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The role of public investment in innovative projects during martial law

■ **Abstract.** The purpose of the study was to analyse the impact of martial law on public investment in innovation projects and to identify ways to adapt them to the new economic environment. The study analysed changes in financial and economic policy during martial law, assessed the priorities of public investment in innovation, and investigated the impact of regulatory measures on the development of technology projects. The martial law in Ukraine has significantly changed the economic priorities of the state, affecting the mechanisms for financing innovation projects. The analysis showed that a significant portion of public resources was redirected to defence needs, with defence funding amounting to UAH 350 billion in 2022 and expected to reach UAH 550 billion in 2024. This has also contributed to the development of dual-use technologies. The introduction of tax incentives and grant programmes has supported businesses operating

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in strategically important sectors, including cybersecurity, healthcare, and energy. Public investment in innovation in 2022 was only UAH 5.8 billion, but in 2024, this figure increased to UAH 7 billion, which became a key tool to support the national economy in the face of limited access to private capital. The creation of strategic funds made it possible to allocate funds for the development of critical innovative solutions that ensure defence capability and economic stability. An analysis of legislative changes has shown that the government has simplified the procedures for financing innovative projects and encourages the export of technological products. Despite serious challenges, the country retains the potential for innovative development through the adaptation of financial instruments and the active use of public-private partnership mechanisms. The study identified effective approaches to financing innovative projects under martial law, which contributes to the development of a strategy for economic sustainability and technological development

■ **Keywords:** defence capability; tax incentives; grant programmes; cybersecurity; energy; economic resilience

■ INTRODUCTION

The martial law in Ukraine has led to new economic challenges that have affected financial processes, investment mechanisms and strategic priorities of the state. Changes in the budget structure and the reallocation of resources to defence and security needs have significantly narrowed the opportunities for traditional financing of innovative projects. At the same time, the growing importance of dual-use technologies and the development of strategically important sectors of the economy, including cybersecurity, healthcare, and energy, require new approaches to public investment. In such circumstances, public funding becomes crucial for maintaining economic stability and promoting the country's technological development. An analysis of financial instruments and tax incentives to support innovation, as well as the adaptation of legislation to current realities, will help determine the prospects for the development of innovation even in times of war.

The issue of the impact of martial law on investment in innovative projects is important for understanding economic processes in a crisis. E.S. De Dios *et al.* (2021) noted that martial law forced the Philippines to redirect resources to defence, which limited the ability to finance innovative projects. At the same time, it has stimulated the development of vital technologies, particularly in the defence and security sectors. J. Juliana *et al.* (2022) emphasised that the introduction of tax incentives was necessary to stimulate private investment in high-tech and defence industries during martial law. This helped to ensure economic sustainability and development of strategic sectors, even in the face of limited access to finance. S. Choi *et al.* (2021) highlighted the role of government grants as an effective tool to support innovative start-ups in times of economic instability. They also pointed out that government support helped to overcome the shortage of investment resources for technological development. Researchers J. Shkabatur *et al.* (2021) noted that foreign investment inflows played a crucial role in the development of innovative projects in strategic sectors, including energy and defence. This required the development of special government support programmes that created attractive conditions for investors. Y. Zeng & T. Peterson (2024) emphasised the importance of government subsidies and soft loans for companies developing dual-use technologies. This made it possible to support innovative projects even in conditions of limited budget and instability.

V. Anghel & J. Džankić (2023) studied the adaptation of public investment in the context of military conflict and justified the need to create special investment funds for

the development of strategic technologies. They believed that these funds should have been focused on supporting enterprises that were engaged in critical developments for the state. Y. Chen *et al.* (2022) emphasised that the role of national governance is critical to ensure the stability of investment in times of crisis. This is especially important for ensuring economic resilience in times of war, when risks and challenges are increasing. G. Ampratwum *et al.* (2022) analysed the prospects of public-private partnerships as a tool for minimising financial risks in the implementation of innovative projects. They believed that such partnerships could become the basis for sustainable financing of technology initiatives. P. Kulikov *et al.* (2022) noted that to maintain interest in innovative projects during the war, it was necessary to develop new financial mechanisms that reduced investment risks. They proposed the creation of special support programmes for enterprises operating in critical industries. Z. Sinaj *et al.* (2024) emphasised the need to develop strategic investment programmes aimed not only at supporting innovation, but also at strengthening the country's technological independence. They should be based on long-term priorities for the development of the national economy in the context of military conflict.

Despite the existing research, there are gaps that require further study. In particular, the specific mechanisms of public-private partnerships under martial law, as well as a comprehensive analysis of the impact of changes in tax policy on attracting investment in technology sectors, have not been sufficiently studied. Another critical area is to assess the effectiveness of the created investment funds and their impact on the development of innovations in critical sectors. The purpose of the study was to comprehensively analyse the impact of martial law on public investment in innovative projects and develop proposals for their reorientation to address pressing economic issues in the new environment. Research objectives are: to investigate the impact of tax benefits and government grants on stimulating investment in innovative projects; to analyse the effectiveness of public-private partnerships as a mechanism for minimising financial risks during the period of military operations; to assess the feasibility of creating special funds to support strategic technologies in times of crisis.

