RESEARCH ARTICLE

Assessing the Interdependence of Oil Industry Indicators on Kazakhstan's Economy

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Abstract

The impact of oil production on the regional economy and average wages is widely discussed among economists and politicians. The oil industry is one of the main sectors of the economy of Kazakhstan and makes a significant contribution to the country's GDP. An assessment of the interdependence of the indicators of the oil industry on the economy allows us to understand what factors affect the development of this industry and, accordingly, the country's economy. This study provides a comprehensive overview of the impact of oil production on the regional economy and average wages, with a focus on the importance of diversification and sustainability strategies for long-term economic growth. The purpose of this study is to study the positive and negative aspects of the impact of oil production on the region's economy and average wages. The research methodology involves two stages of empirical analysis of oil production data and economic indicators in the region from 2016 to 2021. At the first stage, a correlation analysis (Pearson correlation) was carried out; at the second stage, a predictive regression model was built. The study shows that oil production has greatly contributed to the economic growth and development of the region, which has led to an increase in average wages and improved living standards. The findings of this study are of great importance to policy makers and stakeholders involved in the development of the oil industry in the region.

1. INTRODUCTION

The impact of oil production on the regional economy and average wages is one of the most topical and debated topics among economists and politicians. On the one hand, oil revenues can significantly contribute to the development of the region's economy, improve the living standards of the population and increase wages. However, on the other hand, dependence on oil revenues can lead to negative consequences, such as "Dutch disease", environmental degradation and social inequality.

This article provides a comprehensive overview of the impact of oil production on regional economies and average wages, emphasizing the importance of diversification and sustainable development strategies for long-term economic growth. Oil production can have a significant impact on regional average wages. Regions with active oil production may have high wages for oil industry workers, including engineers, technicians, and site workers. In addition, oil production can lead to job creation in the oil industry and related industries such as transport, logistics and facility maintenance. This can also contribute to wage growth in these industries.

However, it should be noted that oil production can have positive and negative consequences for the region's economy. For example, rapid growth in oil production can lead to inflation and job losses in other sectors of the economy, which can negatively affect average wages. In addition, oil production may have a negative impact on the environment and public health, which could lead to social and economic problems that could reduce average wages in the region. Thus, the impact of oil production on average wages in the region depends on many factors and can be both positive and negative (Brown et al., 2019).

The purpose of this study is to examine the positive and negative aspects of the impact of oil production on the regional economy and average wages. In order to achieve this goal, the study employs a comprehensive methodology, including an extensive literature review and empirical data analysis concerning oil production and economic indicators within the region. By scrutinizing various dimensions, the research sheds light on the intricate relationships between oil production, regional economic growth, and wage dynamics.

The positive aspects of oil production's influence on average wages are undeniably significant. The injection of oil revenues into the regional economy can stimulate economic growth, providing the impetus for increased job opportunities across multiple sectors. As mentioned earlier, not only do oil industry workers benefit from higher wages, but the ripple effects extend to ancillary industries. This interconnectivity amplifies the potential for wage growth in various segments of the economy.

However, the potential downsides must not be overlooked. The reliance on oil revenues can engender a skewed economic structure, where other sectors remain underdeveloped due to inadequate investment. This phenomenon, known as the "Dutch disease," can lead to overemphasizing the oil sector at the expense of diversification. Consequently, economic vulnerability could arise if oil prices plummet, resulting in reduced revenues and potential job losses, thus dampening average wages.

Environmental degradation poses another critical concern. While oil production can drive economic growth, the ecological toll it takes might lead to long-term repercussions. Damaged ecosystems, pollution, and resource depletion can fuel negative feedback loops affecting regional health and economic stability. These challenges could put downward pressure on average wages as the societal costs of addressing these issues mount (Bjørn & Hauschild, 2013).

In conclusion, the intricate relationship between oil production and average wages underscores the complexity of their interplay. While oil revenues can contribute positively to wage growth and overall economic prosperity, the potential pitfalls of overreliance and environmental degradation must be vigilantly managed. A nuanced understanding of these factors is crucial for

policymakers and stakeholders as they seek to harness the benefits of oil production while safeguarding the region's long-term economic and social well-being.

