios.

The study covered many aspects, including the analysis of various approaches and concepts aimed at identifying the main factors influencing the successful attraction and retention of clients in medical organisations. The study examined various marketing theories and concepts applicable in the healthcare sector, such as market segmentation theories, marketing combination strategies, customer experience management, and other methods that contribute to increasing sales of medical products. Another aspect of the study included an analysis of successful strategies of medical institutions within the country in order to identify effective methods of attracting and retaining customers. Various factors contributing to success in highly competitive environments have been identified. Sales increase strategy was modelled using the example of a conditional company that specialises in the production of vitamins and minerals. These actions were applied to consider the feasibility of improving the efficiency of the marketability of services in healthcare facilities for their successful development.

■ RESULTS

In the field of medicine, facing increasing competition is becoming one of the key challenges for institutions and clinics. This dynamic trend is explained by several factors that have a significant impact on healthcare. There is an increase in the number of medical institutions, clinics and private practices, which increases competition and redistribution of the customer base. In such circumstances, each institution strives to offer something unique to stand out from the competition. Modern patients are increasingly aware and demanding, focusing on high quality services and are ready to consider alternatives if the current level does not meet their expectations. The Internet and social networks provide patients with the opportunity to quickly compare different medical institutions and share reviews, which makes the choice of a medical organisation conscious and justified (Mohammad *et al.*, 2021).

The rapid progress of technology in the medical field has significantly increased the level of competition in the industry. Organisations that successfully adapt advanced technologies demonstrate the ability to attract more customers and maintain their competitiveness (Gopal *et al.*, 2019). For example, one of the largest pharmaceutical companies, AstraZeneca uses various strategies and tools to reinforce its position in the market. The company's revenue for 2022 amounted to USD 45.6 billion with a net profit of USD 3.4 billion, and has an upward trend over the past 5 years. The company attracts attention with its constant investment in research and development of new medicines. The company invests significant resources in various scientific programmes, works on the development of innovative drugs and therapies to combat a variety of diseases. Their focus on research allows them to maintain leadership in innovative solutions in the pharmaceutical industry. They actively invest in research in oncology, cardiology, neurology, and other key areas, which helps to expand the company's product portfolio and increase

customer satisfaction. An example of their innovation strategy is their lung cancer drug Tagrisso. It was developed after many years of research and has become an effective drug for patients with inoperable lung cancer with an epidermal growth factor receptor mutation (Kettle & Wilson, 2016). Such innovative products become a fundamental element of AstraZeneca's marketing strategy, which allows the company to maintain its position in the market.

Competition between pharmaceutical manufacturers and service providers is one of the key factors determining the share of sales in this industry. This struggle for market positions has a significant impact on the behaviour of companies and consumer choices. Factors such as pricing, the application of discounts, the development of marketing strategies and the general level of competition play a significant role in shaping customer preferences and affect the share of sales of each company in the industry (Erlangga, 2022). AstraZeneca actively uses a variety of marketing strategies and tools to promote its products. The company invests in advertising campaigns aimed at different audiences: medical professionals, patients, and potential consumers. They strive to reach a wide audience by using both traditional channels (television, print media) and digital platforms (websites, social networks, online advertising) to disseminate information about their products and services. They use digital marketing, participate in medical exhibitions and conferences to promote their products, which helps to increase brand awareness and sales. The use of platforms such as Facebook, Instagram, Twitter, and LinkedIn allows companies to not only provide information about their products and services, but also create communities where patients can share their experiences, ask questions and receive support (Verghese *et al.*, 2019). This helps companies build trust and improve their reputation.

Legislation and regulation also have a significant impact on the pharmaceutical market, including AstraZeneca's activities. Government regulations, requirements for registration procedures for new medicines, patent legislation, and other legal aspects have an important impact on companies in this field. Changes in legislation may affect the availability of products, their price and the level of competition between market participants (Durán *et al.*, 2021). These legal aspects establish the basis for regulating the pharmaceutical industry and can significantly influence sales strategies and the overall success of companies in this segment.

Marketing segmentation is an important strategy. Companies analyse the market and divide it into different segments based on consumer characteristics such as age, gender, diseases, preferences, and other factors (Mohammadzadeh *et al.*, 2019). This allows creating targeted marketing campaigns, more precisely adjusting to the needs of each group of customers. Pricing strategies are also an important part of a successful sales share in the pharmaceutical industry. Pricing of medicines and medical products depends on many factors, including production costs, competition, cost of research and development, and accessibility for patients. Choosing the right pricing strategy allows companies to maintain market positions and attract more customers (Bharskar & Siddheshwar, 2020). In 2023, AstraZeneca announced that Tremelimumab would be available at a reduced price in some regions (CADTH

reimbursement recommendation, 2023). This enabled more patients to gain access to innovative treatment, which contributed to the expansion of the company’s customer base. The company’s sales strategies include strategic partnerships with medical institutions and organisations around the world. For example, AstraZeneca entered into a partnership with the International Agency for Research on Cancer, which helped to research and develop new cancer treatments. All these strategies work together to ensure a successful share of sales in the pharmaceutical industry, ensuring the competitiveness of companies and their products in the market.

The pharmaceutical market in Kazakhstan is a dynamically developing sector. It is influenced by many factors, such as increased demand for medical services and pharmaceutical products, changes in healthcare legislation, technological progress, and global trends in the pharmaceutical industry. At the end of 2022, 97 pharmaceutical manufacturers were operating in the country, among which 34 specialise in the production of medicines, 41 – medi-

cal devices, and 22 focus on the development of medical equipment. The estimated value of the pharmaceutical industry reaches KZT 863 billion, while producers in Kazakhstan contributed KZT 162 billion. In 2022, the share of local production in the pharmaceutical market of Kazakhstan was 19%, while imported goods accounted for 81% (Industrial production statistics, 2023). In Kazakhstan, the pharmaceutical market has some features, such as the constant development of medical equipment and technologies, increasing requirements for the quality of medical care and increasing interest in innovative treatment methods. These factors contribute to the growth of investments in healthcare and pharmaceuticals in the country. There is an increase in the number of private medical centres and pharmacies, which indicates increased competition in the sector. In addition, the increase in household incomes and changes in the structure of healthcare contribute to the expansion of the range of medical products and services on the market. Table 1 shows the main indicators of the pharmaceutical sector in Kazakhstan.

Table 1. Dynamics of the main indicators of the pharmaceutical industry in Kazakhstan

Indicator	2020	2021	2022
Production volume, billion KZT	138.3	198.7	162.6
Number of companies	88	96	97
Share of goods from Kazakhstan, %	16%	25%	19%
Investments in billion KZT	15.3	21.3	22.8
Exports, billion USD	0.06	0.06	0.07
Imports, billion USD	1.56	1.72	1.86

Source: compiled by the author based on Industrial production statistics (2023)

A general analysis of these data suggests that the pharmaceutical industry in Kazakhstan shows a tendency to growth and development, but with some fluctuations in key indicators, which requires attention and additional analysis to understand the causes of these changes and develop strategies for stabilisation and sustainable development of the industry. The market is facing some challenges, including the need to improve healthcare infrastructure in the regions, uneven distribution of medical services, and regulatory and legislative aspects that require constant updating and adaptation. The approach to overcoming these problems was presented in the form of a developed strategy to increase the share of wholesale sales of pharmaceutical products. The approximate steps for the successful implementation of this strategy are shown in Figure 1. This innovative approach allows considering in detail practical measures and methods that can be implemented for growth in this area.

To effectively expand the share of sales in the pharmaceutical products market, it is necessary to start with a thorough study of this industry. This stage includes an analysis of key trends, the state of the competitive environment, and identifying market share and the needs of the target audience. Such a detailed analysis helps to identify potential niches for innovative products and highlight the company’s competitive advantages. Based on the results of the market analysis, a unique product offer is being developed that differs from existing products on the market and is able to attract the attention of wholesale buyers. This

may be, for example, the creation of a vitamin and mineral complex with a unique formula, the development of products with increased bioavailability or specialised supplements aimed at certain consumer groups. One of the important steps in this strategy is to ensure high quality products and obtain all necessary certificates and licenses. High product quality and compliance with safety standards are becoming fundamental factors for attracting wholesale customers, as they are focused on providing their customers with reliable and safe products.



Figure 1. Strategy to increase the share of wholesale sales of pharmaceutical products

Source: developed by the author

To attract attention and create connections with wholesale customers, it is necessary to develop an innovative marketing strategy. This may include using a variety of communication channels such as digital marketing, social media, email newsletters, and active participation in exhibitions and events. An important step is also active interaction with wholesale customers, providing a unique product offer and favourable terms of cooperation. Providing training to partners on product features and benefits, informing them about new products and promotions, consulting and assistance in solving issues also contribute to successful cooperation. Constant analysis of feedback from wholesale customers and the use of this data to improve products and conditions of cooperation are key factors in development. In addition, it is important to respond to changes in the market and customer needs by considering ways to expand the product range to attract new customers and retain existing ones. A model situation has been created in which the conditional company Vitamins and Minerals in Kazakhstan aims to increase the share of wholesale sales of vitamins and minerals. The company has applied the previous strategy, which contains 4 stages.

Stage 1. Target audience identification and product development. The Vitamins and Minerals company conducts extensive research on the vitamins and minerals market in Kazakhstan. They analyse data on existing manufacturers and suppliers, sales volumes and demand for various types of vitamins and minerals. They also study consumer preferences and needs by conducting surveys and focus groups among pharmacies, medical institutions, and sports clubs. Based on the results of the study, Vitamins and Minerals identifies the most in-demand vitamins and minerals that need specialised products. For example, they can develop unique complexes for athletes, products to maintain heart health, strengthen immunity, etc. These specialised products help to stand out in the market and attract the target audience.

Stage 2. Free sample distribution and user reviews. A pharmaceutical company provides free samples of a new product to a certain group of potential customers. A strategy for distributing samples to the target audience is being developed. This may include using partner networks, pharmacies, medical facilities, sports clubs, or online platforms to register participants. The company ensures control over the quality of samples and transparency of the process. Participants receive information about the product, its application and benefits, while having the opportunity to give an honest and objective review without the influence of the company. Users who have received samples have the opportunity to use the product and leave their feedback on the online platform. The company collects data on the reaction of participants to the product, analyses feedback and product effectiveness, identifies positive and negative aspects for further improvement of the product and marketing strategy. An online platform can be a specialised website, application, or social network where users can communicate and give feedback. Determining the format of the platform includes choosing the optimal type of resource for information exchange. A user-friendly and intuitive interface is being developed to ensure the security of user data.

Stage 3. Innovative marketing strategy. Vitamins and Minerals actively uses advanced digital marketing tools

to develop its innovation strategy. They pay special attention to SEO (search engine optimisation), using advanced techniques and technologies to optimise their website. They conduct a comprehensive keyword analysis, explore trends and preferences of the target audience in order to optimise the content of the site. Not only the main content, but also metadata, tags, headers, and other aspects of the site are carefully optimised to improve its search results. They create unique and valuable content about their products based on the latest scientific research and trends in a healthy lifestyle. This includes articles, blogs, newsletters, video and audio materials that not only inform, but also engage the target audience. The pharmaceutical company implements a network marketing strategy that includes various approaches to attract and retain users. One of the main methods is affiliate programmes that offer incentives to attract new users. This includes bonuses, discounts or other incentives for both current customers and their referrals. In addition, the company actively engages users through influencer marketing, collaborating with influential personalities or experts in the field of healthcare. They attract such people to promote products through their social networks and blogs, which helps to spread information about the product among their audience.

Stage 4. Feedback analysis and adaptation. The company actively analyses the reaction to the product in various online channels. It tracks discussions, product mentions, and analyses comments, reposts, and general user reactions. The information obtained is used to further improve the product, improve the user experience, and optimise the marketing strategy. The company identifies positive and negative aspects based on data from feedback and online presence monitoring, which helps to make informed decisions to retain current customers and attract new ones. Based on the analysis of data and market trends, further steps are being developed to improve the product and the effectiveness of marketing strategies. Thus, Vitamins and Minerals can effectively implement a strategy to increase wholesale sales, considering market requirements and offering innovative products to customers.

Implementing a strategy to increase wholesale sales of vitamins and minerals may face several difficulties. Obtaining the necessary certificates and licenses can be a complex and resource-intensive process that prevents successful transactions with wholesale customers. The development and implementation of marketing strategies may also require significant financial costs for advertising, marketing materials, and customer training. Financial constraints may limit the company's ability to promote its products. The demand for vitamins and minerals may be seasonal, which affects sales planning and filling production volumes. In addition, customers in the wholesale segment may have doubts about new suppliers, which slows down the process of concluding contracts (Kraus *et al.*, 2021). For the successful implementation of the strategy, it is necessary to consider these problems and develop action plans to solve them. It is important to contact specialists and agencies who can help to obtain the necessary certificates and licenses. This also includes competent preparation of documents and constant monitoring of legislative updates to ensure timely certification updates. Budgeting for marketing activities, considering cost optimisation and efficient use of

company resources, is also extremely important. In some cases, it may be necessary to attract investments or loans to support business expansion and marketing initiatives.

Marketing campaigns and discount offers can be effective to stimulate demand during periods of reduced seasonal demand. The diversification of the product range will meet the needs of customers in different seasons. To overcome the trust from the customers, test samples of the products can be provided to them. Complete and reliable information about products and certification will also help to establish trusting relationships with customers. Creating flexible marketing strategies will help to adapt to market variability, and constant monitoring of its trends will allow responding in a timely manner to changes in demand.

■ DISCUSSION

The conducted research emphasises the importance of effective use of marketing strategies in a highly competitive healthcare market. Strategic planning is becoming a necessity to ensure the sustainable growth and development of the organisation in this segment. Maintaining competitiveness is a critical aspect for medical institutions, given the saturation of the market and the variety of products provided by various organisations. Strategic planning includes an analysis of the market and needs, enabling an assessment of the current situation, identifying risks, and highlighting opportunities for further growth. A deep understanding of customer requirements allows customising the services offered to their expectations and create a valuable offer for the target audience. Given the limited resources such as finances, personnel and equipment, the strategy should clearly identify priority areas for development and allocate funds to the most significant projects to make optimal use of available resources.

This study emphasises that a strategy to increase wholesale sales of vitamins and minerals should be based on an integrated approach, considering market characteristics and customer needs. Product quality, effective marketing promotion, adaptability to market changes and the establishment of long-term partnerships with wholesale customers are the most important factors for the success of this strategy. Product quality is central, requiring strict control of all stages of production and compliance with international standards. An effective marketing strategy that can attract the attention of potential wholesale customers and a sustainable retention policy for existing customers become important elements of a successful strategy. It is also necessary to maintain a high level of service, respond to customer requests and offer favourable terms of cooperation in order to strengthen partnerships and remain a reliable partner in the market.

P. Esfahani *et al.* (2018) analysed the concept and strategy of marketing focused on the field of medical services. Given the specific features of this industry, marketing approaches should be adapted and aimed at specific methods of marketing strategy management. The study highlights the specifics of developing a marketing strategy in the field of healthcare, considering the complexities and characteristics associated with the provision of medical services. This includes an analysis of the dynamics of patient needs, compliance with the standards and norms of this industry, and features of the competitive environment and changes

in consumer behaviour. The study examines communication and pricing strategies that play a key role in attracting customers and maintaining their loyalty. The researchers' findings, like this study, present an analysis of marketing aspects in the medical field, revealing important aspects of marketing strategy development that can be applied to successfully develop and improve the efficiency of medical organisations in today's market competition. The researchers also consider aspects such as unique product offers, service expansion, the development of new market segments, and the establishment of long-term partnerships.

In the course of the study, M. Subedi (2018) analysed the strategies used in the field of wholesale sales of medical products. The findings confirmed that effective strategies include a number of key elements: market research and needs analysis, developing a unique product offering, establishing long-term partnerships with wholesale customers and paying attention to feedback. In addition, the researcher drew attention to the importance of considering possible problems and suggested methods to solve them, such as customer support, adaptation to changing market conditions, and expansion of the product range. The results of the study emphasise the importance of an integrated approach to the development of strategies in the field of wholesale sales of medical products. Given the specifics of the market, offering unique products, developing long-term partnerships and providing flexible solutions to overcome problems are important success factors in this field. These findings can be very useful for companies wishing to increase their efficiency and success in the sale of medical products.

M. Alshurideh *et al.* (2018) analysed the factors influencing the success of a marketing strategy in the field of medicine. The results confirmed that there are certain key factors that play a significant role in achieving success in this industry. Customers of medical services and products highly value quality, and this becomes a determining factor in their choice. In the medical field, where competition can be fierce, it is important to create and implement promotion strategies that can attract the attention of customers and distinguish the company from competitors. Customer loyalty is also of great importance, and establishing long-term mutually beneficial relationships with them helps to ensure a stable flow of orders and increase the level of trust on the part of customers. It is important to note that the adaptation of strategies to the features of consumer behaviour and the dynamic needs of patients is a critical necessity. These findings can be highly valuable for companies in the medical field, helping them effectively develop marketing approaches, increase their sales share, and reinforce their competitiveness in the market.

M. Khazzaka (2019) analyses in detail the main theoretical aspects related to marketing in the field of pharmaceuticals and the marketing research system of the drug market. The study highlights key marketing strategies applicable in the pharmaceutical industry, which contributes to a deeper understanding of the current market situation and the identification of factors affecting the success and competitiveness of companies in this industry. Aspects of the promotion of medicines, the development of optimal pricing strategies, the establishment of long-term and mutually beneficial relationships with customers, and

other strategies that help attract and retain the customer base are investigated. The paper under consideration, as well as this study, has significant practical significance for companies involved in the pharmaceutical sector. The presented research and analysis can help identify the strengths and weaknesses in the drugs market. This allows companies to develop marketing strategies more effectively, optimise their activities, and improve their competitiveness in the market. Y. Wang *et al.* (2018) analysed the effectiveness of strategies in the medical industry with an emphasis on the level of customer satisfaction. The results showed that customer satisfaction plays a significant role in attracting and retaining customers in the field of medical services. The researchers highlighted that the quality of the service provided and the medical care itself directly affects the level of patient satisfaction. In order to reinforce their position in the medical services market, companies should actively work to improve the quality of services provided, pay attention to customer feedback, and regularly analyse the level of satisfaction. One of the key components of a successful marketing strategy in this industry is the continuous training of medical personnel and the development of a positive attitude towards patients.