■ MATERIALS AND METHODS

The study analysed changes in the economic environment in 2021-2024 in Ukraine (World Economic Forum, 2024), driven by the increase in public spending on defence and security, as well as the redistribution of the budget to

support key industries. The first step was to study the changes in economic conditions caused by the need to increase public spending on defence and security and to reallocate the budget to support key industries. This included an analysis of changes in tax incentives for strategically important sectors, such as defence technology and energy security, and a study of how these changes affected the attraction of private capital to innovative projects. An important aspect was to assess how the increased economic and political risks associated with the war could affect the country's investment attractiveness and the willingness of businesses to participate in such projects.

The second area of the study was to identify priorities for public investment in 2021-2024 (Innovative activity of industrial enterprises, 2018). The study analysed which industries receive the most support from the state under martial law, including funding for defence technologies, cybersecurity, and energy independence. At the same time, the creation of special strategic funds for the development of innovative projects to maintain economic stability in a crisis and promote technological development in important areas was studied. Particular attention was paid to supporting scientific and technological research, particularly in key areas such as medicine and logistics, which are critical to national security.

The next step was to explore the possibilities of developing public-private partnerships to increase the efficiency of public funds. It was analysed how co-financing of innovative projects could reduce the budgetary burden, and how involvement of the private sector in the development of new technologies could help to speed up their implementation and increase their economic efficiency. An important aspect was also the simplification of conditions for launching innovative start-ups, which can stimulate entrepreneurial activity in this difficult period. The study analysed the changes in the economic situation in Ukraine,

in particular the increase in public spending on defence and security, which leads to a redistribution of budgetary resources and affects the financing of other sectors. The transformation of the financial and tax environment, including the introduction of privileges and subsidies for strategically important industries and the creation of grant programmes to support innovation, is also considered. Particular attention is paid to the impact of martial law on investment in innovative projects, including risks to attracting private capital and opportunities for developing public-private partnerships.

The last important aspect was the study of changes in legislation to create favourable conditions for innovation under martial law, including simplification of financing and registration of innovative enterprises, as well as stimulation of foreign investment. In particular, the measures introduced in April 2022 were analysed (Nosenko *et al.*, 2023). This included the reduction of the single tax rate, the temporary abolition of mandatory payments for individual entrepreneurs, the introduction of a zero-excite tax on fuel and the reduction of the value added tax (VAT) rate, which helped to stabilise the market and ensure the supply of essential goods.

■ RESULTS

Changes in the economic situation during martial law

Martial law usually has a significant impact on a country's economy, changing its structure and functioning in various areas. In Ukraine, starting in 2022, the economic situation has undergone significant changes due to military operations and the need to reorient resources to ensure national security. In this context, there are three main aspects of changes in the Ukrainian economy: increased defence and security spending, reallocation of the state budget to support critical industries, and the impact of increased risks on private capital attraction (Table 1).

Table 1. Changes in the economic situation in Ukraine

Indicator	2021	2022	2023	2024
Economic growth (GDP, %)	3.4	-30.4	-4	1.5
Investment attractiveness	56	42	44	48
Exports of goods and services (billion USD)	49.3	25.5	30.2	34
Unemployment (%)	9	13.5	11	9
National currency exchange rate (UAH/USD)	27.1	37.3	39	38.5
Inflation (%)	10	22.3	19.7	15
External debt (USD billion)	126	150	170	180

Source: created by the authors based on World Economic Forum (2024)

One of the most important consequences of martial law is a significant increase in defence and security spending. In times of war, the state is forced to significantly increase funding for the army, law enforcement agencies and other bodies that ensure national security. This includes spending on the purchase of weapons, equipment, logistics, and financing the needs of military personnel and volunteer groups. These expenditures can have both positive and negative effects on the economy. On the one hand, they stimulate certain industries, in particular, the production of defence equipment, weapons, and ammunition. On the other hand, the reorientation of financial resources towards defence often leads to a reduction in funding for

other important sectors, such as education, healthcare, and social protection (Becker & Dunne, 2021).

During martial law, the structure of public spending changes significantly. The budget, which could previously have been focused on social benefits or infrastructure development, is redirected to finance industries that are strategically important to the country. One of these is the energy sector, which ensures the operation of the entire infrastructure and the maintenance of production facilities. Particular attention is paid to the agricultural sector, which is important for the country's food security, as well as to the transport infrastructure, which ensures the supply of essential goods. Budget reallocation may lead to a

reduction in funding for sectors that are not critical in a time of war. For example, capital investment in infrastructure, research, and other long-term projects may be suspended or reduced, which could affect the sustainability of economic development after the war ends in the long run. One of the main challenges for the economy during martial law is the increase in risks associated with investment activities. Martial law is accompanied by increased uncertainty and risks, which significantly reduces the country's attractiveness to foreign investors. Increased geopolitical and economic risks, including a decline in confidence in the stability of the legal system and financial infrastructure, make investment in the country less profitable. Investors often decide not to invest in countries with high political and economic risks, even if the market remains large and promising. As a result, the domestic market is experiencing a shortage of investment that could stimulate innovation, business development, and support for small and medium-sized enterprises. At the macro level, the government may try to compensate for the lack of private investment by attracting international aid and loans, which could lead to an increase in external debt (Sun *et al.*, 2023).