The main purpose of the paper: to explore the positive and negative aspects of the impact of oil production on the region's economy and average wages. This study proposes the following hypotheses:

H1: *Average monthly salary in Atyrau region affects the economic growth of the regions.*

H2: *Unemployed population about Atyrau region affects the economic growth of the regions.*

H3: *The cost of oil on world markets affects the economic growth of regions.*

2. LITERATURE REVIEW

Oil production is an essential source of economic growth for many countries and regions worldwide. Oil production can have a significant impact on average wages in a region, including through the creation of new jobs and increased output. This literature review will examine several studies that analyse the impact of oil production on economic growth and average wages in the region. Olayungbo (2019) assessed the impact of the oil industry on economic growth and income in Nigeria using data from 1970 to 2015. The study found that oil production positively affects economic growth, but no effect on average wages was found.

Studies have also been conducted on the impact of oil production on incomes in Israel. A study published in 2015 showed that oil extraction leads to an increase in average wages in regions with a high concentration of oil companies. However, national income generally needs to increase more to fully offset the cost of importing oil extraction technology and equipment (Zaher & Maayan, 2015). U.S. researchers conducted a study on the impact of oil production on income and employment in Louisiana. The study found that oil production positively affects employment and average income in the region. However, the authors of the study note that this positive effect may be short-term, as it depends on oil prices and changes in the investment policy of oil companies (Luthra et al., 2007).

Kilian & Park (2009) investigated the impact of oil price shocks on the U.S. stock market. Knowing that oil prices can fluctuate widely and often cause volatility in global markets, it is important to understand how these fluctuations are reflected in the U.S. market and how they affect investors. The authors look at the period from 1986 to 2016 to analyse the various oil price shocks that occurred during this period. They examine these shocks' short-term and long-term effects on the U.S. stock market. From their analysis, the authors come to some interesting conclusions. First, they find that oil price shocks have a significant short-run impact on the U.S. stock market. High oil prices tend to cause panic among investors, leading stock prices to fall. On the other hand, low oil prices can make stocks more attractive to investors, leading to higher stock prices. However, researchers also find that the long-term impact of oil price shocks on the stock market is less significant. Companies in the oil industry can quickly adapt to price changes and take measures to mitigate their risks. In addition, the stock market has many other factors that can affect the stock market. Overall, the authors provide an interesting analysis of the impact of oil price shocks on the U.S. stock market. She emphasises the importance of closely monitoring oil prices and their impact on investments. However, she also points out that the long-term effects may be less significant, offering a more stable picture for investors.

O'Hara & Gentile (2009) studied Kazakhstan's economy and noted that the sharp decline in the prices of other major export commodities, especially metals (another cornerstone of Kazakhstan's resource-based economy), has also led many mining companies to either reduce working hours or lay off workers. Consequently, wages are beginning to decline in real and nominal terms. As the economy is heavily dependent on the export of oil and other commodities, Kazakhstan is clearly in a vulnerable position. With an economy heavily dependent on oil and other commodities exports, Kazakhstan is clearly vulnerable to global economic shocks.

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The results of Kang et al. (2016) show that positive oil price changes are significant in all cases with an expected positive sign, which means that an increase in oil prices leads to an increase in real GDP. On the other hand, negative oil price changes are significant only for Kuwait and Qatar, with the expected positive sign indicating that a fall in oil prices leads to a decrease in real GDP. In the case of Bahrain, Oman, Saudi Arabia and UAE, the results show that negative oil price changes are not statistically significant, implying that falling oil prices do not significantly impact the real GDP of these countries.

Prasad & Keane (1995) suggest that oil prices can significantly impact wages in countries dependent on oil revenues. They focus on a few large oil-producing countries such as Saudi Arabia, Russia and Nigeria and analyse data on wages and oil prices in these countries. The authors of the paper use empirical analysis to examine the impact of oil price changes on wages. They consider both the short-run and long-run effects of oil prices on wages. The primary approach of the analysis is to model the relationship between changes in oil prices and changes in wages. The results of the study show that there is a significant relationship between changes in oil prices and wages in oil-producing countries. When oil prices increase, wages also increase, and vice versa; when oil prices fall, wages decrease. This is because oil revenues are a significant part of the gross domestic product of these countries, and changes in oil prices affect the overall economic situation.

