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Impact of investments on labour productivity in the chemical and petrochemical industry of the Republic of Kazakhstan

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Abstract

Relevance. Currently, the petrochemical and chemical industries are one of the main areas in the international economy. That is why it is important to choose effective alternative networks by promoting investments in factories to achieve certain indicators in the field of labour. The relevance of this topic is conditioned by the fact that labour productivity in the modern environment plays a crucial role in the activities of various industries.

Purpose. The purpose of the study is to assess the correlation of investment and labour productivity in the chemical and petrochemical industry of the Republic of Kazakhstan.

Methodology. The study used several methods of scientific research, specifically: correlation and regression analysis.

Results. As a result, it was possible to explore the areas of activity responsible for the development of the chemical and petrochemical industry, namely: the development and production of oil, associated (petroleum) and natural gas, the production of chemical and petrochemical products, the production of coke and refined petroleum products, the development of rubber and plastic products. This allowed establishing the level of impact of investments on labour productivity of each of the above-mentioned sub-sectors. In addition, statistical data were investigated, based on which indicators were established reflecting the features of interaction between such components as investment, industrial development, and the improvement of professional personnel. The factors that qualitatively affect the efficiency of external market conditions for corporations are disclosed.

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Conclusions. The research shows that investments in chemical products, coke, and refined petroleum are more effective than those in crude oil and natural gas production. The practical value of the study is revealed in the possibility of using the results when developing development plans for specific chemical and petrochemical enterprises in the Republic of Kazakhstan, by attracting a specific type of investment.

Keywords: energy efficiency; capital; infrastructure; productivity factors; innovation.

Introduction

The petrochemical industry is a highly integrated network of chemical processes, where a certain product is produced by a combination of production aspects, where one chemical substance can be used as a raw material for various processes. Moreover, the petrochemical industry is important in the chemical industry, where products are produced at the expense of crude oil or natural gas.

A key aspect of petrochemical production is that the central unit is at the disposal of suppliers at the apogee and forms the primary material for other units. Relying on the advantageous priorities of natural resources and the workforce, developed countries have attached special importance to the development of manufacturing industries, thereby becoming the production base of the world's raw materials and primary industrial products. Given the availability of rich natural resources, the proximity of important markets and the growing demand for chemical and petrochemical products, Kazakhstan has a solid base for further development of this industry. However, this developing sector of the economy is hampered by a shortage of skilled workers and low labour productivity. Economic factors are actually crucial in determining the structure of the industry.

For example, K.M. Boaventura et al. [1] proposed a multi-purpose model that determines how much the power of labour-dependent processes can minimise functions representing the total cost and risk of the petrochemical network. The proposed model can be used to evaluate investments in the petrochemical industry, while assessing the level of risk in general. Economic uncertainty contributes to the preservation of the need for innovation and technological progress. H. Hassani et al. [2] considered definitions of the importance of innovation and technology in the oil and petrochemical industry. The paper by G. Yang et al. [3] reported that infrastructure investments improve the economic growth of all countries to varying degrees, i.e., contributes to strengthening the division of labour and the structure of trade between countries.

The petrochemical industry is an area that creates jobs, i.e., has the ability to play a significant role as an engine of the economy for other industrial sectors. The rise of the performance indicator in production in terms of increasing the efficiency of the use of resources and the application of comparative advantages is very significant. For example, the study by V.B. Samuel et al. [4] gives an idea of the sustainable production indicators used by the petrochemical industry to measure sustainable activity. Like other branches of the manufacturing industry, the petrochemical industry uses all kinds of resources (labour, income, and energy) to implement production indicators. Nevertheless, energy carriers, including natural gas, petroleum products, and electricity, represent a noticeable impact in the production functioning of this sphere.

In general, there is an open consistency in the work and energy environment. Human labour and energy are the main keys of production functioning, and there is a connection between them. J. Valizadeh et al. [5] analysed the impact of energy prices on the efficiency of energy use in the petrochemical industry. The results of the study demonstrate that the energy labour index in the petrochemical industry has a long-term growth trend. The growth of investments in labour can directly lead to the replacement of labour by energy factors, which will lead to an increase in energy intensity. It is also worth considering that the replacement of labour with capital will favourably affect energy intensity with the help of a complementary relationship between energy and income. At the same time, the problem of increasing labour costs is effectively solved by replacing working personnel with technological equipment in order to reduce costs. However, this will lead to an increase in energy consumption, since the equipment requires connection to electricity.

In this regard, the purpose of this study is to analyse and evaluate the correlation of investment and labour productivity in the chemical and petrochemical industry of the Republic of Kazakhstan. The study examines the relationship between the volume of investments in the petrochemical and chemical industries of the country and labour productivity in these industries.