All three aspects—increased defence and security spending, reallocation of the state budget to support criti-

cal industries, and the impact of increased risks on private capital attraction—indicate that martial law is changing Ukraine's economic landscape. While these changes are necessary to ensure national security, they also have serious economic consequences. The redirection of funding to defence and critical industries often results in fewer resources available for the development of other sectors of the economy, which can have lasting consequences for the country's stability and economic growth. At the same time, increased risks for private capital limit the opportunities for attracting investment, which significantly affects economic recovery and modernisation.

Changes in financial and tax conditions

Martial law, like any emergency situation, requires prompt decisions to ensure economic stability. In Ukraine, due to the war, changes in the financial and tax environment were introduced to support key sectors of the economy and stimulate innovation. Particularly important are measures such as the introduction of tax incentives for strategically important industries, the creation of grant programmes to support innovative developments, and the introduction of subsidies for enterprises engaged in dual-use technologies (Table 2).

Table 2. Changes in financial and tax conditions in Ukraine

Indicator	2021	2022	2023	2024
Income tax rate (%)	18	15	15	18
Moratorium on inspections	Inspections were carried out	Moratorium on inspections	Moratorium on inspections	The moratorium remains
Tax benefits	Missing	Benefits for farmers, tax deferral	Continuation of benefits for small businesses	Limited benefits for business recovery
Land tax rates (UAH/ha)	3,600	1,800	1,800	2,000
Tax revenues (bn UAH)	454.1	325.5	315.7	350
Financing of defence needs (bn UAH)	130	350	500	550
Real estate tax (UAH/m ²)	0.50	0.10	0.10	0.20
VAT rate (% average rate)	20	10	10	20

Source: created by the authors based on N. Bak & A. Kharovska (2023)

One of the first steps taken to adapt the economy to martial law was the introduction of tax breaks for strategically important industries. In a time of war, certain sectors of the economy, such as energy, agriculture and defence, are of particular importance. To support these industries, the Ukrainian government has proposed tax cuts and temporary exemptions to reduce the financial burden on businesses operating in these critical sectors. In particular, companies engaged in the production of military equipment and ammunition have been granted reduced corporate tax rates. This will provide them with the necessary financial resources to fulfil government orders and develop new technologies. In addition, farmers have been granted tax holidays, which has helped to maintain production capacity in the agricultural sector, which is important for the country's food security (Markowski *et al.*, 2021). These measures also help maintain economic activity during the war and are aimed at preserving jobs. However, their impact on the country's budget in the future may be difficult to predict, as a decline in tax revenues in the short term may affect the financing of other important social programmes. A key element of economic adaptation during martial law is

to support innovation and scientific and technological developments. One of the main strategies has been to create grant programmes to support research and development that not only helps the country during the war, but also contributes to its recovery after the conflict.

The grants are provided to small and medium-sized enterprises, start-ups and research institutes working in areas such as information technology, energy, healthcare, and defence technologies. This stimulates the development of new technologies that can be used for both military and civilian purposes (Peng & Tao, 2022). Grant programmes are of particular importance in times of war, as supporting innovation can ensure economic growth in the future by stimulating the development of high-tech sectors that not only contribute to national security but can also help Ukraine rebuild its economy after the war. In particular, start-up support programmes in the field of dual-use technologies can become the basis for developing new export opportunities and attracting investment after the war.

Dual-use technologies are developments that can be used in both the military and civilian sectors. Under martial law, this area of activity becomes particularly

important, as companies operating in this sector can provide the country with the necessary technologies for defence and contribute to economic recovery after the war. To support such enterprises, the government has introduced a system of subsidies that provides partial funding for research and development costs, as well as for the purchase of necessary equipment and technologies. This allows enterprises to adapt their production capacities to wartime requirements, in particular for the production of dual-use products for both the army and the civilian sector. Subsidies for enterprises engaged in dual-use technologies not only provide operational support in times of war, but also lay the foundation for economic growth in the long term. As many of these technologies can be adapted for peaceful purposes, they have a high potential for export, which will help Ukraine increase foreign exchange earnings and strengthen its competitiveness in global markets (Efendi *et al.*, 2023).

Changes in financial and tax conditions during martial law in Ukraine are important tools to support strategically important industries, stimulate innovation, and ensure technological independence. In the future, the implementation of such initiatives could be a key factor in maintaining economic stability in the short term and restoring the country's competitiveness in the future (Teremetskyi *et*

al., 2024). In particular, tax holidays for small and medium-sized businesses in critical sectors of the economy, exemptions from import duties and VAT on equipment for the production of defence products, grant programmes such as eRobota supporting start-ups in the technology and agriculture sectors, and state subsidies for the introduction of energy-efficient technologies in industry have been introduced. These measures help to adapt the economy to wartime conditions and create the basis for recovery and development after the war.