However, the article also notes that the impact of oil prices on wages may vary from country to country and its institutional structure. For example, in some countries, a portion of oil revenues may be alienated from the government through taxes or levies rather than being paid in the form of increased wages. Political stability and the government's response to changes in oil prices also play a role. In conclusion, the article emphasises that oil prices can significantly impact wages in oil-producing countries. Changes in oil prices can lead to changes in the economic status of workers, and it is important to take this into account in policymaking and planning for social and economic interventions in these countries.

Herrera et al. (2019) examined the relationship between oil price fluctuations and changes in employment and unemployment. The authors of the study analyse macroeconomic data to identify how rigid or elastic the labour market responds to changes in oil prices. They assess the relationship between oil price changes and employment and unemployment rates in different countries or regions. The paper provides various theories on how changes in oil prices can affect the labour market. For example, higher oil prices can lead to higher energy and transport costs for businesses, negatively affecting their ability to hire new employees or retain old jobs. At the same time, lower consumer incomes due to higher oil prices could reduce demand for goods and services, potentially leading to higher unemployment. As a result of the study, the authors conclude how changes in oil prices affect the labour market. For example, they may find that higher oil prices lead to lower employment or higher unemployment in the short or long term.

Stevens (2018) examines the various ways in which oil and gas affect the economy. The author discusses the role of the oil and gas industry in creating jobs and attracting investment. Extensive oil and gas extraction and production projects require significant infrastructure, technology, and human capital investment to boost the economy. Foreign scholars argue that when oil prices rise in Liberia, the high costs of resource reallocation among oil-producing industries lead to labour intensification, whose contribution to Liberia's GDP far exceeds that of oil. Thus, the overall conclusion of the study is that when substitution opportunities are available, rising oil prices lead to high labour and capital intensity and may have an offsetting effect depending on the contribution of these factors to GDP. Thus, when oil prices fall in Liberia, measures should be taken to stimulate the services sector (Brown et al., 2019).

American Exercise studied how ownership of subsurface resources affects oil and gas revenues. For the average U.S. County with production growth from 2000 to 2014, we found that

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royalty income and its multiplier effect accounted for 70 per cent of total revenue growth, with each royalty dollar generating an additional 49 cents of local revenue. The county whose residents owned the subsurface earned 28 cents more from each production dollar than the county with no ownership. Nationally, oil and gas production increased personal income in the U.S. in 2014 by $67 billion (0.5%) more than it would have if all royalties had accrued overseas. Thus, areas with the same abundance of resources can have opposite economic outcomes due to differences in property rights (Gbatu et al., 2017).

A study by Russian scientists analysed the impact of oil production on economic growth and average wages in Russia. The study found that oil production positively impacts Russia's economic growth, but no impact on average wages was found. However, the authors of the study note that this may be because oil production in Russia is carried out by state-owned companies, which may need to make more efforts to develop social programs and improve living conditions in the production regions (Kononova & Zaverisky, 2016).

In Tabata (2009), one of the main conclusions is that oil prices significantly impact the Russian economy. When oil prices are high, Russia earns significant export revenues, and its economy grows. However, when oil prices fall, Russia faces serious challenges, including economic recession, inflation, and declining financial reserves. The author also discusses measures the Russian government took to mitigate the adverse effects of falling oil prices.

In the Kazakhstan studies, the author pointed out that analysing the impact of the oil and gas sector on the socio-economic situation in the region The oil and gas sector is a systemically important segment of the economy, so it is difficult to overestimate the impact it has on the situation in the region as a whole. The experts interviewed also recognise the determining role of the oil and gas sector in the socio-economic development of the western region. At the same time, both positive and negative aspects of oil companies' presence in the western oblasts' territory are noted. As the most important plus, experts call the creation of jobs, as well as a relatively high level of labour remuneration, which can be offered by oil and gas companies. This fact directly affects the living standards of the local population, as the presence of a high-income group represented by oil and gas company employees increases effective demand and stimulates the development of other industries (Buldybaeva, 2013).

