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RESEARCH OF BANKS PARTICIPATION IN CREDITING THE NEEDS OF INNOVATIVE DEVELOPMENT OF INDUSTRY IN UKRAINE

Об'єктом дослідження є результати впливу банківського кредитування на процеси інноваційного розвитку промислових підприємств та економіки України. Одним з найбільш проблемних місць є низький рівень інноваційної діяльності, інноваційної активності українських промислових підприємств та економічної ефективності загального інвестиційного потенціалу України. Уповільнення економічного зростання також спричиняє слабкий та зворотній зв'язок між процесами інноваційного розвитку економіки країни й довгостроковими кредитами банків. До несприятливих чинників в роботі віднесено й відсутність значущого впливу довгострокових кредитів банків на процеси модернізації та зміни чистого фінансового результату групи вітчизняних промислових підприємств.

В ході дослідження використовувалися методи системного підходу, порівняння, кореляційного аналізу, непараметричної статистики, табличного та графічного подання результатів. Це дозволило автору довести системний характер негативних тенденцій змін інноваційного розвитку економіки, обумовлених загальними принципами організації соціально-економічної діяльності України.

Отримані результати доводять, що одними з основних дестабілізуючих чинників розвитку виробництва й фінансової стійкості промислових підприємств є низький рівень рентабельності операційної діяльності та вище критичного рівень зносу основних засобів. Особливістю фінансування інноваційної діяльності є нерациональна структура сформованих джерел, де на:

- власні кошти приходиться 84,49 %;
- кошти державного бюджету – 2,49 %;
- кошти місцевих бюджетів – 1,05 %;
- кошти вітчизняних інвесторів – 2,96 %;
- кошти іноземних інвесторів – 1,18 %;
- кредити банків – 6,52 %;
- інші кошти – 1,26 %.

Зазначене негативно впливає на відтворювальний цикл та актуалізує потребу у використанні банківського кредиту для часткового вирішення проблем фінансового забезпечення реструктуризації підприємств зокрема та інноваційного розвитку країни в цілому.

На прикладі групи промислових підприємств доведено, що приріст чистого прибутку забезпечується приростом незавершених капітальних інвестицій, який супроводжується приростом довгострокових кредитів банків.

На підставі емпіричних узагальнень визначено заходи активізації стимулювання кредитування банками технологічного розвитку національної промисловості. Це забезпечується за рахунок практичної реалізації державою програмно-цільового методу планування, заснованого на цільовому управлінні та фінансуванні, створенні системи взаємодії державних та приватних інститутів, фондів прямих та венчурних інвестицій, національних довгих грошей та ринку деривативів. Реалізація системи заходів сприятиме створенню робочих місць, реалізації інфраструктурних та інноваційних проектів.

Ключові слова: інноваційний розвиток економіки країни, промислове підприємство, інноваційна активність, джерела фінансування, банківський кредит.

1. Introduction

The main direction of reforming the Ukrainian economy and the development of a new socially oriented market economic system is a substantial restructuring of production based on innovative changes. World experience shows that the development of innovative entrepreneurship plays an important role in the transformation of the economic mechanism and the increase in the intensity of its structural adjustment. However, the instability of

economic development inherent in Ukraine, the budget deficit, the imperfection of long-term financing and lending mechanisms, the lack of own funds and, as a result, the underdevelopment of market mechanisms constrain innovation processes in the national economy [1]. Innovation processes, accompanied by budget cuts, financial market development and passivity by the majority of participants, contribute to enhancing the role of banks in innovation lending processes as the main providers of investment resources [2].

The search for mechanisms to stimulate the relationship and interaction of banking capital and innovative development as guarantors of ensuring sustainable economic growth in Ukraine is extremely relevant. Great importance is acquired by bank investments directly related to structural changes and innovations, the quality ratio of which lays the foundation for modernizing the economy and its macroeconomic balance.

Innovation activity is impossible without adequate financial support. Financing innovation leads to an increase in GDP in the ratio of 1 to 3, financing information and communication technologies – the basis of the new economy – in the ratio of 1 to 2. In developed countries, up to 90 % of GDP growth is determined by innovation and technological progress [3].

2. The object of research and its technological audit

The object of research is the results of the impact of bank lending on the processes of innovative development of industrial enterprises and the economy of Ukraine.

In order to formulate recommendations on financing innovation development and improving the efficiency of innovation activities, the problems of state innovation management are investigated. The analysis of the specifics of financial sources in the context of globalization and new phenomena in the financial and credit support of innovative development at the level of national economies has been carried out [4–6].

Particular attention is paid to the formation of a methodological basis and methods of participation of banks in financing innovation, the development prospects of the first in the conditions of the need to accelerate the innovative development of enterprises in the real sector of the economy [7, 8].

One of the most important moments of the participation of banks in financing innovation processes is precisely the long-term interaction process, by investing in the capital of innovative enterprises or lending to investment and innovation projects. However, the activities of commercial banks operating in Ukraine are legally regulated, which limits their control over the enterprise in order to prevent a negative impact on the reliability of the financial system. In this connection, there is an urgent need to find new methods and mechanisms for the financial support of innovation, which will ensure the attraction of additional investments in the real economy.

3. The aim and objectives of research

The aim of research is development of recommendations for creating conditions for the use of bank loans as a source of financing the needs of innovative economic development.

Disclosure of the aim contributes to the following objectives:

1. To study the trends of changes and factors influencing the innovative development of the Ukrainian economy.
2. To assess the investment potential of the country, sources of financing innovation, as a factor in the restructuring of industrial enterprises.
3. To determine the relationship between the main variables characterizing the relationship between the credit

activities of banks, the innovation activity of industrial enterprises and the country's development ability.

4. To determine the significance of the participation of banks in the processes of modernization of the group of industrial enterprises of Ukraine.

4. Research of existing solutions of the problem

The problem of finding effective forms, directions and mechanisms of financial interaction between investors and innovators is the subject of scientific research by many scientists [9, 10]. At the same time, the problem of determining the role of banks in supporting economic growth at the current stage of the country's development remains important.

Thus, according to the authors of [11], «innovativeness is the defining characteristic of modern scientific, technical, industrial, socio-economic, and all social processes. The fate of Ukraine depends on mastering innovative development mechanisms: it will move towards becoming one of the developed countries, staying as a stagnant country on the sidelines of scientific, technical and social progress. This is due to the general laws of social development, according to which the world is moving from a predominantly reproducible to an innovative type of development.

But the transition to an innovative type of development opens up not only great prospects, but also creates significant risks to the stability and balance of development itself. Just as a car at high speed has big accident risks, so the economy is dynamically developing and has increased risks of destabilization. Therefore, it is important to ensure the reliability of all social mechanisms of innovation development, the safety of the functioning of the entire socio-economic system.

The prolonged shortage of financial resources for the innovation activity of enterprises hinders the modernization of the production potential of the Ukrainian industry. Attracting credit funds allows enterprises to expand the innovation and technological basis of production...».

It is noted that «...the underlying causes of the crisis of the Ukrainian model are embedded in the system of social reproduction of industrial capital, which, under the conditions of the market criteria for the efficiency of enterprises, led to a sharp reduction in the processing industries and the expansion of the commodity sector. Manufacturing enterprises were not ready to participate in competition either domestically or on world markets...

The way out of the current difficulties and the transition to the trajectory of sustainable development is possible on the basis of a new socio-economic model, where expanded reproduction is possible at enterprises of the real sector of the economy. Every company must have the resources sufficient for continuous expansion and renewal of production. These resources are known to be:

- first, depreciation funds, providing not only the reproduction of fixed capital, but also a constant increase in its technical level;
- secondly, bank loans necessary for the expansion of production;
- thirdly, the profits of enterprises, is used to expand the scale of the business...

The formation of a new reproduction model of fixed capital is hindered by a high level of inflation, which does not allow enterprises to accumulate available funds for renewal...

As the experience of financial and credit support for the renewal of fixed capital in developed countries shows, the allocation of funds through targeted investment lending is the best way to achieve the final result. Funds for investment lending can be not only the assets of the banking system itself, but also the funds raised from privatization, financial resources in the form of debt obligations that the state can attract. For 10 years, the share of investment lending could grow by several times... With this approach, the financial and credit plan will be aimed at implementing the investment program of production renewal, and ultimately at obtaining the end results of a sustainable socio-economic development of the country» [12].