Priorities of public investments

Martial law is not only a period for maintaining stability and ensuring national security, but also an important stage in determining the priorities of public investment. In the context of current geopolitical challenges, economic policy should be aimed at ensuring strategic autonomy and development of key sectors that determine the country's future. In Ukraine, during the war, the main areas of investment were the financing of defence technologies, cybersecurity, energy independence, the creation of strategic funds for the development of innovative projects, and support for scientific and technical research in the fields of medicine and logistics (Table 3).

Table 3. Impact of martial law on investment in innovative projects in Ukraine

Indicator	2021	2022	2023	2024
State investment in innovation (bn UAH)	15.2	5.8	5	7
Foreign investment (USD billion)	4.5	1.2	0.8	1.5
Startup financing (bn UAH)	3.1	0.8	1	1.5
Investments in the IT sector (bn UAH)	4.5	2	1.5	3
Industries affected	IT, energy, agriculture	IT, energy, agri-food sector	IT, energy, agri-food sector, infrastructure	IT, energy, agri-food sector, infrastructure restoration

Source: created by the authors based on Innovative activity of industrial enterprises (2018)

In times of war, the main priorities for public investment are defence technology, cybersecurity, and energy independence. Being at war, Ukraine has to significantly increase investments in its defence capabilities. This includes not only the purchase of the latest weapons and equipment, but also the development of technologies that ensure a high level of defence capability. Cybersecurity is of particular importance in the face of modern threats. In addition to physical attacks, the aggressor is trying to carry out cyber-attacks on critical infrastructure, banking systems and government agencies. Investments in cyber defence are becoming a key factor in ensuring the continuity of state institutions and the economy during wartime. To this end, government resources are being channelled to develop encryption technologies, protect information systems and train personnel to effectively counter cyberattacks.

Energy independence is also an important priority, as Ukraine needs a stable energy supply, even during shelling and other military operations. Investments in renewable energy sources, construction of new infrastructure facilities, and modernisation of existing energy systems help to reduce dependence on external suppliers and increase the resilience of the energy infrastructure in times of war (Ige *et al.*, 2024). Creating strategic funds to support innovative projects is an important area of public investment. Martial law requires not only defence mobilisation

of resources, but also the creation of conditions for the development of new technologies that can be used in both military and civilian sectors. To do this, it is necessary to attract investments in research, start-ups and innovative companies that can form the basis for economic recovery after the conflict ends.

Investments in start-ups that deal with dual-use technologies, digital development, energy, and infrastructure allow the country to retain its intellectual potential and promote economic growth even during a time of war. Establishing government funds that provide non-repayable or low-interest financing is an important tool to support innovative enterprises working to bring new products or technologies to market (Riebe *et al.*, 2024). It also creates additional opportunities for the development of research institutions that provide the country with innovative solutions in various sectors, from defence to healthcare and agriculture. Scientific and technical research in the fields of medicine and logistics is also gaining importance under martial law. The COVID-19 pandemic has demonstrated how critical effective medical technologies and healthcare systems are, but the war has highlighted an even greater need for innovative solutions to provide medical care, treat the wounded, and maintain public health (Wang *et al.*, 2021).

Investments in the development of medical technologies – from the introduction of new treatments to the

development of tools for the diagnosis and treatment of severe injuries – are extremely important for the country. This ensures a high level of medical care for both military personnel and civilians, especially in resource-limited environments. Supporting research projects in the field of logistics is also of great importance. In times of war, efficient logistics is key to ensuring the supply of food, medicine, weapons, and other essential resources. Creating innovative solutions for transport, warehousing, and supply helps to reduce costs and increase the efficiency of public and private companies involved in logistics.

The priorities for public investment under martial law determine Ukraine's future in several important areas. Funding for defence technology, cybersecurity, and energy independence is essential to ensure national security and resilience. The creation of strategic funds to support innovative projects and scientific and technical research in medicine and logistics helps preserve the country's potential to recover from the war and maintain the efficient functioning of the economy even during the war. All these priorities are key to Ukraine's future development and its ability to adapt to new economic and technological realities.

Development of public-private partnership

Public-private partnerships (PPPs) are an important tool for ensuring sustainable economic development, particularly in times of crisis or martial law. In Ukraine, given the difficult economic and political situation, expanding and intensifying this partnership can be an effective mechanism for attracting investment, developing innovation, and implementing important projects. One example of a successful PPP is the implementation of a road infrastructure modernisation project involving private investors, which allows raising capital to rebuild roads and bridges at the local level, creating new jobs and contributing to the development of regional economies. In addition, the introduction of a PPP programme in the energy sector allows private companies to be involved in the reconstruction of thermal power plants, which helps to reduce energy dependence and ensure a stable supply of energy locally (Fay *et al.*, 2021). Co-financing of projects reduces the budgetary burden, engages private companies in the development of new technologies, and simplifies the conditions for launching innovative start-ups.