The work of other Kazakhstani scientists shows that possessing huge oil and gas resources, the presence of which in any state allows successful solving of the most complex socio-economic, technological, financial and monetary problems, Kazakhstan is still unable to realise this advantage, which can bring tangible benefits to the national economy.

Thus, it is clear from the presented studies that oil production positively affects economic growth in different countries, but the effect on average wages needs to be clarified. In some regions with a high concentration of oil companies, an increase in wages can be observed, while in other regions, such an effect was not found. However, the authors of the research note that the positive effect may be temporary and depend on changes in oil prices and the investment policy of oil companies. It is also worth noting that state-owned oil companies may need to make more efforts to develop social programmes and improve living conditions in the production regions (Egorov et al., 2018). In the following sections, the research methodology, calculations, and description of the results obtained will be described in more detail.

3. METHODOLOGY

Systematic literature review and empirical data analysis are essential research methods that can be used together or separately, depending on the research objective. A systematic literature review helps to identify key themes and issues related to the research topic and to highlight important findings by other researchers. This method also helps assess the quality of previous

studies and identify gaps in their methodology and data. Empirical data analysis, in turn, allows statistical methods to analyse the data collected during the research process. This helps to identify relationships between variables and determine which variables influence the study results. In addition, this method can help identify hidden factors influencing the study results. Together, these two methods can help better understand the problem and achieve the objective.

In order to achieve the purpose of this study, the methods listed above were chosen: systematic literature review and empirical data analysis (based on the use of Pearson correlation). To perform correlation analysis, it is necessary to determine the correlation coefficients between all pairs of variables, including the dependent variable (Y) and independent variables (X1, X2, X3).

Pearson correlation coefficient shows the degree of linear relationship between two variables. It can take values from -1 to 1, where 1 indicates a positive linear relationship, -1 indicates a negative linear relationship, and 0 indicates no linear relationship.

The method of least squares is used to calculate the regression coefficients. Multiple linear regression allows us to determine which variables affect the dependent variable Y. To do this, it will be use the formula (1):

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon \qquad (1)$$

where Y is the dependent variable, X_1, X_2, X_3 are the independent variables, β_0 is the free coefficient, β_1, β_2, β_3 are the regression coefficients, ε is the random error.

This method allowed us to analyse:
Theoretical aspects of the impact of oil production on the economy.
Real economic indicators in Atyrau region.
Quantitative data were used, which allowed us to obtain results based on correlation analysis of indicators of the impact of oil production on the economy of the region. In particular, gross regional product (hereinafter GRP) and average monthly wages in Atyrau region were taken as an economic indicator.

The phases of this study included the following important steps:
Selecting the object of research and setting the research objective.
Collecting, sampling and analysing literature sources related to the research topic.
Collect, sample and analyse empirical data related to oil production and economic performance of the region.
Analysing the findings and drawing conclusions.
Results of correlation analysis and their interpretation.
Results of regression analysis and their interpretation.
Findings of the study (conclusion).

The data for this study were taken from the annual statistical collections of the Bureau of National Statistics of the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan from 2016 to 2021. Table 1 presents variables for correlation analysis. The data for Atyrau region were selected for analysis.

TABLE 1. Variables for correlation analysis

Code	Indicator	Unit of measurement
Y	Gross regional product per capita of Atyrau oblast	US dollars.
X1	Average monthly salary in Atyrau region	tenge
X2	Unemployed population about Atyrau region	person
X3	Cost of oil on world markets	US dollars.
Note: compiled by the authors		

Gross regional product per capita is presented as the dependent variable, the other variables are independent. Table 2 below presents data for correlation analysis which was carried out with the help of the SPSS program.