Materials and Methods

This study used such research methods as correlation analysis, regression analysis using the statistical programme SPSS Statistics. Correlation analysis is necessary to establish the relationship between variables, which can be further applied in practice. With a positive linear correlation, higher values of the investment value will correspond to higher values of productivity, and lower values of one will correspond to low values of the other, respectively. With a negative linear correlation, higher investment values correspond to lower productivity values, and lower values of one attribute correspond to high values of another. But the presence of correlation is not enough to formulate a final conclusion about the presence of a causal relationship. The Pearson correlation coefficient r_{xy} , which is between -1 and 1, was used in this paper as follows (1):

$$r_{XY} = \frac{\text{cov}(X,Y)}{\sigma_X \sigma_Y} = \frac{\sum_{i=1}^N (X_i - \bar{X})(Y_i - \bar{Y})}{\sqrt{\sum_{i=1}^N (X_i - \bar{X})^2 \cdot \sum_{i=1}^N (Y_i - \bar{Y})^2}} \quad (1)$$

The value r_{XY} characterises the level of relationship between variables: -1 shows a strong negative relationship; 0 – lack of relationship; +1 – a strong positive relationship. At the same time, the maximum value is reached when the points on the graph of two-dimensional scattering lie on one straight line, i.e., the outlier of values is minimal. Regression analysis was also carried out to study the patterns of relationships between certain quantities by

setting the regression equation. The conditional mathematical expectation of the dependent variable (labour productivity) is also estimated at the given values of predictors (2):

$$f(x_1, x_2, \dots, x_n) = M(y|x_1, x_2, \dots, x_n). \quad (2)$$

When analysing the influence of factors on energy, the following regression model was used (3):

$$GAP_{Et} = \beta_0 + \beta_1 \left(\frac{L}{E}\right)_t + \beta_2 \left(\frac{K}{E}\right)_t + \beta_3 P_{Lt} + \beta_4 P_{Kt} + \beta_5 P_{Et} + \beta_6 T + U_t, \quad (3)$$

where GAP_{Et} – average efficiency of energy consumption at time t ; $\left(\frac{L}{E}\right)_t$ – the ratio of labour to energy production at time t ; $\left(\frac{K}{E}\right)_t$ – the ratio of income to energy used at time t ; P_{Lt} – the cost of labour over time; T – technological progress; U_t – error variable.

All analyses were performed using SPSS Statistics software suite, which has the ability to solve any type of problems from forecasting to data analytics with graphical demonstrations. A number of features of the information and analytical system SPSS Statistics can be distinguished:

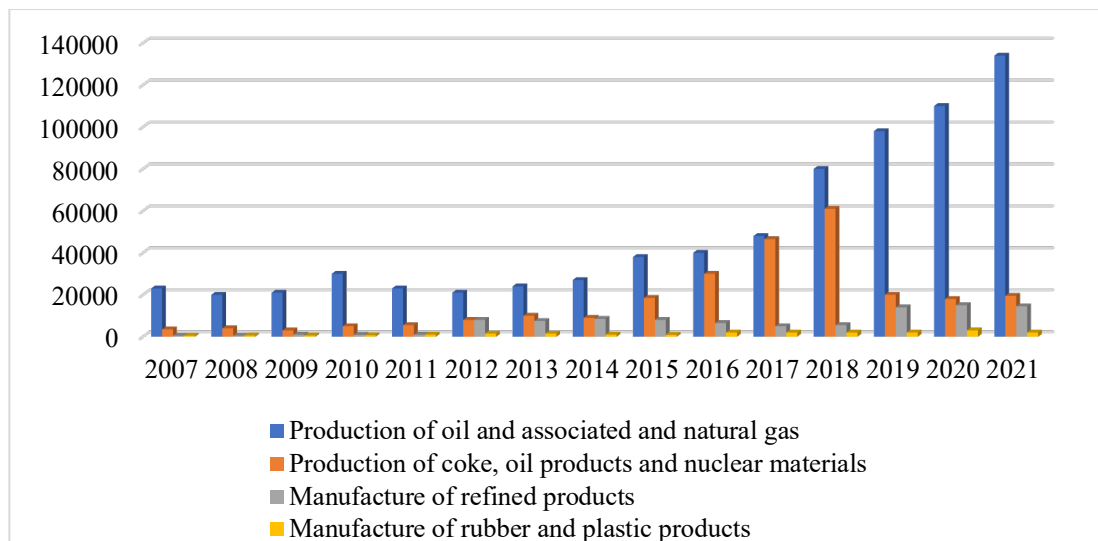
- system provides personal customisation of functions and user interfaces for various degrees of qualification and functional responsibilities;
- SPSS Statistics covers all the main parts of complex functioning – from data collection and preparation and management to analysis and reporting;
- provides ready-to-use standards for graphs and reports, enabling easy processing of the final results in a presentable and clear view for other interested parties.

