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MANAGEMENT OF INDUSTRIALIZATION AND REINDUSTRIALIZATION OF THE ECONOMY: STRATEGIC DIMENSION

The object of research is the management of industrialization and reindustrialization processes of the economy in a strategic dimension. The analysis of existing approaches to the formation of industrial policy in Ukraine revealed the main shortcomings, in particular, the fragmentation of state initiatives, the lack of a coherent long-term strategy, the low level of coordination between state and regional institutions, insufficient support for innovation and human capital. One of the most problematic areas is the lack of a comprehensive model of reindustrialization management that would take into account modern technological, economic and environmental challenges.

The research used methods of historicism, theoretical generalization, logical-structural analysis, as well as economic and mathematical modeling to construct an integral index of industrialization, cluster grouping and forecasting the dynamics of industrial development of Ukraine until 2033.

A quantitative assessment of the level of industrialization of Ukraine over the past 30 years has been obtained and a forecast of reindustrialization has been constructed, which indicates the potential for moderate growth under the condition of implementing an effective industrial policy. This is due to the fact that the proposed model of reindustrialization management is multi-level, provides for the definition of a strategic goal, time horizons and specific instruments (tax incentives, industrial parks, public-private partnership, R&D programs).

This ensures the possibility of achieving an increase in the share of industry in GDP, an increase in the industrial production index and technological complexity of exports. Compared to known approaches, the model has advantages in complexity, phased implementation and integration of digital and green technologies, which allows adapting industrial policy to global challenges.

Keywords: *industrialization, reindustrialization, strategic management, industrial policy, industrialization index, public-private partnership.*

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1. Introduction

Industrialization over the past two centuries has been one of the key drivers of economic growth and transformation of socio-economic structures.

The transition from an agrarian to an industrial model of economy has provided a technological breakthrough, mass production, urbanization, institutional modernization and increased well-being in developed countries. However, since the second half of the 20th century, there has been a shift to a post-industrial model dominated by the service sector, globalization of production and a decline in the share of industry in the GDP of most countries. This trend, known as deindustrialization, has over time revealed its vulnerability in the context of geopolitical, economic and logistical shocks, in particular during the COVID-19 pandemic, the war in Ukraine, as well as structural energy and climate crises. In the conditions of the new economic reality, the concept of reindustrialization is becoming more relevant – the restoration of industrial potential taking into account modern technologies, innovations, environmental standards, digitalization and digitization.

This is not so much a return to the traditional industrial structure as a qualitatively new stage of development, which involves the integration of high-tech production, flexible forms of labor organization, intellectual management and sustainable development.

Of particular importance in this process is the effective strategic management of industrialization and reindustrialization processes. It includes the formation of long-term goals, national industrial strategies, the creation of a stimulating institutional environment, the development of industrial clusters, industrial parks, public-private partnership mechanisms, as well as digital platforms and solutions for industrial policy. Without a clear management vision and proper implementation, reindustrialization risks remaining declarative or fragmented.

The relevance of the topic is due to both global challenges and internal needs of the Ukrainian economy, namely:

– in the restoration of destroyed industrial infrastructure;

– building a new model of the economy integrated into the European space;

– the formation of an innovation-oriented economy capable of ensuring sustainable growth, economic security and technological sovereignty.

Recently, a number of scientists and practitioners have been considering individual issues of the deindustrialization process. Thus, in the study [1], the deindustrialization process is argued as a key problem of our time. The emphasis is placed on the fact that the current process of reducing the share of industry in Ukraine's GDP is destructive in nature and is not a consequence of natural transformation, but involves a return to the industrial model of development. The author points to the unevenness of structural changes, loss of competitiveness and the need for a new, innovative industrialization, but there is no mention of managing the deindustrialization process.

In the paper [2], it is substantiated that reindustrialization is not only the restoration of production, but also an important factor in the technological renewal of the country. Particular emphasis is placed on the need for a strategic response in the context of military challenges and post-war recovery. The author identifies the processes of reindustrialization and deindustrialization, but not from the point of view of managing them in a strategic dimension.

Paper [3] is aimed at systematizing and dividing the phases of economic development, including a new stage – neo-industrialization. The author emphasizes the need to form industrial capital, technological competitiveness and intra-regional integration in modern conditions, but not their management.