TABLE 2. Data for correlation analysis

Year	Y	X1	X2	X3
2016	25 289,60	268 441	445 467	55
2017	29 708,90	264597	442 279	65
2018	36 162,30	293572	443 644	50
2019	38 104,20	351103	440 652	70
2020	28 776,40	367799	448 805	50
2021	37 643,80	406 166	449 644	70
Note: compiled by authors according to source Bureau of National Statistics (2023)				

4. ANALYSIS

Kazakhstan is a significant oil producer, and oil production is one of the key sectors of the country's economy. Kazakhstan continues to produce oil from significant fields such as Tengiz, Kashagan, Karabatan. Also, recently, the government of Kazakhstan has been actively promoting investment projects in the oil and gas industry aimed at developing new fields and improving production efficiency. It is also worth noting that Kazakhstan is a member of the Organisation of Petroleum Exporting Countries (OPEC) and complies with the agreements on limiting oil production within the framework of this organisation. Before analysing oil indicators, it is proposed to consider an essential regional economic indicator, GRP. Table 3 shows the dynamics of GRP indicators in Kazakhstan for 2016-2021.

Table 3. Dynamics of development of GRP indicators in Kazakhstan for 2016-2021, in USD

Region	2016	2017	2018	2019	2020	2021	Ratio 2021/ 2016, %
Akmola	5 313,9	6 465,6	6 675,2	6 848,3	7 513,0	8 555,5	+60,9
Aktobe	7 203,9	8 434,7	9 097,5	8 874,7	8 063,4	9 347,0	+29,6
Almaty	3 256,4	3 790,8	3 998,1	4 142,4	4 371,5	5 166,5	+58,6
Atyrau	25 289,6	29 708,9	36 162,3	38 104,2	28 776,4	37 643,8	+48,8
West Kazakhstan	9 293,3	11 130,1	12 462,1	11 760,2	10 052,5	12 495,8	+34,4
Zhambyl	3 105,9	3 711,7	3 963,6	3 968,1	4 058,1	4 640,3	+49,4
Karaganda	7 840,2	9 512,0	9 955,9	10 218,2	10 731,8	12 720,5	+62,2
Kostanay	5 047,3	6 469,0	6 866,6	7 357,0	8 026,4	9 583,4	+89,6
Kyzylorda	4 971,7	5 641,1	6 057,6	5 980,7	4 923,8	5 504,5	+10,7
Mangistau	11 341,5	15 517,8	16 484,9	13 985,1	10 497,9	11 657,6	+2,9
Pavlodar	7 619,0	9 614,4	10 562,8	10 511,6	10 053,0	12 170,5	+59,8
North Kazakhstan	4 737,5	6 091,7	6 317,5	6 547,1	6 968,6	7 778,3	+64,1
Turkestan*	2 850,4	3 367,2	2 431,6	2 633,8	2 843,4	3 199,5	+31.
East -Kazakhstan	5 862,8	7 023,0	7 539,1	7 653,0	8 160,3	8 738,8	+49,1
Astana	15 411,8	17 687,7	18 448,8	18 486,7	16 645,1	17 280,2	+12,1
Almaty	17 940,4	20 534,4	19 250,7	18 769,2	16 740,5	17 594,5	-1,8
Shymkent*			6 431,8	5 622,7	5 715,7	5 734,1	-12
Note: compiled by authors according to source Bureau of National Statistics (2023)							

According to the presented data on GRP indicators for the period 2016-2021, positive dynamics can be traced in all regions of Kazakhstan. For 2021, the GRP indicator for Kazakhstan was 10,369.9 USD. In 2021, the GRP indicator for Kazakhstan amounted to 10,369.9 USD, which is 34.2% more compared to 2016. It should be noted that the highest indicators were found in the following regions of Kazakhstan: Kostanay region (+89.6), North- Kazakhstan region (+64.1), Karaganda region (+62.2), Akmola region (+60.9), Pavlodar region (+59.8). At the same time, regions with negative indicators were identified: Shymkent city (- 12), Almaty city (-1.8). Zhambyl (+49.4), East Kazakhstan (+49.1), Atyrau (+48.8) regions developed at the average level. In some regions, changes in GRP dynamics are not very noticeable. Thus, in Aktobe, West-Kazakhstan, Kyzylorda, Mangistau, Turkestan and Astana regions GRP growth was slightly below the national average. In general, we can say that Kazakhstan demonstrated stable GDP growth during this period.