The SPSS Statistics programme has the following advantages:

- provides a quick understanding of large and complex data sets with the help of modern statistical actions that support the provision of high verbatim and character exclusion solutions;
- allows the use of software extensions in the Python and R programming languages for integration with open source software;
- facilitates software preference and management by providing flexible deployment options.

Results

Investments are a function of two components: technical uncertainty and uncertainty regarding the growth of prices for equipment, materials and services. Thus, it is presented as a product between these two components. At the same time, the characteristics of these uncertainties are independent. The analysis begins with studying the dynamics of changes in investment volumes, but since the volume of investments in the production of oil and associated and natural gas exceeds investments in other industries by several times, in particular, in 2019, the volume of investments in the production of coke and refined petroleum products exceeded by 26 times, in the production of chemical products – by 28 times, and in the production of rubber and plastic products – 508 times. In order to carry out a comparative assessment and achieve comparability of data, the volume of investments accounted for on average per employee in the relevant field was calculated and the dynamics of changes in this indicator was studied (Figure 1).



Source: compiled by the authors based on D. Karabayev [6].

It is also worth noting that in comparison with the volumes of oil production and reserves, only insignificant oil refining capacities are concentrated in developing countries, while in most countries this industry is in decline. According to the presented data, there is a steady growth and excess of investments in the field of oil and associated and natural gas production compared to other

areas. Until 2018, stable growth was observed in the production of coke and refined petroleum products, but in the subsequent years there was a sharp decline in this indicator, and it turned out to be 4 times less than in the field of oil production. In the production of chemical industry products, the volume of investments per employee is 8 times less than investments in oil production, while,

however, there has been an upward trend over the past three years. The lowest volume of investment per employee is observed in the production of rubber and plastic products: 33 times less than in oil production. Thus, even after bringing the indicators into a comparable form, there is a big difference in the financing of the extractive and manufacturing industries.

Considering the dynamics of changes in labour productivity, there is a significant excess and stable growth since 2015 in oil and associated gas production, while relatively low labour productivity indicators are observed in the production of refined petroleum products and rubber and plastic products, which is explained by the specifics of production (Figure 2).

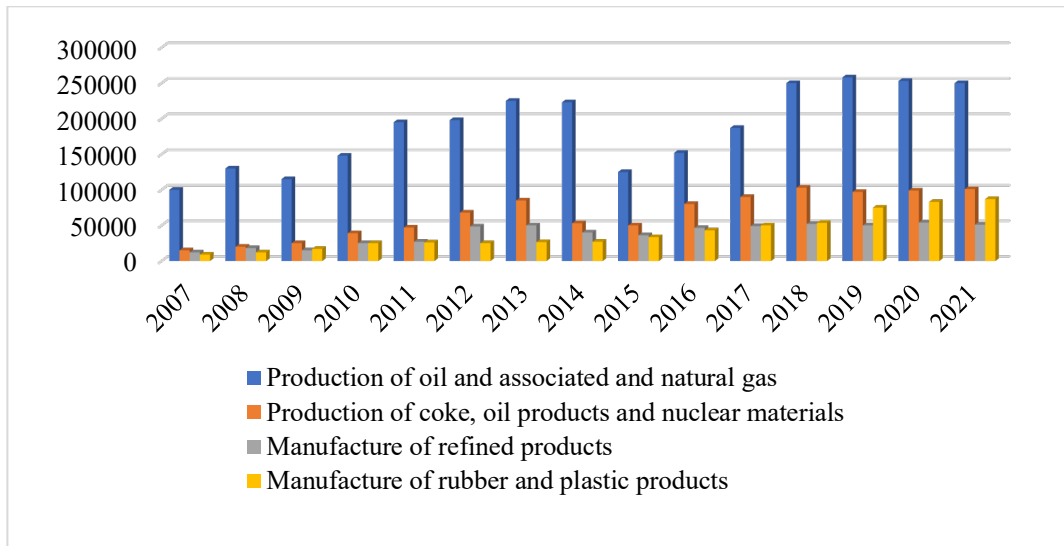


Figure 2. Dynamics of labour productivity changes in the chemical and petrochemical industry of the Republic of Kazakhstan, thousand KZT per 1 employee

A correlation analysis of investments and labour productivity for each production is presented below (Table 1).