In addition to what the researchers have said, they should consider the use of information technology and digital media platforms, which can significantly improve communication with customers and increase customer satisfaction. Online appointment platforms, as well as feedback through social media and other digital solutions, contribute to improving the availability of medical services and provide greater convenience for customers. In general, the findings emphasise the importance of developing effective strategies in the field of medicine and product sales. Medical marketing emphasises the need to adapt strategies to customer needs, pharmaceutical sales emphasise marketing promotions and tax reduction, in medicine the key factor is customer satisfaction driven by quality of service and the use of digital technology to improve accessibility of services. These findings highlight the importance of adapting strategies and continuous market analysis for successful development in various industries.

The pharmaceutical market in Kazakhstan is a dynamically developing sector. It is influenced by many factors, such as the constant demand for medical services and pharmaceutical products, technological progress, and global trends in the pharmaceutical industry. The study revealed the significant importance of this topic in the face of fierce competition. Factors such as pricing, the application of discounts, the development of marketing strategies, and the general level of competition play a significant role in shaping customer preferences and affect the share of sales of each company in the industry. The pharmaceutical industry uses a number of marketing and sales strategies that play a key role in attracting customers, promoting products, and increasing

the share of sales. Interacting with patients, increasing brand awareness and increasing sales are important aspects in which digital marketing is actively involved.

■ CONCLUSIONS

It was revealed that the pharmaceutical industry in Kazakhstan shows a tendency to growth and development, but with some fluctuations in key indicators, which requires attention and additional analysis to understand the causes of these changes and develop strategies for stabilisation and sustainable development of the industry. As a result, a strategy was developed to increase wholesale sales, including market research, unique offers, product quality and certification, marketing strategies, cooperation with wholesale customers, training, customer support, feedback and adaptation, and product range expansion. The application of this strategy is also modelled on the notional Vitamins and Minerals company. Possible problems were identified, such as market volatility and difficulties with certification. To solve them, it is necessary to actively cooperate with industry participants, use innovations and information technologies, and consider customer satisfaction and regular analysis of market trends. Competent preparation of documents, constant monitoring of legislative updates, budgeting for marketing activities, attracting investments or loans, diversification of the assortment, constant monitoring of the market are also important actions to improve the efficiency of pharmaceutical companies. The results of the study emphasise the need to develop flexible strategies and use new technologies for successful functioning in the field of wholesale sales of medical products in the pharmaceutical market.

In general, the development of comprehensive and flexible strategies plays an important role in the success and development of medical organisations and enterprises engaged in the sale of goods and services. An integrated approach that includes analysing the market and needs, creating unique offerings, ensuring high quality products, effective marketing strategy and developing partnerships is considered an effective method for increasing sales share in the pharmaceutical sector. In addition, it is necessary to actively adapt to customer characteristics and consumer behaviour trends. These strategies help to attract and retain customers, increase satisfaction and trust, and increase competitiveness in the market. In subsequent studies, it is advisable to consider the effectiveness of using digital marketing tools in promoting pharmaceutical products. Exploring digital advertising techniques, networking, data analytics and online platforms would facilitate a more accurate assessment of their impact on increasing sales and customer engagement.

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■ CONFLICT OF INTEREST

None.

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Стратегія зі збільшення частки продажів на фармацевтичному ринку

■ **Анотація.** Тема продажу медичних товарів є актуальною, оскільки фармацевтична галузь постійно піддається трансформаціям відповідно до нових вимог, що змушує компанії та організації постійно адаптуватися до змін у середовищі та приділяти більше уваги стратегіям продажу медичних товарів. Мета дослідження полягала в аналізі сучасних тенденцій та викликів у сфері охорони здоров'я, сфокусованих на підвищенні частки продажу. Серед застосованих підходів було включено аналітичний, статистичний, функціональний, системний аналіз, дедуктивний, метод синтезу, порівняння та моделювання. Дослідження з цієї теми включало аналіз поточних практик, що охоплюють стратегії підвищення обсягу продажів на фармацевтичному ринку на прикладі компанії AstraZeneca. Проаналізовано основні чинники, що впливають на зростання конкуренції в цій сфері та необхідність розробки ефективних методів для збільшення частки продукції компаній на даному ринку. Проведено аналіз ринкових тенденцій, переваг споживачів і маркетингових стратегій, що застосовуються в цій галузі. У ході аналізу різних підходів до збільшення продажів у сфері фармацевтики було виділено різноманітні стратегії. Ці стратегії охоплюють різні аспекти, такі як методи маркетингу, адаптація до динаміки ринку та стратегії залучення нових клієнтів. З проведеного огляду ситуації на ринку та потреб цільової аудиторії розроблено комплексну стратегію, спрямовану на збільшення частки реалізації конкретної фармацевтичної продукції. Ідентифіковано основні перешкоди, з якими стикаються компанії у сфері фармацевтики при прагненні збільшення своєї частки на ринку. Дослідження має практичну значущість у використанні отриманих результатів для розробки та застосування стратегій збільшення продажів фармацевтичних товарів

■ **Ключові слова:** охорона здоров'я; цифровий маркетинг; конкуренція; споживча поведінка; оптимізація продаж

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Trends in the development of digital subscription services in international markets

Abstract. Companies are trying to harness the potential of the current stage of development of the digital industry and make it cost-effective, which requires not only technological innovation but also the transformation of many existing business models. Based on an analysis of examples of digital subscription companies, this article provides additional explanations, including definitions and constituent characteristics of digital subscription business models. The aim of the article was to identify trends in the development of digital subscription services by analysing the number of active subscribers and the impact of COVID-19 on this indicator. Autoregression and analysis methods were used in the study, and the implementation of the selected models was carried out using the Python-3 programming language. The article describes a theoretical basis that determine the feasibility of using the subscription model for the company under non-deterministic critical conditions. The main approaches to forecasting the company's performance indicators are identified. The type of data to be forecasted is determined, and the necessity of using autoregressive models for further analysis is declared. Factors associated with the COVID-2019 incidence that should be considered as exogenous variables were identified. The multicriteria selection problem was constructed by restricting the family of autoregressive models and determining the criteria for forecasting and data preparation time, forecast accuracy, and the possibility of

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considering external factors in determining the algorithm efficiency. It is found that moving average autoregression is the most effective. Given the further application of this algorithm to predict the number of subscribers, the expediency of implementing a subscription strategy for the company under non-deterministic critical conditions is declared. It is possible to effectively apply the selected mathematical model to predict the performance of a subscription company. The practical significance of the work lies in the possibility of creating certain benchmarks for the development of the market and a business strategy for product promotion, which will be based on an understanding of the potential benefits and threats of the market for digital subscription products and services

■ **Keywords:** business model optimisation; autoregressive model; software as a service; monthly recurring revenue; number of users

■ INTRODUCTION

In recent years, there has been a process of increasing economic integration between countries, which leads to the merging of individual national markets into one global market, which stimulates the strengthening of the process of economy virtualisation. T. Jelassi & F. Martínez-López (2020) argued that the electronic information revolution and its product (digital economy) are changing the shape of economic relations, institutions and organisations in the global space of market economy. Therefore, it is particularly important to analyse the companies operating in this environment and identify their strategies and key success factors.

The relationship between buyers and producers has changed. Thanks to the development of the Internet and the digital world, everyone can quickly access information compare goods, services and prices. R. Kübler *et al.* (2021) point out that subscription models are becoming increasingly popular, which makes them a good way for companies to benefit from the advantages of this business model. Subscriptions offer customers more options by delivering services or products directly to their doorway and giving them the opportunity to try something without high upfront costs. Therefore, today it is possible to talk about the digital transformation of companies; in this situation, there is interest in new ways to promote a product or service through the subscription economy. C. Bagnoli *et al.* (2022) presented new digital business models in Industry 4.0 that help achieve unique competitive advantages. H. Chin *et al.* (2022) address the evolution of digital transformation in services by comparing actual use cases and published theoretical studies. Researchers W. Wang & Q. Guo (2021) studied the optimal subscription strategy for network video platforms considering social impact. P. Hanafizadeh *et al.* (2019) focused on the business model of Internet service providers at the industry level. S. Akter *et al.* (2022) examined the transformation of digital business through the prism of four emerging technology areas: artificial intelligence, blockchain, cloud, and data analytics. D. Grewal *et al.* (2019) point out in their work that the use of the Internet for business is characterized by low costs that are often covered and have a valuable offer of intangible or informative nature. Such content providers have become truly popular among consumers. Recent research in marketing has made significant progress in understanding various issues in Internet marketing, including browsing behaviour, search engine visits, and referral agents (Soegoto & Rahmansyah, 2018; Ivanechko *et al.*, 2022; Li, 2022).

Researches by economists C. Katsikeas *et al.* (2019), T.G. Lewis (2023) on information product pricing identify different pricing models that can be used to make these decisions. These include usage-based pricing, micropayments, and subscription models. The book by E.M. Noam (2019) examines in detail various aspects of digital organisation, including pricing issues. L. Rainsberger (2023) examined the current state of digital sales technology and tools, focusing on processes from positioning to customer management throughout the sales strategy. K. Sato & K. Nakashima (2020) addressed the consequences of competitive equilibrium when the same electronic goods are offered at different pricing policies. The share of online companies offering their services by subscription is slowly but steadily increasing. Given the growth of the global economy and the growing demand for fast and effective solutions, the operating principles of work of subscription companies will spread to other areas of life. B.W. Wirtz (2021) proved that simultaneously with the growing demand for such programs, the methods of data analysis to improve the work with consumers will also increase. This will provide the opportunity to optimise processes to understand what works and what does not work in this online business. Provided that the needs of consumers are met qualitatively, companies will thrive and offer their founders the opportunity to constantly increase their revenues. The relevance of the study is determined by the increasing role and market share of digital products in the international market and the significant potential of the digital products market as one of the driving factors for the development of the economy. Therefore, the aim was to examine trends in the development of digital subscription services, taking into account the number of active subscribers and the impact of COVID-19 on this indicator.

■ MATERIALS AND METHODS

In order to properly select categories for analysis, a set of axiomatic rules was defined. Firstly, the companies under study must adhere in their policies to the model of unrestricted use at fixed rates. Secondly, business segments and company sizes are differentiated by income and number of employees. Thirdly, only companies that have a competitive advantage due to their subscription strategy are considered. The number of subscribers can be used in forecasting indicators of companies' business activities. In this study, autoregressive models were used as a baseline. The autoregressive model can be presented as follows:

$$\Phi_0 y_t = \Phi_1 y_{t-1} + \dots + \Phi_p y_{t-p} + \Theta_0 u_t + \Theta_1 u_{t-1} + \dots + \Theta_q u_{t-q}, \quad (1)$$

where y_t is the K -dimensional time series; Φ_i, Θ_j is the $K \times K$ matrices, $i=1, \dots, p, j=1, \dots, q$; u_t is the K -dimensional white noise vector with zero mean and non-degenerate covariance matrix $\Sigma = E(u_p, u_t')$. It should be noted that Φ_0 and Θ_0 are non-degenerate matrices, therefore, they can be normalized to 1. Since it is proposed to take into consideration the effects of the dynamics of coronavirus infection, this model should be modified, as it does not allow for exogenous variables. To do so, $\Phi_0 y_{t-1}$ needs to be subtracted from the right and left parts of the given equality:

$$\Phi_0 \Delta y_t = \Pi y_{t-1} + \Psi_1 \Delta y_{t-1} + \dots + \Psi_{p-1} y_{t-p+1} + \Theta_0 u_t + \Theta_1 u_{t-1} + \dots + \Theta_q u_{t-q}, \quad (2)$$

where $\Pi = -(\Phi_0 - \Phi_1 - \dots - \Phi_p)$; $\Psi_i = -(\Phi_{i+1} + \dots + \Phi_p)$, $i=1, \dots, p-1$. This formula (2) is a generalized representation of the whole family of autoregression models, which includes the following models: autoregression (AR); seasonal autoregression (SAR); autoregression of distributed lags (ARDL); autoregression of moving average (ARMA). In order to determine the most effective model in the framework of the proposed study, the statement of the criteria selection problem should be developed. As a first step (the set of alternatives has already been selected), it is necessary to determine the comparison criteria: algorithm runtime; forecast accuracy; completeness of consideration of exogenous variables; data preparation time. The forecast accuracy was measured in whole percentages and can take values between 0 and 100. To make the result more objective, the algorithms should be applied to Netflix and Amazon Prime data to forecast the number of subscribers for 2023. The time indicator was measured in seconds (s), and it was later converted into time savings so that all indicators relate to the same optimisation function (maximum). To avoid problems related to a measurement error, 5 time measurements were performed. To be able to use a qualitative indicator of the completeness of consideration of exogenous variables, the following scale was introduced: exogenous variables are not considered – 0 points; exogenous variables are partially considered – 1 point; exogenous variables are fully considered – 2 points. To implement autoregression models and to check their accuracy and runtime, the Python programming language was used, in particular such libraries as: numpy, scikit-learn, pandas.

After measurements, the determination of the most effective model from the selected family was carried out according to the principle of linear additive convolution with weighting coefficients, with the time indicators replaced by the time-saving indicators and a score assigned to each criterion. After these measures, the alternatives are eliminated using the Pareto principle (those that have values for all the criteria no higher than any of the other alternatives may not be considered). Given the importance of the accuracy indicator and the possibility of considering external factors, the following is noted (with the time indicators being roughly equal in value): accuracy – 4 points; consideration of external factors – 4 points; forecast time saving – 1 point; preparation time saving – 1 point. The following weighting factors: accuracy – 0.4; consideration of external factors – 0.4; forecast and preparation time saving – 0.1.

RESULTS AND DISCUSSION

The experimental results obtained are described below. The accuracy results are presented in Table 1. The average value for AR is 85%, for SAR – 89%, for ARDL – 88%, for ARMA – 95%. Thus, the moving average algorithm for the selected datasets shows greater accuracy.

Table 1. Result of accuracy measurements

Data	AR	SAR	ARDL	ARMA
Netflix	83%	89%	86%	94%
Amazon Prime	87%	88%	90%	95%

Source: made by the authors

This can be explained by the existing possibility of considering the volatility of indicators using an average value between neighbouring training learning variables and a broader spectrum of considering exogenous variables in the forecast. The results for the runtime data are shown in Table 2.

Table 2. Result of forecast time measurements

AR	SAR	ARDL	ARMA
0.039 s	0.064 s	0.073 s	0.088 s
0.043 s	0.069 s	0.087 s	0.092 s
0.059 s	0.073 s	0.078 s	0.086 s
0.067 s	0.077 s	0.074 s	0.095 s
0.075 s	0.069 s	0.082 s	0.086 s

Source: made by the authors

The average values for AR are 0.057 s, for SAR – 0.070 s, for ARDL – 0.079 s, for ARMA – 0.089 s. The relatively slow speed of the ARMA algorithm, which was the most accurate, is explained by the need for additional calculations of the neighbouring averages. Instead, the AR algorithm is algebraically and informationally the simplest (it uses the least number of mathematical operations for accessing the memory), thus it shows the best results for the runtime. The data for the preparation time are shown in Table 3.

Table 3. Result of data preparation time measurements

AR	SAR	ARDL	ARMA
0.012 s	0.022 s	0.025 s	0.039 s
0.011 s	0.025 s	0.023 s	0.040 s
0.013 s	0.019 s	0.018 s	0.029 s
0.012 s	0.024 s	0.023 s	0.026 s
0.011 s	0.027 s	0.021 s	0.035 s

Source: made by the authors

The average values for AR are 0.012 s, for SAR – 0.023 s, for ARDL – 0.023 s, for ARMA – 0.034 s. These dynamics in the preparation time is explained by the fact that the SAR, ARDL, and ARMA algorithms require exogenous variables that must also be processed. However, ARMA can use external indicators more frequently than the others. The non-zero time of data preparation for AR is explained by the need to check the training sample for outliers, empty values converted to an average, etc. Table 4 is formed with the criteria data for each model. The time indicators are replaced with the time-saving indicators (Table 5).

Table 4. Criteria values

	Forecast time	Accuracy	Consideration of external factors	Preparation time
AR	0.057 s	85%	0	0.012 s
SAR	0.070 s	89%	1	0.023 s
ARDL	0.079 s	88%	1	0.023 s
ARMA	0.089 s	95%	2	0.034 s

Source: made by the authors

Table 5. The criteria values are reduced to the same optimisation principle

	Forecast time saving	Accuracy	Consideration of external factors	Preparation time saving
AR	0.032 s	85%	0	0.022 s
SAR	0.019 s	89%	1	0.011 s
ARDL	0.010 s	88%	1	0.011 s
ARMA	0.000 s	95%	2	0.000 s

Source: made by the authors

To reduce the number of possible alternatives, the Pareto principle was applied. According to it, the ARDL alternative can be excluded, since all the indicators for it are lower than or equal to the SAR alternative. Table 6 shows the Pareto-optimal alternatives. Now the time criteria have to be normalized, taking into account that there are no reference values for them. The best value for the forecast time saving is 0.032 s, the worst is 0 s. For SAR: $0.019/0.032=0.59$. The best value for the preparation time saving is 0.022 s, the worst is 0 s. For SAR: $0.011/0.022=0.5$. In precision, the reference value is 100, and for the consideration of external factors – 2. The following normalized values are shown in Table 7.

Table 6. Pareto-optimal alternatives

	Forecast time saving	Accuracy	Consideration of external factors	Preparation time saving
AR	0.032 s	85%	0	0.022 s
SAR	0.019 s	89%	1	0.011 s
ARMA	0.000 s	95%	2	0.000 s

Source: made by the authors

Table 7. Normalized values

	Forecast time saving	Accuracy	Consideration of external factors	Preparation time saving
AR	1	0.85	0	1
SAR	0.59	0.89	0.5	0.5
ARMA	0	0.95	1	0

Source: made by the authors

Using the predetermined weighting factors, the value of the selected convolution can be found.

For AR: $0.1 + 0.85 \times 0.4 + 0.1 = 0.54$.