In the study [4], the authors indicate that Ukraine can use European practices of industrial and digital technologies as a basis for its reindustrialization. Scientists make recommendations for adapting EU institutional models to the Ukrainian context as a tool for managing them.

Paper [5] considers how reindustrialization in the Eurozone can serve as a prerequisite for the industrial renaissance of Ukraine. It is recommended to strengthen the role of foreign direct investment and institutional stability for sustainable development. The authors of [6] consider reindustrialization as a strategic condition for increasing the competitiveness of macro-regions in the global environment. Their mechanism includes the renewal of technological bases and the operation of roadmaps at the regional level.

Case studies – for example, South Korea's HCI drive strategic program – demonstrate the long-term effectiveness of industrial policies that have changed the balance of the country's industrial structure [6]. The long-term effect on related industries is also emphasized.

The concept of Green Industrial Policy is emerging, combining climate goals and industrial strategies. These measures include the creation of technological "niches", green bonds and public procurement for non-price market support.

The resource-based view emphasizes the importance of internal resources as the basis of competitiveness, and the theory of dynamic capabilities is used to understand the conditions for flexible development of production in the face of technological change [7], etc.

Despite the growing scientific interest in industrialization and reindustrialization, the issue of strategic management of these processes remains insufficiently studied. In particular, existing works do not sufficiently reveal the relationship between institutional mechanisms, instruments of state industrial policy and the effectiveness of reindustrialization in an open economy.

The aim of research is to formulate the conceptual principles of strategic management of industrialization and reindustrialization of the economy, outline key challenges and tools, and propose approaches to assessing the dynamics and effectiveness of the relevant policy using the example of Ukraine in a global comparative context.

To achieve the aim of determining the cause-and-effect relationships of the economy's transition from industrialization to reindustrialization, the following objectives were set:

– to investigate and generalize the historical aspects of the emergence of industrialization and reindustrialization processes;
– to analyze the managerial aspects of the industrialization and reindustrialization processes of the economy;
– to propose a model for managing the reindustrialization of the economy;
– based on economic and mathematical modeling, to determine the level of industrialization of Ukraine and make a forecast until 2033.

2. Materials and Methods

The object of research is the management of the processes of industrialization and reindustrialization of the economy in a strategic dimension.

The hypothesis of research is that the management of industrialization and reindustrialization of the economy, which is focused on reducing the duration of innovation cycles and reducing the innovation lag, will contribute to increasing the competitiveness of the national economy through the acceleration of the technological paradigm.

The study of the stages of the industrial revolution and their main features is possible through the use of methods of theoretical generalization, comparison and logical-structural analysis.

When substantiating the managerial aspects of the processes of industrialization and reindustrialization of the economy and their changes according to the stages of the industrial revolution, the methods of historicism, comparison, synthesis and theoretical generalization are involved.

Through the use of economic and mathematical methods and models, methods of theoretical generalization, and analysis of actual data, the significance of the level of industrialization and reindustrialization of the country has been determined and substantiated.

3. Results and Discussion

3.1. Historical aspects of the emergence of industrialization and reindustrialization processes

Each of the stages of the industrial revolution has its own characteristics, which are caused by different reasons and affect the subsequent periods of the revolution in a certain way, causing certain consequences. Therefore, despite significant research into the evolution of industrialization and reindustrialization processes, namely, consideration of each of the phases of the industrial revolution in the historical aspect, let's consider it necessary to combine the processes of evolution with the processes of their management [8, 9].

Considering the processes of industrialization and reindustrialization, it should be noted that in the historical aspect the development of all processes occurs in a spiral. Taking into account Kondratiev's "long waves" (30–40 years), the influence of industrial development on the processes of industrialization, deindustrialization, reindustrialization and neo-industrialization has also been proven (Fig. 1).

The longest process of the industrial revolution is industrialization, which is a fundamental and long-term process of transforming the economy from an agrarian to an industrial one. It went through several waves over two centuries (late 18th – mid-20th centuries), each of which corresponded to a new technological structure and socio-economic model:

– from the birth of industry (development of the textile industry, coal power and the formation of the factory system);
– through electrification, the appearance of internal combustion engines, the chemical industry;
– the formation of heavy industry and railway transport;
– to digitalization, globalization of production, increased outsourcing and the beginning of deindustrialization in developed economies.