Table 1. The relationship between investment and labour productivity

Sphere of production	Value calculation	Value
In the field of oil and associated and natural gas production	Pearson correlation	0.676*
	Value (two-sided)	0.011
In the production of coke and refined petroleum products	Pearson correlation	0.744**
	Value (two-sided)	0.004
In the production of chemical industry products	Pearson correlation	0.743**
	Value (two-sided)	0.004
In the field of production of rubber and plastic products	Pearson correlation	0.344
	Value (two-sided)	0.250

Note: * – correlation is located at 0.05 (two-sided); ** – correlation is located at 0.01 (two-sided).

Source: compiled by the authors.

There is a significant correlation between investments and labour productivity in the field of oil and associated gas and natural gas production, in the manufacture of coke

and refined petroleum products, in the production of chemical products, and in the latter two the correlation is significant at the level of 0.01 (Figure 3).

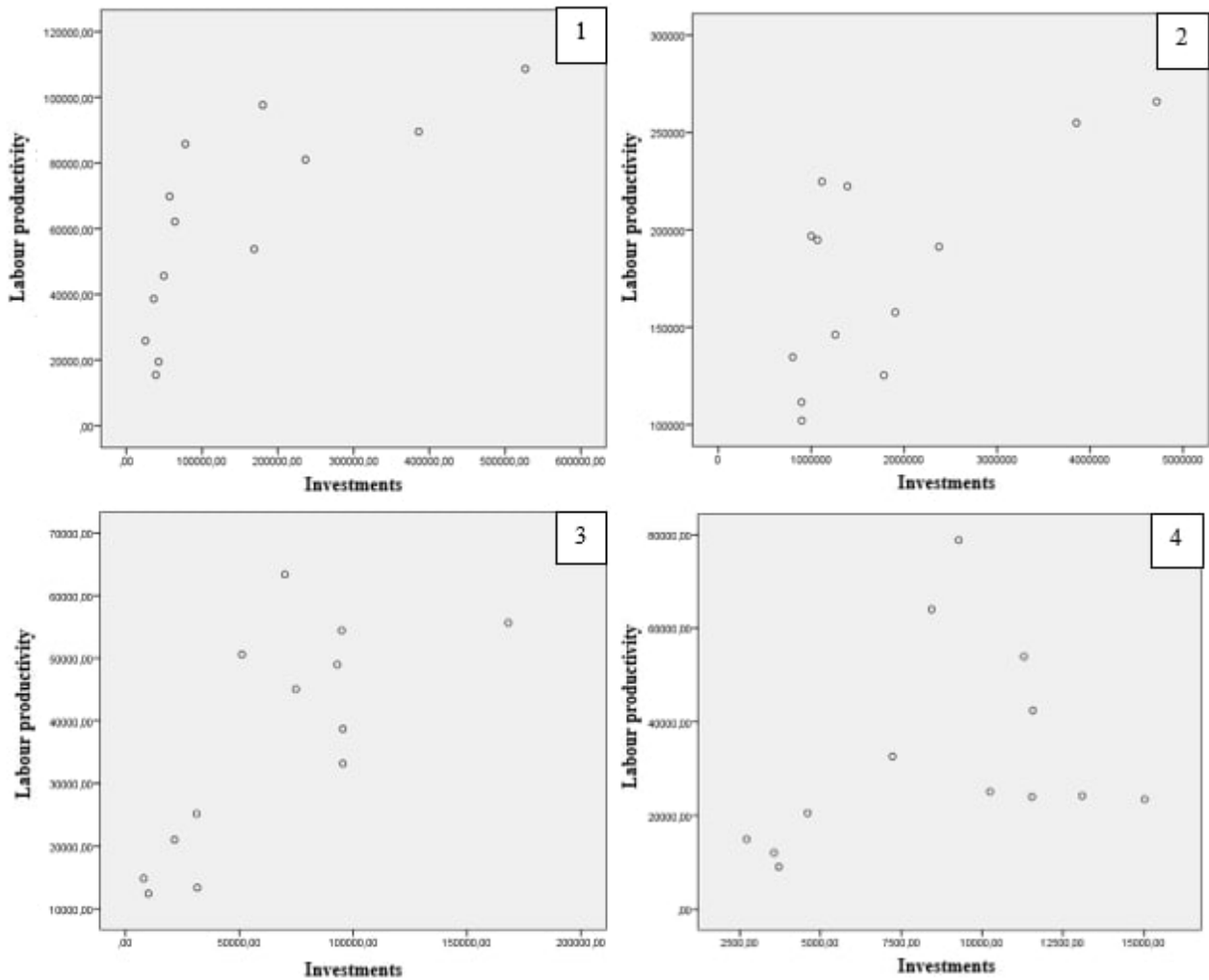


Figure 3. The correlation field of the relationship between investment and labour productivity: 1) in the field of oil and associated and natural gas production; 2) in the manufacture of coke and refined petroleum products; 3) in the production of chemical products; 4) in the production of rubber and plastic products

Source: compiled by the authors.