According to the author of the work [13], «modern innovative development is proceeding rapidly, caused by total modernization and transition to a post-industrial society... Today there are close links between the trends of innovative development and the performance parameters of an individual enterprise, the performance of the industry and the national economy... At the present stage, a number of diversified classifications of sources of financing innovations have been formed... The basic classification is recognized by the sources of mobilization of financial resources, within which, along with its own funds, credits and investments are called basic. These sources create financial resources that allow to implement projects to generate additional profit, which allows to meet the growing needs of the subjects of innovation in the innovation process».

As the author notes [14], «innovation is considered to be a driving force of firm growth allowing a means of differentiation from competition and of establishing a dominant role in an industry... Besides, while extant literature has investigated the connection between corporate innovation and venture capital or private equity funding the impact of bank financing on fostering innovation remains a matter of debate due to theoretically ambiguous predictions as well as endogeneity concerns...

Evidence indicates that relationship lending fosters corporate innovation and that bank financing is material for the investment in the innovative process, thus leading to technological progress».

It is reported that «innovative small firms – those implementing new products, processes or business models – are most likely to create new markets, achieve rapid growth, and help the economy recover. External finance may be particularly important for innovative small firms, as they can lack the internal resources to successfully commercialize innovations» [15].

The author of the article [16] notes, «...that bank financing is the major source that accounts for the positive effect. The author suggests that the banking sector plays a crucial role in financing innovation when the equity market and other market-based financing systems are underdeveloped in emerging economies...».

According to the paper [17] «empirical studies also investigate the impact of access to external financing on firms' R&D expenditure. They find that weaker access to external financing leads to lower R&D expenditure... Another strand of literature investigates the effect of credit constraints in economic downturns and shows that these lead to lower R&D expenditure».

The author in paper [18] draws attention «to the importance of bank funding for R&D investment... It is sug-

gested that contractions in credit supply matter, even if firms are not funding R&D spending through bank debt. The argument is that the disruption in credit supply that follows banking crises will cause firms to divert internal cash flows away from R&D towards more «essential» investments, especially in bank-based economies where they have less access to other types of external finance».

It is generally acknowledged that «financial constraints are one of the main obstacles to innovation activity, which in turn is an important driver for the growth of an economy... A number of studies consider the length of the firm-bank relationship and find that long-lasting firm-bank relationships foster the implementation of innovation activities» [19].

In paper [20] authors examine the effect of bank interventions triggered by debt covenant violations. They show that «bank interventions negatively affect innovation quantity but do not affect innovation quality... The reduction in innovation quantity is concentrated in innovation projects that are unrelated to a firm's core business, which leads to a more focused scope of innovation output and ultimately an increase in firm value... Creditors help mitigate investment distortions in innovation arising from conflicts of interest between managers and shareholders and shed new light on the real effect of bank financing».

It is reported that «the impact on the socio-economic development of the country provides an investment loan if:

- 1) stimulates enterprises to invest in new (modernized) non-financial and intangible assets and research and development (R&D);
- 2) provides qualitative changes in production (new equipment, technologies, forms of organization of production and management);
- 3) increases the competitiveness of products, works and services not only in the domestic, but also in the global markets.

However, lending to innovation is a rather risky tool, and without state support its development in Ukraine is impossible» [21].

5. Methods of research

The following scientific methods are used:

- systematic approach in the study of the current state of innovation in Ukraine, problems of formation and use of sources of its financing;
- comparison method when comparing the processes of innovative development of the country and the modernization of industrial enterprises, in particular with the help of indicators of past years, to identify common features and differences with actual indicators;
- method of correlation analysis in identifying the relationship between factors, namely: determining the impact of reducing or increasing indicators of banks' lending activity on changes in indicators characterizing the innovation activity of industrial enterprises and the country's development ability;
- method of non-parametric statistics in the study of the statistical significance of changes in the net financial result of a group of industrial enterprises when using long-term bank loans;
- method of tabular and graphical presentation of the results for a visual representation of the research results.

6. Research results

According to the Law of Ukraine «On Innovation Activity», innovation activity is defined as an activity aimed at using and commercializing the results of research and development and predetermines the release to the market of new competitive products and services. It is aimed at creating the necessary innovative technologies or services and is carried out in close relationship with the environment. Innovation activity is objectively determined by the market demand, opens up new areas of application, and consequently, new consumers of the product, technology or service being created» [22].

An important branch of the Ukrainian economy is industry. The discrepancy between the technical levels of production, the effects of the global financial and economic crisis, the growing level of competition and the technological advantages of countries have chosen the innovative path of development, necessitate the modernization of the industry and the economy of Ukraine as a whole.

Modernization is the process of transition from a traditional to an industrial society. It is also a driving force of the state's economic development and represents progressive changes in the activities of industrial enterprises under the influence of scientific and technological progress towards creating competitive advantages and increasing the productivity of production factors. However, not all enterprises are ready to invest in modernization processes.

So, as of 2017, the volume of industrial products sold amounted to 2625862.7 million UAH/93580.28 million USD. In 2000, this figure was 210842.7 million UAH/38829.22 million USD, which indicates an increase in sales. However, if consider the industrial output index, then there is an opposite dynamic. The industrial output index tended to decrease from 114.2 % to 100.4 % during 2000–2017 years (Fig. 1).



Fig. 1. The main indicators of industrial products for 2001–2017 [23]

Let's recall that the global financial and economic crisis of 2008–2009 had a devastating impact on Ukraine, first of all, on the industrial sector, the production volume of which after the growth of 2001–2007 is halved.

The post-crisis recovery period 2010–2011 has not been successfully used in Ukraine. This reinforced the negative trends in the economy in 2012–2013 (zero economic growth), which essentially means the lack of creating a basis for sustainable economic growth.

Let's consider it necessary to note that the level of modernization is significantly affected by the innovation activity of enterprises.

According to Fig. 2, the number of enterprises that implemented innovations tended to increase during 2000–2016. The share of innovation-active enterprises as of 2016 amounted to 16.6 %, which is more than the pre-crisis period of 2007 in 1.6 times.

The increase in the indicator is accompanied by the development of new types of technology by enterprises and the implementation of new technological processes (growth rate of 2000–2016 – 206.81 % and 248.68 %, respectively) [24].

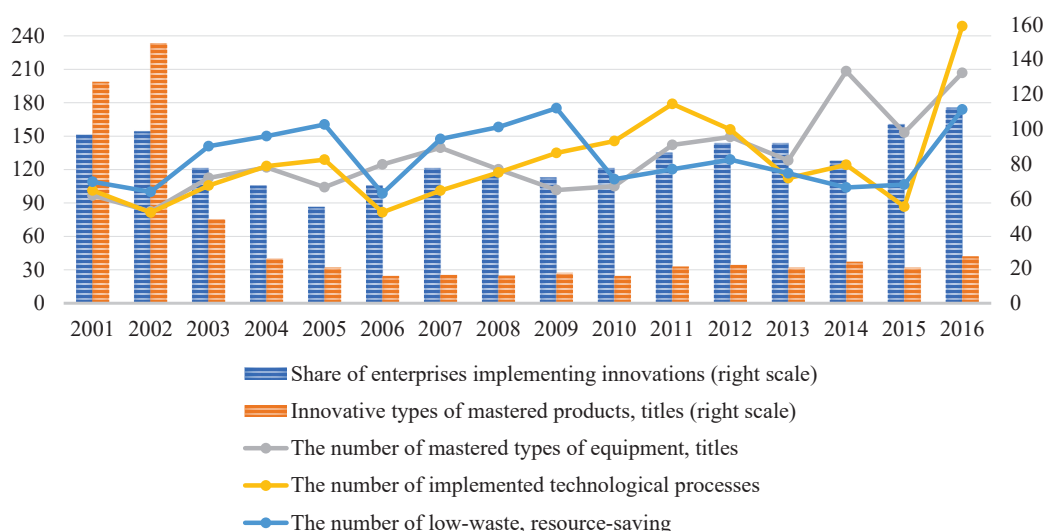


Fig. 2. The growth rate of the results of innovation activities of industrial enterprises of Ukraine for 2000–2016 (by the method of basic substitutions), %

Let's also note that there is an increase in the level of innovation activity and the effectiveness of the innovation process of industrial enterprises in Ukraine to create innovative products and develop new technological solutions since 2008. Thus, in 2016, the industry mastered the production of 4139 types of innovative products. This is 1.63 times higher than in 2007 and 1.21 times higher in 2012, when it was created 2526 and 3403 items of innovative products, respectively. Despite the failure of the country to maintain the trend of economic growth in 2010–2011 and the onset of a significant crisis period of 2013–2014, the volume of innovative products mastered at enterprises in 2014 amounted to 3661 units. This is 1.07 times more than the 2012 indicator.