The reasons for the departure from the traditional industrial model of the economy since the middle of the 20th century have occurred in the developed countries of the world. First of all, this is due to a change in the structure of the economy. As a result of automation, outsourcing of production to countries with cheap labor, there is a decrease in the share of industry in GDP and employment.

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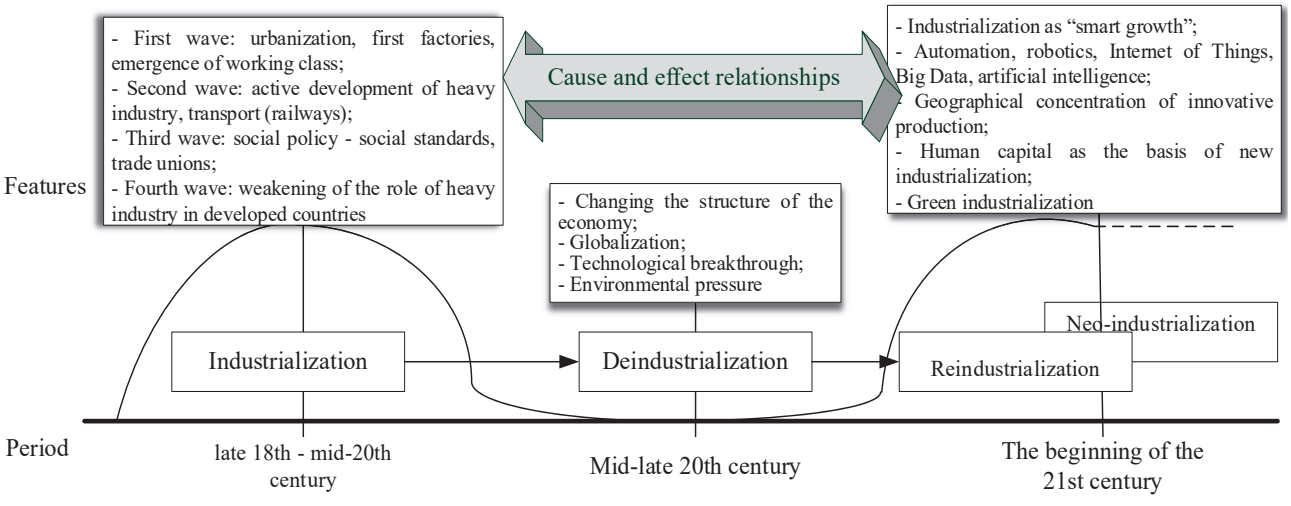

Fig. 1. Cause-and-effect relationships of industrialization and reindustrialization processes

Another reason for the transition to deindustrialization is globalization processes with the transfer of production to countries with low costs. Under such conditions, corporations sought to reduce costs and moved factories to Asia, Latin America, and Eastern Europe. One of the main factors is the increase in environmental standards, which forced them to reduce or modernize enterprises, causing environmental pressure. In many cases, it was cheaper to transfer production to countries without strict environmental standards.

These processes led to the degradation of industrial infrastructure, the loss of technological sovereignty, and the socio-economic decline of individual regions.

In the 21st century, industrialization has taken on new forms – it does not involve the mass construction of enterprises, but is based on high technologies, services, and flexible production models.

Industrialization is considered as "smart growth" with an orientation towards innovation, energy efficiency, digitalization, integration of production and services (for example, "production as a service").

Industry 4.0 involves the development of automation, robotics, the Internet of Things, Big Data, artificial intelligence, which leads to adaptability to demand, minimizing human intervention.

Green industrialization takes into account production with a low carbon footprint, renewable energy sources, circular economy, environmental requirements are becoming part of the development strategies of any country in the world.

Geographical concentration of innovative production leads to the development and increase in the number of clusters, technology parks, industrial hubs. State support is increasing through the development of infrastructure, tax breaks, and export promotion.

A significant factor in development is human capital as the basis of new industrialization. It is not the number of employees that is taken into account, but their qualifications, which determine competitiveness. The role of STEM education, engineering training, and lifelong learning is increasing.

The above factors have led to reindustrialization processes that are returning interest in industry, but in a much shorter time.

The vulnerability of global supply chains, associated with the COVID-19 pandemic, geopolitical tensions, wars (in particular in Ukraine), have demonstrated the risks of import dependence and require localization of production. As a result: a strategic return to domestic production – in particular in the defense, pharmaceutical, food security sectors.