The data show that Kazakhstan's economy has grown steadily over the past six years, with some regions growing more strongly than others. However, the country still faces economic challenges, especially with the COVID-19 pandemic and oil price fluctuations that have had a significant impact on the economy. Figure 1 shows the dynamics of crude oil production in Kazakhstan for 2016-2021, in million tons.
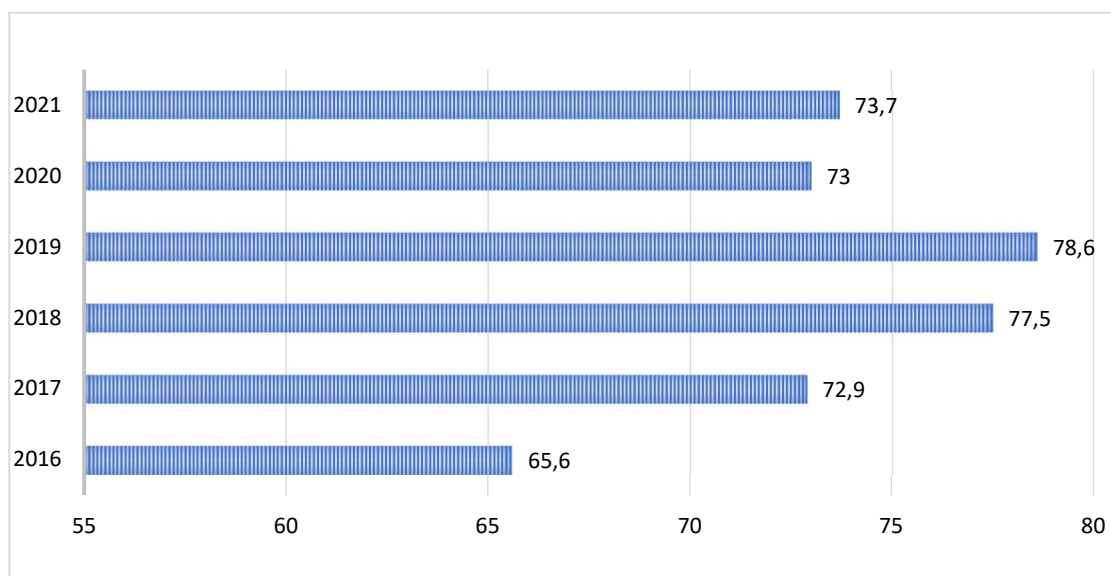

FIGURE 1. Dynamics of crude oil production in Kazakhstan for 2016-2021, in mln tonnes

Note: compiled by authors according to source Bureau of National Statistics (2023)

Analysing annual data on crude oil production in Kazakhstan for the period from 2016 to 2021, the following conclusions can be drawn: The general trend of crude oil production in Kazakhstan has some instability, changing during the period under review. Thus, in 2016-2019, a positive growth trend of 13 million tonnes (19%) of crude oil production was recorded. In 2020, crude oil production decreased by 5.6 million tonnes (6.3%), and in 2021 - there was a slight increase of 0.7 million tonnes (1%), which may indicate that the economy is beginning to recover from the COVID-19 pandemic and other economic difficulties.

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5. FINDINGS

Prior to conducting the correlation analysis, a test for normality of distribution using the Kolmogorov-Smirnov method was conducted. From the table 5 below, it can be seen that a test for normality of distribution using the Kolmogorov-Smirnov uniform distribution was conducted for four samples labelled as Y, X1, X2 and X3. The following statistics were calculated for each sample: number of observations (N), normal distribution parameters such as mean (Mean) and standard deviation (Std. Deviation).