This indicates that the effectiveness of innovation activity in Ukraine tends to improve, but still does not meet the requirements for ensuring stable innovation development, founded in 2000–2002. The growth rate of the studied indicator was only 27.02 % in 2000–2016, that is, there was a significant reduction in the results of innovation activities of industrial enterprises by 72.98 %. In addition, let's note that in 2017 there is a significant reduction in all indicators. In particular, the share of enterprises that implemented innovations was 14.3 % (growth rate 2016–2017 – 86.14 %), which:

- fewer titles of innovative products for 1752 units were mastered (Growth rate in 2016–2017 – 57.67 %) and types of equipment – by 1552 units (Growth rate in 2016–2017 – 57.54 %);
- new technological processes were implemented – by 1657 units (Growth rate in 2016–2017 – 52.47 %) and low-waste, resource-saving – by 137 units (Growth rate in 2016–2017 – 81.68 %).

So, according to the above, there is a negative dynamic regarding the implementation of innovations by enterprises of the industrial complex. This means that the problems that were characteristic of Ukrainian industry in recent years have not been resolved, namely (Fig. 3):

- extensive nature of innovation processes in industry;
- use of scientific and technical developments of previous years;
- structural imbalances in investment activities;
- low demand for innovative products;
- lack of incentives for innovation and the like.

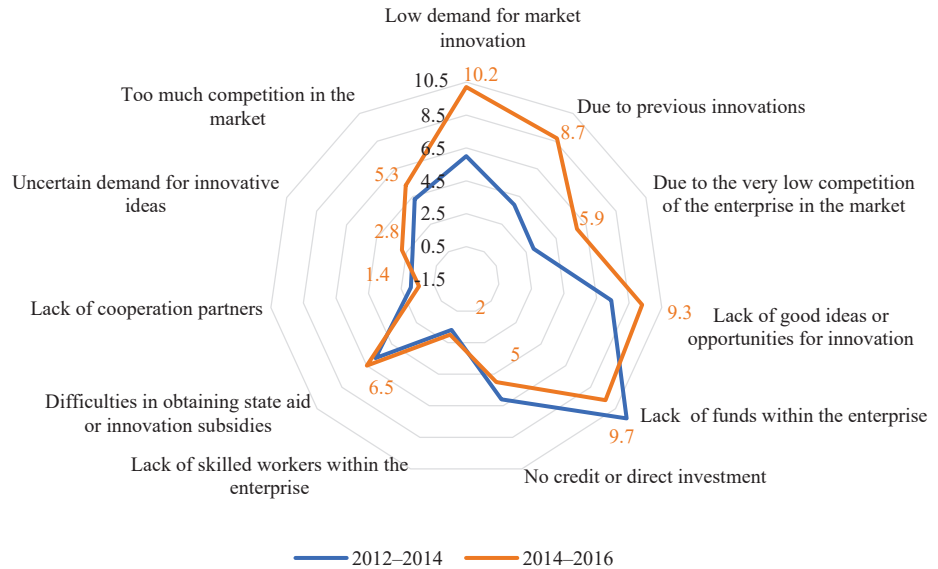


Fig. 3. Distribution of non-innovative enterprises for reasons hindering the implementation of innovations during 2012–2016, % [25]

This conclusion confirms the unstable dynamics of innovation in industrial enterprises of Ukraine. So, during the 2000–2017 the volume of implementing innovative types of products exceeds the volume of implementing new technological processes, although it tends to decrease (Fig. 4).

It is equally necessary to note that during 2006–2016 there has been a tendency to increase the number of enterprises that have implemented the process, marketing and organizational innovations (growth rate 2006–2008/2014–2016 – 107.29 %, 261.53 % and 228.94 %, respectively) (Table 1).

This indicates that industrial enterprises:

- become more active in non-technological innovations, the development of which has a positive effect on labor productivity;
- create competitive advantages in new markets (marketing strategies for entering new markets);
- develop new ways to promote products (innovation in marketing).

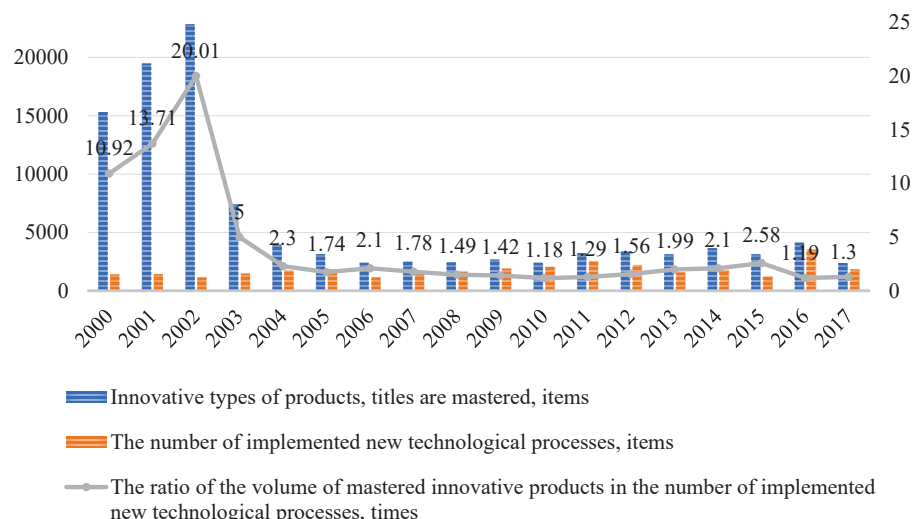


Fig. 4. Dynamics of innovation in the industrial enterprises of Ukraine in 2000–2017

Table 1
The share of industrial enterprises of Ukraine, implemented innovations by type of innovation in 2006–2016*

Types of innovations implemented by industrial enterprises	2006–2008	2008–2010	2010–2012	2012–2014	2014–2016
Technological innovations					
Innovative products	9.9	10.6	11.7	5.2	5.7
Innovative processes	9.6	10.6	12.4	7.2	10.3
Non-technological innovations					
Marketing innovation	3.9	4.0	3.1	5.4	10.2
Organizational innovation	3.8	4.0	3.1	4.7	8.7

Note: * – the table is based on the data of [25]

However, despite the positive changes in innovation, let's note that the industrial enterprises of Ukraine are still not using enough the potential of implementing non-technological innovations. The low level of implementation of these innovations indicates a lack of use by enterprises of modern methods of corporate governance and the development of integrated business management strategies. Among the main indicators characterizing innovation, an important place belongs to the costs of innovation (Fig. 5).

In the expense structure of the innovation activities of enterprises in Ukraine during 2000–2017 expenses for the purchase of machines, equipment and software, the proportion of which in 2017 was 64.69 %, prevail. The structure of expenditures of industrial enterprises in the areas of innovation is inefficient, because it has a low proportion of research and development, which in 2017 amounted to 23.7 % of their total. Despite the fact that by 2016, there was a positive dynamics of innovation activity of industrial enterprises in Ukraine, its level in 2017 decreased and amounted to only 16.2 %. Let's note that in 1992–1995 the share of innovation-active enterprises ranged from 20–26 %, and at the end of 1980 – 60–70 %. It should be noted that today in the countries of the European Union, the proportion of enterprises engaged in innovation activity is about 53 %.

This causes a high level of depreciation of fixed assets during 2000–2015 exceeds the critical 60 % (Fig. 6).