One of the key advantages of public-private partnerships is the ability to attract private investment to finance public projects. In the context of tight state budgets and ever-increasing financial obligations, co-financing reduces the burden on public funds and reduces risks to budgetary stability. Projects in the infrastructure, energy, healthcare, and education sectors require significant investments that often exceed budget capacity. In this context, PPPs allow private companies to take on part of the costs, which makes it possible to implement important social and economic initiatives without significantly increasing public debt. The role of PPPs is particularly important in the restoration and modernisation of infrastructure damaged during the war. Co-financing allows private capital to be used to rebuild infrastructure such as bridges, roads, hospitals and educational facilities, ensuring that they can be restored more efficiently and quickly. In addition, private companies can provide the necessary technological support, innovation,

and project management to improve the quality and timing of work. The public sector is often limited in its ability to develop new technologies due to a lack of resources or high levels of bureaucracy. Private companies, on the other hand, often have considerable capacity for innovation, but may lack access to large-scale markets or funding to develop and deploy their technologies.

Joint investments between the public and private sectors can significantly accelerate the adoption of new technologies, which can contribute to technological progress in critical areas such as defence, energy, healthcare, and agriculture. The public-private partnership format makes it possible to attract private investors to develop dual-use technologies that can be used for both civilian and military purposes (Pandey *et al.*, 2021). Involving private business in technology development allows the country to use its experience, investment, and expertise to create solutions that meet modern requirements. It also contributes to the accelerated introduction of new technologies, such as artificial intelligence, innovations in the energy and environmental sectors, which have the potential to significantly improve the efficiency of the Ukrainian economy after the war.

One of the key aspects of developing public-private partnerships is to support start-ups and small businesses involved in innovative technologies. Ukraine has significant potential in areas such as information technology, agronomy, renewable energy and biotechnology, which is also confirmed by other researchers (Bokovets *et al.*, 2024). However, a favourable business environment needs to be created for start-ups to develop, including reduced bureaucratic obstacles, tax incentives, access to finance and government support programmes. Simplifying the conditions for start-ups can include lowering tax rates, creating special innovation zones, and launching mentoring and financing programmes. Such initiatives may include grants and soft loans, assistance in entering foreign markets, support for research, and training programmes for entrepreneurs. Joint projects between the state and the private sector aimed at innovative development can be an important driver for creating new jobs, technological solutions, and contribute to the country's economic growth (Stahl *et al.*, 2023).

The development of public-private partnerships in Ukraine is a key step towards ensuring stable economic development, including in the context of martial law. Co-financing of projects reduces the burden on the state budget, involvement of private companies in the development of the latest technologies stimulates technological progress, and simplification of conditions for start-ups opens up new opportunities for innovative solutions. All these measures will not only contribute to an effective response to current challenges, but also to ensuring the country's recovery and further growth in the future. Public-private partnerships are a powerful tool for creating conditions for sustainable development and technological progress in any national context.

Adaptation of legislation

Adapting legislation during martial law is an important factor in ensuring economic stability and promoting the country's innovative development. In April 2022, the government introduced a number of tax changes aimed at supporting the economy under martial law. In particular, the single tax rate was reduced from 5% to 2% for taxpayers

of the first and second groups. This change significantly reduced the tax burden on small businesses and individual entrepreneurs, allowing more than 185,000 companies and 40,000 individual entrepreneurs to continue operating in the difficult environment. Mandatory payments for this category of taxpayers were also temporarily cancelled, providing them with financial support in the face of economic instability. Another important initiative was the introduction of a zero-excise tax rate on petrol, diesel fuel and liquefied gas, which helped to reduce fuel costs and stabilise the supply of goods essential to the country's vital functions. The reduction of the VAT rate from 20% to 7% on a number of goods also helped to reduce the cost of essential goods. These steps helped to stabilise the market situation, improve the availability of basic goods and services for the population and ensure uninterrupted supply of vital resources during the crisis. In addition, the creation of special economic zones, where investors can benefit from tax incentives and other advantages, is an important step to attract foreign capital and stimulate the development of new high-tech industries. This process includes simplifying procedures for financing and registering innovative companies, creating special regimes for exporting technological products, and encouraging foreign investment through legislative reforms.

One of the main obstacles to the development of new technology companies in Ukraine is the complex bureaucratic procedures that require significant time and money. To support innovation and ensure the effective development of start-ups, it is necessary to amend the legislation governing the financing and registration of innovative enterprises. Simplification of these procedures involves the introduction of electronic platforms for business registration, reducing the number of required permits and shortening the time for obtaining licences or other permits. This will reduce the costs of starting new businesses and make financial resources more accessible to small and medium-sized innovative companies. In addition, the government could offer preferential terms for entrepreneurs planning to start businesses in areas important for the country's economic recovery, such as information technology, energy, agriculture, and research and development.

Simplifying procedures for registration and financing will help create a favourable environment for business start-ups, attracting not only domestic entrepreneurs but also foreign investors. This is especially important during martial law, when the country needs to quickly restore its economic potential and create new jobs (Das & Das, 2021). One of the main areas of development of the innovation economy is to support the export of technological products. Ukraine has significant potential in areas such as software development, energy technologies, biotechnology, and engineering. In order to support these industries and facilitate their expansion on international markets, special legislative regimes for exports of technology products should be introduced.