The largest absolute differences between the empirical distribution function and the normal distribution function. These values are indicated as "Absolute" and divided into positive and negative differences. In addition, the values of the Kolmogorov-Smirnov test statistic (Test Statistic) and the corresponding two-sided p-values (Asymp. Sig. (2-tailed)), which indicate the probability of obtaining the observed differences if the data are normally distributed. The values of Asymp. Sig. (2-tailed) are equal to .200 for all samples (Y, X1, X2 and X3). This means that at a significance level of 0.05, the Kolmogorov-Smirnov test fails to reject the null hypothesis that the data are normally distributed. Thus, based on this sample and the result of the Kolmogorov-Smirnov test, we can assume that the data Y, X1, X2 and X3 probably have a normal distribution.

TABLE 5. Results for normality of distribution (One-Sample Kolmogorov-Smirnov Test), N=6

Parameter		Y	X1	X2	X3
Normal Parametersa,b	Mean	32614,200	325279,667	445081,83	60,000
	Std. eviation	5382,2901	58199,1982	3588,045	9,4868
Most Extreme Differences	Absolute	,245	,207	,184	,201
	Positive	,205	,207	,156	,201
	Negative	-,245	-,171	-,184	-,201
Test Statistic		,245	,207	,184	,201
Asymp. Sig. (2-tailed)		,200c,d	,200c,d	,200c,d	,200c,d
a. Test distribution is Normal. b. Calculated from data. c. Lilliefors Significance Correction. d. This is a lower bound of the true significance.					

Note: compiled by authors

Value from (-)1 to (+)1 – if the coefficient is positive, it indicates a direct relationship (when one variable increases, the other also increases). If negative - on the reverse (when one increases, the other decreases). A value of 0 indicates that there is no linear relationship between the variables. Testing the significance of the correlation coefficient allows you to determine whether the relationship found is random or statistically significant. Table 4 below presents the results of correlation analysis.

Table 4. Results of correlation analysis (N=6)

Parameter		Y	X1	X2	X3
Y	Pearson Correlation	1	0,553	-0,160	0,510
	Sig. (2-tailed)		0,255	0,762	0,301
X1	Pearson Correlation	0,553	1	0,581	0,340
	Sig. (2-tailed)	0,255		0,226	0,509
X2	Pearson	-0,160	0,581	1	-0,220

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	Correlation				
	Sig. (2-tailed)	0,762	0,226		0,675
X3	Pearson Correlation	0,510	0,340	-0,220	1
	Sig. (2-tailed)	0,301	0,509	0,675	
Note: calculated by authors using SPSS programme					

Correlation between Y and X1: the correlation coefficient is 0.553, indicating a moderately strong positive linear relationship between Y and X1. The p-value is 0.255, which is above the generally accepted significance level of 0.05, indicating that the correlation coefficient may not be statistically significant at this level. The sample size for this correlation is 6.

Correlation between Y and X2: the correlation coefficient is -0.160, indicating a weak negative linear relationship between Y and X2. The p-value is 0.762, which is above the significance level of 0.05 and indicates that the correlation coefficient is not statistically significant at this level.

Correlation between Y and X3: the correlation coefficient is 0.510, indicating a moderate positive linear relationship between Y and X3. The p-value is 0.301, indicating that the correlation coefficient cannot be statistically significant at the significance level of 0.05. The sample size for this correlation is 6.

Correlation between X1 and X2: The correlation coefficient is 0.581, indicating a moderately strong positive linear relationship between X1 and X2. The p-value is 0.226 which is below the significance level of 0.05, indicating that the correlation coefficient is statistically significant at this level.

Correlation between X1 and X3: the correlation coefficient is -0.220, indicating a weak negative linear relationship between X2 and X3. The p-value is 0.675, which is above the significance level of 0.05, indicating that the correlation coefficient is not statistically significant.