This is especially clearly seen in the post-crisis years 2011 and 2015 (the growth rate of 2009–2011 was 280.15 % and the growth rate of 2014–2015 was 179.87 %). With a simultaneous increase in the total expenditure on research and development (R&D) (the growth rate of 2009–2011 was 127.54 % and the growth rate of 2014–2015 was 116.23 %) (Fig. 5).

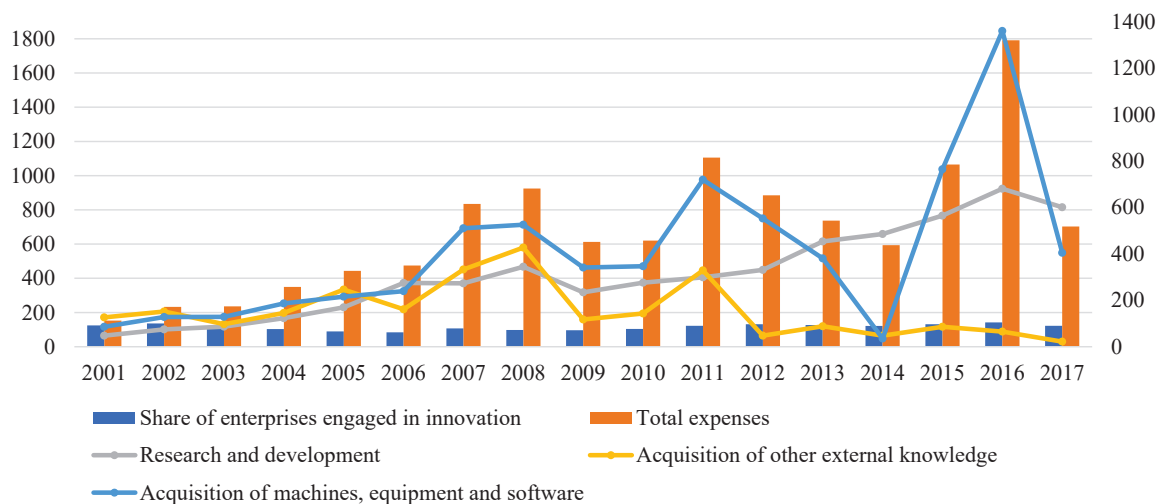


Fig. 5. The growth rate of total expenses in the areas of innovation enterprises in 2000–2017 (by the method of basic substitutions), % [26]

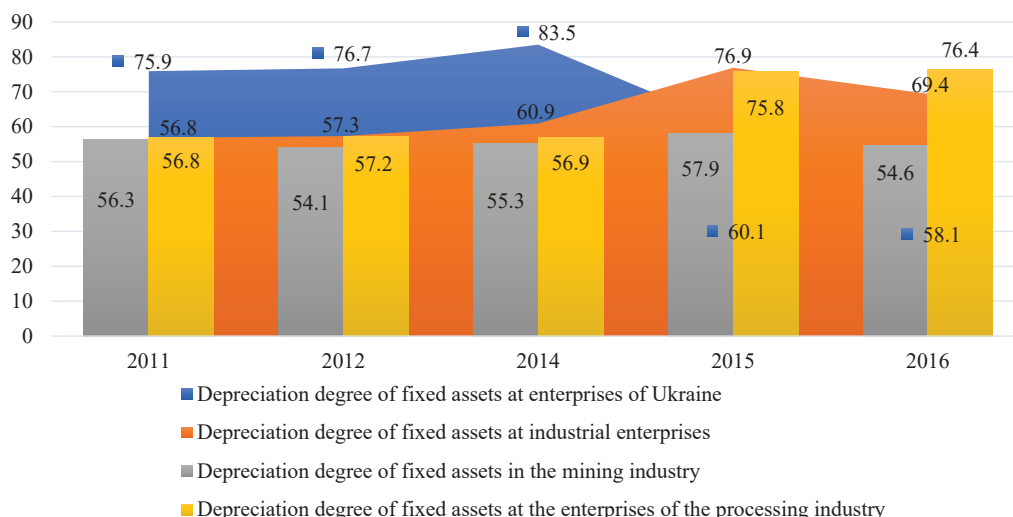


Fig. 6. Depreciation degree of fixed assets at the enterprises of Ukraine during 2011–2016, % [27]

A significant level of depreciation of fixed assets, including at the enterprises of the processing industry, in 2016 was 76.4 %, which leads to increased technical and technological backwardness. In addition, let's note that the share of costs associated with the acquisition of other external knowledge (new technologies) tends to increase since 2000 (Growth rate in 2000–2008 – 598.39 %).

Based on the above, let's state the imperfection of the structure of innovative costs and the growth of the orientation of industrial enterprises to acquire ready-made technological solutions. This situation leads to a decrease in the interest of businesses in the independent development of new products and technologies and encourages the financing of innovation processes that can ensure a return on investment in a relatively short time. Also worth noting is the downward trend in the share of expenditures on research and scientific and technical work in GDP, which is the decisive criterion for evaluating the effectiveness of innovative and transformational changes in the economy (Fig. 7). This confirms the presence of underfunding of research and development at the required level. Let's note that according to experts, the share of expenditures on the implementation of scientific and technical works in GDP was in the USSR: in 1950 – 0.99 %; 1960 – 1.77 %; 1970 – 2.49 %; 1980 – 3.00 %, in 1990 – 2.89 % [28]. In Ukraine in 2015, the share of these costs was 0.64 %, which is 4.5 times less when compared with 1990.

GDP growth in developed countries, more than 70 % is achieved through innovation, the use of patents and know-how in modern technology. In order to implement innovations in 2015, 213 enterprises bought new technologies (in Ukraine and abroad), of which 32 enterprises bought technologies abroad (Fig. 8).

In general, during 2007–2015 the number of new technologies acquired by domestic enterprises in Ukraine and abroad tends to

decrease. However, the number of transferred new technologies in 2015 was 118 against 1197 acquired (including 20 and 60 outside Ukraine, respectively). How do we conclude about the openness of the national innovation system of Ukraine, which is determined by the support of domestic enterprises not of their own science, but by the actual financing of foreign innovators. That is why technology transfer has not affected the economic performance of industry.

It should be noted that the creation of opportunities for expanded reproduction on an innovative basis is possible only if the level of profitability from operating activities is 30 % or more. This is especially true of the processing industry enterprises, the value of which in 2017 is only 4.4 %, from which it can be concluded that the production management of enterprises is ineffective in implementing high-end technologies.

It is equally necessary to indicate that the peculiarities of the quantitative and qualitative characteristics of the innovation costs of the domestic economy are determined by the conditions for financing innovation activities formed in Ukraine. Therefore, the next step in this work is an analysis of the distribution of the volume and structure of sources of financing innovation in industry (Fig. 9).

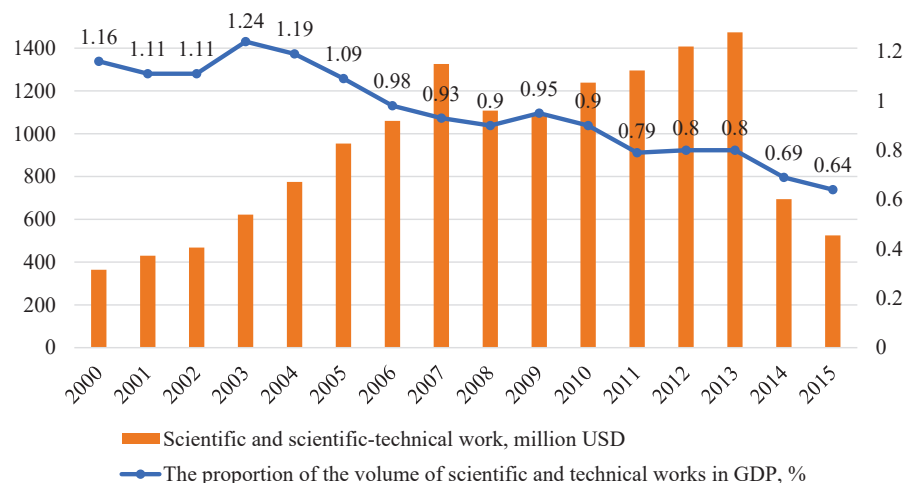


Fig. 7. Evaluation of the effectiveness of innovation and transformational changes in the economy of Ukraine for 2000–2015 [29, 30]