For SAR: $0.1 \times 0.59 + 0.89 \times 0.4 + 0.5 \times 0.4 + 0.5 \times 0.1 = 0.67$

For ARMA: $0.95 \times 0.4 + 0.4 = 0.78$

Thus, it can be argued that the moving average autoregression model is the most effective within the proposed subject area. It is necessary to present the obtained results of this model, starting with the parameters. For the Netflix data, the following model parameters are presented in Figure 1.

	coef	std err	z	P> z	[0.025	0.975]
const	104.1840	161.005	0.647	0.518	-211.381	419.749
x1	0.0030	0.002	1.772	0.076	-0.000	0.006
ar.L1	0.9953	0.048	20.767	0.000	0.901	1.089
ma.L1	0.8331	0.185	4.494	0.000	0.470	1.196
ma.L2	0.4437	0.122	3.642	0.000	0.205	0.682
sigma2	13.0820	4.720	2.771	0.006	3.830	22.333

Figure 1. Model parameters for Netflix

Source: made by the authors

From the result, it can be seen that the direct base data are the most influential, their moving average is not so influential, which is due to the insignificant volatility of the number of subscribers. In this case, the forecast result is as follows (Fig. 2). Q1 2022: 222 million people – the real value is 222; Q2 2022: 223 million people – the real value is 221; Q3 2022: 225 million people – the real value is 223; Q4 2022: 229 million people – the company's forecast value is 224. For the Amazon Prime data, the following set of coefficients was obtained (Fig. 3). In this case, the impact of the base data is even larger. The result of the research is as follows (Fig. 4). Q1 2022: 155 million people – the real value is 153; Q2 2022: 156 million people – the real value is 153; Q3 2022: 158 million people – the real value is 155; Q4 2022: 160 million people – the company's forecast value is 157. Thus, it can be concluded that during this time period, an external factor such as the COVID-19 pandemic did not significantly affect the number of Netflix and Amazon Prime subscribers, and the overall trend persisted. Taking into consideration the obtained mathematical models, it is possible to make a forecast of the number of subscribers for the four quarters of 2023 (Table 8).

It should be noted that the obtained results are based on the forecast of the average number of COVID-19 diseases per quarter, which may lead to an increase in the error of the forecast data. According to the results of the study, it can be concluded that the existing business strategies in the selected companies are effective in maintaining and increasing the number of active subscribers. The efficiency in the present study meant the value of the linear additive convolution with the weighting coefficients for accuracy indicators, time saving in forecasting and data preparation, and the possibility of considering the impact of external factors. The findings from the research could be applied in various ways. One potential use is the creation of a customized pricing strategy. Additionally, the algorithm could serve as an integral component of a decision support system, offering both passive and active support to help companies reduce risks when employing a subscription model in circumstances like those experienced during the pandemic.

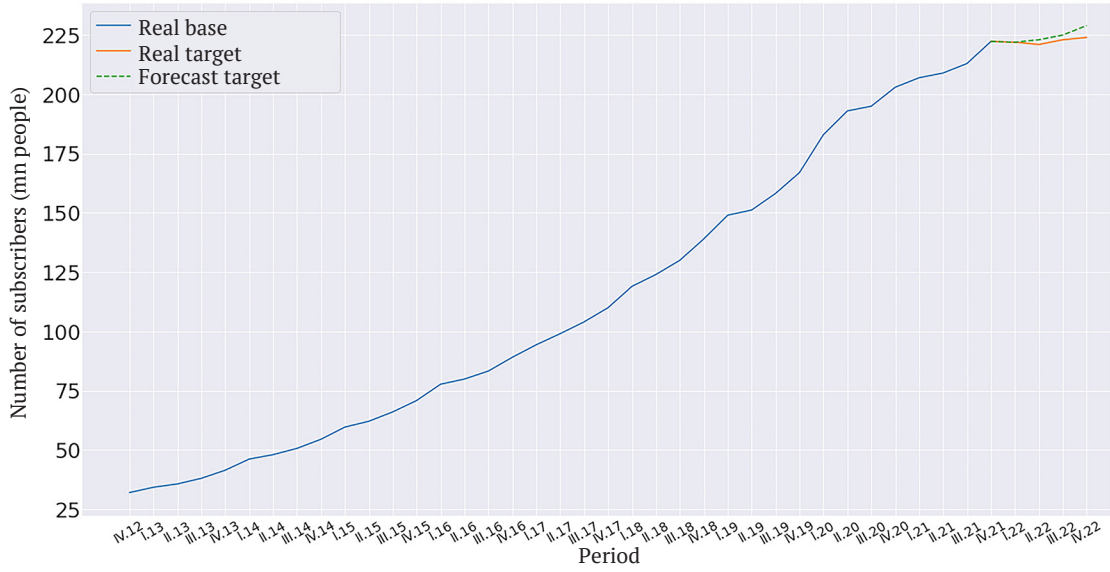


Figure 2. Forecast result for Netflix

Source: made by the authors based on Statista (n.d.)

	coef	std err	z	P> z	[0.025	0.975]
const	78.6722	82.730	0.951	0.342	-83.476	240.820
x1	0.0011	0.002	0.696	0.486	-0.002	0.004
ar.L1	0.9958	0.029	33.944	0.000	0.938	1.053
ma.L1	0.7360	0.286	2.569	0.010	0.175	1.297
ma.L2	0.9764	0.707	1.381	0.167	-0.410	2.363
sigma2	5.0784	3.602	1.410	0.159	-1.982	12.139

Figure 3. Model parameters for Amazon Prime

Source: made by the authors

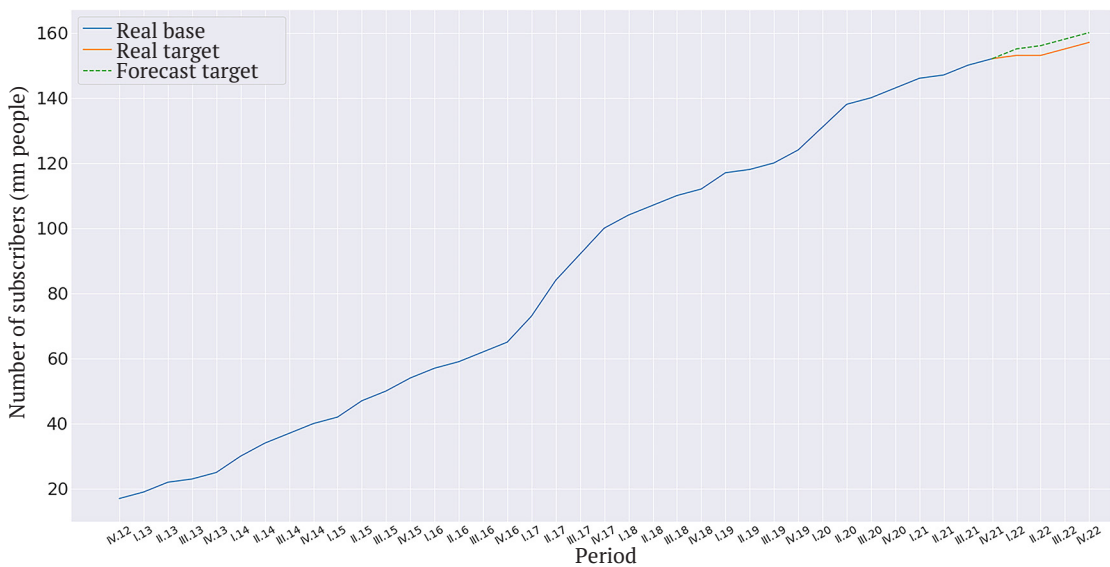


Figure 4. Forecast result for Amazon Prime

Source: made by the authors

Table 8. Forecast of the number of subscribers

	Q1, 2023	Q2, 2023	Q3, 2023	Q4, 2023
Netflix	229 mn people	234 mn people	238 mn people	241 mn people
Amazon Prime	164 mn people	168 mn people	168 mn people	174 mn people

Source: made by the authors

It should be noted that the problematics related to predicting the number of subscribers with autoregressive models is new, but this class of models has been applied by M. Nkongolo (2023) to study the volume of user data; in this work, he proved the feasibility of using the selected family of algorithms when dealing with extensive data related to users of subscription services. I. Ullah *et al.* (2019) point out in their study that machine learning is quite sensitive to the amount of data, and since this type of service has been spreading for a relatively short time, it is quite a complex process to obtain a satisfactory result, even after data augmentation. The probabilistic approach is used in cases where the external conditions are relatively stable and do not significantly affect the overall result, as stated by P. Ghosh *et al.* (2021). Taking into account that the data were affected first by the crisis triggered by the pandemic and then by the general political instability due to the Russian Federation's full-scale invasion of Ukraine, this approach may also be considered inexpedient.

In addition to the above, using autoregression to predict indicators of business activity (which include the number of subscribers) during significant social changes caused by emergency situations, which include the COVID-19 pandemic, generally yields a 95% result accuracy, according to the study by A. Khovrat *et al.* (2022). In this research, the moving average autoregression algorithm was determined as the most effective. It should be noted that, compared to the research mentioned, to predict the number of subscribers without considering polymorphic data, additional constraints need to be introduced to the selection of the target companies, which were mentioned earlier. When these constraints are removed, there is a significant risk of obtaining a less accurate forecast, but the use of more exogenous variables, especially those not directly related to the pandemic, is beyond the scope of the present study.

The selected exogenous variables that are indicators of COVID-19 were studied by P. Congdon (2021), who not only showed the possibility of effective use of autoregression to forecast the dynamics of incidence rates, but also examined the issue of including these data as external factors influencing business development in general and their digital strategies in particular. Similar results were obtained by scholars E. Karaçuha *et al.* (2020) from Istanbul Technical University and B. Buru & M. Gursoy (2022) from Koçu University. It should also be mentioned here that separate approaches, which may include, for example, expert evaluation or logistic regression, must be used in selecting additional external factors. According to the work of A. Khovrat *et al.* (2022), the first of the approaches has proven its effectiveness regarding the outlined problematics, while the second has found its confirmation in the context of various tasks, as noted by J. Wang *et al.* (2023).

Regarding other algorithms for forecasting the number of subscribers, it is worth mentioning the work of

a scholar from the University of Toronto in Canada, B.W. Wirtz (2021), on the application of multidimensional linear regression. The author of the article notes that despite the fairly accurate results of the forecast, there is the problem of high sensitivity to outliers. Similar results were also obtained by Q. Yan (2022) from the University of Sydney, who studied the issues of forecasting subscription prices for Netflix. In view of all the above mentioned points, it can be argued that the selected approaches, methods, and exogenous variables were selected in accordance with international scientific practices. The findings do not contradict recognised scientific studies.

■ CONCLUSIONS

The study has proved that the digital economy includes economic activities involving millions of daily online communications between people and businesses, which means the growing need of people and organisations for information exchange that is only possible through the Internet, mobile technologies, etc. The use of the family of autoregressive models to forecast the number of active users allows to assert the overall effectiveness of using the subscription model under non-deterministic critical conditions. Four autoregressive models were considered in the study: autoregression; seasonal autoregression; autoregression of distributed lags; autoregression of moving average. Given the number of new COVID-19 cases in the proposed time frame, among the algorithms of this family that showed an accuracy of 85% to 95% on the test data provided by Amazon and Netflix, the moving average algorithm is the most effective. The efficiency factors selected were: saving forecast time, saving preparation time, accuracy, and the possibility of considering exogenous variables. Among these factors, the ARMA model is the slowest of the proposed models, but this shortcoming is compensated by the accuracy, which is the most important indicator in case of crisis.

In addition to providing practical confirmation of the feasibility of using the subscription model under non-deterministic critical conditions, the present study examined the theoretical basis that would determine the effectiveness of this strategy. The constraints imposed on the target data of the company were determined, which allowed to obtain a more accurate result. The results obtained in the study can be used, for example, to develop an own pricing strategy. Another possible application is the use of this algorithm as part of a decision support system, both passive and active, which would mitigate the risks for companies using the subscription model in situations similar to COVID-19. Since only basic autoregressive models, which are quite sensitive to external factors and outliers in target time series, were considered for the present work, it was decided to leave for further research the issue of reducing the impact of outliers and missing

target data as well as their augmentation. The latter is due to the fact that the data on the number of subscribers are usually reported in open sources on a quarterly basis; thus, to present them correctly on a weekly scale, it is necessary to use separate methods.

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■ CONFLICT OF INTEREST

None.

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Тенденції розвитку цифрових підписних сервісів на міжнародних ринках

■ **Анотація.** Компанії намагаються використати потенціал сучасного етапу розвитку цифрової індустрії та зробити його економічно вигідним, для чого необхідні не лише технологічні інновації, а й трансформація багатьох існуючих бізнес-моделей. Базуючись на аналізі прикладів цифрових підписних компаній, ця стаття надає додаткові роз'яснення, зокрема визначення та складові характеристики бізнес-моделей передплати в цифрових сервісах. Метою статті було виявлення тенденцій розвитку цифрових підписних сервісів на основі аналізу кількості активних підписників та впливу COVID-19 на цей показник. У дослідженні були використані методи авторегресії та аналізу, імплементація обраних моделей здійснена мовою програмування Python-3. Описано теоретичне підґрунтя, яке зумовлює доцільність використання підписної моделі для компанії в недетермінованих критичних умовах. Визначено основні підходи до прогнозування показників діяльності компанії. Встановлено характер даних, що прогнозуватимуться, декларовано необхідність використання авторегресійних моделей для подальшого аналізу. Визначено фактори пов'язані із захворюваністю COVID-19, які варто врахувати як екзогенні змінні. Здійснено побудову задачі багатокритеріального вибору шляхом обмеження сімейства авторегресійних моделей та визначення критеріїв часу прогнозування і підготовки даних, точності прогнозу і можливості врахування зовнішніх факторів при знаходженні ефективності алгоритму. Визначено, що найбільш ефективною є авторегресія рухомого середнього. З огляду на подальше застосування вказаного алгоритму для прогнозування кількості підписників, декларується доцільність реалізації підписної стратегії для компанії в недетермінованих критичних умовах. Передбачається можливість ефективного використання обраної математичної моделі для прогнозування показників діяльності компанії, що працює за передплатою. Практичне значення роботи полягає у можливості побудови певних орієнтирів для розвитку ринку та розробки бізнес-стратегії просування продукту, які базуватимуться на розумінні можливих переваг та загроз, які має ринок цифрових підписних продуктів та сервісів

■ **Ключові слова:** оптимізація бізнес-моделі; авторегресійна модель; програмне забезпечення як послуга; щомісячний регулярний дохід; кількість користувачів

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Increasing the EBITDA of private equity portfolio company through digital enablement

■ **Abstract.** The study of the role of digital implementation in increasing earnings before interest, taxes, depreciation and amortization (EBITDA) in portfolio companies of private equity funds is a topical issue for the development of strategies and competitiveness. Thus, the main purpose of the study was to determine how private equities increase EBITDA in the portfolio companies via digital enablement. For the purpose of understanding the role of digital enablement strategies in value creation, the critical realism research paradigm was identified as the best-fit philosophy. The critical realism approach was chosen because it advances research methodologies through the development of a qualitative theory of causality. A sample of 26 respondents was used with semi-structured interviews being conducted. The data analysis process involved the identification of 3 themes through thematic analysis. Three themes were identified, namely new digital capabilities to improve top-line growth, driven by the Head of Strategy/Head of Department, and transformative initiatives. The results from all three themes indicate that digital enablement is useful in improving private equity firm revenue and EBITDA levels through digital transformation, improved customer engagement, and identification of market opportunities towards digital data capabilities. The findings show that redefinition is critical to improving EBITDA, as it challenges the existing model and provides a forward-looking approach to strategy formulation. Digital enablement strategies are an unexplored area in the context of private equity firms. The strategies are momentous in improving revenue levels and competitiveness while accentuating the EBITDA rates by cost reduction. The results of this study will be of practical use to both businesses and other economic entities

■ **Keywords:** transformation process; company strategy; customer engagement; market opportunities; data capabilities; revenue level

■ INTRODUCTION

The nexus between private equity (PE) and value creation has for decades now served as the crux for disputatious debates among scholars and practitioners alike. Common dispositions from the debates adumbrate that PE firms utilize their industry expertise to pinpoint attractive investments. The expertise is combined with operational know-how when developing value creation plans for the investments. The PE firms stress more on the operational stature of the investments in a bid to generate attractive returns for their investors. The value creation plans are revamped or tailored to fit every portfolio company in the

PE firm structures. It is imperative to note that the portfolio companies are classified under the company level with the general partner setting up an investment fund that is managed by the holding company, as noted by D. Robu & J.B. Lazar (2021) and J.B. Cohn *et al.* (2022). The holding company gauges the operations of the portfolio company with the aim of generating revenue, equity, dividends as well as proceeds from the exit.

Considering the changing nature of the PE environment, firms have been prompted to adopt new strategies of value creation. What is not known to most practitioners is

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that strategies such as digital enablement are momentous in increasing revenue as well as the equities increase earnings before interest, taxes, depreciation and amortization (EBITDA). By definition, digital enablement is a strategy that utilizes technologies with the aim of improving a portfolio company's operational efficiency, performance as well as reach. T. Tawaststjerna & H. Olander (2021) alludes that digital enablement creates efficient business processes while modifying the PE firm model to fit modern needs. Some schools of thought confuse digital enablement with digital transformation. E.J. Omol (2023) denotes that digital transformation serves as a catalyst for change management and the transformation of businesses. With digital transformation comes the revamping of the business model with digital tools being introduced (Tenyukh *et al.*, 2022). This means that the entire structure of the PE firm is digitalized with everything undergoing change which results in improved output, better experiences, and a surge in the revenue streams. The digital transformation allows companies to grow rapidly and improve their competitive stature.

Digital enablement, on the other hand, sets forth a conducive milieu that permits digital transformation. According to E.J. Omol (2023), the two enjoy a symbiotic relationship in the PE firm environment although digital enablement focuses on improving the existing business process rather than completely changing it. The digital enablement strategy creates value by encouraging the use of new technologies that collect vital PE industry information which improves decision making. Furthermore, the strategy is substantial in maintaining business standards and alignment through the creation of objective funnels. The funnels determine whether the rules of the PE firm are being followed or not. Considering the confusion

revolving around digital transformation and enablement, most general partners are not cognizant of the various strategies imbued in the latter that can increase EBITDA. At the centre of digital enablement is the introduction of new digital capabilities which improve top-line growth and increase customer engagement, as written by J. Gilligan & M. Wright (2020) and N. Hutchison *et al.* (2022). The digital capabilities focus more on top-line growth rather than bottom-line growth since the former increases the revenue earned by the PE firm through the business operations. Although there are various studies on aspects of digital enablement, the lack of manuscripts addressing the specific topic of this study demonstrates its relevance. Hence, the primary objective of the research was to ascertain how private equity firms enhance EBITDA within their portfolio companies through digital empowerment.