Second stage: regression calculations

To perform a regression analysis, you need to exclude the variable X2, since only the influence of X1 and X3 on the dependent variable Y was confirmed. Now you can perform a regression analysis to estimate the influence of X1 and X3 on X. For this, multiple regression will be applied. Since there is only one dependent variable, a simple linear regression can be run. To perform regression analysis, it is necessary to estimate the regression parameters - free term (b0) and regression coefficients (b1 and b2). The least squares method is used to estimate these parameters. Further regression analysis is carried out using the provided data. Presumably the model will be linear by formula (2):

$$Y=\beta_0+\beta_1 X_1+\beta_3 X_3 \qquad (2)$$

Using the least squares method, obtain the parameter estimates: b0 = 0,246; b1 = 0,603; b2 = 0,042. Thus, the regression equation will be by formula (3):

$$Y=0.246+0.603*X_1+0.042*X_3, \qquad (3)$$

Next use this model to predict Y values based on X1 and X3 values. Regression parameter estimates are used to predict Y values based on X1 and X3 values. For example, if the new values X1 = 0.7 and X3 = 0.8 are inserted into the regression equation, then the predicted Y value is obtained by formula (4):

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$$Y=0.246+0.603*0,7 +0.042*0,8=0.357 \qquad (4)$$

Thus, the predicted value of Y for X1 = 0.7 and X3 = 0.8 is 0.357.

6. DISCUSSIONS

Discussing the impact of the average monthly salary in the Atyrau region on the economic growth of the region requires a holistic approach, considering both direct and indirect impacts and the specific nuances of the Atyrau region, a crucial oil-producing area in Kazakhstan. Higher average monthly wages generally translate into higher disposable income and, consequently, higher income tax revenues (assuming a progressive tax system). The government can use this extra income to invest in public services, infrastructure, and other growth-enhancing projects. Regions with higher wages tend to attract skilled workers looking for better pay and living conditions. This influx could lead to a more competitive and innovative workforce and economic growth.

Risks: Given that Atyrau is a vital oil industry centre in Kazakhstan, wages, especially in the oil sector, may be higher than in other sectors or regions. This disparity can lead to income inequality and potential social unrest. Even if it offers high salaries, over-reliance on one industry can be risky. Diversifying the economic base and ensuring growth benefits the broader population is critical to sustainable long-term development.

Rising oil prices could lead to increased revenues, improved financial balances and foreign exchange reserves. Conversely, lower prices could lead to fiscal pressure, potential layoffs in the energy sector, and reduced ability to finance public services. It should be noted that the cost of oil on world markets plays a crucial role in shaping the economic trajectories of regions around the world. Its multifaceted influence affects everything from direct financial balances to consumer behavior and geopolitical dynamics. Regions and countries should be aware of these implications and, where possible, take steps to diversify their economies and reduce their vulnerability to oil price fluctuations.

Conclusions on the hypotheses:

H1: *Average monthly salary in Atyrau region affects the economic growth of the regions* - accepted.

H2: *Unemployed population about Atyrau region affects the economic growth of the regions*-rejected.

H3: *The cost of oil on world markets affects the economic growth of regions* - accepted.

7. CONCLUSIONS

The study found that oil production has significantly contributed to the region's economic growth and development, increasing average wages and improving the population's quality of life. However, dependence on oil revenues has also led to negative consequences that must be considered when designing regional development strategies. The findings of this study have significant implications for policymakers and stakeholders involved in developing the region's oil industry.

In conclusion, the study has established strong links between average monthly wages, unemployment rate and gross regional product per capita in Kazakhstan. In addition, it was found that the cost of oil on world markets can impact the region's economic performance, but this impact is not strong. These results have important implications for the design of economic policies and development strategies of the region. In particular, an increase in average monthly wages can stimulate gross regional product growth. However, other factors, such as unemployment rates and

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the impact of world markets, need to be considered. Overall, the study emphasises the importance of considering various factors when designing regional economic development strategies.

Thus, oil production can positively and negatively affect the economy and population depending on many factors. For example, oil prices, the investment policy of oil companies, the level of social infrastructure development, etc. Therefore, to assess the impact of oil extraction on the economy and society, it is necessary to consider numerous factors and research the specific conditions of each country and region. The results obtained are intended for decision-making by persons responsible for developing the oil industry in the region.

8. LIMITATIONS

It is extremely important to remember that correlation does not imply causation. Observed relationships may be influenced by latent variables not included in this analysis. Also, the predictive power of the regression model, while promising, requires further testing, preferably using an out-of-sample data set, to ensure its robustness.

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