In particular, preferential tax rates or even exemptions from certain taxes could be provided for companies exporting innovative products abroad. This will allow Ukrainian companies to be more competitive in international markets and attract foreign exchange earnings to the country's economy. In addition, the introduction of special regimes

for technology exports will help reduce trade barriers and facilitate access to international contracts and agreements (Fang *et al.*, 2023). The introduction of such special regimes could become an important step in the strategic development of Ukraine's economy, as it would allow attracting additional resources to expand production, improve technologies, and enter new markets for Ukrainian innovative companies. Attracting foreign investment requires profound legislative reforms that will ensure transparency, stability, and predictability of the economic environment. One of the main tasks is to create legal guarantees for foreign investors so that they can feel confident in a country at war and with significant risks.

Key steps in this direction include reforming tax legislation, introducing benefits for investors, protecting their rights and property, and simplifying procedures for investing in various sectors of the economy, including high-tech projects. One important tool to stimulate foreign investment could be the creation of free economic zones, where investors can take advantage of additional tax benefits and other advantages (Zakari & Khan, 2021). Reforms aimed at improving the investment climate will help attract capital to finance innovative projects, rebuild infrastructure, and develop new technologies. This, in turn, will help Ukraine to improve its economic potential, ensure high employment, and promote social recovery.

Adapting legislation is a key step to ensure stability and economic development under martial law. Simplifying procedures for financing and registering innovative enterprises, introducing special regimes for exporting technological products and encouraging foreign investment will create favourable conditions for the development of new businesses, increasing competition in international markets and attracting resources for innovative progress. The legal changes will not only support national enterprises but also strengthen ties with international investors, which will contribute to the recovery and development of the Ukrainian economy both during and after the war.

■ DISCUSSION

During martial law, the economic situation in the country underwent significant changes that affected all areas of government policy, including the financing of innovative projects. Increased spending on defence and security has led to a significant reduction in resources for other sectors of the economy. However, the reallocation of the budget to support critical sectors such as energy, transport, and healthcare has highlighted the importance of investing in the country's resilience and stability. The preservation and development of infrastructure of strategic importance has become a priority. This situation has led to increased risks for attracting private capital, as investors are generally reluctant to invest in countries with a high level of uncertainty, making it difficult to finance innovative projects.

This problem was also studied by M. Maher & Y. Zhao (2021), where the results confirmed that political instability and high military spending in Egypt have a significant impact on the country's economic growth. Applying the ARDL approach to analyse this impact allowed to clearly identify how such factors slow down economic development by reducing government revenues and affecting fiscal policy. As a result, the state budget is under pressure,

as a significant portion of resources is directed to support the army, which limits investment in other key sectors of the economy.

The study by F. Dorn *et al.* (2024) also showed that European countries in 2024 face the need to increase defence spending as growing global threats require increased security. However, economic difficulties such as inflation and financial instability limit the scope for such spending. Reallocating spending to critical sectors is becoming an important element of the strategy, as countries must balance security with other needs while ensuring that financial resources are used efficiently. It is important to note that political instability and increased defence spending can have long-term negative consequences for the economy, as reallocation of resources to the military is often at the expense of investments in infrastructure, education, and healthcare (Kostyk & Ovsienko, 2023). This creates a vicious circle where economic growth slows down, which in turn worsens the country's financial situation, reducing its ability to innovate and recover. Such factors can make it much more difficult to overcome economic difficulties, especially when the state budget is already under considerable pressure due to high security spending.

An analysis of the financial and tax environment during martial law has shown that the introduction of tax incentives for strategically important industries was a necessary measure to support innovation. At the same time, the introduction of grant programmes to support technological development and subsidies for enterprises engaged in dual-use technologies helped to attract investment in key areas such as defence and cybersecurity (Kirilenko, 2024). This has helped to maintain support for innovation, even in times of economic instability, which has confirmed the importance of such mechanisms for ensuring national security and technological independence. X. Dai & G. Chapman (2021) concluded that in China, tax incentives and grants for strategic industries have become an important tool to stimulate research and development (R&D). This enables companies to reduce the cost of innovation and technological development, which is a key factor for economic growth and the country's competitiveness in the global market. The study shows that the effectiveness of R&D incentive programmes depends on the proper organisation of grant mechanisms and support at the government level.

In the brief by Deloitte it was found that dual-use technologies, in particular in the field of cybersecurity, require active cross-sectoral cooperation to achieve maximum results (Dual-use technology..., 2024). Involvement of the private sector and the state in the financing and development of such technologies allows for a balance between national security and innovation. Subsidies for companies developing dual-use technologies help to reduce financial risks by stimulating the creation of new technologies that can be used in both civilian and defence applications (Lyndyuk *et al.*, 2023). These results confirm previous research, as they demonstrate how tax incentives and grants can foster innovation in strategic sectors. They also underline the importance of state support for the development of scientific and technological potential, which is key to ensuring competitiveness in a globalised world. The use of such incentives not only accelerates

technological development but also creates favourable conditions for economic growth.