The closure of enterprises has led to unemployment, migration, a reduction in the tax base, loss of industrial potential, which has caused economic and social degradation of regions. In this case, reindustrialization is seen as a tool for "resuscitating" depressed areas.

The rapid development of new generation technologies requires a new quality of industry. Industry 4.0, digitalization, 3D printing, "smart" factories allow making production high-tech and cost-effective even in countries with expensive labor. Modern reindustrialization is no longer "smokestacks", but intelligent production with a minimal environmental footprint.

Geopolitical challenges shape the need for economic autonomy. Without our own industrial production, national security is impossible. Therefore, governments are actively investing in critically important sectors: defense, energy, mechanical engineering, microelectronics.

The need for new types of industry is a green transition. The transition to renewable energy, electric vehicles, and energy-efficient construction generates new demand for modern industry. That is, reindustrialization does not deny environmental goals, but on the contrary, it becomes their tool. The world has abandoned classical industrialization due to globalization, automation, and environmental pressure. But these factors, reinforced by geopolitical crises, have proven to be insufficiently sustainable – and have stimulated the search for a new model of industrial development.

Reindustrialization is not a return to the past, but a strategic transition to a modern, innovative, environmentally responsible industry.

3.2. Management aspects of the processes of industrialization and reindustrialization of the economy

The processes of industrialization and reindustrialization are not only historically determined stages of economic development, but also the result of the application of specific management tools. The evolution of these tools reflects changes in economic management paradigms, the technological context, the global conjuncture and the strategic priorities of states (Table 1).

Noting the evolution of management models, it is necessary to pay attention to several of them that correspond to their time, political system, socio-economic relations, and so on, namely: the classical model; the liberal model, the modern industrialization strategy. Let's present their main characteristics.

Classical management models (XVIII–XX centuries) are characterized by centralized planning with a state monopoly on investments and industrial strategy. At this time, large-scale creation of industrial facilities takes place, regardless of efficiency.

In the post-industrial period (1970–1990s), the liberal model of industrialization management prevails. The main features of this time were:

– minimal role of the state with market dominance;
– refusal of direct intervention: deregulation, privatization;
– industrial policy is reduced to "creating conditions".

Table 1

Evolution of industrialization management models

Stage	Role of the state	Management type	Tools	Vulnerabilities
Classical industrialization	Directive (centralizer)	Rigid planning	Planning, public investment	Innovative inertia
Deindustrialization	Passive (deregulator)	Minimal intervention	Liberalization, privatization	Devaluation of strategic industries
Reindustrialization (neo-industrialization)	Active (partner, facilitator)	Flexible strategic management	Innovation policy, partnership, digital analytics	Systemic complexity, need for coordination

The modern reindustrialization strategy (2000–2020) has multi-level governance through a partnership between the state, business and science. The development of digital tools, artificial intelligence is reflected in Smart governance forecasting, data-driven policy. There is also a development of institutional support for innovative production: Smart Specialization, industrial hubs, industrial clusters, etc.

Therefore, it should be noted that industrialization is not a completed stage, but a changing paradigm. Its modern form is reindustrialization, which is due to global risks and technological transformations. Management of industrialization processes has evolved from centralized directives to adaptive multi-level models that combine strategic planning with flexibility and a partnership approach [10, 11]. Reindustrialization is not a return to the past, but a qualitatively new vector of economic development, based on high technologies, sustainability and human capital.

The evolution of industrialization is not only a technological history, but above all an evolution of forms of governance, from centralized directiveness to decentralized strategic facilitation. That is, effective cooperation to achieve common goals by finding the best solutions.

Managing industrialization in the 21st century requires a balance between a systemic vision, flexibility, partnership and digital tools (Fig. 2).

In the context of modern challenges caused by the destruction of industrial potential, the transformation of global supply chains and the transition to sustainable development, strategic management of reindustrialization is gaining particular relevance.