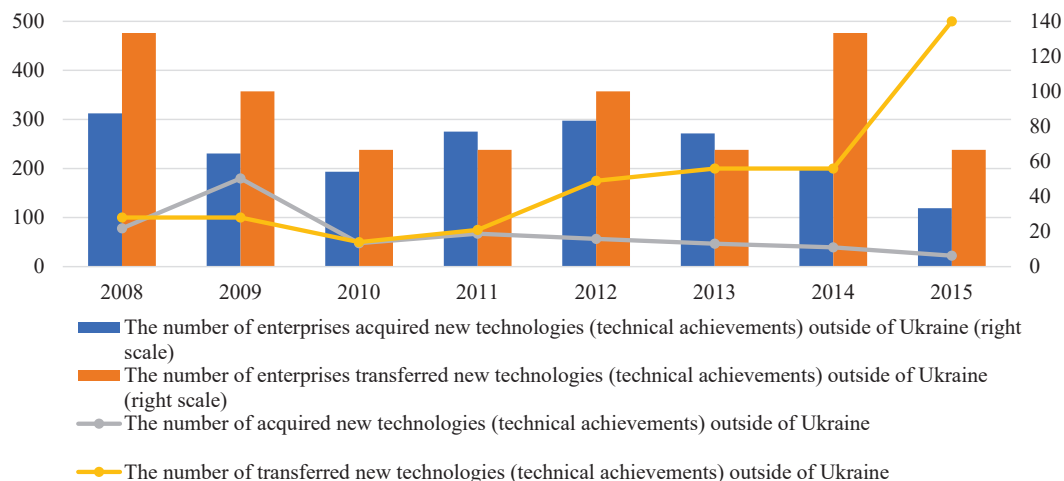


Fig. 8. Growth rates of the acquisition and transfer of new technologies by enterprises outside Ukraine during 2007–2015 (by the method of basic substitutions), %

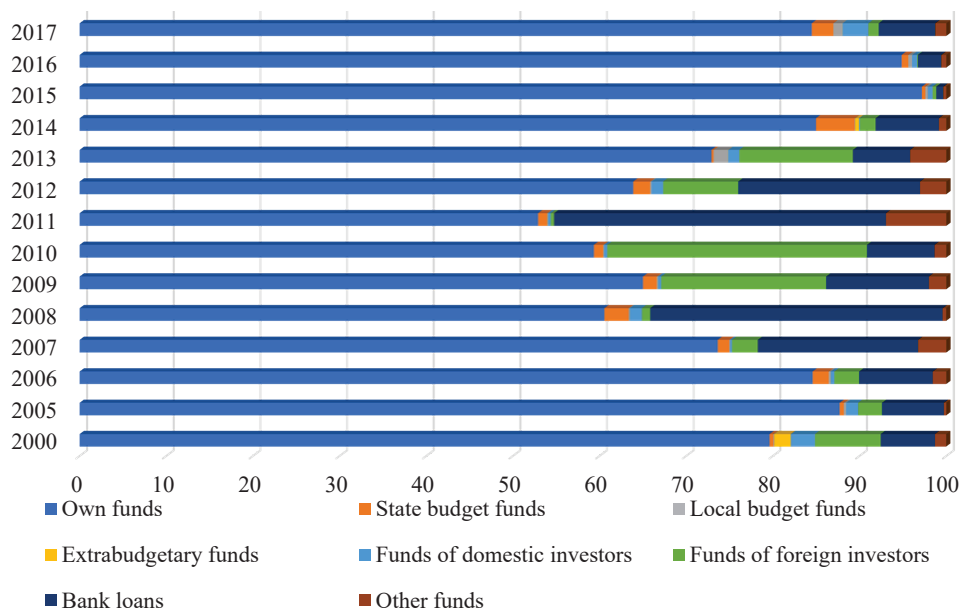


Fig. 9. Dynamics of the structure of financing innovation activities by sources in 2000–2017, % [31]

The main source of financing for innovation in Ukraine is the own funds of enterprises, which share in the general structure during 2000–2017. It is 79.6–94.8 %. However, in 2017 there is a tendency to reduce the indicator in absolute and relative terms, the share of which in the total volume of funding sources is 84.4 %, which is by 14331.8 million UAH/510.7 million USD less compared to 2016. On one enterprise that was engaged in innovative activities, on average in 2017 accounted for 30.61 million UAH/1.09 million USD of funds from all sources, including own funds – 29.03 million UAH/1.03 million USD (Fig. 10).

Let’s also note that the volume of loans from banks and other sources, which include funds from non-bank financial institutions, increased by 577.1 million UAH/20.59 million USD compared with 2000 and amounted to 709.4 million UAH/25.28 million USD in 2017. In 2015, their share was only 1.14 % (in 2000 – 7.52 %) due to financial and economic instability, and in 2017 it tended to increase and amounted to 7.78 %. The presented calculations make it possible to make an assumption about the role of financial institutions and the intensification of their participation in the investment processes of innovative development of the economy, which is a positive development. In addition, one enterprise that conducted innovation activity, on average, accounted for 0.82 million UAH/0.03 million USD of credit funds (in 2000 – 0.61 million UAH/0.11 million USD, in 2015 – 0.14 million UAH/0.01 million USD).

The state of sources of financing is reflected in the effectiveness of innovation in the industry of Ukraine, the level of which is defined as low. This is evidenced by the indicator

of the share of sold innovative products decreased by 8.7 % in 2017 compared to 2000 (9.4 %) and amounted to 0.7 % of the total volume of industrial products sold (Fig. 11). This indicates the insufficiency of the available sources of financial resources for the proper maintenance of the implementation of innovation activities and the implementation of priority innovation projects in Ukraine. This is due to the influence of the financial and economic crisis and the country’s inability to use the opportunities of 2010–2011 to ensure the growth of the economy. This is reflected in the fall in total funding in 2017, which amounted to only 9117.5 million UAH/324.93 million USD, or 0.80 % of GDP (in 2000 – 1.0 %, in 2008 – 1.3 % and 2014 – 0.5 %).

Let’s emphasize that since 2011 the intensity of innovation spending (the ratio of the volume of financing for innovation and sales of industrial products) has steadily decreased and by the end of 2017 reached its minimum value of 0.36 % (Fig. 12).

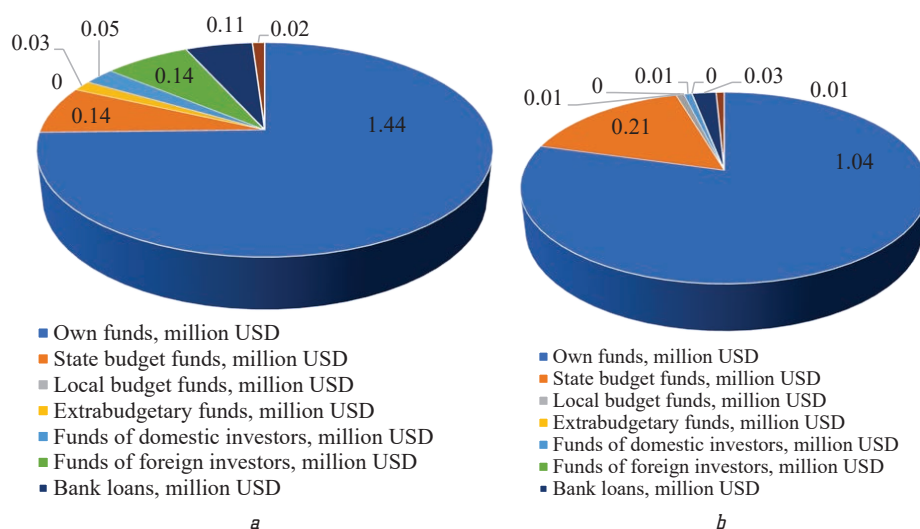


Fig. 10. Volumes of funds by sources attracted to finance the innovative development of one industrial enterprise of Ukraine in: a – 2000; b – 2017