■ MATERIALS AND METHODS

The data analysis process involved the identification of themes through thematic analysis. Using the constant comparative method, the researcher was able to determine the specific themes that were correlated to the responses provided and subsequent classification into the aforementioned 3 categories. The thematic analysis revealed a number of emergent categories with key concepts being identified. The interview approach was chosen for the study. The interviews lasted an average of 60 minutes based on institutional review board (IRB) standards which state that any interview that is less or more than the aforementioned time limit is likely to be ineffective or intrusive respectively. Open questions were further applied which were important in improving the reliability and comparability levels of the results. The interview questions in were distinguished into 3 sections that focused on the 3 strategies (Table 1).

Table 1. Interview sections

I. New digital capabilities to improve top-line growth
1. What is digital enablement?
2. How do digital capabilities improve top-line growth?
3. How do digital capabilities/enablement increase customer engagement?
4. How do new business models correlate with improved revenue and customer engagement?
II. Driven by Head of Strategy/Head of Department
1. What is the role of department heads in digital transformation?
2. How can department heads influence the success of digital enablement/transformation?
III. Transformative initiatives
1. What is the relationship between digital enablement and digital transformation?
2. What is the role of digital enablement in improving multiple business functions in order to accentuate revenue?

Source: made by the author

The questions were sent to the respondents 5 days prior to the interviews in order to appraise them of what was being covered. Questions or concerns raised regarding the clarity were handled through the second contact whereby clarifications were doled out. For the purpose of increasing the internal validity of the responses, the observer was involved. The data collected from the semi-structured interviews were recorded using notes with the responses being correlated with the themes. Even though the study was aimed at developing a theory on value creation strategies, the intended queries were sourced from the theoretical framework. By following the theoretical framework, it was

possible to compare the findings and explain why specific actions are taken in the different companies.

The interviews were guided by a semi-structured questionnaire with the researcher applying an ad-hoc foundation based on critical realism. The semi-structured interview was chosen because it aligns with the theoretical framework with the researcher exploring the theme of value creation. The inclusion criteria for the employees focused on their experience in the industry, position in the company as well as knowledge of value creation strategies using digital enablement. The semi-structured interviews were conducted through face-to-face interactions with the



respondents from the 3 equity firms. On the contrary, some of the respondents preferred conducting the interviews through video calls due to their schedules. All through the interviews, confidentiality was assured to the respondents in order to create a climate of honesty and responsibility for all parties involved. The interviews followed an IRB-approved guide which required the interviewer to uphold objectivity. The interviewees were asked to avoid naming or directly identifying others prior to the start of the interview. Any questions that were correlated with the above requirement were removed. Furthermore, any questions that directly solicited negative/critical information about the organization were avoided when possible. This is because a breach of confidentiality would have a negative impact on the reputation of the interviewee as well as harm their relationship. It was ensured that strong protections for privacy and data storage were put in place if some of the questions were asked to adequately address the research topic. The study complied with the Declaration of Helsinki (2013).

The qualitative case study approach made it possible to examine areas of value creation research that are still in an early phase of investigation. There is a large gap in knowledge when it comes to the importance of digital enablement in increasing revenue and EBITDA. Using ontological questions such as “What is digital enablement and how does it work?” among others, it was possible to bridge the existent dearth of knowledge/information. As a result, the approach gleaned a verbalized business experience in the form of results. The main purpose of including this data was to increase the meaningfulness of the qualitative information gleaned from the respondents. For the interviews, a sample of 26 respondents was derived from the 3 companies with a split of 9/8/9 coming from each.

RESULTS

For the purpose of understanding the role of digital enablement strategies in value creation, the critical realism was identified research paradigm as the best-fit philosophy. The paradigm is a combination of the traditional interpretivism, and positivist positions used in qualitative research. Using a critique of ontological monovalence, critical realism permitted to explore the nexus between activation, success, and failure of digital enablement strategies. The ontological approach applied by critical realism emphasizes key questions such as “What is x and how does it work?” or epistemological questions like “How can we know x?”. The paradigm highlights that the ontological questions are better compared to the epistemological questions as they offer deep transitive knowledge into phenomena like digital enablement. The approach ensures that the paradigm is methodologically ecumenical while defining which scheme is the best fit in data collection processes. The explanations were based on observed or experienced situations which conform to the events-effects relationship. The paradigm allowed to develop explanations that analysed the mechanisms of PE entities that generate revenue and EBITDA as well as the inchoate structures that empower or undermine value creation.

Digital enablement is a form of value creation that explores the divergent strategies that utilize technology in a bid to improve the reach, performance, and operational efficiency of an entity. The main aim of the technologies is to create flexibility and ease through the streamlining of processes. Furthermore, they improve data management and stakeholder communication all of which are connected to the organizational revenue. The key strategies and benefits to be accrued explored are shown in Figure 1.

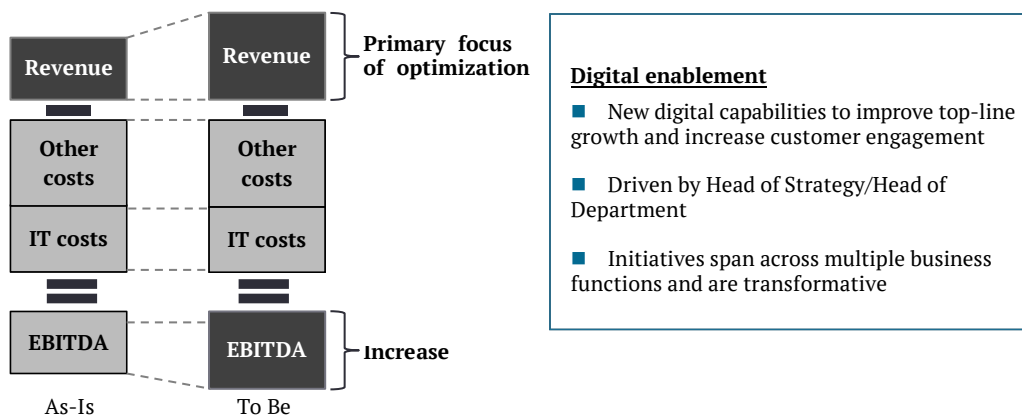


Figure 1. Digital enablement

Source: made by the author

The value creation strategy requires PE firms to incorporate new digital capabilities and initiatives that improve top-line growth and accentuate customer engagement. PE firms are required to plan an onboarding process that modifies the structure of the portfolio and its operations. Furthermore, the plan has to communicate the core message with new interaction models and interfaces being introduced for the teams. Regarding the topic of digital capabilities discussed by J. Gilligan & M. Wright (2020) and N. Hutchison *et al.* (2022), the top line refers to the gross

sales and revenues over a predefined period. The growth is further correlated to the EBITDA metric as it emphasizes operational profitability from the primary operations (Biesinger *et al.*, 2020; Metselaar, 2021). With digital enablement comes an increase in the top-line growth since the portfolio companies operate on low marginal costs with their business models being scalable (Rosola *et al.*, 2018; Shebanina *et al.*, 2022). The digital enablement strategies increase top-line growth by involving more people through customer engagement. Global surveys, such as D. Rohn *et*

al. (2021), S.K. Shivakumar (2023) reveal that the customer engagement process is key in improving sales as they are actively involved in the formulation of products, services as well as decision. The digital enablement tools permit the collection of data with a bifurcation being elucidated in the relationship between sales and customer engagement. The strategy accentuates interconnectedness which doles out vital data to the General Partners on how they can improve customer satisfaction rates.

The second strategy involves the inclusion of the Head of Strategy or Head of Sales Department. The work by A. Fuller *et al.* (2020) defined how the PE firms can venture into the niche or existing markets and capitalize on the demand rates. The reliance on digital enablement tools permits decision-making and nudges the firms to shift from the large off-the-shelf schemas used in PE firms. The new schemas harness insight that lives deep in the transactional data with PE firms fine-tuning simple portions of the sales process to improve effective transactions. The digital enablement strategy prompts the leaders to adopt a more scientific approach during decision making with iron-clad business and corporate strategies being formulated. The final strategy is the introduction of initiatives that span multiple business functions and are transformative by nature. As opined prior, digital enablement is commingled with digital transformation (Shivakumar, 2023). The latter acts as a catalyst for the transformation of business operations across the PE firm context with key areas like process, business model, domain as well cultural transformation being addressed.

The organization has to be aligned around the new processes and goals prior to valuation. This can involve the use of a lean governance model that supports the increased pace of digital structures. Digital enablement takes into account source optimization and returns on investment. A good digital enablement program reduces the cost and time taken when adopting new technology. Moreover, it minimizes reliance on information technology teams and improves the ability of a firm to attain high EBITDA. The lack of a digital enablement strategy means that a company will be unable to oversee the digital transformation.

The first facet is digital connectivity with the changing stature of the PE firm context amid digitalization allowing for the creation/collection of data. The conversion is key in capitalizing on the opportunities brought about by the advent of digital. The PE firms are also capable of unlocking insights from an avalanche of data. The second facet is digital services which can be exposed through digital channels. The main aim of exposure is to expand the business relationships as well as increase customer value. With digital enablement, PE firms leverage their services or products in new ways which in turn creates new streams of revenue. The third facet is digital experiences which are momentous in improving customer loyalty. V. Gurbaxani & D. Dunkle (2019) indicates that changing how PE firms work and creating new business models is vital to digital success. The business models help improve customer satisfaction with foundational elements allowing the digital business to yield agility. The agility is substantial in the delivery of customer experiences that are compelling by nature (Becker & Schmid, 2020; Mention *et al.*, 2020). Furthermore, the agility permits PE firms to capitalize on new business opportunities in their respective industries (Fig. 2). While the

three facets might seem daunting to firms, the path is clear and geared towards value creation purposes. Astute leaders and executives have to embrace the changes and enable their PE firms to capitalize on digital technologies so as to navigate in the new environment.

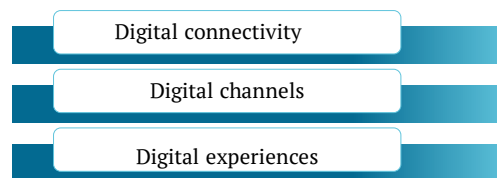


Figure 2. Three facets of digital enablement

Source: made by the author

Considering the novel nature of critical realism, one can note that there are no predefined methods of data collection. This is because the paradigm adopts an ecumenical approach to data collection with the choice of methodology depending on the nature of the study or topic (De Paoli & Foss, 2019). Qualitative interview techniques encourage respondents to talk freely with the information collected offering knowledge on how they feel or think about digital enablement. The interviews are often distinguished as conversations riddled with a purpose or aim. This means that researchers are able to probe in more depth about everyday issues or operations in the PE context. The interviews lasted an average of 60 minutes based on IRB standards which state that any interview that is less or more than the aforementioned time limit is likely to be ineffective or intrusive respectively. The interviews took place through problem-centered and guideline-based structures.

By definition, open-ended queries are those which cannot simply be answered using rating scales, numbers, multiple-choice or options. Rather than fixed responses, the respondents are allowed to give statements or definitions of concepts. The open-ended questions permitted to adopt comprehensive look into the experiences and observations of the respondents with regard to digital enablement strategies for value creation. Moreover, the open-ended queries ensured that there is no limit to data collection possibilities. The questions were vital in understanding the perspectives and definitions of the respondents with regard to digital enablement or transformation. Different respondents approach questions from a myriad of angles that have to be conglomerated so as to align them to the theme or topic. Also, it was possible to make appropriate follow-up queries in the event that some of the information provided was not clear.

The interviews are lauded by scholars and practitioners alike for their flexibility with the queries being asked using a different order with the aim of understanding tech-enabled improvement of operations in the PE context. The structure permitted to omit or add specific queries which did not in any way or manner fit the context. The first portion of the interview focused on the new digital capabilities which are imbued in digital enablement strategies so as to improve top-line growth and increase customer engagement. In this portion, the questions revolved around the pragmatic definitions of digital enablement. 18 respondents provided a definition that is aligned with the theoretical framework.

7 respondents opined that they were not cognizant of digital enablement with their responses showing confusion in the nexus between the concept and digital transformation. One of the respondents however quipped in and cited that digital enablement comes intact with a select number of capabilities that drive top-line growth. The respondent cited that the topmost capability is “digital sales enablement which involves empowering the customer-service staff with technology to be more effective”. This response correlates to the question in the first portion which focuses on how digital capabilities improve customer engagement. The respondent cited that the technologies allow for continued engagement and interaction between the “PE firm managers and investors”. This then creates a sustainable and trustworthy relationship. Additionally, 25 of the respondents opined that digital enablement capabilities drive top-line growth through optimization.

The optimization process was lauded by 12 of the respondents as substantial in “improving existing operating processes and introducing new business models”. The introduction of the new business models is defined by the business and PE firm environment. The aim of digital optimization is that it allows for the identification and creation of an exceptional user experience that delights the investors or customers (Gorb *et al.*, 2022; Loi, 2023). The digital capabilities were also cited by 26 of the respondents as momentous in the collection of data. One of the respondents indicated that “we use digital enablement strategies to collect information and data on our market. The data is then used to formulate iron-clad corporate strategies that allow us to maximize revenue and value for our investors. This then increases satisfaction and the rates of investment into our holding firms”. The response is indicative of the fact that the digital enablement variable of data is useful for decision-making purposes. Furthermore, the application of a centralized data storage framework ensures that all the required information is readily available for the management to formulate decisions on the way forward for the PE firm.

When prodded about the correlation between new business models, improved revenue, and customer engagement, 11 of the respondents cited that there is no direct nexus. On the contrary, 15 of the respondents highlighted that introducing a new business model via digital enablement adds new product revenue streams to the business. A response from one of the participants highlights that “effective PE firms are those which transform their business models by creating new ways to monetize the products and services”. “The redefinition process is important in improving the EBITDA levels as a result of a spike in the top-line growth. The promise of digital enablement is that it allows PE firms like ours to leverage the connected capabilities of the internet and adopt different models”. Based on the response, one can note that the digital enablement schemes are substantial in creating new value-added services which attain the capacity and utilization needs of the entities. Furthermore, standardized data connectivity through the data variables of the digital enablement capabilities allows the PE firms to pivot to remote resolution and provision of predictive services for optimized user productivity.

The second portion of the interview explored the involvement of the Head of Strategy/Head of Department in the implementation of digital enablement strategies. At least

18 of the respondents opined that the department heads are immensely involved in the digital enablement process via digital transformation. This is because the department heads are well versed in the position of the PE firm in the market and how they can initialize new schemes or models that improve the revenue. The interview results reveal that most respondents stand for the idea that process transformation strategies imbued in digital enablement schemes help in the reinvention of business processes with the aim of improving quality. The quality information is based on the department heads with predictive data being used to determine market response. The end result is a decline in the costs and an influx in the customer satisfaction rates.

Subsequently, the respondents opined that the department heads and strategy managers directly influence the success of digital enablement/transformation. This is because they define the finite nature of the process transformations or business model changes. The process transformations and business model changes are focused on creating foundational building blocks which improve value delivery. One of the respondents cited that the strategy managers have to possess a forward-looking perspective that focuses on digital connectivity, channels and experiences. The lens ensures that the digital transformation/enablement strategy shifts the company directly from the traditional models toward contemporary ones that are aligned with the market. Furthermore, 21 of the respondents highlighted that the department heads and strategy managers are responsible for digital enablement success through cultural/organization transformation. The redefining of the PE firm mind-set towards revenue creation involves usurping the existent culture and initiating new ones. The new strategies have to “emphasize a flexible workflow and improve the decision-making processes through decentralization”. 5 of the respondents cited that the cultural transformation requires the continuous involvement of employees in the PE firm context by providing them with information on how they can work towards improving the revenue and minimizing costs. This is correlated with a spike in the EBITDA levels due to improved cost-effectiveness.

The third portion analysed how the digital enablement initiatives can be transformative by nature while spanning cross multiple business functions with the aim of improving revenue. The key query in this section explored the relationship between digital enablement and digital transformation. All of the respondents provided responses that were connected to the theoretical framework. The results showed that most of the respondents believed that digital transformation hinges deeply on digital enablement via digital capabilities. Digital enablement requires the digitization of specific and finite aspects of the business which in turn improves the existing business model. Furthermore, the digital transformation was cited as a tantamount on the success of digital enablement. This is because digital enablement is gradual by nature with transformation being conducted wholly by changing the whole business model. A response from the sampled participants shows that “digital enablement allows PE firms to become more agile and tech-savvy with predictive analytics and data variables preparing them for digital transformation”.

The second query analysed how digital enablement can serve as a transformative initiative involving multiple

business functions in order to increase revenue and EBITDA. 20 respondents indicated that digital enablement ensures that PE firms maintain business standards and alignment. This is attained through a one-size-fits-all culture and business model. If the culture emphasizes on cost reduction and top-line growth, then the multiple prongs will follow a similar pattern. Furthermore, fostering digital adoption is key in transforming the business model and generating revenue. The enterprise tools and platforms have a probability of increasing “revenue by a solid 70% in my opinion. In our company, we have seen influxes in the EBITDA due to top-line growth since the enterprise tools conglomerate our multiple departments. The conglomeration allows us to achieve the set objectives without any hassles whatsoever”.

■ DISCUSSION

The relevance of critical realism as the best philosophy for research can be examined through an analysis of the views expressed in other studies. According to F. Haigh *et al.* (2019), critical realism adumbrates that there is a reality that exists independent of the thoughts of the researcher with observations improving in the data collection process. The paradigm breaks down reality and business contexts into three domains namely the empirical actual and real. The empirical domain largely focuses on the actual events and effects which can be observed or experienced. Using this domain, the researcher was able to determine whether digital enablement has generated more revenue and EBITDA for PE firms. Moreover, the critical realism research paradigm was chosen because it offers insight into the PE firm context and the various levels. As per S. Vincent & J. O’Mahoney (2018), the context comprises a broad range of entities that have properties that endow them with liabilities or powers. The activation of the powers in either level of the PE firm context (company/fund) leads to the occurrence of events. On the contrary, the stratified nature of reality into the real, actual, and empirical domain can cause some of the entities to be visible or invisible. Emphasis is drawn on the visibility of key entities like the Head of Department/Strategy who guides the digital enablement implementation strategy. In some contexts, employees or stakeholders are termed as invisible entities using the critical realism paradigm. The approach highlights that the absence of such entities can be causally efficacious or detrimental to the success of a digital enablement strategy.