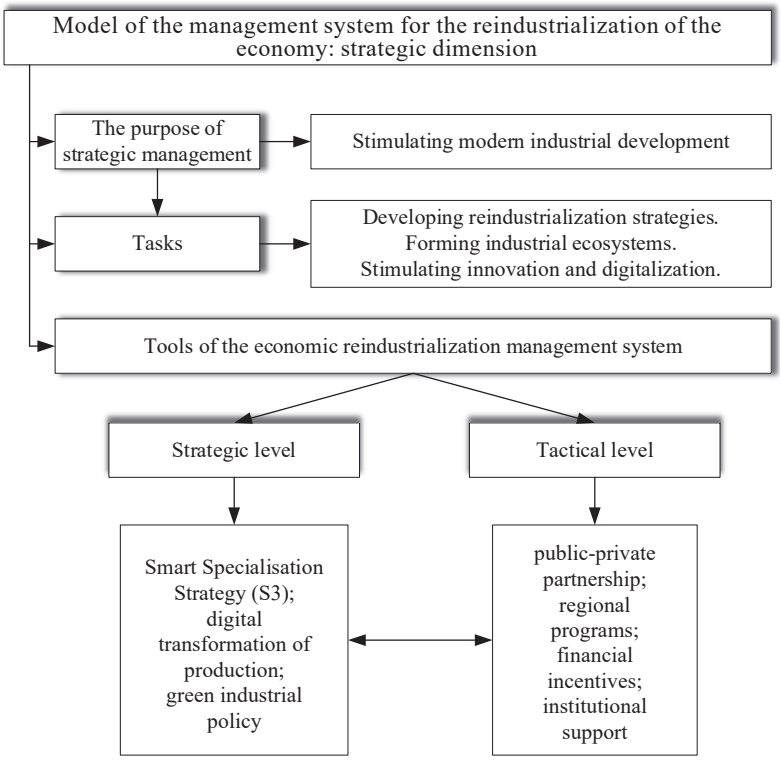

Fig. 2. Model of management of reindustrialization of the economy

Based on a critical analysis of sources, international experience and Ukrainian realities, a multi-level model of management of reindustrialization is proposed, which combines a strategic goal, time horizons, tools and a system of coordinated actions.

The strategic purpose of the reindustrialization management system is the formation of a high-tech, environmentally responsible and competitive industry as the basis for long-term economic growth and national economic security.

The model provides for three management levels, each of which is assigned system management functions:

1. *National level of management* – strategic planning, financial and legal framework.

2. *Regional level* – implementation of policies on the ground, clustering, business support.

3. *Institutional-private* – direct implementation of innovations, educational and production programs.

Of particular importance is feedback, the necessary condition for which is:

– constant monitoring of performance indicators (KPI), such as the industrial production index, employment level, technological complexity of exports;

– adaptation of tools based on external changes (economic, geopolitical, technological).

The model is phased, dynamic and adaptive to change. Reindustrialization is seen not as a short-term recovery program, but as a long-term strategic transformation of the economy. The key is the combination of top-level planning and local implementation with an emphasis on innovation, personnel training and sustainability.

3.3. Methodological approach to assessing the level of industrialization and reindustrialization

In the context of studying the strategic dimension of industrialization and reindustrialization of the economy, there is a need to develop a holistic analytical approach that allows both to quantitatively assess the level of industrial development and to determine the country's place in global transformation processes. The methodological basis of this research is based on a combination of index analysis, cluster grouping and econometric modeling [12].

Firstly, to determine the level of industrialization of the country, an integral industrialization index was used, built on the basis of several key indicators (1), (2):

– the share of industry in GDP;
– the share of manufacturing industry;
– the index of industrial production volume;
– the share of employment in industry;
– labor productivity in the industrial sector.

Each of the indicators is normalized within [0;1] with subsequent weight aggregation

$$x_{i,t}^{'} = \frac{x_{i,t} - \min(x_i)}{\max(x_i) - \min(x_i)}. \quad (1)$$

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Further, the index itself is calculated according to the formula

$$II_t = \sum_{i=1}^{n} w_i x'_{i,t}, \quad (2)$$

where II_t – industrialization index in year t; $x'_{i,t}$ – normalized value of the i-th indicator; w_i – weight coefficient (can be equal or adjusted according to expert significance).

The aggregated value of the indicator allows to obtain a composite measurement of the overall level of industrial development in dynamics and compare the values of different countries.

To compare the international context, clustering of countries by the level of industrialization and the nature of reindustrialization processes is used [13].