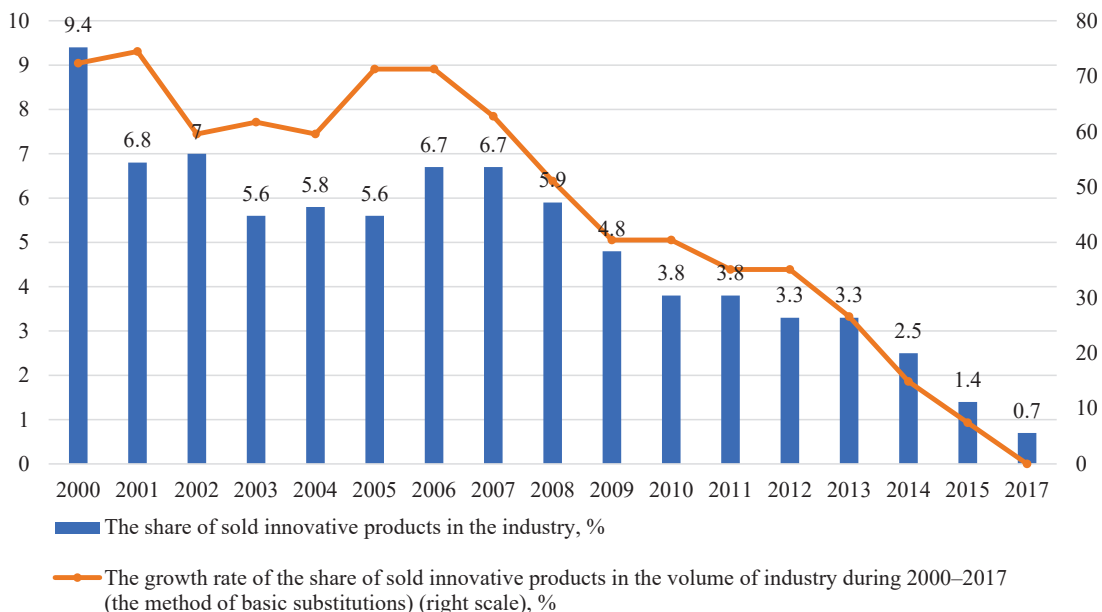


Fig. 11. The share of sold innovative products in the volume of industry [24]

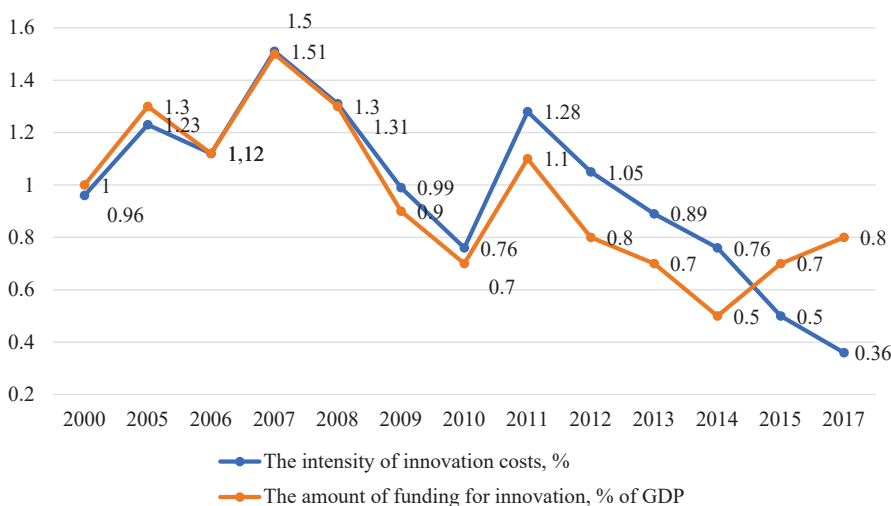


Fig. 12. The intensity of the formation of financial resources of innovative development of Ukraine for 2000–2017

The essence of the problem of insufficient efficiency of financial support for innovative development in Ukraine is the absence of well-established mechanisms for disclosing the potential of existing financial sources, the effective redistribution of the structure of attracted financial resources and priorities for the consumption of innovative products.

The innovative nature of the development of the economy requires the accumulation of fixed capital due to the growth of investment. According to Fig. 13 value of the indicator of gross fixed capital formation as a percentage of GDP below the critical level (18 %). Despite a gradual increase from 2015 as of 2017, the indicator is 16 %. Let's note that, in accordance with the «Methodological recommendations on the calculation of the level of economic security of Ukraine» recommended optimal value of the indicator is 25–30 % [32]. The existing regime in Ukraine bears the risk of degradation of the economy, which does not contribute to accelerated modernization of the economy (30 % or more).

Further, in accordance with the structure of this research, let's assess the degree of participation of banks in

lending the needs of the innovative development of the Ukrainian economy. To do this, let's define:

1) closeness of the relationship between the indicators characterizing the relationship between the credit activity of banks in innovative development, innovation activity of industrial enterprises and the country's ability to develop during 2007–2017;

2) significance of the participation of banks in the processes of modernization of industrial enterprises for 2002–2017.

In modern conditions, the development of industrial enterprises in Ukraine is of particular importance due to the modernization of the sectoral structure of the economy.

The quality of life of society, economic growth and the position of Ukraine in the world market of services depend on the development of industrial enterprises. The development of industrial enterprises becomes possible only in the context of the implementation of a model of intensive innovation development; it envisages the search for innovative methods and management technologies that can accelerate the adaptation of these enterprises with the latest scientific achievements.

A general rise in the well-being of the population is possible under the condition of the dynamic development of the economy, which is ahead of GDP growth, the growth of expenditures on the development of scientific and technological progress and financial support for the innovation activities of enterprises. That is why it is necessary to develop measures to stimulate the processes of bank lending for the innovative development of both individual enterprises and the economy of Ukraine as a whole.

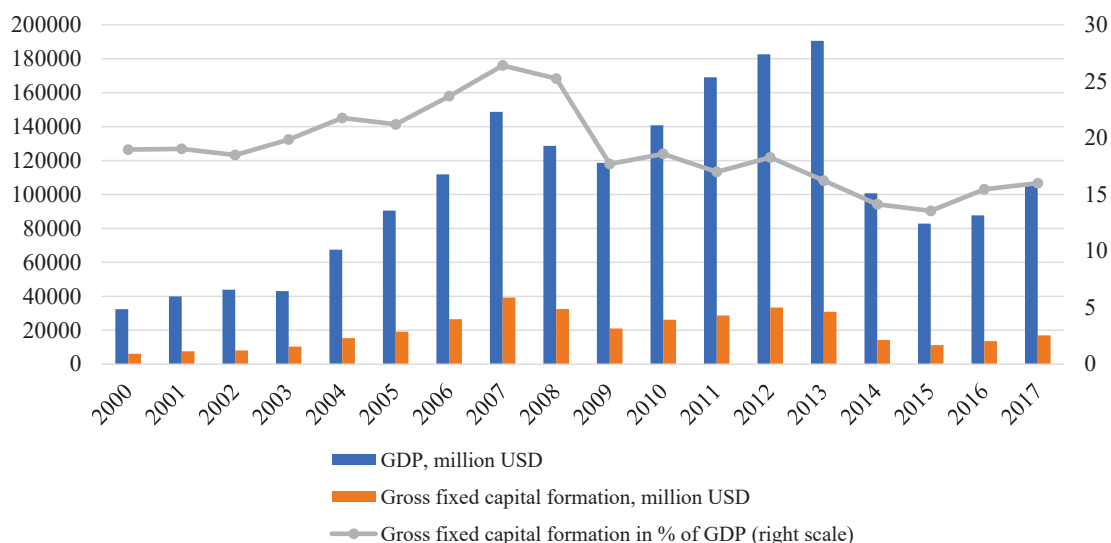


Fig. 13. Gross fixed capital formation in % of GDP for 2000–2017 [33]

In order to determine the closeness of the relationship between the two countries during the period 2007–2017, let's use the method of statistical information processing, such as correlation analysis and official data of the National Bank of Ukraine and the State Statistics Committee of Ukraine. Correlation matrix between indicators Credits granted to non-financial corporations for the purchase, construction and reconstruction of real estate (over 1 year) (million USD), Share of innovative products sold in industry (%), Capital investment (million USD), Gross accumulation of fixed capital (million USD) and GDP (million USD) will be built in the software package Statistica 10.0. Despite the limited time interval within which the estimated indicators are analyzed, let's consider them representative (Table 2).