While in the sphere of production of rubber and plastic products, there is no relationship between the considered indicators. To carry out a regression analysis of data for these areas of production, it is necessary to consider not

only the strength, but also the significance of the connection. The data related to the production of oil and associated and natural gas (Tables 2-4).

Table 2. General summary for the model in the field of oil production and associated and natural gas

Model	R	R-square	Adjusted R-square	Standard error of estimation
1	.676 ^a	.457	.408	41474.115

Note: ^a – predictors: (constant), investment.

Table 3. Calculation of ANOVA^a

	Model	Sum of squares	Degrees of freedom	Medium square	F	Significance
1	Regression	1.594E+10	1	1.594E+10	9.266	.011 ^b
	Remainder	1.892E+10	11	1720102226	-	
	Total	3.486E+10	12	-	-	

Note: ^a – dependent variable: labour productivity; ^b – predictors: (constant), investment.

Table 4. The value of the coefficients^a

Model		Unstandardized coefficients		Standardised coefficients	T	Significance
		B	Standard error	Beta		
1	(Constant)	126032.317	20891.794	-	6.033	.000
	Investments	.030	.010	.676	3.044	.011

Note: ^a – dependent variable: labour productivity.

The regression model describing the impact of investments on labour productivity in the field of oil and associated and natural gas production turned out to be statistically significant in general and for individual regression coefficients, therefore, the interpretation of this model can be considered reliable. According to this model,

the following conclusion can be drawn: the positive development of the volume of investments per unit of measurement leads to an innovative outcome of labour productivity in this industry by an average of 30 KZT per employee. In the production of coke and refined petroleum products (Tables 5-7).

Table 5. General summary for the model

Model	R	R-square	Adjusted R-square	Standard error of estimation
1	.744 ^a	.554	.514	21448.15411

Note: ^a – predictors: (constant), investment.

Table 6. Calculation of ANOVA^a

Model		Sum of squares	Degrees of freedom	Medium square	F	Significance
1	Regression	6292096095	1	6292096095	13.678	.004 ^b
	Remainder	5060256462	11	460023314.7	-	
	Total	1.135E+10	12	-	-	

Note: ^a – dependent variable: labour productivity; ^b – predictors: (constant), investment.

Table 7. The value of the coefficients^a

Model		Unstandardized coefficients		Standardised coefficients	T	Significance
		B	Standard error	Beta		
1	(Constant)	39605.179	8302.357	-	4.77	.001
	Investments	.147	.040	.744	3.698	.004

Note: ^a – dependent variable: labour productivity.

In this case, the pair regression is also statistically significant and the following conclusion can be drawn: the expansion of investments in the production of coke and refined petroleum products per unit of measurement increases the average productivity in this area by KZT 147 per employee. Based on the results of the analysis of data in the production of chemical industry products, having

made sure of the significance of the obtained model, the following conclusion can be drawn: an increase in the volume of investments in the production of chemical industry products per unit of measurement increases the average productivity in this area by KZT 291 per employee (Tables 8-10).

Table 8. General summary for the model

Model	R	R-square	Adjusted R-square	Standard error of estimation
1	.743 ^a	.553	.512	12441.36228

Note: ^a – predictors: (constant), investment.

Table 9. Calculation of ANOVA^a

Model		Sum of squares	Degrees of freedom	Medium square	F	Significance
1	Regression	2104160589	1	2104160589	13.594	.004 ^b
	Remainder	1702662449	11	154787495.4	-	
	Total	3806823039	12	-	-	

Note: ^a – dependent variable: labour productivity; ^b – predictors: (constant), investment.

Table 10. The value of the coefficients^a

Model		Unstandardized coefficients		Standardised coefficients	T	Significance
		B	Standard error	Beta		
1	(Constant)	17760.078	6180.266	-	2.874	.015
	Investments	.291	.079	.743	3.687	.004

Note: ^a – dependent variable: labour productivity.

To neutralise the influence of absolute indicators, the elasticity coefficients are calculated reflecting the relative change of the dependent variable under the influence of an independent factor. Moreover, it is worth paying attention to the data in Table 11, which consists in summing the elasticity coefficients between labour productivity and investment.