During martial law, public investment priorities focused on defence technology, cybersecurity, and energy independence (Herus, 2024). Strategic funds were created to support innovative projects, allowing resources to be focused on the most critical areas for the state. At the same time, state support for scientific and technical research in the fields of medicine and logistics contributed to an effective response to crisis situations and the development of technologies that could help reduce the economic and social consequences of the war.

It is worth noting the work of J. Reis *et al.* (2021), who also found that high-tech defence industries, in particular the development of autonomous intelligent systems, are an important area for ensuring national security and maintaining strategic stability. Investments in defence and energy technologies are key to maintaining competitiveness in the global market and stimulating innovation in defence. The development of these technologies not only improves the efficiency of military systems, but can also become the basis for creating new energy solutions that are necessary to ensure the energy security of states. In turn, F. Zhou *et al.* (2020) concluded that knowledge management practices in medical cloud logistics use advanced technologies, such as semantic discovery of transport resources through ontology modelling, to improve the efficiency of medical supply chain management. This helps to reduce transportation costs and increase the availability of medical resources, which is especially important in the context of current healthcare challenges. Support for research in medicine and logistics also includes the development of new technologies that facilitate innovation in these areas, ensuring a rapid response to new threats and reducing costs in the industry (Hysi *et al.*, 2024). These findings are consistent with the theses presented in the previous section, as they confirm the importance of investment in high-tech defence industries for strategic stability and national security. In addition, the results show that investments in energy technologies, in particular in the context of defence infrastructure, are important for increasing energy independence and reducing the risks associated with energy threats. These facts once again underline the need to support innovation in such sectors to strengthen national security and economic stability.

The development of public-private partnerships has become a key tool for securing funding for innovation (Bokii & Kovalenko, 2024). Co-financing of projects has helped reduce the burden on the budget and attract private companies to develop the latest technologies. Simplifying the conditions for innovative start-ups was an important step in reducing barriers for young businesses operating in high-tech industries. This has contributed to the formation of a more flexible and adaptive economy that is able to respond quickly to changes in the external environment. H. Toxopeus *et al.* (2021) also conducted a study that confirmed that companies can access bank financing to implement innovative business process models by participating in special lending programmes for innovation or start-ups offered by banks. Such programmes often include favourable terms, such as preferential rates and long-term loans, which help to reduce financial risks. To qualify, companies

must provide a clear project justification, a business plan, and demonstrate the potential of the innovations to improve business competitiveness and efficiency.

M.A. Mendoza *et al.* (2021) also noted that the “Battle of the Drones” and the use of legitimisation strategies for the transfer and dissemination of dual-use technologies highlight the growing importance of technologies that can be used for both civilian and military purposes. In the context of global security, the role of the private sector in the development of such technologies is becoming increasingly important, as private companies are able to provide the necessary resources to create innovative solutions. Legitimisation strategies that allow for the effective transfer of these technologies between public and private entities contribute to the optimal use of such technologies and reduce barriers to their implementation in various sectors of the economy.

Comparing the data obtained from the study, it can be concluded that grant support and co-financing are effective tools for stimulating innovation. This helps to provide the necessary resources for the development of new technologies that require large investments at the early stages. In addition, the combination of public and private financing helps to reduce financial risks and increase innovation potential, which is an important factor in achieving sustainable economic development (Ciula *et al.*, 2024). Adapting legislation during martial law has also become an important component of supporting innovative projects. Simplified procedures for financing and registering innovative enterprises have reduced administrative barriers and provided quick access to finance for start-ups and R&D. The introduction of special regimes for the export of technological products was an important step in attracting international investment and stimulating the expansion of innovative companies into the global market.

O. Krainik (2023) considered the issue of the relationship between innovation projects and sustainable development, but with the note of the need to evaluate such projects effectively. K. Alekseeva *et al.* (2023) concluded that government business support programmes in times of war are an important tool for maintaining economic stability and entrepreneurship development. Simplifying the financing and registration of enterprises reduces bureaucratic barriers, which are critical in crisis situations such as war. This not only facilitates access to financial resources, but also ensures a quick response to changing market conditions, allowing businesses to remain competitive. V.K. Singh *et al.* (2024) found that green export strategies are an effective tool to support the sustainable development of small and medium-sized enterprises (SMEs), as they promote the adoption of innovative technologies and the development of environmentally friendly production. The intermediary roles of innovation, readiness for change and proactivity allow SMEs to adapt to new market requirements and ensure high export efficiency. Legislative initiatives aimed at stimulating exports support this process by providing favourable conditions for entering international markets and increasing the competitiveness of Ukrainian goods.

The analysis of the survey results showed that government programmes to support business and simplify financing and registration of enterprises significantly reduce financial and administrative barriers for entrepreneurs. This

allows businesses, especially in times of crisis, to adapt to changes more quickly while maintaining economic stability. In addition, support for small and medium-sized businesses through innovative approaches and legislative initiatives is an important factor in the development of environmentally friendly production and increased competitiveness in international markets. Thus, despite numerous challenges, the government has maintained its focus on developing innovative projects, recognising their importance for technological progress and economic stability. Public investment has become the main tool for technological development, national security and adaptation to war conditions. A strategic approach to financing, the development of public-private partnerships, and the adaptation of legislation have proven effective in the challenging martial law environment, helping to preserve the investment climate and strengthen the country's resilience.