When evaluating the tendencies, the researcher relied on seminal comments made by F. Haigh *et al.* (2019). The comments show that the tendencies are inclusive of recurrent relationships between value creation, variability in the relations or the absence of the nexus. The tendencies would then be classified in terms of complexity in order to understand the interactions between PE firms and value creation. The qualitative case study approach proved substantial to the paper as it offered an emic view of the PE firm context with contextual information being generated. The emic information cited the causal factors and effects of digital enablement strategy with the symbolic practices, meaningful beliefs and values being identified (Kakilla, 2021). Moreover, the qualitative approach was chosen by the author because it is attuned to the open or messy nature of the PE firm context. The approach helped collect

insight based on the three reality stratifications namely empirical, actual, and real domains while determining how they all affect the outlook of the respondents in their everyday lives in PE firms. The qualitative case study approach is quite common in PE research since it collects data regarding the various value creation methods used by the firms. The qualitative information is touted by S. Vincent & J. O’Mahoney (2018) as one that contains a high degree of quality and detail. This is brought about by small samples which work better in qualitative designs compared to quantitative contexts. In light of this, the information contains a higher intrinsic value as it summarizes the experiences beliefs, values and perspectives of the respondents.

Digital enablement value creation is touted by practitioners as a holistic approach that enables entities to champion digital excellence and attains greater agility which ultimately scales the business faster (Dent *et al.*, 2021). The adoption of new business models requires direct input from the Head of Strategy at the PE firm. Furthermore, the digital enablement process is marked by the introduction of initiatives that span multiple business functions and are transformative by nature. The focus of the digital enablement value creation scheme is on revenue which has to be optimized in a bid to increase the EBITDA. V. Gurbaxani & D. Dunkle (2019) opines that digital enablement strategies used in value creation contexts have to be revamped to meet a targeted outcome or result. Most PE firms are designed for growth with managers and leaders being required to provide solutions that meet the demands of the investors. The solutions are oft tailored to enable PE firm growth and prosperity with access to technology supporting digital enablement. It is imperative to note that digital enablement strategies are based on three key facets.

K. North *et al.* (2018) introduces digital enablement as a process that helps in the realization of digital transformation through the use of digital tools. Firms that utilize digital enablement are granted the first adaptor advantage. This is because they are accorded a front-line view into how they can improve top-line growth by revamping their business models (Jules *et al.*, 2021). The Head of Strategy or Head of Department is required to undertake tech due diligence when evaluating a new deal opportunity. This means that they have to incorporate key findings and apply critical thinking while creating a value creation plan that permits them to continue to refine once they have invested. Accelerated technology enablement or adoption is something that most PE firms have adopted in the divestment context. The initiatives have to be designed in a manner that augments existing services while developing new ones. Furthermore, digital enablement is transformative by nature as it prompts PE funds to shift from their fear of changing frontline sales organization, especially in the early periods of the lifecycle specifically the ownership period. The fear causes them to worry about disruptions to the revenue flows. By applying digital enablement, portfolio companies are able to push the revenue growth past the industry average (Rohn *et al.*, 2021).

The digital enablement schemes help them determine whether the potential investment or portfolio entity has the right mix of field and virtual sales. The determination process allows them to recognize that virtual sales are becoming increasingly effective. Subsequently, digital

enablement sharpens the execution of a strategy by allowing PE firms to adopt play-based selling techniques. The techniques assist in prescribing how resources will be orchestrated in an organization. At the end of the day, revenue influxes measure the sales of a firm which increases the profitability or EBITDA rates at a margin of 10% or more.

■ CONCLUSIONS

At the current stage of development, digital strategies play an important role in increasing the revenue and competitiveness of PE firms. Simultaneously, digital enablement strategies are an unexplored area in the context of PE firms. The preceding analysis shows the merits of applying digital enablement and how organizations can harness their merits. The analysis is based on qualitative responses from case studies in companies that have used digital enablement strategies before.

In general, the results obtained during the research are consistent with theoretical conclusions. However, respondents' views on the role and impact of digital opportunities for profit growth were mixed. Digital capabilities have been found to positively impact decision-making efficiency through improved data collection and analysis. The importance of digital optimization to improve customer experience and increase investment attractiveness was highlighted. In addition, the results of the conducted analysis can testify to the positive effect of the introduction of new business models using digital technologies on obtaining new sources of income from products and increasing EBITDA.

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During the study of the aspects of involvement of strategy/department managers in the implementation of the strategy, a high interest of the department managers in the processes of digital transformation was noted. Digital transformation strategies have been found to improve quality through rethinking business processes, as well as reduce costs and increase customer satisfaction. The success of such strategies depends not least on managers and heads of departments, who determine the main directions of change and lead the company from a traditional business model to a more modern one. Also, it should be added that the successful implementation of digital technologies significantly depends on the implementation of appropriate transformations in the cultural and organizational sphere of the company.

Conclusive denotations indicate that there is a need for PE firms to adopt digital enablement strategies in order to change their business models and remain competitive while generating positive revenue and EBITDA. Further areas of research may relate to an in-depth analysis of the impact of the transformation of the company's cultural and organizational environment on the implementation of digital technologies.

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■ CONFLICT OF INTEREST

None.

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Збільшення ЕВІТДА приватної інвестиційної портфельної компанії за допомогою цифрових можливостей

■ **Анотація.** Дослідження ролі цифрових технологій у збільшенні прибутку до вирахування відсотків, податків, зносу та амортизації (ЕВІТДА) в портфельних компаніях приватних інвестиційних фондів є актуальним питанням для розвитку стратегій та підвищення конкурентоспроможності. Тому основною метою дослідження було визначити, як приватні інвестиційні фонди збільшують ЕВІТДА у своїх портфельних компаніях за допомогою цифрових технологій. Для того, щоб зрозуміти роль стратегій цифрових технологій у створенні вартості, дослідницьку парадигму критичного реалізму визначено як найбільш підходящу філософію. Підхід критичного реалізму було обрано тому, що він розвиває дослідницькі методології через розробку якісної теорії причинності. Була використана вибірка з 26 респондентів, з якими проведено напівструктуровані інтерв'ю. Процес аналізу даних передбачав визначення 3 тем за допомогою тематичного аналізу. Було визначено три теми, а саме: нові цифрові можливості для покращення зростання прибутків, під керівництвом голови стратегії/голови департаменту, та трансформаційні ініціативи. Результати за всіма трьома темами вказують на те, що цифрові можливості є корисними для підвищення доходів та рівня ЕВІТДА приватних компаній завдяки цифровій трансформації, покращенню взаємодії з клієнтами та визначенню ринкових можливостей для використання цифрових даних. Результати показують, що переосмислення має вирішальне значення для підвищення ЕВІТДА, оскільки воно кидає виклик існуючій моделі та забезпечує перспективний підхід до формулювання стратегії. Стратегії впровадження цифрових технологій є недослідженою сферою в контексті діяльності фондів прямих інвестицій. Ці стратегії відіграють важливу роль у підвищенні рівня доходів і конкурентоспроможності, одночасно акцентуючи увагу на показниках ЕВІТДА за рахунок скорочення витрат. Результати цього дослідження будуть корисними на практиці як бізнесу, так й іншим економічним суб'єктам

■ **Ключові слова:** процес трансформації; стратегія компанії; залучення клієнтів; ринкові можливості; можливості даних; рівень доходів

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Main areas of development of the digital economy in the Republic of Azerbaijan

Abstract. The development of the digital economy in Azerbaijan contributes to the country's modernisation and competitiveness in the global economic landscape, which is why research on this topic is relevant. The purpose of the research was to study, provide an objective assessment and organize the fundamental elements related to the advancement of the digital economy in Azerbaijan. The methods used included analytical method, statistical method, functional method, system analysis, deduction, synthesis, and comparison. The study analysed the existing condition of digital infrastructure in Azerbaijan, including an assessment of broadband Internet access, mobile coverage, and digital literacy. The main industries and sectors that have a major impact on the country's digital development were also analysed. A research investigation delved into the influence of digital development on society and residents of the country, analysing

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its impact on the labour market, education, healthcare, public administration, consumer habits, and other aspects. One of the key aspects of the research is an in-depth study of the sources of funding and investment for digital projects in the country. In addition, a comparative analysis of various digital and economic indicators of Azerbaijan with similar data from other highly developed countries was carried out. The practical significance of the obtained results lies in their use for solving modern problems related to the advancement of the main spheres of the digital economy in Azerbaijan. The findings offer valuable insights for policymakers and stakeholders, aiding in addressing contemporary challenges within Azerbaijan's digital economy

■ **Keywords:** technological progress; global integration; investments; cybersecurity; regulation

■ INTRODUCTION

Given the rapid technological progress and global changes in the economy, the development of the digital economy is becoming an important priority for wealthy countries. In this era of information revolutions and digital transformation, the Republic of Azerbaijan does not remain aside from exciting changes, actively directing efforts to create an innovative and technologically advanced economy. In the modern world, digital technologies are intertwined with every sphere of life, penetrating into business processes, education, healthcare, public administration, and many other aspects of public activity. The transformation of traditional methods and approaches by digital innovations opens up new opportunities to increase efficiency, elevating service quality, and cutting costs. In this regard, the strategic advancement of the digital economy becomes essential to maintain competitiveness and address the requirements of contemporary society. This approach expresses Azerbaijan's aspirations in the field of innovation and digitalization. Moving forward in this area has the potential to benefit both economically and socially. From building digital infrastructure to creating educational programmes aimed at training personnel for the digital age, every step in this direction opens up new horizons for growth and development.

All developed countries have been diversifying their national economies and improving their structure. Sustainable measures are being implemented in this area to increase the competitiveness of transport, construction, industry, and agriculture. The transition of the economies of developing countries to a new phase of digital advancement is marked by its significance. Digitalization of sectors of the national economy plays a crucial role in fostering economic development. In the agricultural sector, digital transformation involves the use of various information and communication technologies, statistical data forecasting and the application of artificial intelligence, as noted by E. Cozac (2021) and O. Radchenko *et al.* (2023). As highlighted by J.S. Tukhtabaev *et al.* (2023), digitalization of the agricultural sector can significantly contribute to enhancing export opportunities of entrepreneurs working in this field.

In conformity with a study conducted by K. Abdullayev *et al.* (2022), the swift advancement of the digital economy within the nation may prove to be a critical factor in accelerating economic growth and diversity, opening up prospects for sustainable development. In today's dynamic reality, where information technology penetrates all spheres of life, the country should strive not only to reach a new level of technological development, but also to effectively apply digital innovations to update and improve existing systems. A.S. Nechaev *et al.* (2022) claim that the

digital economy possesses the capability to serve as not just a domestic driver of economic development, but also a powerful bridge for strengthening international partnerships. In the era of globalization and rapid technological progress, the importance of cooperation in the international arena is becoming extremely relevant.

According to M. Korsunskaya *et al.* (2022), it is pointed out that digital progress leads to significant social changes that should be carefully considered during the shift to the digital economy. Digital technologies also optimize production processes, enhance product and service quality, and minimize time and financial expenditures. This allows for more effective resource utilization, contributing to heightened competitiveness of the company and the country as a whole. According to B. Miethlich *et al.* (2020), active investment in start-ups and support for young innovators are critical factors determining the success and dynamics of the digital economy. Start-ups, as engines of innovation and technological breakthroughs, have enormous potential to transform the economic landscape. In their paper, P. Yang *et al.* (2022) discuss the need for a deep renewal of the educational system, which should actively respond to the challenges of the new era. The researchers emphasize that in the context of rapid technological changes, it implies a deliberate enrichment of curricula and methods so that they reflect current trends and needs of the digital economy.

In general, the rapid advancement of the digital economy can become a key catalyst for accelerated economic growth and diversification, while active investment in innovation will create a springboard for new technological ideas and products. The objective of this research was to pinpoint optimal strategies and provide recommendations for the efficient advancement of the digital economy. These efforts aim to enhance Azerbaijan's global competitiveness and foster the nation's sustainable development in the digital era.

■ MATERIALS AND METHODS

Official documents and reports were used to investigate the topic, namely the reports of the State Statistics Committee of the Republic of Azerbaijan and the official website of the United Nations. Scientific research on the digital economy was carried out using scientific methods that reveal the content of the object. The analytical method helped to explore various aspects of the digital economy, such as the current state of digital infrastructure and investments in technology projects. This method allowed understanding the strengths and weaknesses of digital development and identifying key areas for improvement. Using the statistical method, it was possible to collect data on the growth rates of the digital economy, the accessibility of the of modern

technologies to the population, and changes in economic indicators, which helped to assess the dynamics and effectiveness of digital transformation.

The functional method identified the essential factors of the digital economy and indicated which specific sectors and areas of the economy can benefit most from digital development. This will help identify priority areas for investment and development. The system analysis helped to consider the digital economy as a complex system, including the interrelationships between various elements and factors. This method helped to identify possible effects and influences in various fields, such as economics, education, and healthcare. Using the deduction, it was possible to extract general principles and patterns based on the analysis of specific cases and data. Drawing upon an examination of the experiences of other nations, we've discerned successful practices and approaches that can be adapted to the advancement of Azerbaijan's digital economy. Utilizing a synthesis approach, authors amalgamated diverse data and research into a cohesive understanding of the present status and future possibilities within the digital economy digital economy. This synthesis facilitated the identification of common trends, opportunities, and challenges. Using the comparison, it was possible to compare the situation in Azerbaijan with the experience of other countries, which helped to determine the strengths and weaknesses of digital development and identify best practices that can be adapted to achieve success in the country.

The study was conducted with the disclosure of some aspects, including theoretical and practical components. The theoretical aspect analyses and systemizes existing theoretical approaches, concepts, and trends related to the advancement of the digital economy. This includes a review of the definitions and main features of the digital economy, as well as its impact on economic growth and social change. Another aspect of the study is the analysis of specific practical measures and initiatives implemented in Azerbaijan and other countries towards the development of the digital economy. This includes investigating the structure of digital infrastructure, the level of digital literacy of the population, investments in technology projects, and the degree of digital technology adoption in various industries. The conclusions of the study provide a basis for specific recommendations on how to highlight the problems in the digital economy, contributing to solving these problems and enhancing the development of its key areas. As a result, these actions were applied to consider the feasibility of increasing the level of digitalization, for the successful advancement of the economy and the overall country.

■ RESULTS

The digital economy encompasses a series of economic and social processes where digital technologies assume a pivotal role in generating, disseminating, and consuming both economic and social value. It combines information and communication technologies, data, networks and digital platforms, penetrating into various aspects of life, including business, public administration, education, healthcare, and public relations. Within the business, the digital economy brings new opportunities for the creation and provision of products and services (Pan *et al.*, 2022). Digital platforms, e-commerce, and online services accelerate

and simplify trade, facilitate customer interaction, and allow companies to adapt to changing market demands. In public administration, digital technologies help make public services more accessible and efficient, including e-government, electronic public registries and online filing (Li *et al.*, 2020). In the education sector, the digital economy promotes the development of online learning, the creation of e-learning platforms and the introduction of distance learning formats. In the healthcare sector, digital technologies facilitate the advancement of telemedicine, the introduction of electronic medical records and health monitoring systems. Public relations are also influenced by the digital economy, through social networks, online information exchange platforms, and virtual communities (Xun *et al.*, 2020).

Digital technologies are changing the ways of employment and work. Simultaneously with the emergence of new digital jobs, old professions may become obsolete. Specialists must have digital literacy and adapt to changes in the labour market. Flexibility and the possibility of remote work are becoming key features of the modern labour market (Zaki, 2019). The digital economy is closely tied to innovation and continuous technological development, resulting in the rapid emergence of new digital solutions and tools. It is also reshaping the way authors work and interact. This approach provides global connectivity and access to resources and markets for both large corporations and small businesses, allowing them to compete on the global stage (McQuire, 2021). A consumer-focused sphere can support the provision of personalized services, where digital technologies enable the creation of customized solutions and deeper interaction with customers.

The digital economy also generates huge amounts of data that can be analysed to gain valuable insights. This analytical approach allows companies and governments to make informed decisions. Technology also helps automate routine tasks and optimize business processes, which increases efficiency and directs resources to more strategic tasks. Social networks and information exchange platforms play an essential role in the modern digital economy, creating new mechanisms for interaction and exchange of experience (Sturgeon, 2021). And, ultimately, the digital economy implies the integration of various technologies and platforms to create a single ecosystem, facilitating more effective collaboration and data exchange between participants in this dynamic environment. An assessment of the current state of digital infrastructure in Azerbaijan, including Internet access and mobile communications, is a significant step in determining the country's readiness to move to a digital economy. This analysis not only helps to determine achievements, but also identifies challenges and reveals the potential for digital development in the country. It is worth noting that Azerbaijan has already taken essential steps in developing access to the Internet, which demonstrates its recognition of the importance of digital progress. At the moment, broadband Internet access covers a significant part of the population, including both urban and rural areas. However, there may have been additional efforts to expand coverage and provide high internet speeds in remote areas. Mobile communications also play a key role in the digital infrastructure. Mobile communications are widely available in Azerbaijan, and the majority of the population

has access to mobile phones (Guarda *et al.*, 2021). The development of mobile communications includes not only providing wide signal coverage, but also providing a variety of services such as mobile Internet, mobile applications.

Azerbaijan has the potential to further improve its digital infrastructure. The development of next-generation networks, such as 5G, can create new opportunities for faster data transfer and support for the Internet of Things. However, there are some challenges facing the digital infrastructure in the country. This may include the need to

improve the quality of communications in remote areas, ensuring the reliability of networks, as well as cybersecurity and data protection issues. It is important to constantly monitor and update the digital infrastructure so that it meets the rapidly changing requirements of the digital economy. Continuous investment in infrastructure, staff training, and the development of the technological ecosystem create a favourable foundation for the digital advancement of the Republic of Azerbaijan. The results of the digital economy development in the country can be found in Table 1.

Table 1. Indicators of the development of the digital economy in Azerbaijan

Indicator	2015	2016	2017	2018	2019	2020	2021	2022
Number of Internet users for every 100 people in the population	77	78	79	80	80	81	82	82
Number of broadband Internet users for every 100 people in the population	72	72	73	75	76	79	80	80
Volume of international Internet bandwidth per capita, kbit/s	54	68	79	83	89	102	111	120
ICT Development Index	6.23	6.25	6.2	6.33	-	-	-	-
E-Government Index	0.55	-	-	0.66	-	0.71	-	0.69

Source: developed by the authors based on The State Statistical Committee of the Republic of Azerbaijan (2023)

The ICT Development Index serves as a comprehensive measure to evaluate the advancement of information and communication technologies across diverse nations. Calculated until 2018, top performers included Iceland (8.98),

South Korea (8.85), and Switzerland (8.74). Azerbaijan held the 65th position in the global ranking as per the UN in 2022. Table 2 provides a breakdown of countries based on the E-Government Index.