Table 11. Elasticity coefficients between labour productivity and investment

Sphere of production	Value
In the field of oil and associated and natural gas production	0.297
In the generation of coke and refined petroleum products	0.350
In the development of production of chemical products	0.516

It should also be borne in mind that oil prices are not completely determined by supply, demand, and market dynamics. These conclusions do not differ from the conclusions on absolute values. At the same time, it is worth noting the inelastic change in labour productivity in relation to the change in the volume of investments. Based on the analysis, investments have an impact on labour productivity, to varying degrees in different industries. That is, there is a solid correlation in relation to innovation and labour productivity. The productivity of an enterprise with a low level of investment is adversely affected by labour productivity. Quality management can help the industry control and manage the nature of existing business operations, eliminate errors in production functioning, and involve the interest of employees in achieving high performance indicators. Kazakhstan needs to develop the refining sector for the use of its natural resources within the country and on the basis of various goals, namely the petrochemical and chemical sectors, which demonstrate a stable market. The economic advantages of Chinese petrochemical corporations are mainly constrained by external market conditions in four factors:

1. The impact of international crude oil price modifications. At this stage, there are two significant reasons: if the foreign economic price of crude oil

risers, then the price of oil for domestic production remains either constant (in extreme cases, the price is lower compared to the foreign economic price of oil, while the company's dividend will decrease, which will significantly affect the income as a whole) or the government provides that the price of oil will be modified depending on fluctuations in the international oil price. It should be borne in mind that if the international price of oil falls too much, the prices of petrochemical products will also decrease.

2. The impact of modifications in the gross domestic product (GDP) of Kazakhstan. An important indicator for any economic development (level) is the value of GDP. Changing economic conditions will have a providential impact on petrochemical corporations: for example, when the economy develops, the economic profits of petrochemical enterprises will multiply, and when profits fall, the economic benefits of petrochemical enterprises decrease.
3. The impact of modifications in the ratio of oil production in Kazakhstan to cumulative energy consumption. It is necessary to formulate and develop energy policies and regulations aimed at reducing the share of fossil energy sources (coal, oil and natural gas) in the total use of energy and expanding the share of non-fossil energy types (wind, water, solar, nuclear energy, biomass, geothermal energy, marine energy, and other renewable energy sources). The primary reasons are that fossil energy releases excessive amounts of carbon during consumption and pollutes the environment.
4. The impact of government restrictions on carbon emissions on the economic profit of petrochemical enterprises.

With the growth of conditions, when the market environment imposes on petrochemical enterprises, the economic benefits of petrochemical enterprises weaken. The expansion of internal control at petrochemical and chemical enterprises has the opportunity to cover some unfavourable aspects, and basically, the economic profits of downstream petrochemical enterprises are more optimal compared to upstream enterprises. In the future, it is necessary to set the task of investigating the impact of the energy policy action index, the market environment

additions index, and the internal management index on the economic interest of petrochemical and chemical enterprises. The government should improve the development of the market environment and develop a national programme that helps to increase the space for the formation of a dividend for petrochemical enterprises (for the production of chemical raw materials and products).

Discussion

Natural resources are important in both developed and developing countries because they serve to eliminate trade in any economic imbalance and generate financial and economic activity by supporting financial development, investment opportunities, and low financial risk. The paper by Zh. Wang et al. [7] reports that domestic investments in gross fixed capital formation have significantly supported economic activity. C. Calvillo et al. [8] demonstrate that various investments and changes in industrial activity will affect regional and national consequences in terms of economic indicators and indicators of well-being (for example, employment, competitiveness, and economic growth) and to address these issues, it is necessary to systematise in detail the entire economy of the country. The future of oil lies in petrochemical or commercial products, because by now the main consumer is transport, which is being significantly reduced and replaced by electric vehicles.

Market demand is forcing a number of refineries to review their production capacities and rethink their technological activities. Because the growing demand for petrochemical raw materials and the shift in demand for refined products will lead to financial benefits and emissions reduction [9; 10]. X. Zhu and L. Zhu [11] examined the external reactions of energy policy and market price modifications to the financial profit of petrochemical enterprises and the impact of internal monitoring and management of petrochemical enterprises on their income. The study by G.M. Galeeva [12] discusses the popular concepts of capital analysis and intensification of the nature of the department by the structure of the fixed and working capital of petrochemical enterprises.