■ CONCLUSIONS

During martial law, the economic situation in the country undergoes significant changes. One of the main areas of public spending is to increase funding for defence and security. This requires a reallocation of the budget, with some funds being redirected to support critical industries such as energy, transport, healthcare, and other important sectors. In particular, defence spending increased from UAH 130 billion in 2021 to UAH 550 billion in 2024. However, this redirection of funds to high defence risks affects the attraction of private capital. Increased economic instability reduces investor interest in new projects, especially those not directly related to defence or security.

In response to these challenges, government agencies are introducing a number of measures to stimulate innovative development. These include tax incentives and grants for strategically important industries, such as information technology, medicine, and energy. In addition, subsidies have been introduced for companies working with dual-use technologies, allowing them not only to meet the country's domestic needs but also to enter foreign markets.

Under martial law, public investment is focused on priority areas such as defence technology, cybersecurity, and energy independence. Investments in these areas not only ensure strategic security, but also contribute to technological progress that can be widely applied. In Ukraine, public investment in innovation decreased from UAH 15.2 billion in 2021 to UAH 7 billion in 2024, which reflects limited budget spending due to economic difficulties, but also due to a focus on priority areas. In addition, considerable attention is paid to supporting scientific and technological research in areas such as medicine and logistics, which are essential to ensure social stability and the effective functioning of the country in times of crisis. A key element of this strategy is the development of public-private partnerships. Co-financing of innovative projects helps to reduce the financial burden on the state budget while engaging the private sector in the creation of advanced technologies. The participation of private companies in the development of innovative solutions ensures a high level of expertise and efficiency.

Simplifying the conditions for innovative start-ups creates a favourable business climate that promotes the development of technological ideas in various fields. One of the key factors in attracting investment is the

adaptation of the legal framework. Simplifying the procedures for financing and registering innovative enterprises reduces barriers to starting new businesses. The introduction of special regimes for the export of technological products also encourages integration into foreign markets. Legislative initiatives that facilitate foreign investment play an important role in ensuring sustainable economic growth by providing an opportunity to attract additional resources. However, foreign investment, which stood at \$4.5 billion in 2021, declined to \$1.5 billion in 2024, as a result of economic instability. Despite serious challenges, public investment in innovative projects during martial law remains an important tool for ensuring economic stability and technological development of the country. Measures taken to support key sectors, develop scientific and technological progress, and change tax and financial

policies have contributed to strengthening economic security and competitiveness even in the most difficult periods. A limitation of the study is the limited availability of data on public investment in innovation projects under martial law due to confidentiality of information and the changing economic situation. To more fully assess the role of public investment in innovative projects during martial law, it is necessary to study the impact of such investment on the country's long-term economic development and its interaction with international financial markets.

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■ CONFLICT OF INTEREST

None.

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Роль державних інвестицій в інноваційні проєкти під час воєнного стану

■ **Анотація.** Метою дослідження було проаналізувати вплив воєнного стану на державні інвестиції в інноваційні проєкти та визначити напрями їх адаптації до нових економічних умов. У дослідженні було проведено аналіз змін у фінансовій та економічній політиці під час воєнного стану, оцінено пріоритети державних інвестицій у сфері інновацій, а також досліджено вплив регуляторних заходів на розвиток технологічних проєктів. Воєнний стан в Україні суттєво змінив економічні пріоритети держави, вплинувши на механізми фінансування інноваційних проєктів. Аналіз показав, що значна частина державних ресурсів була перенаправлена на оборонні потреби, зокрема, фінансування оборони в 2022 році становило 350 млрд грн, а в 2024 році очікувалося 550 млрд грн. Це водночас сприяло розвитку технологій подвійного призначення. Запровадження податкових пільг і грантових програм підтримало підприємства, які працюють у стратегічно важливих сферах, зокрема в кібербезпеці, медицині та енергетиці. Державні інвестиції в інновації у 2022 році становили лише 5,8 млрд грн, але в 2024 році цей показник зріс до 7 млрд грн, що стало ключовим інструментом підтримки національної економіки в умовах обмеженого доступу до приватного капіталу. Створення стратегічних фондів надало змогу спрямовувати кошти на розробку критично важливих інноваційних рішень, що забезпечують обороноздатність та економічну стабільність. Аналіз законодавчих змін засвідчив, що уряд спростив процедури фінансування інноваційних проєктів і стимулює експорт технологічної продукції. Попри серйозні виклики, країна зберігає потенціал інноваційного розвитку завдяки адаптації фінансових інструментів і активному використанню механізмів державно-приватного партнерства. Проведене дослідження дозволило визначити ефективні підходи до фінансування інноваційних проєктів в умовах воєнного стану, що сприяє виробленню стратегії економічної стійкості та технологічного розвитку.

■ **Ключові слова:** обороноздатність; податкові пільги; грантові програми; кібербезпека; енергетика; економічна стійкість