Table 2. Ranking of countries by E-Government Index

Country	Value	
1	Denmark	0.972
2	Finland	0.953
3	South Korea	0.953
4	New Zealand	0.943
5	Iceland	0.941
6	Sweden	0.941
7	Australia	0.94
8	Estonia	0.939
9	Netherlands	0.938
10	USA	0.915
...
83	Azerbaijan	0.694

Source: developed by the authors based on United Nations (2022)

The E-Government Index characterizes the degree to which government agencies utilize information and communication technologies for efficient engagement with citizens and businesses. E-government strives to improve access to public services, simplify procedures, increase transparency and citizen participation in decision-making processes. The following factors are the evidence of the advancement of the digital economy in Azerbaijan: the establishment of the Azerbaijan Service and Assessment Network (ASAN), which ensures the coordination and unified execution of public services; the adoption of a State Programme to expand digital payments in the Republic of Azerbaijan for 2018-2020; the establishment of a sustainable and operational social security network (DOST), which provides services for the appointment of pensions, benefits employment and resolving issues within the competence of the Ministry of Labour; the introduction of laws and

regulations related to the establishment of e-government; the implementation of digital transformation of the functions of state institutions. Digitalization permeates every facet of economic operations, with significant strides observed in the advancement of e-government in the nation. New electronic portals are emerging, and there is a notable growth in e-commerce, e-tourism, and the establishment of e-universities (Matthess & Kunkel, 2020).

While transitioning into the era of digital transformation, it is crucial to focus extensively on fostering the business sector for the establishment of a competitive economy. Beyond their pivotal contribution to economic advancement, small and medium-sized enterprises (SMEs) exert a considerable influence on job creation and poverty reduction (Abdullayev *et al.*, 2023). Table 3 provides an overview of key metrics related to the adoption of information and communication technologies within enterprises.

Table 3. Key indicators the adoption of information and communication technologies within the operational domain of enterprises, %

Indicator	2015	2016	2017	2018	2019	2020	2021	2022
Share of enterprises using computers	63.1	65.3	66.9	67.2	62.8	63.9	65.2	66.1
Share of employees using computers	28	29.6	30.7	33.4	33.9	35.1	35.8	36.2
Share of enterprises using the Internet	48	51.6	52.5	52.9	51.5	52.5	54.2	57.1
Share of employees using the Internet	20.4	21.9	23.1	25.3	25.8	26.9	28.1	31
Share of enterprises with an Internet presence (web page, website)	11.9	11.9	12.2	12.36	9.8	9.9	10.2	11.4

Source: developed by the authors based on The State Statistical Committee of the Republic of Azerbaijan (2023)

An assessment of key indicators related to the ease of starting and running a business in Azerbaijan confirms that the country's business environment is conducive to the ease of starting a business. The integration of innovative technologies and the introduction of digital transformation is one of the ways to increase business competitiveness, which contributes to overall economic progress. It is important to note that the COVID-19 pandemic has played a significant role in the advancement of the digital economy in Azerbaijan. This has contributed to the intensive expansion of electronic services. Since the beginning of 2020, there has been a significant increase in online commerce and online orders for goods and services. As of the beginning of January 2022, the number of Internet users in the country was 8.32 million, which is a substantial percentage of the total population of 10.26 million at that time. Over the period from 2020 to 2022, the number of Internet users in the country increased by 267,000 people, which is a 3.3% increase. The Internet penetration rate in January 2022 was 81.1%. In comparison with neighbouring countries, such indicators are also available: Georgia – 68.9%, Armenia – 68.2%, Iran – 70%, Turkey – 77.7% (Kemp, 2022).

Investments in Azerbaijan's digital economy play a crucial role in stimulating the advancement of information and communication technologies, fostering innovation, and enhancing the country's competitive standing globally. In recent years, attention to investment in the digital economy has increased significantly, and steps have been taken in the country to attract both domestic and foreign investors to this sector. The Republic of Azerbaijan is developing and implementing various measures to support digital

development. This may include financing innovative projects, the creation of technology parks and incubators for start-ups, and tax incentives for companies in the IT sector, which helps attract investment. An example of government support is the creation of the National Agency for the Development of the Digital Economy (DIA). The agency works to coordinate and support projects in the field of digital technologies, innovations and start-ups, including providing financial assistance and advice. Azerbaijan is developing a start-up ecosystem to support young entrepreneurs and innovators.

Establishing incubators, accelerators, and technology parks facilitates the growth and commercialization of novel concepts within the realm of digital technologies. One example of the development of the start-up ecosystem in Azerbaijan is the creation of the Technopark of the Azerbaijan State Oil and Industry University. Digitalization has a significant impact on transport services, bringing innovation and optimization to this area. Digital technologies allow creating intelligent traffic management systems, optimizing the movement of vehicles and improving the mobility of citizens. Online booking platforms and mobile applications allow passengers to book taxis, rent cars, buy public transport tickets, and monitor traffic conditions in real time. The integration of digital technologies is contributing to the development of electric vehicles, reducing emissions, and improving the environment. Details of the country ranking by logistics indicators are shown in Table 4. By optimizing the movement of goods and ensuring more efficient supply chain management, digital transformation is also having a significant impact on the logistics sector.

Table 4. Ranking of countries according to the Logistics Performance Index (LPI)

	Country	Value
1	Singapore	4.3
2	Finland	4.2
3	Denmark	4.1
4	Switzerland	4.1
5	Germany	4.1
6	Netherlands	4.1
7	Canada	4
8	Sweden	4
9	Belgium	4
10	China	4
...
122	Azerbaijan	2.5

Source: developed by the authors based on United Nations (2022)

Azerbaijan feels certain challenges in the field of logistics efficiency, which is reflected in its position in the world rankings. Despite the efforts made to develop its transport infrastructure, the country remains low in the global logistics rankings. The introduction of digital innovations, such as cargo tracking, warehouse, and traffic management systems, can improve the transparency and manageability of logistics processes. Regulation of the digital economy is an essential aspect of ensuring sustainable development and a balance between dynamic progress and protecting the interests of society. In the regulatory context, laws and regulations play a crucial role. They create a legal framework defining the responsibilities and rights of participants in the digital economy (Banalieva & Dhanaraj, 2019). This includes data protection, intellectual property, e-commerce, and cybersecurity. Competition and antitrust regulation ensure fair play in digital markets and prevent possible abuse of the

dominant position of companies. Cybersecurity is becoming increasingly important in the face of constant threats of cyber-attacks and data leaks. Regulation in this area includes the development of standards and practices that help ensure reliable protection of digital infrastructure and personal data (Kerber, 2016).

The level of cybersecurity in a country can be assessed using the Global Cybersecurity Index (GCI). This index helps to determine how countries are protected from cyber threats and how effectively they can ensure the security of their digital infrastructure. The assessment includes an analysis of various aspects, such as national cybersecurity strategies, legal frameworks, the structure of government agencies in the field of cybersecurity, interaction with other countries and international organizations, as well as the population's level of education and awareness regarding cybersecurity. The ranking of countries by cybersecurity is presented in Table 5.

Table 5. Ranking of countries according to the GCI indicator

	Country	Value
1	USA	100
2	United Kingdom	99.54
3	Saudi Arabia	99.54
4	Estonia	99.48
5	South Korea	98.52
6	Singapore	98.52
7	Spain	98.52
8	Russia	98.06
9	UAE	98.06
10	Malaysia	98.06
...
40	Azerbaijan	89.31

Source: developed by the authors using information from United Nations (2022)

In Azerbaijan, effective regulation of the digital economy is crucial for fostering sustainable and innovative development in the country. Government authorities have adopted a wide range of measures and policies to establish a conducive environment, promoting the advancement of digital technologies, strengthening digital infrastructure, and stimulating digital innovation (Horoshko *et al.*, 2021). For example, the State Computer Emergency Response Team (CERT) has been established to monitor, prevent, and respond to cyber threats, while also coordinating

efforts to safeguard information. To develop e-commerce in Azerbaijan, norms and standards have been introduced to regulate online trading and consumer protection. The Law of the Republic of Azerbaijan No. 908-IIQ "On Electronic Commerce" (2005) defines the rules and requirements for electronic trading platforms, helping to protect the interests of consumers during online purchases. Additionally, there is an e-government portal that provides access to a variety of government services, from paperwork to paying taxes and fees.

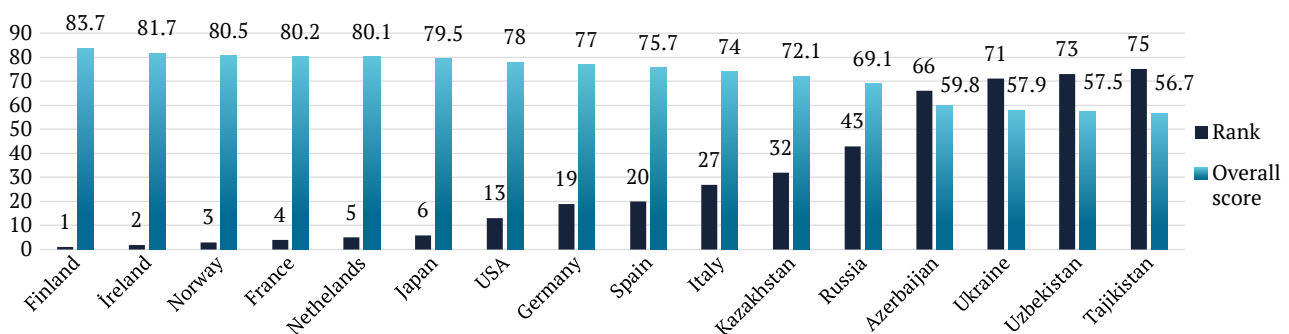


Figure 2. Comparative dynamics of changes in the food security index as a result of the development of the digital economy in some countries of the world (2022)

Source: developed by the authors based on the Global Food Security Index (2022)

In recent times, enhancing food security by bolstering the agricultural sector has emerged as a pivotal focus for ensuring the economic resilience of nations globally. The extensive digitization of the national agricultural sector assumes a crucial role in guaranteeing robust food security. The assurance of regional food security stands out as a fundamental prerequisite for supplying the country's populace with dependable food and agricultural products (Shahini *et al.*, 2023). Studies indicate that fortifying economic resilience significantly hinges on securing food security through the advancement of the agricultural sector.

The Global Food Security Index (GFSI), introduced by The Economist Intelligence Unit, stands as a noteworthy instrument for gauging the level of food security across countries worldwide. This index assesses the food security rankings of countries based on diverse parameters. The digital transformation spanning various sectors of the national economy, particularly the agricultural sector, contributes directly to enhancing food security. Disparate rankings in the GFSI among countries underscore the varying degrees of digital innovation in the agricultural sector and its consequential impact on food security (Khakhula *et al.*, 2024).

For example, in the field of food safety in 2022, Finland took 1st place with 83.7 points. Ireland took 2nd place with 81.7 points, and Norway took 3rd place with 80.5 points. USA took 13th place with 78 points, Germany – 19th place with 77 points, and Italy – 27th place with 74 points. Among the post-Soviet countries, this indicator amounted to 69.1 points in Russia, taking 43rd place, and in Kazakhstan – 72.1 points, taking 32nd place. In Azerbaijan, this indicator amounted to 59.8 points, taking 66th place. In addition, Ukraine took 71st place, Uzbekistan – 73rd, Tajikistan – 75th. The analysis shows that digitalization of the agricultural sector also has a positive impact on the development of this sector.

Azerbaijan has taken substantial strides in advancing its digital economy. Reforms, the adoption of e-government practices, encouragement for innovative start-ups, and investments in digital initiatives have collectively fostered a conducive environment for digital technology development. Positive trends are evident in the growing user base of the Internet users and the rise of the ICT development index. However, despite these accomplishments, challenges persist. Issues such as incomplete access to high-speed Internet, inadequate digital literacy in certain population segments, and the imperative to enhance cybersecurity demand attention and effective solutions.

In order to promote further progress in the digital economy of Azerbaijan, it is necessary to focus efforts on several key areas. Continued investment in expanding broadband Internet and mobile communications, especially in remote and rural areas, will be fundamental to ensuring equal access to digital services for all residents. It is also necessary to introduce educational programmes aimed at raising the level of digital literacy of all age groups, which will allow every citizen to successfully adapt to the changing digital reality. Continuing to support innovative ideas and start-ups through financing, accelerators and incubators will stimulate the development of advanced technological solutions. Digital solutions must also be combined with active steps in the field of cybersecurity, including the development of strategies and the application of measures to ensure the protection of digital

infrastructure, data, and personal information of citizens. Cooperation in the international arena, participation in international initiatives and the exchange of experience with other countries seeking to develop the digital economy are also of great importance. Such co-operation will enrich knowledge and enable learning from best practices in digital transformation. Through the implementation of these principles, Azerbaijan will persist in evolving into a contemporary digital society, attaining sustainable growth, and enhancing the quality of life for its residents.

■ DISCUSSION

Within the strategic framework of the digital economy, this study contributes to a more profound understanding of the imperative need for digital technology development in Azerbaijan. Countries should recognize the pivotal impact of digital transformation and innovation in achieving sustainable economic growth and enhancing the citizens' quality of life. A strategic avenue for advancing the digital economy in Azerbaijan involves implementing a contemporary digital infrastructure, encompassing high-speed broadband Internet and mobile networks. Initiatives focusing on nationwide Internet accessibility aim to bridge regional digital disparities and facilitate the integration of digital services across all sectors of the economy. Another crucial domain is the advancement of e-government. Leveraging modern technology streamlines citizen-state interactions, enhances the quality of public services, and augments transparency and trust in the government. Investments in startups and support for emerging innovators also play a pivotal role in digital economy development. Creating an enabling environment for startups and providing financial backing aid in identifying and nurturing talented entrepreneurs while stimulating innovative solutions. This study demonstrates that the process of developing the digital economy may face numerous challenges and problems that require special attention and measures to successfully realize the potential of digital transformation.

One of the main challenges is ensuring cybersecurity in an increasingly dependent environment on digital technologies. In the modern digital environment, vulnerability to cyber-attacks and hacker attacks is becoming especially relevant. It is important to develop and implement effective measures to protect digital infrastructure, company data and personal information of citizens. A proactive cybersecurity strategy, including employee training, the use of modern security technologies, and regular security monitoring and auditing, can significantly reduce risks and provide reliable protection against threats. The protection of data and personal information is another key aspect. With the increasing volume of digital data and its personalization, it is important to ensure reliable storage and transmission of information. Strict encryption standards, access control and compliance with data protection legislation can ensure the confidentiality and integrity of digital resources.

R. De' *et al.* (2020) described the impact of digital technologies and artificial intelligence on economic relations. They are changing the ways in which companies, states, and individuals interact, defining new business models and requiring society to adapt to the new digital reality. In connection with the fight against the COVID-19 pandemic, the transition to remote operation has become one of the

factors enhancing the digitalization of society. The acute debatable problems of the global digital divide of society are noted. This implies a division between those who actively use and master digital technologies and those who lag behind. It is also necessary to provide specific recommendations on how to eliminate problems related to the advancement of the digital economy in the country. This may include strengthening cybersecurity, improving the educational level of the population, and improving access to technology in remote areas.

S. Ding *et al.* (2022) highlight the main aspects of the evolution of the digital economy, focusing on the creation of favourable conditions for high-performance technologies and platforms, as well as related industries and markets where suppliers and consumers of high-tech, including financial, services actively interact. In this context, the digital economy functions as a dynamic catalyst, fostering the advancement of high-tech industries and promoting convergence between suppliers and consumers. Global expertise significantly contributes to adapting and refining the phases of digital economy development. This analysis allows assessing the importance of the harmonious advancement of the digital economy in the context of current economic conditions. However, it is also necessary to consider the social aspects of digital transformation. The growth of the digital economy may lead to changes in the demand for labour and skills, which will require staff to be retrained and improve their skills in line with new requirements.

L.D. Williams (2021) underscores crucial facets concerning the governmental regulation of business endeavours, the interplay between private and public interests, the legal system's role in advancing digital infrastructure, and significant considerations pertaining to the legal governance of international economic activities. In the modern world, where technological progress is changing the way people interact and influencing economic processes, understanding how legal norms can regulate and support digital infrastructure is important. The analysis of the relationship between the digital economy and law provides an in-depth look at the challenges and opportunities that exist in this area. This paper is a valuable resource for researchers, practitioners, and specialists dealing with the legal aspects of economic relations. But it is worth considering that in a rapidly changing economic environment and technological development, some aspects of legal regulation may turn out to be outdated or insufficiently flexible to adapt to new challenges.

N. Deng & S. Chelliah (2022) analysed the main trends in the digital economy, which provides an opportunity to identify key areas of informatization that are becoming the main engines of growth in modern conditions. This includes the advancement of artificial intelligence technologies, the expansion of Internet infrastructure, strengthening cybersecurity, and the creation of new business models based on digital platforms and services. The analysis of these trends allows anticipating future development directions and effectively adapting strategies in accordance with market needs. Of particular importance is the identification of the growth potential that can be implemented within the framework of the digital economy. Studying the methods of integrating digital technologies into various sectors of the economy helps to identify areas where digitalization

can lead to the greatest positive results. It is crucial to note that the findings of this research have significant practical implications. They are an important information foundation for strategic decision-making at various levels, from commercial enterprises to government agencies. Analysing trends in the development of the digital economy allows formulating development strategies that maximize the use of existing potential and ensure competitiveness in the global economic environment.

S. Bresciani *et al.* (2021) consider modern transformational processes in the socio-economic sphere, which are an integral part of the development of modern society. In the process of analysing the stages of development of the digital economy, it becomes clear that this process represents a gradual transition from traditional forms of doing business and organizing society to more integrated and efficient models based on digital technologies. Examples of successful digitalization strategies across different nations underscore the significance of formulating innovative approaches, stimulating investment in infrastructure, developing digital literacy and fostering collaboration among governmental bodies, business, and scientific institutions. In addition, it is important to pay attention to the role and importance of the country in the processes of digital transformation. An analysis of the current and future prospects of digitalization allows to assess the strengths and difficulties faced by the country. This helps to develop more effective and adapted strategies to accelerate digital development.