Recently, various refineries have been launched or are analysing the potential for integration with petrochemicals. In particular, the intention of the oil-producing countries is to direct production to a more stable petrochemical industry as the main market segment for innovative and stable strengthening of the crude oil market. M. Al-Samhan et al. [13] proved that the combination of oil refining industries with petrochemicals benefits due to environmental friendliness, which gives additional value to both sectors. Important structural modifications are being made in the global petrochemical industry. As reported by V.A. Kryukov and V.V. Shmat [14], the essence of structural changes is that enterprises focus on the production of special-purpose products (high-tech, functional polymers, composite materials, special-type rubbers, fibres, and other new modern materials).

The main qualities of the development of the petrochemical industry in the current world (not considering the factor of expanding flexibility and the influence of science and the degree of personnel category) include the promotion and expansion of the boundaries of cooperation (primarily within industrial clusters). At the

same time, industrial associations in the petrochemical industry are characterised by the similarity of the relationship between production and technological facilities (installations) and the commonality of their mechanisms. In addition, research structures and associations are being organised and formed within the framework of petrochemical clusters [15; 16].

The materialisation of projects and areas for the development of the petrochemical industry also has a sequence of both general and characteristic qualities over time, i.e., it should be borne in mind that this is characteristic not only of any particular country, but also of a particular period of scientific and technological development in a certain significant period. Globally, the demand for the petrochemical and chemical industries is growing rapidly, which implies significant operational and economic benefits. In addition, environmental problems also play a significant role in connection with which the oil industry is criticised by environmentalists [17-19].

The development of the economy leads to an increase in energy consumption, which gives a large emission of pollutants. For continuous economic growth, measures such as the development of scalability of innovation development are being taken. In general, environmental management can effectively improve the environmental performance of industrial enterprises, but taking into account the fact that additional investments will be required, which may affect the production of the enterprise, because labour productivity is an economic indicator [20-22].

For example, the study by Y. Ma et al. [23] demonstrates the results of the fact that environmental management expresses a significant impact on productivity, despite the fact that a high level of environmental management creates an accumulation of output. Y. Li et al. [24] indicate that when environmental measures are taken in enterprises, economic profits can increase annually, and the payback period for investments in fixed assets can be reduced by the shortest period. The environmental responsibility of an enterprise has an important impact on its financial activities. As reported by P.J. Liu et al. [25], investors need to analyse the environmental uncertainty of an enterprise, predict its future business situation, and assess its credit risks. The increase in the cost of hired labour can affect a certain branch of the industrial system in two ways:

- the addition to wages and the amount of dependent purchases affects the consumption structure of residents;
- the emergence of issues in the field of primary production sectors with low added value and the erosion of the industrial structure.

To supply innovations and investments, theoretical and metaphysical aspects related to the application of preferential investment and innovation organisations should be introduced. Preferential investment and innovation systems are specific areas of the company's operations, as well as special conditions in which guarantees and suitability are considered, with which the implementation of investment obligations is managed. For example, E. Omshanova [26] analysed and highlighted the main mechanisms of investment contracts and projects and their impact on innovation in enterprises. F.W. Chen et al.

[27] developed a model for solving abstract disagreements and report three mediating effects of labour costs on energy intensity, also proposing a new method to calculate the contribution of the influencing factors.

T.B. Leybert and E.A. Khalikova [28] propose a developed financial and economic model, where the main subject is investment in the petrochemical industry, the results of which show that the introduction of such a proposal will be effective for the activities of enterprises. D.C.L. de Penalva Santos et al. [29] report that worldwide investments in research and development are still needed to help reduce production costs and significantly improve production, thereby increasing the competitiveness of the sector. In general, assistance in monitoring and improving environmental parameters comes after the establishment and clear ownership of the company's activities. Assistance to the audited facility or the production manager in improving environmental indicators is provided by the head of the audit organisation due to the information compiled and the assessment carried out.

Thus, the position of the primary capital of the enterprise in large-scale reproduction is determined by its impact on the productivity of the workforce. The increase in the scale of labour tools and their improvement are those circumstances that should not be neglected, and the increase in the number of labour tools is only the result of increased productivity of the working staff. The impact of the intensity of production by the fixed assets of the fund on the productivity of work in a greater case depends on their technical and technological perfection. An important aspect in understanding the role of the process of reproduction of fixed assets is the fact that, in fact, in this process, an increase in production efficiency is made. And also the fact that in this process the technical reconstruction of the petrochemical industry as a whole is being implemented. In conditions when a good production potential has already been created, the most important thing is not the quantitative growth of fixed assets, but their quality, achieved primarily through technical improvement. The constant increase in the mass of fixed assets, their qualitative improvement and more efficient use are powerful factors for the growth of production and increasing its efficiency. The main production assets are the technical base of production for petrochemical and chemical enterprises [30; 31].