According to the data presented in Table 2, there is a relationship between the considered indicators, but not close. A moderate (medium) relationship is determined between the indicators Gross fixed capital formation and Loans granted to non-financial corporations for the purchase, construction and reconstruction of real estate (over 1 year) ($r=-0.377$). A moderate connection is also defined between the indicators Capital investments and loans granted to non-financial corporations for the purchase, construction and reconstruction

of real estate (over 1 year) ($r=-0.444$). Negative correlation indicates the inverse relationship between variables, that is, the growth of Gross fixed capital formation and Capital investment occurs when the indicator decreases. Loans granted to non-financial corporations for the acquisition, construction and reconstruction of real estate (over 1 year). It is possible to conclude that the success of the modernization and restructuring measures of the economy is determined by the level of investment in fixed assets. This is largely determined by the effect of other data that are not included in the analysis of data and is practically unrelated to the use of long-term banking system resources.

An innovative model of economic development requires the formation of a powerful industrial base capable of creating new value. Let's recall that the use of state budget funds is limited (in 2017, the share of the indicator is only 2.49 % of the total amount of sources of funding for innovation activities). Own funds of enterprises are characterized as an unstable source in conditions of insufficient profitability from operating activities (4.4 % in 2017) and a general reduction in the number of enterprises that made a profit (71.7 % in 2017 compared to 73.7 % in 2015).

Table 2

Matrix of correlation between loans granted to non-financial corporations for the purchase, construction and reconstruction of real estate (over 1 year) and indicators characterizing the innovation activity of industrial enterprises and the country's ability to development during 2007–2017*

Variables	Correlation				
	GDP, million USD	Gross fixed capital formation, million USD	Capital investment, million USD	Share of sold innovative products in the industry, %	Credits granted to non-financial corporations for the purchase, construction and reconstruction of real estate (over 1 year), million USD
GDP, million USD	1.000	0.913	0.925	-0.903	-0.304
Gross fixed capital formation, million USD	0.913	1.000	0.985	-0.671	-0.377
Capital investment, million USD	0.925	0.965	1.000	-0.705	-0.444
Share of sold innovative products in the industry, %	-0.903	-0.671	-0.705	1.000	0.230
Credits granted to non-financial corporations for the purchase, construction and reconstruction of real estate (over 1 year), million USD	0.304	-0.377	-0.444	0.230	1.000

Note: * – author's own development using data of [34]

Therefore, it is the availability of loans that should be the source of growth in the real sector of Ukraine. However, the potential of bank lending, defined as the ratio of bank loans to GDP, is only 27.82 % (in developed countries – more than 60 %) (Table 3).

Reducing the threshold for enterprises to use investment bank loans, their insignificant share in the total volume of loans to the corporate sector and in GDP indicates the manifestations of the financial and economic crisis. The consequences of the financial and economic crisis are:

- unprofitability and high level of depreciation of fixed assets of the majority of operating industrial enterprises;
- focus of banks on obtaining current benefits (investing in projects with a short payback period) and meeting the needs for banking services of various sectors of society.

The next step in this research is determination of the significance of the participation of banks in the processes of modernization of industrial enterprises. To do this, let's use the methods of nonparametric statistics (Statistics Nonparametrics) in the software package Statistica 10.0.

The main criterion for the selection of industrial enterprises is the use of long-term bank loans to finance capital investment in progress. The system of indicators also includes own funds, the depreciation ratio of fixed assets, financial expenses and net financial result: profit (loss).

In our work let's use the data of the official financial statements of 23 industrial enterprises of Ukraine for 2002–2017, namely:

- PJSC «Odesa Cable Plant «Odesakabel»;
- PJSC «Odesa Baby Food Cannery»;
- PJSC «Odesa Loaf»;
- PJSC «Odesa Machine–Building Plant»;
- PJSC «Odesa Agricultural Engineering Plant»;
- PJSC «Dneprotyazhmash»;
- PJSC «Zaporizhzhia Ferroalloy Plant»;
- PJSC «Artemivsk Non-Ferrous Metals Processing Plant»;
- PJSC «Ukrelectroaparat» (Khmelnyskyi);
- PJSC «Sumy Plant of Pumping and Power Engineering»;

- PC «AvtoKrAZ» (Kremenchuk);
- PJSC «Dnipropetrovsk Aggregate Plant»;
- PJSC «Holodmash» (Odesa);
- PJSC «Azovstal Iron&Steel Works» (Mariupol);
- PJSC «Poltava Mining and Processing Plant»;
- PJSC «Avdiivka Coke Plant»;
- PJSC «Fregat» (Pervomaisk, Mykolaiv region);
- PJSC «Ukrgraphite» (Zaporizhzhia);
- PJSC «ROSAVA» (Bila Tserkva, Kyiv region);
- PJSC «Makiivka Iron&Steel Works»;
- PJSC «Marganets Ore-Repair Plant» (Marganets, Dnepropetrovsk region);
- SLC «InterChem»;
- PJSC «Kyivhimvolokno».

The choice of these enterprises is due to:

– first, the existence of a direct relationship between the size of the enterprise and its level of innovation (implementation of innovations requires appropriate personnel involved in the implementation of research). According to the State Statistics Committee, the highest proportion of both technologically innovative and non-technologically innovative enterprises is among the large enterprises (31.4 % and 28.1 %, respectively, during 2014–2016) [25];

– secondly, since the industrial enterprises included in the sample are large taxpayers, issuers of securities, regular and irregular information about their activities is available in the public information database of the National Commission on Securities and Stock Market [35]. This allows the author to collect all the necessary information for the study.

The use of non-parametric statistics in the work is justified by conducting tests, according to which the hypothesis of normality is rejected. To check the normality of the distribution calculated: average and median; coefficients of asymmetry, kurtosis, their comparison with the standard error is made. The tests of Kolmogorov-Smirnov and Shapiro-Wilk's W test are also calculated for variables: the net financial result of industrial enterprises before and after using long-term bank loans.

Table 3

The volume of loans granted by banks in investment and innovation activities during 2007–2017*

Indicators Years	The total amount of loans granted by banks of Ukraine to non-financial corporations in the target area, million USD	Share of bank loans in GDP, %	Credits for the purchase, construction and reconstruction of real estate (from 1 year), million USD	Share of loans for the purchase, construction and reconstruction of real estate (from 1 year), in total loans to non-financial corporations, %	Credits to non-financial corporations and households for the purchase, construction and reconstruction of real estate (from 1 year), million USD	Share of loans to non-financial corporations and households for the purchase, construction and reconstruction of real estate (1 year) in GDP, %
2007	51579	34.68	1829	3.55	10177	6.84
2008	57618	44.78	2011	3.49	13360	10.76
2009	57921	48.81	1878	3.24	14594	12.30
2010	62934	44.71	1448	2.30	12005	8.53
2011	72123	42.66	1113	1.54	10120	5.99
2012	75772	41.49	791	1.04	8247	4.52
2013	86596	45.44	1511	1.75	8069	4.23
2014	49418	49.08	919	1.86	5542	5.50
2015	32824	39.62	475	1.45	3298	3.98
2016	30235	34.46	330	1.09	2562	2.92
2017	29577	27.82	317	1.07	2009	1.97

Note: * – table is based on the data of [29, 34]

So, let's study the indicators of 23 industrial enterprises of one sample before and after using long-term bank loans using the comparing two dependent samples (variables) method of non-parametric statistics. Namely, let's confirm the statistical significance of the change, or refute the idea that the use of long-term bank loans leads to a significant change in the net financial result of industrial enterprises.

Let's form the working hypotheses:

- H_0 – no significant changes;
- H_1 – changes are significant.

To confirm statistical significance, let's use the Wilcoxon Matched Pairs Test (Table 4).