In general, the digital economy is not only changing the way business and government interact, but also has a significant impact on lifestyle, work, education, and even healthcare. All this requires comprehensive approaches and active training, both in technical and legal aspects. The digital economy already requires careful and harmonious development. Implementing strategic plans, investing in technological innovations, and ensuring cybersecurity will be key success factors in this dynamic and rapidly developing field.

■ CONCLUSIONS

This research highlights the essence of the digital economy, its impact on the progress of nations and the primary directions of this process. The current state of digital infrastructure in Azerbaijan was analysed, and the main indicators of digitalization were compared with the leading countries. Azerbaijan is actively developing the digital economy, realizing its potential as a driving force for innovative development. Strategic areas, such as improving digital infrastructure, expanding Internet access, and developing innovative projects, allow the country to actively integrate into the global digital community. Attracting investments in the development of the digital economy is an important factor for ensuring sustainable growth. The government of Azerbaijan actively supports start-ups, innovative projects, and the creation of technology parks, which helps to stimulate new ideas and technological progress. Azerbaijan's government agencies are also taking a number of measures and policies to create a favourable environment that promotes the development of digital technologies, strengthens digital infrastructure, and stimulates digital innovation. With the increasing dependence of society on digital technologies, cybersecurity issues are becoming critically



important. The need to ensure the protection of data and personal information of citizens requires the active development of cybersecurity. The following recommendations were highlighted for the successful development of the digital economy in Azerbaijan: continued investment in the expansion of broadband Internet and mobile communications; the introduction of educational programmes; support for innovative ideas and start-ups; cooperation in the international arena.

The examination of the primary domains of digital economy advancement in the Republic of Azerbaijan shows that the country is actively moving forward, taking significant steps in the field of innovation and technological devel-

opment. Future analyses can help assess the effectiveness of investments in the digital economy and identify successful practices and areas that require additional funding. Furthermore, studying the experience of other countries in developing the digital economy and analysing international cooperation can serve as a basis for identifying optimal policies and effective strategies for further development.

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■ CONFLICT OF INTEREST

None.

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Основні напрямки розвитку цифрової економіки в Азербайджанській Республіці

■ **Анотація.** Розвиток цифрової економіки в Азербайджані сприяє модернізації та конкурентоздатності країни в глобальному економічному ландшафті, тому дослідження цієї теми на часі. Метою дослідження було вивчення, об'єктивна оцінка та систематизація основних елементів, пов'язаних із просуванням цифрової економіки в Азербайджані. Використані методи включали аналітичний метод, статистичний метод, функціональний метод, системний аналіз, дедукцію, синтез і порівняння. У дослідженні проаналізовано існуючий стан цифрової інфраструктури в Азербайджані, зокрема надано оцінку широкосмуговому доступу до інтернету, мобільному покриттю та цифровій грамотності. Також було проаналізовано основні галузі та сектори, які мають значний вплив на цифровий розвиток країни. Дослідження заглибилося у вплив цифрового розвитку на суспільство та мешканців країни, проаналізувавши його вплив на ринок праці, освіту, охорону здоров'я, державне управління, споживчі звички та інші аспекти. Одним із ключових аспектів дослідження є поглиблене вивчення джерел фінансування та інвестицій у цифрові проекти в країні. Крім того, було проведено порівняльний аналіз різних цифрових та економічних показників Азербайджану з аналогічними даними інших високорозвинених країн. Практичне значення отриманих результатів полягає в їх використанні для вирішення сучасних проблем, пов'язаних з просуванням основних сфер цифрової економіки в Азербайджані. Результати дослідження пропонують цінну інформацію для політиків і зацікавлених сторін, допомагаючи вирішувати сучасні виклики в цифровій економіці Азербайджану

■ **Ключові слова:** технологічний прогрес; глобальна інтеграція; інвестиції; кібербезпека; регулювання

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Global experience in public debt reduction (on example of Sweden, Switzerland, and Iceland)

■ **Abstract.** Public debt reduction is one of the main objectives of budget policy formation in the current crisis conditions. In this regard, the study of the experience of different countries in this area is relevant. Therefore, the aim of the study was to provide recommendations for reducing the debt burden in the Kyrgyz Republic, based on the experience of other countries. The main methods used in the research were historical, comparison and generalisation. The study analysed the factors affecting the reduction of public debt in the Kyrgyz Republic. It was concluded that the components that can help affect the debt burden in the country are inflation, economic development, and a targeted policy of the state to pay debts. It was shown that in the current realities, countries that are successful in this direction most often use the latter approach. In addition, the situation in Sweden, Switzerland and Iceland was analysed directly and the

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main recommendations were given as to how the Kyrgyz Republic can improve its current situation in terms of debt reduction. These recommendations focused primarily on fighting corruption and improving the situation in the context of institutional development, as well as reducing expenditures to achieve a budget surplus. It was recommended not to increase taxes directly to increase state revenues, but to increase the efficiency of their collection. The data obtained from the results of the study can be used to formulate public policy in the area of public debt and budget management both in the Kyrgyz Republic and in other countries

■ **Keywords:** fiscal policy; inflation; economic growth; budget; management

■ INTRODUCTION

Public debt is a set of financial obligations of the state to its creditors, which can be other countries, international organisations, private investors, and citizens. This indicator arises as a result of borrowing to finance budget deficits, infrastructure projects or other public needs. By using various instruments, such as loans and securities (bonds), the state can cover current budget needs at the expense of future generations. In general, the competent use of such an instrument may become a positive factor in long-term economic development, although at the expense of a negative impact on financial stability. In modern conditions, when after the time of economic abundance in the world the factors causing crisis events (such as COVID-19 virus and military conflicts) have become more evident, it becomes more and more important to improve the financial condition of countries. Thus, analysing public debt policy is relevant.

Many scholars have worked on the assessment of the financial condition of the Kyrgyz Republic. D. Sharipova & A. Kudebayeva (2023) analysed the financial well-being of Kazakhstan and the Kyrgyz Republic between 2011 and 2018. They noted that the Kyrgyz Republic generally experienced an improvement in well-being despite crises and economic and political instability. However, the study remains rather limited as it only assessed data up to 2018. Financial sustainability in the Kyrgyz Republic has also been studied by N. Alymkulova & J. Ganiev (2019), but they focused on the formation of sound monetary policy without studying problems in the context of state budget formation and public debt servicing. A.A. Sherbekova & A.S. Ryspaeva (2021) studied the impact of the COVID-19 crisis on the state of the financial system of the Kyrgyz Republic. They showed the negative trends in the development of the country during this period and concluded that monetary and fiscal policies during this period should be aimed at mitigating the consequences. In particular, the importance of investing in economic recovery was emphasised to sustain the country, restore confidence in markets and contain risks to financial stability. E. Vinokurov *et al.* (2022) assessed the resilience of the Kyrgyz Republic's debt to external shocks. Kyrgyz Republic was shown to be more sensitive to a global recession than to a financial shock, indicating underdeveloped financial markets and a continued dependence on commodity exports and remittances. In this regard, the researchers pointed to the importance of diversifying the economy for its stable development but did not describe clear recommendations for improving the situation in the country. The study of the Kyrgyz Republic's external debt was also conducted by J. Ganiev *et al.* (2020), point to its significant recent growth. The researchers concluded that the country is dependent on foreign revenues, which led them to recommend that

investors should be motivated to invest in instruments other than debt, especially foreign direct investment.

This study uses the results of this analysis to create a recommendation for the Kyrgyz Republic. This will form a better policy for the country in the sphere, strengthening its financial sustainability, including in the face of global crises. Ignoring this component in the management of the state can lead to negative long-term consequences for the country's economy and its social component. Thus, the study aimed to formulate recommendations on public policy in the context of public debt management based on an assessment of the experience of other countries.

■ MATERIALS AND METHODS

The study analyses the level of public debt in the Kyrgyz Republic and assesses the debt management policies of individual countries. In the current conditions of economic development, most countries are characterised by trends related to the growth of the ratio of public debt to gross domestic product (GDP). In this connection, certain countries to which such a trend is not relevant, and which remain developed, were chosen, including: Switzerland, Sweden, and Iceland. The period chosen for the study was 2006-2022 due to the abundance of information to analyse for all countries in this interval; it is also large enough to note the main trends and draw conclusions based on them.

The study used various sources of information to characterise the level of public debt in the countries. For example, data from the Kyrgyz Republic was assessed based on information from the National Statistical Committee of the Kyrgyz Republic (State debt, n.d.). Data on the ratio of public debt to GDP for such countries as Sweden, Switzerland and Iceland were analysed from official data of the website of the international organisation World Bank (GDP (current US\$)..., 2022; Inflation, consumer prices..., 2022). Data from other sources were also used to assess the situation in these countries: in particular, Sweden government budget deficit (2022) to analyse the nominal public debt and the ratio of budget deficit to GDP and Statista (Iceland: Inflation rate..., 2023; Sweden: Inflation rate..., 2023; Switzerland: Inflation rate..., 2023) to assess the inflation rate in the countries. The Countryeconomy website (General government gross debt, 2022) also made it possible to assess information about the situation in terms of public debt in such countries as Kazakhstan, Moldova, Uzbekistan, and Armenia, as states that are similar to the Kyrgyz Republic in terms of their development and are also members of a single international organisation – Eurasian Economic Union (EEU). All constructions and calculations in the study were carried out in Microsoft Excel.

One of the main methods used in the study was the historical one, which was used to assess the situation in this context in retrospect, i.e. based on past data. The comparison was used to assess how the dynamics of public debt differ in individual countries and to draw conclusions about the reasons for changes in this indicator. The graphical method was used to present the data in the form of figures for easier evaluation. The generalisation method, in turn, allowed us to discard all secondary data on the state of public debt in the Kyrgyz Republic and other countries to focus on the main information for concluding the study. The description was used to collect the main data in the study and then characterise them.

■ RESULTS

In general, only a few main reasons can be singled out, due to which a decrease in the level of public debt in the country can be observed. These are direct debt repayment due

to an increase in revenues and decrease in budget expenditures, growth of inflation rate, which leads to depreciation of debt denominated in the respective currency, and rapid economic growth, which increases the level of GDP, and thus reduces the ratio of debt to this value (Butkus *et al.*, 2021). Thus, when assessing the trends related to the reduction of public debt, it is worth assessing the causes of this phenomenon as well. In modern conditions, it may not be difficult to achieve a lower burden on the budget by devaluing the national currency, but it may lead to other kinds of difficulties in economic development together with the discontent of citizens, and therefore, a possible negative social consequences or even political ones can be expected. Such an approach is undesirable and arises rather as a consequence of other economic problems that the state authorities have failed to solve. It is worth assessing the situation in terms of the level of public debt of the Kyrgyz Republic (Fig. 1).

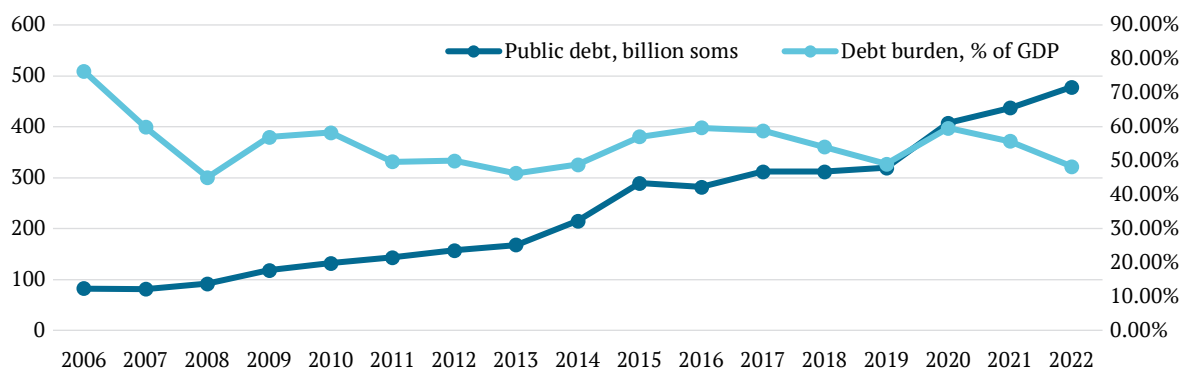


Figure 1. Change in public debt in monetary terms and relation to GDP, 2006-2022

Source: compiled by the authors based on State debt (n.d.), Inflation, consumer prices (annual %) – Kyrgyz Republic (2022)

As can be seen from Figure 1, the country's public debt in monetary terms (KGS billion) is growing, while the burden per GDP is gradually decreasing. Thus, such

trends could be caused by one of two reasons: rising inflation rate or rapid growth of GDP. The relevant data is shown in Figure 2.

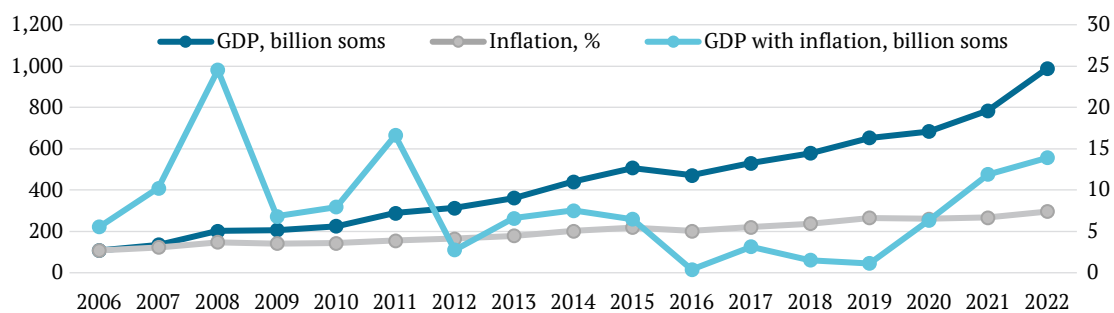


Figure 2. Data characterising the level of GDP in Kyrgyz Republic with and without inflation in KGS and inflation rate, 2006-2022

Source: compiled by the authors based on State debt (n.d.), Inflation, consumer prices (annual %) – Kyrgyz Republic (2022)

As can be seen from Figure 2, the level of GDP in nominal terms in the Kyrgyz Republic increased significantly: by 816%. Nevertheless, in real terms, the change was 174%, which also remains significant. At the same time, the growth in the level of public debt in the country was 73.68% over the selected period. Thus, it is possible to conclude that the reason for the reduction of public debt in the country was high inflation (which cumulatively for the selected period

was at the level of 224%), as well as rapid growth of GDP (by 174% including inflation), but not debt repayments by the state. Although inflation was at sane levels from 2012 to 2019, it increased significantly in 2020 and 2021 due to the onset of the COVID-19 pandemic and continued to rise in 2022 due to the onset of the Russian invasion of Ukraine and the negative effects it brought to the economic development of the Kyrgyz Republic (negative impact of

sanctions, complication of trade interactions, deterioration of the investment climate). It has been noted above that in the long term such trends may hurt the economic well-being of the country as a whole and its citizens in particular (Samus *et al.*, 2023). In this regard, the political authorities of the Kyrgyz Republic should change their

approach to fiscal and monetary policy, directing more efforts to fight inflation. It is also worth evaluating data that would characterise the situation concerning public debt dynamics in countries similar in their characteristics and development features to the Kyrgyz Republic. Such data are shown in Figure 3.

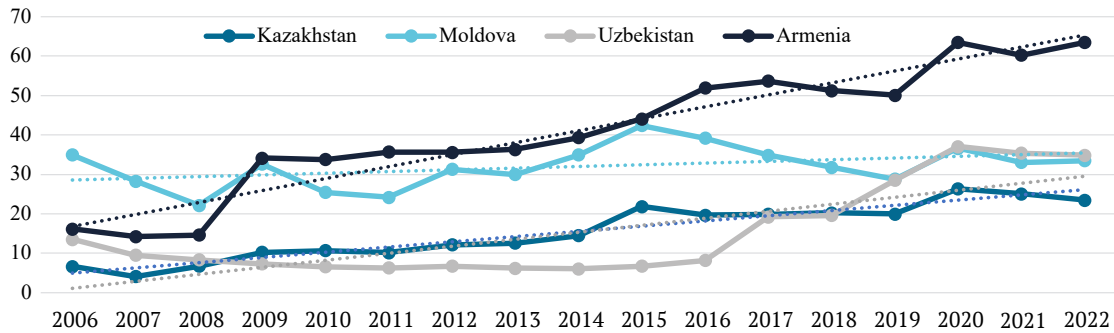


Figure 3. Data on dynamics of public debt-to-GDP ratio in Kazakhstan, Moldova, Uzbekistan, and Armenia, 2006-2022, %
Source: compiled by the author based on General government gross debt (2022)

As can be seen from Figure 3, most of the selected countries have an upward trend in the level of public debt. In particular, such a trend has been observed since 2008, which is associated with the global financial crisis. It is also worth noting that although the level of debt to GDP ratio in these countries is still small, such trends may lead to

negative consequences in the long run. Considering the statistics of public debt of most countries, it shows an upward trend, including concerning GDP. This also applies to developed countries. One of the examples of the reverse situation are such countries as Sweden, Switzerland, and Iceland. The level of their public debt to GDP can be seen in Figure 4.

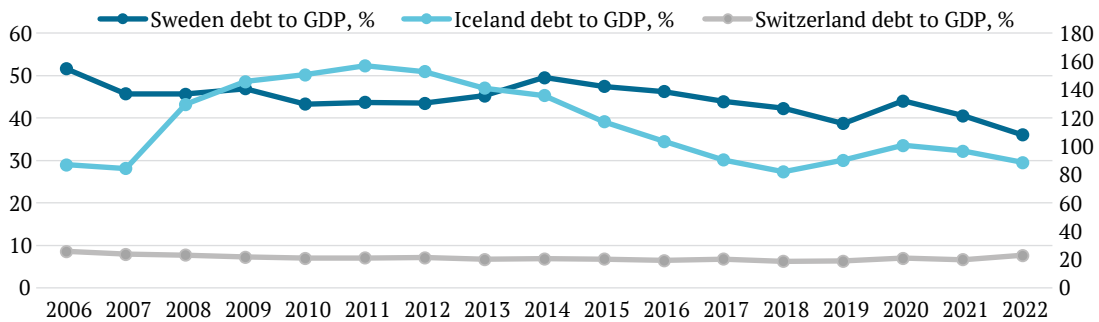


Figure 4. Data on public debt levels in Sweden, Switzerland, and Iceland, 2006-2022
Source: compiled by the author based on GDP (current US\$) – Sweden, Switzerland, Iceland (2022)

As can be seen from Figure 4, the level of public debt in these countries is gradually decreasing. To understand why this is the case, it is worth analysing

inflation, economic growth, and budget deficit in the same way. The situation in Sweden was analysed, which can be seen in Figure 5.