The methodology includes [13]:

– selection of representative countries (EU, China, USA, Ukraine, others);

– formation of a multidimensional sample from indicators: share of industry, growth rates, share of high-tech sectors, level of digitalization;

– dimensionality reduction (PCA – Principal Component Analysis) to reduce the number of factors without losing informativeness;

– clustering by the *K*-means method or DBSCAN – algorithms that group countries by similarity.

The sample of countries is formed according to the criterion of the availability of current statistical data. This allows to identify the so-called "industrial profiles" and position Ukraine within the global industrial structure.

To forecast the dynamics of industrial development, econometric models are used (3), (4) – in particular:

– ARIMA (Auto Regressive Integrated Moving Average) to build a forecast based on time series;

– multiple regression to identify relationships between industrial production volumes and factors such as GDP, investments and foreign direct investments.

The model is based on the time series of the indicator (for example, the share of industry in GDP)

$$y_t = \alpha + \sum_{i=1}^{p} \varphi_i y_{t-i} + \sum_{j=1}^{q} \theta_j \varepsilon_{t-j} + \varepsilon_t, \quad (3)$$

where y_t – the value of the indicator for the year t; φ_i, θ_j – model parameters; ε_t – random error.

The model allows to build a forecast for 5–10 years based on the trend and cyclicality of processes.

For a deeper analysis of the influencing factors, the model

$$IndustOutput_t = \alpha + \beta_1 GDP_t + \beta_2 Invest_t + \beta_3 FDI_t + \varepsilon_t, \quad (4)$$

where $IndustOutput_t$ – the volume of industrial production; GDP_t – the volume of GDP for the year t; $Invest_t$ – the volume of capital investments; FDI_t – the volume of foreign direct investments was used.

The model allows to identify cause-and-effect relationships and predict both the current effectiveness of the incentive policy and potential reindustrialization scenarios in the medium term.

3.4. Forecast of the industrialization level of Ukraine

Using the example of Ukraine, using the above models, an analysis of the level of industrialization was carried out based on statistical information for the last 30 years (Table 2, Fig. 3), and a forecast of the reindustrialization level of the country's economy by 2033 was proposed (Fig. 4) [14–17].

Table 2

Input data for determining the industrialization level of Ukraine [14–17]

Year	Share of industry in GDP (%)	Share of manufacturing industry in GDP (%)	Industrial production volume index (1992 = 100)
1992	54	44.6	100
1993	48	41	92
1994	43	38.2	85
1995	38	34.1	78
1996	34	31	70
1997	30	27	63
1998	26	22.5	60
1999	24	18.3	57
2000	23	16.7	55
2001	23	15.8	54
2002	22	15	52
2003	22	14.2	51
2004	21	13.5	50
2005	21	12.9	48
2006	20	12.3	47
2007	20	11.5	46
2008	19.5	10.8	45
2009	19	10.2	44
2010	18.5	9.5	42
2011	18	9.1	41
2012	17.8	8.8	40
2013	17.5	8.4	42
2014	17.3	8.1	45
2015	17.1	7.9	47
2016	17.5	7.7	50
2017	17.8	7.6	52
2018	18.2	7.9	54
2019	18.4	8	53
2020	18.6	8.1	52
2021	18.4	8	51
2022	18.2	7.9	52
2023	18.84	8.25	55

From the graph of the dynamics of the industrialization index of Ukraine for 1992–2023 (conditionally normalized values), one can observe a sharp drop in the 1990s in the share of industry in Ukraine's GDP, which plays a significant role in determining the level of industrialization, stagnation in the 2000s and partial recovery in recent years, which indicates potential signs of reindustrialization (Table 3)

$$IndustOutput_t = \alpha + 0.476 GDP_t + 0.193 Invest_t + 0.136 FDI_t + \varepsilon_t.$$

Fig. 3. Dynamics of changes in the share of industry in Ukraine's GDP, % [14–17]

Fig. 4. Forecast of the industrialization index of Ukraine until 2033, USD units [14–17]

Table 3

Results of multiple regression (dependent variable: Volume of industrial production)

Indicator	Coefficient (β)	Standard error	t statistic	p value
Constant (α)	1.102	0.389	2.83	0.007
GDP volume per year t (GDP)	0.476	0.081	5.88	< 0.001
Volume of capital investments ($Invest_t$)	0.193	0.067	2.88	0.005
Volume of foreign direct investment (FDI_t)	0.136	0.059	2.31	0.023
R^2	0.73	–	–	–
Adjusted R^2	0.71	–	–	–
Number of observations (N)	32	–	–	–

Determining the relationship between industrial production volumes and factors such as GDP, investment and foreign direct investment, a multiple regression model was obtained. The results indicate that all factors have a positive impact on changes in industrial production volumes, namely:

– GDP_t has a statistically significant positive impact on the volume of industrial production ($\beta = 0.476$; $p < 0.001$);

– capital investment also has a positive effect ($\beta = 0.193$; $p = 0.005$);

– foreign direct investment – less pronounced, but also significant ($\beta = 0.136$; $p = 0.023$).