Table 4

The results of the test for statistical significance by the Wilcoxon Matched Pairs Test*

Pair of Variables	Wilcoxon Matched Pairs Test Marked tests are significant at $p < 0.05000$			
	Valid N	T	Z	p -level
Net financial result: profit (loss) before using long-term bank loans, thousand USD & Net financial result: profit (loss) after the use of long-term bank loans, thousand USD	172	6242.500	0.202064	0.839867

Note: * – author's own development using data of [35]

According to the obtained results, the Wilcoxon test is not significant, since p -level > 0.05 (Wilcoxon Matched Pairs Test p -level > 0.839). According to the hypothesis H_1 , the change is significant is refuted. This means that the use of long-term loans from banks in the period from 2002 to 2017 not a few significant effects on the processes of modernization and did not contribute to significant changes in the net financial result of a group of industrial enterprises.

Let's also consider it necessary to note that during the study period only 11 enterprises:

- PJSC «Odesa Cable Plant «Odesakabel»;
- PJSC «Dneprotvazhmash»;
- PJSC «Zaporizhzhia Ferroalloy Plant»;
- PJSC «Artemivsk Non-Ferrous Metals Processing Plant»;
- PJSC «Ukrelectroaparat»;
- PJSC «Dnipropetrovsk Aggregate Plant»;
- PJSC «Azovstal Iron&Steel Works»;
- PJSC «Poltava Mining and Processing Plant»;
- PJSC «Fregat»;
- PJSC «Ukrgraphite»;
- SLC «InterChem»

are received a net financial result in the form of profit, the dynamics of changes of which correspond to an increase after the use of long-term bank loans in certain years.

For example, PJSC «Odesa Cable Plant «Odesakabel» has been using long-term bank loans for 11 years. The company is one of the CIS leaders in the production, in accordance with international standards, of telephone communication cables, optical fiber cables and LAN (Local Area Network) cables. By types of economic activity of KVED (classifier of types of economic activity) DK 009:2010 PJSC «Odesakabel» refers to the processing industry.

During the study period, PJSC «Odesakabel» implemented the following investment projects:

- 2007 – new plant for the production of power cables with voltage up to 1 kV;

- 2008 – the work of the new direction for the production of heating cables;
- 2008 – modernization and increase in production capacity for the production of LAN cables;
- 2009 – commissioning of the production capacity of power copper and aluminum cable up to 10 kV;
- 2010 – establishment of additional capacity to increase the production of digital and LAN cables;
- 2016 – reconstruction and modernization of the shop for the production of fiber optic cables began;
- 2017 – reconstruction and modernization of the shop for the production of fiber-optic cables is continued.

Sources of financing and financial results from the implementation of measures for the restructuring of the enterprise are presented in Table 5.

Table 5

Financial statement data PJSC «Odesa Cable Plant «Odesakabel» for 2006–2017

Year \ Indicator	Long-term bank loans, thousand USD	Own funds, thousand USD	Capital investments in progress, thousand USD	Net financial result: profit (loss), thousand USD
2006	5000	18395	6748	684
2007	5279	13797	919	2227
2008	4889	6209	1109	-7931
2009	3391	3569	598	-1590
2010	2696	5192	1251	1354
2011	3404	8356	927	2809
2012	3801	3197	616	868
2013	3801	5201	234	1067
2014	3802	50	429	-2401
2015	3800	1174	713	1031
2016	3828	3385	147	2181
2017	7761	5956	994	2316

Let's note that the most successful were 2016–2017. The processes of modernization and reconstruction of the specified period ensured an increase in the net financial result (profit) by 5.700 thousand UAH/203 thousand USD. The growth in the capital investment in progress (growth rate 2016–2017 – 676.19 %) contributed to the growth of net profit in the amount of 6.18 %. Incomplete capital investments were financed by long-term bank loans and the company's own funds at a ratio of 1:8:6 (the 2016–2017 growth rate was 202.27 % and 176.04 %, respectively). This confirms the conclusions about the importance and role of banks in the processes of modernization of industrial development.

7. SWOT analysis of research results

Strengths. The strength of research is that, based on empirical generalizations, data are given that provide an opportunity to determine the impact of funding sources, in particular bank loans, on the state of Ukraine's innovation sector. And also to identify measures to enhance the stimulation of banks' lending of technological development of the national industry. The implementation of the proposed measures will contribute to the stable development of the real sector of the economy.

Weaknesses. The weak point is that the recommended measures for program-targeted management and financing can be implemented only if a comprehensive national economic breakthrough program is implemented.

Opportunities. Opportunities for further research is studying the experience of the leading countries of the world in building a system of interaction between public and private institutions, creating conditions for socio-economic development with a modern management model, ensuring the effectiveness of investment in the real sector.

Threats. Threats to the research results are that the provision of structural transformations in the Ukrainian economy is due to the complexity of combining the resources of various departments. Changing the mechanisms for ensuring stability requires rapid response, the development of an adequate system of indicators for assessing the impact of new economic factors.

8. Conclusions

1. Investigation of trends in the innovation of economic development. From what it is possible to conclude that the problem of inadequate level of innovation activity and low level of innovation activity of Ukrainian industrial enterprises is systemic in nature and is due to the general principles of organizing the socio-economic activities of Ukraine, namely:

- lack of strategic goals and objectives of the innovative development of the state, long-term and medium-term forecasting and planning of socio-economic development;
- loss of its value in the priority directions of development of science and technology and innovation in Ukraine; competitive financing systems, as the main mechanism for financing science and innovation; stimulating factors of science development. This led to a significant reduction in innovation activity of industrial enterprises caused by the suspension of the implementation of the laws of Ukraine «On the nationwide comprehensive program for the development of high technology-intensive technologies», «On the priority directions of innovation activity in Ukraine», «On the special mode of innovation activity of technological parks». Also, the implementation of the laws of Ukraine «On Science Parks» and «On State Regulation of Activities in the Field of Technology Transfer»;
- failure to comply with the provisions of the Law of Ukraine «On Scientific and Scientific-Technical Activities» regarding budget financing of science at the level of 1.7 % of GDP and measures to create favorable economic conditions for the activities of scientific institutions. This led to a weakening of the financial, tax, credit incentives for the development of innovation, technology transfer, lack of incentives for attracting funds of enterprises in research and development.

2. It is determined that the overall investment potential of Ukraine is characterized by low economic efficiency, which leads to a slowdown in the innovative development of the economy, namely:

- predominance of own funds in the structure of sources of financing innovation, a low level of profitability of operating activities, which adversely affects the reproduction cycle and is a destabilizing factor in the development of production and financial sustainability of industrial enterprises;

- unacceptably low level of state financing of innovation activities, significant fluctuations in the funds of foreign investors, as a result of deteriorating business conditions and an unfavorable investment climate in the country. This actualizes the need to actively use the advantages of a bank loan to partially solve the problems of financial support for innovative development of the economy in general and restructuring industrial enterprises in particular.

3. The interrelation between the credit activity of banks in innovative development, the innovation activity of industrial enterprises and the country's ability to develop is investigated, namely, it is determined that:

- processes of innovative development of the country's economy are practically unrelated to the use of long-term bank loans and have feedback. The low level of closeness of the relationship between the variables indicates the effect of unrecorded data in the analysis, in particular the cost of bank loans, which requires further research;
- decline in the use of loans of the banking system is caused by the low ability of industrial enterprises to create opportunities for expanded reproduction on an innovative basis and a significant level of depreciation of fixed assets.

4. The participation of banks in the processes of modernization of the group of industrial enterprises of Ukraine is determined using the methods of statistical information processing, from which it can be concluded that:

- use of long-term bank loans as a source of financing capital investment in progress does not have a significant impact on the modernization processes of a group of industrial enterprises and does not contribute to significant changes (increase or decrease) in the net financial result;
- development (increase in net financial result in the form of profits) of enterprises is ensured by the increase in capital investment in progress, which is accompanied by an increase in long-term bank loans.

Based on the above, the activation of stimulating creating by banks of technological development of national industry, the search for opportunities for a breakthrough in economic development as the main prerequisite for innovative development of Ukraine, provides for the practical implementation by the state of the program-targeted planning method. The method of indicative planning, based on targeted management and financing, envisages the creation of a system of interaction between state and private institutions for financing development projects, direct and venture capital funds, national long-term money and a derivatives market.

The main tasks of development institutions for financing projects are financing with state support for development programs, programs for updating and modernizing the means of production, the ultimate goal of which is creation of high-tech export-oriented products with the creation of new jobs.

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