Environmental management can improve working conditions thereby affecting their effectiveness. Quality management is an effective management tool that helps to achieve the best performance through continuous improvement of production processes and technologies. The price of the quality management issue is considered mainly as an investment that can bring more to the company in the future. In general, for the development of the enterprise itself, as well as its productivity, it is necessary to focus on such measures as employee training (improving their qualifications by paying the company), the formulation of goals and the assessment of economic and production indicators. The best use of fossil fuels is the production of expensive products with an imperceptible impact on the environment.

Conclusions

The industry is a major variable for the study of environmental management and labour productivity. Petrochemistry is developing at an increasingly rapid pace and is becoming one of the most promising industries in all countries. When analysing the impact of investments on labour productivity, it is important to note that investments in the production of chemical products, coke and refined petroleum products are more effective than investments in both the production of crude oil and its by-products, and in the production of natural gas. At the same time, as noted above, the relative volumes of investments in the field of oil and associated and natural gas production significantly exceed similar indicators in other branches of the chemical and petrochemical industry. Moreover, the growth of investments in labour positively contributes to the improvement of work efficiency, since work efficiency occupies an important place in the assessment of industrial energy efficiency. According to the analysis, the increase in labour costs contributes to the growth of aggregate factor productivity.

In general, petrochemical and chemical industrial modernisation will benefit from investments in infrastructure. In the future, it is planned to increase the scalability of data not only for the chemical and petrochemical industries, but also for manufacturing enterprises engaged in other areas of the industry. Moreover, to further clarify the relationship between investment and labour productivity, it is necessary to select other variables for analysis. The conducted research is extremely important for statistical measurement of the real cost of potential projects. In most countries, during the seasons of investment growth for various types of projects, there is a noticeable tendency to gap between the investment plan and its financial implementation due to the long time it takes between approval and spending of cash settlements, which exacerbates economic instability (capital reduction). This phenomenon is observed due to poor-quality investment forecasting in conditions of uncertainty, which obliges enterprises to incur higher costs than anticipated, while affecting the financial situation.

In the future, it is necessary to set the task of investigating the impact of indicators of energy policy influences, indicators of market environment restrictions and the list of internal controls on the economic benefits of petrochemical and chemical enterprises. The government should improve the market environment, develop and implement policy innovations that contribute to increasing the space for profit development of enterprises in the petrochemical industry (enterprises producing raw materials and chemical products).

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Conflict of Interest

There is no conflict of interests involved.

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Вплив інвестицій на продуктивність праці в хімічній і нафтохімічній промисловостях Республіки Казахстан

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Анотація

Актуальність. В даний час нафтохімічна і хімічна промисловість є однією з головних сфер у міжнародній економіці. Тому важливо обирати ефективні альтернативні мережі, сприяючи інвестиціям у заводи для досягнення певних показників у сфері праці. Актуальність даної теми зумовлена тим, що продуктивність праці в сучасних умовах відіграє вирішальну роль у діяльності різних галузей.

Мета. Метою дослідження є оцінка співвідношення інвестицій і продуктивності праці в хімічній і нафтохімічній промисловості Республіки Казахстан.

Методологія. У дослідженні використано декілька методів наукового дослідження, зокрема кореляційний та регресивний аналіз.

Результати. У результаті дослідження вдалося дослідити сфери діяльності, відповідальні за розвиток хімічної та нафтохімічної промисловості, а саме: розробка та видобуток нафти, попутного (нафтового) та природного газу, виробництво хімічної та нафтохімічної продукції, виробництво коксу і продуктів нафтопереробки, розробка гумових і пластмасових виробів. Це дозволило встановити рівень впливу інвестицій на продуктивність праці кожної із зазначених вище підгалузей. Крім того, досліджено статистичні дані, на основі яких встановлено показники, що відображають особливості взаємодії таких складових, як інвестиції, промисловий розвиток, підвищення кваліфікації кадрів. Розкрито фактори, які якісно впливають на ефективність зовнішніх ринкових умов для корпорацій.

Висновки. Дослідження показало, що інвестиції в хімічні продукти, кокс та нафту ефективніші, ніж у видобуток сирої нафти та природного газу. Практична цінність дослідження виявляється в можливості використання його результатів під час розробки планів розвитку конкретних хімічних і нафтохімічних підприємств Республіки Казахстан шляхом залучення конкретного виду інвестицій.

Ключові слова: енергоефективність; капітал; інфраструктура; фактори продуктивності; інноваційність.