The model explains about 73% of the variation in production volumes ($R^2 = 0.73$). Fig. 3 demonstrates the historical dynamics of the industrialization index of Ukraine (1992–2023), which is the initial data for the formation of forecast models.

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The forecast of the industrialization index of Ukraine until 2033 demonstrates the expected moderate growth of the indicator, which indicates a realistic trajectory of reindustrialization provided that the economy is stabilized, industry is supported, and innovative development is pursued.

Thus, the chosen methodological approach provides a multi-level analysis of both quantitative and qualitative nature, combining macroeconomic assessment, comparative analytics, and forecasting tools. It allows for a comprehensive understanding of the dynamics, structural features, and prospects of the country's industrial development in the context of post-industrial transformation.

3.5. Discussion of the research results on the process of effective strategic management of industrialization and reindustrialization processes

The obtained research results have significant practical value for the formation of an effective industrial policy of Ukraine. The proposed composite industrialization index can be used by government bodies to monitor the dynamics of industrial development and assess the effectiveness of state production support programs. Forecast scenarios built on the basis of the ARIMA model are a tool for strategic planning in the field of economic policy, regional development, as well as in the development of modernization programs for key industries. The proposed reindustrialization management model can serve as a methodological basis for creating a national strategy, regional Smart Specialization programs, as well as for planning investment support for clusters, industrial parks and high-tech industries.

The research is based on aggregated statistical data (mining and processing industries, mechanical engineering, etc.), which have limited detail regarding the industry and regional structure. This reduces the possibilities for a deeper analysis of individual industrial sectors (IT technologies). The proposed management model assumes the creation of effective institutional mechanisms and the availability of adequate funding, which in the real conditions of Ukraine requires additional research on the economic feasibility and political feasibility of the proposed measures. In addition, the forecast calculations do not take into account potential external shocks associated with military actions, global economic crises or radical changes in global supply chains.

Further scientific research should be directed at developing detailed sectoral models of reindustrialization, taking into account the regional characteristics of Ukraine. It is also important to conduct an analysis of the effectiveness of specific industrial policy instruments (tax breaks, industrial parks, R&D incentives) and develop a system of key indicators (KPIs) to assess the effectiveness of their implementation. A promising direction is the combination of quantitative forecasting with qualitative scenario modeling, which will allow taking into account various options for the foreign policy and economic environment.

4. Conclusions

1. Based on the comprehensive analysis of historical waves of industrialization, modern approaches to industrial policy and the cause-and-effect relationships of deindustrialization and reindustrialization have been identified. This has made it possible to substantiate the relevance of forming a new model of strategic management of industrial development.

2. As part of the analysis of the managerial aspects of the processes of industrialization and reindustrialization of the economy, a quantitative assessment of the level of industrialization of Ukraine for 1992–2023 was carried out and a forecast was made until 2033. A composite industrialization index was proposed, which takes into account the share of industry in GDP, the share of manufacturing industry, the index of industrial production volume and other indicators.

3. A multi-level model of reindustrialization management has been proposed, which involves determining the strategic goal, objectives and tools for the short, medium and long term. The model integrates financial incentives, institutional coordination, human capital development, digitalization and green transformation of production.

4. The research builds forecast scenarios for the reindustrialization of Ukraine using the ARIMA model and regression analysis. The results obtained indicate the potential for moderate growth of the industrialization index, provided that a comprehensive state policy of supporting industry is implemented.

Conflict of interest

The authors declare that they have no conflict of interest regarding this research, including financial, personal, authorship or other, which could affect the research and its results presented in this article.

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Data availability

Data will be provided upon reasonable request.

Use of artificial intelligence

The authors confirm that they did not use artificial intelligence technologies when creating the presented work.

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