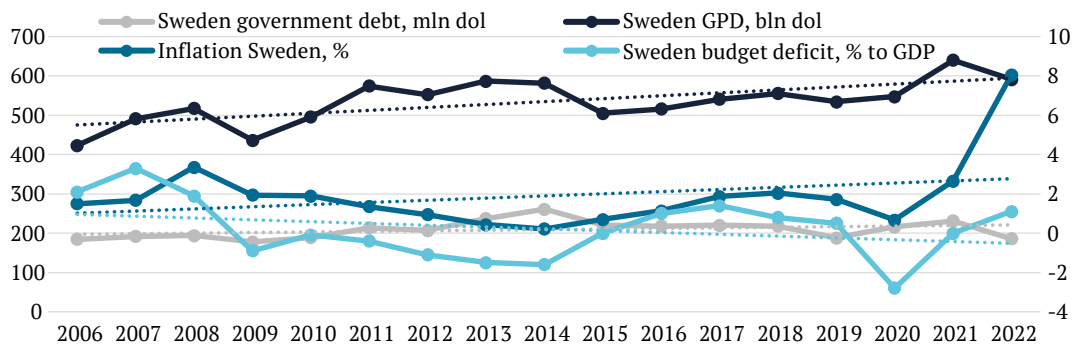


Figure 5. Data on inflation, GDP, public debt, and budget deficit in Sweden, 2006-2022
Source: compiled by the author based on Sweden government budget deficit (2022), Sweden: Inflation rate from 1988 to 2028 (2023)

As can be seen from Figure 5, the overall reduction in the level of debt burden in the country simultaneously accompanied the growth of GDP (by almost 40%); and overall growth in the level of public debt, but by the time of 2022 it was already at the level of the beginning of the period under consideration, i.e. it did not change even in nominal terms; low inflation (at the level of up to 4%

until 2022) and different indicators of the budget deficit, which, depending on the year, could turn out to be both positive and negative.

All this indicates that the reduction in the level of public debt to GDP in the country was caused by an appropriate budget policy. The data on the situation in Switzerland are also worth considering (Fig. 6).

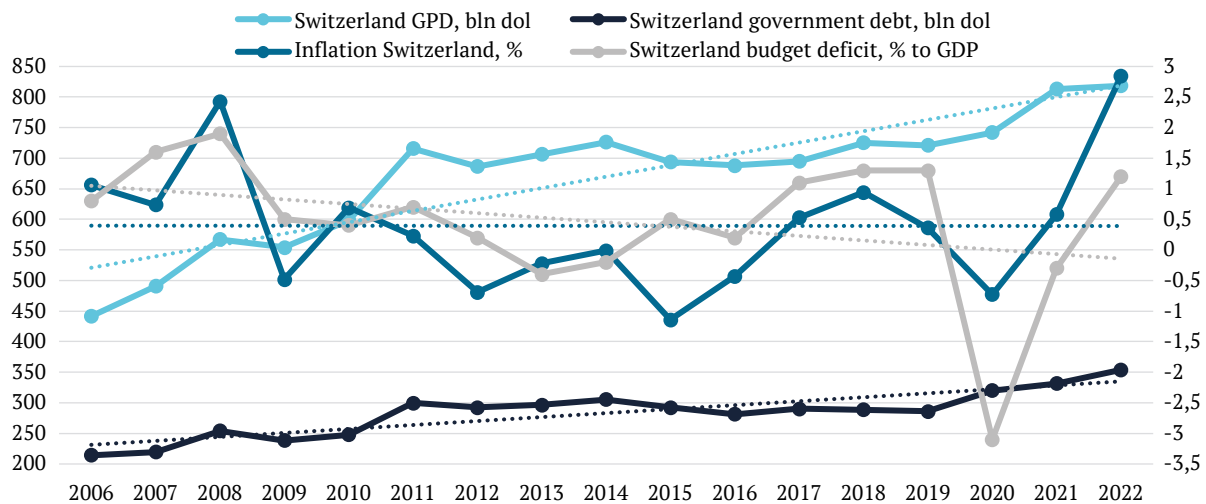


Figure 6. Data on inflation, GDP, public debt, and budget deficit in Switzerland, 2006-2022

Source: compiled by the author based on Switzerland: Inflation rate from 1988 to 2028 (2023)

As can be seen in Figure 6, Switzerland has experienced strong GDP growth, low inflation (deflation in some years), and mostly positive budget deficits. Nevertheless, public debt ratios increased over time, but at a lower rate than GDP (until 2020, when the increase was triggered by the start of

the COVID-19 crisis and subsequently by the start of the Russian full-scale invasion of Ukraine). This indicates that the reason for such trends was both the appropriate fiscal policy and the country's significant economic growth rates. Similar data are worth considering for Iceland (Fig. 7).

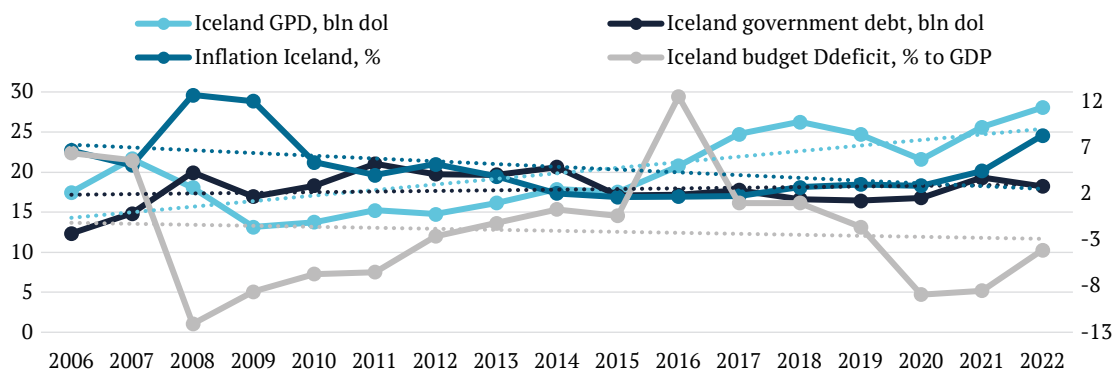


Figure 7. Data on inflation, GDP, public debt, and budget deficit in Iceland, 2006-2022

Source: compiled by the author based on Iceland: Inflation rate from 1988 to 2028 (2023)

In general, the decline in the level of public debt to GDP in Iceland started after 2011. As can be seen from Figure 7, this period of the country's functioning is marked by some key indicators: significant GDP growth; relatively low inflation; a near-zero budget deficit and in 2016 a large surplus (negative values started to emerge from 2020 onwards due to the onset of the COVID-19 crisis); and a decline in the nominal level of public debt. This indicates that the country pursued a strategy of deleveraging directly through loan repayments.

Thus, if a government aims to reduce its debt load, it should do so primarily by reducing public debt directly, rather than through any of the other instruments described in the study. While each situation may be unique, there are still consistent and similar principles to each approach. Thus, the priority to ensure the possibility of debt repayment is a budget surplus or near-zero deficit, because only in case of more inflows than outflows can the state allocate part of the funds to repay the debt. This, in turn, can be achieved either by reducing expenditures or increasing

revenues. Considering the revenue side, it is worth paying attention to the tax component and updating the existing policy in this area. This does not necessarily mean increasing the tax burden on citizens or businesses: revenue can be increased by ensuring that collection efficiency is increased and that businesses come out of the shadows. This also applies to customs, optimising procedures to combat smuggling. Increasing collections is also generally an effective policy, but there are several nuances to it.

The question of how businesses and the population react to it remains, as such steps are often not approved, which can lead to all sorts of consequences. It also increases the likelihood of increase in the shadow economy, increasing the share of enterprises that will try to avoid taxes. To combat the latter, there are appropriate mechanisms, in particular, the introduction of digital technologies and automation of the processes of collecting information and direct payments from entrepreneurs. Nevertheless, they are not yet widespread enough within government structures to eliminate such activities (or in any significant way). It is also worth noting that taxes primarily arise from income generation by businesses, especially exporters, and therefore activities aimed at supporting them are also effective.

Another possibility to achieve a budget surplus is to reduce expenditures. Since the reduction of social benefits is also often an unpopular policy on the part of citizens (moreover, it should be indexed every year, ideally by a level above inflation), the only way out is to reduce the state apparatus as much as possible. State actions should be aimed at optimising internal processes, allowing to reduce unnecessary expenditures, including in the context of projects managed by the government (Assoum & Alinsato, 2023; Dimnwobi *et al.*, 2023). Fighting corruption is also effective: since it is most often caused by excessive cost overruns in the implementation of projects, countering it can either reduce budget expenditures or increase the efficiency of the implemented projects. Both of these outcomes remain acceptable. Finally, it is worth noting that to reduce the debt burden, it may also be important to discuss with creditors what options remain for restructuring it. For example, if the state authorities manage to achieve lower interest rates or lengthen the debt repayment period, its instant redemption, this may make the task of debt repayment much easier.

■ DISCUSSION

In general, it remains acceptable for the Kyrgyz Republic to implement any of the above recommendations. Nevertheless, given the difficulties in the country caused by a rather high level of corruption, it is more effective to reduce costs in the country by ensuring more effective management of civil servants' activities. This can be achieved primarily through the introduction of new technologies, reduction of the role of the state, automation of many processes, staff reduction. Special attention should be paid to the role of the state. Countries with a low level of corruption often have a rather high level of state involvement in the management of economic processes, which may be paradoxical in some ways. The absence (or low influence) of this negative component is due to well-developed institutions and a suitable legal framework, which is also worth paying attention to in the fight against corruption (Baklouti & Boujelbene, 2022). Nevertheless, reducing the role of the state in economic

processes may help to combat this component by making it more difficult for the authorities to act in violation of state laws: however, it should be realised that such practices may only have a temporary effect. In turn, an increase in the tax burden can only lead to a worsening of the situation in this direction. In addition, it is worth considering the possibilities of debt restructuring. It is also worth understanding that such a policy in the country should be based on the real capabilities of the country in the context of how it can withstand the existing crises related to the consequences of the COVID-19 crisis and the complex geopolitical situation in the region (Elberry *et al.*, 2023). In any case, their policy should become such sooner or later if the country's goal is to ensure quality long-term sustainable development.

I. Hussain *et al.* (2022) and A. Aspide *et al.* (2022) analysed the impact of fiscal adjustments on public debt reduction. Their analysis showed that there is a clear relationship between public finance objectives and economic growth and that changes made in fiscal policy are more effective in stimulating economic growth but not necessarily for fiscal sustainability. In addition, they concluded that variables such as GDP growth as well as changes in the political sphere (elections and changes in government) significantly affect the change in the debt level cut-off. The study on public debt in the Kyrgyz Republic also concluded that the economic development of the country plays a significant role in this context. Nevertheless, it is difficult to agree with the conclusion that financial stability and economic growth should be achieved by different instruments of public policy. Thus, if financial stability is lacking, the flow of investment, especially foreign direct investment, may be significantly reduced, which in turn will lead to lower economic growth, and there are many examples of this (Heimberger, 2021; Trusova, 2022). Such assessments require additional analysis to form full-fledged conclusions.

The determinants of public debt reduction in Central and Eastern European countries were assessed by S. Semik & L. Zimmermann (2022). The results of the study showed that in this context the main factors are the importance of fiscal policy framework, economic growth, and the interest burden of the government to achieve a significant debt reduction. It is noteworthy that fiscal adjustments are most successful when they focus on reducing government expenditure, especially by reducing public employee compensation and social benefit payments. The study emphasises the positive impact of high real GDP growth rates on the likelihood of significant public debt reduction, highlighting the need for structural reforms to increase the pace of economic development of countries. The researchers also noted the correlation between changes in interest rates on debt service and its size. Thus, they noted that the higher the interest rates are, the more the public debt will be reduced due to the desire to reduce the growth of costs associated with its servicing. In general, the scientists' conclusions are confirmed by the assessments made within the framework of the study of the debt burden situation in the Kyrgyz Republic. Although economic development does have a positive impact on improving the situation with the level of liabilities in the country, however, to achieve qualitative results it is worthwhile to pursue a targeted policy in this area.

The interaction between public debt and economic growth was assessed by Z. Liu & J. Lyu (2020) and

S.K. Hilton (2021). The scholars noted that high fiscal discipline is crucial for the use of borrowed funds with a focus on priority projects, preferably infrastructure or investment projects. Such activities have a positive impact on the economic development of a country in the long run. Therefore, governments are advised not to expect immediate economic improvement in the short term due to effective debt management, but in the long term, a significant positive effect is expected from these activities. It is also worth being prepared for an increase in inflation in the short term along with an increase in debt levels with expectations of likely changes in the long term. The study on debt burden in the Kyrgyz Republic also concluded that one of the main components that should allow the country to achieve a reduction in the level of budgetary burden should be a directed policy for the payment of liabilities (which is fiscal discipline). It was shown that this is the only way to achieve a sufficiently high level of long-term economic development, which is in line with the conclusions of the study above.

The relationship between public debt and economic development has been studied by S.H. Law *et al.* (2021). Using data from 1984 to 2015, the researchers showed that there is a non-linear relationship between public debt and economic growth. The results emphasise the importance of institutions in influencing the relationship between public debt and economic growth, with better institutions mitigating the negative impact of high public debt on economic growth. In this regard, understanding the levels at which fiscal policy should operate to avoid excessive debt accumulation remains an important component (Broner *et al.*, 2022). The study on the debt burden situation in the Kyrgyz Republic also concluded on the role of institutions in achieving the goals of reducing the level of liabilities in the country. Based on selected developed countries, it was also shown that only through appropriate public policies aimed at debt repayment can sustainable financial development be achieved in the long term.

As part of their study, S. Bernardini *et al.* (2019) studied the experience of public debt reduction using data from the last 70 years. The analysis showed that there were about 30 recent cases where the ratio of public debt to GDP fell by more than 25%. At such times, countries were more likely to have had high inflation and growth rates, fiscal tightening, significant levels of economic development, debt restructuring, or standard methods of adjustment through spending cuts and tax increases (but this became more common after 1980). Some past practices, such as debt repayment through sudden inflation, are too impractical in the current realities, while the method related to cost reduction and tax increases can be considered more than viable. In the case of restructuring, although necessary in some cases, it cannot be used as a holistic method but must be supported by another methodology (i.e. cost reduction and tax increases).

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The study on the public debt situation in the Kyrgyz Republic also concluded that in the current environment, it is possible to achieve qualitative results in the long term only through the implementation of appropriate policies. At the same time, the country in recent years has also seen a trend towards a generally lower debt burden, but it was caused more by inflation and a relatively high level of economic development, which cannot be a sustainable model for the future. Scientists' estimates based on data for the last 70 years only confirm this concept.

■ CONCLUSIONS

Thus, the study identified three main factors that can lead to the reduction of public debt in countries: direct repayment of debt by increasing revenues and reducing budget expenditures; reduction of its real value due to high inflation (debt depreciation); significant economic growth and increase in the level of gross domestic output. The study concluded that in modern realities, the states that have achieved improvements in terms of the state of public debt have used instruments aimed at direct payment. Although there are still opportunities to reduce its impact through economic growth and inflation problems, this is less effective and applicable, given the likely negative short- and long-term consequences of such policies.

The study analysed the situation in terms of public debt of the Kyrgyz Republic: it was shown that generally positive dynamics are characterised by a reduction in the burden, but it was concluded that it was caused primarily by high inflation and significant growth rates. When analysing the EEU member countries, it was shown that they are generally characterised by trends that are more likely to increase the ratio of public debt to gross domestic product. To describe the necessary reforms for the Kyrgyz Republic, the dynamics in Sweden, Switzerland and Iceland were assessed, which also managed to achieve an improvement in the situation with public debt, but without high inflation. Based on this, conclusions were drawn as to what public policy should be in terms of debt management in the Kyrgyz Republic. In particular, it was concluded that there is a need to actively fight corruption and improve institutions in principle. Particular attention was paid to ensuring the effectiveness of public sector management. It remains relevant for future research to find other methods to improve the macroeconomic situation in the Kyrgyz Republic, in particular, to fight inflation, given the crisis in the world and the region.

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■ CONFLICT OF INTEREST

None.

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Світовий досвід скорочення державного боргу (на прикладі Швеції, Швейцарії та Ісландії)

■ **Анотація.** Скорочення державного боргу є одним з основних завдань формування бюджетної політики в сучасних кризових умовах. У зв'язку з цим вивчення досвіду різних країн у цій сфері є актуальним. Тому метою дослідження було надання рекомендацій щодо зниження боргового навантаження в Киргизькій Республіці на основі досвіду інших країн. Основними методами дослідження були історичний, порівняння та узагальнення. У дослідженні було проаналізовано фактори, що впливають на скорочення державного боргу в Киргизькій Республіці. Було зроблено висновок, що складовими, які можуть допомогти вплинути на боргове навантаження в країні, є інфляція, економічний розвиток та цілеспрямована політика держави щодо виплати боргів. Було показано, що в сучасних реаліях країни, які є успішними в цьому напрямку, найчастіше використовують останній підхід. Крім того, було безпосередньо проаналізовано ситуацію у Швеції, Швейцарії та Ісландії та надано основні рекомендації щодо того, як Киргизька Республіка може покращити свою поточну ситуацію в плані скорочення боргу. Ці рекомендації були зосереджені насамперед на боротьбі з корупцією та покращенні ситуації в контексті інституційного розвитку, а також на скороченні видатків для досягнення профіциту бюджету. Було рекомендовано не збільшувати податки безпосередньо для збільшення державних доходів, а підвищувати ефективність їх збору. Отримані за результатами дослідження дані можуть бути використані для формування державної політики у сфері управління державним боргом та бюджетом як у Киргизькій Республіці, так і в інших країнах

■ **Ключові слова:** фіскальна політика; інфляція; економічне зростання; бюджет; управління

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