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Gender Inequality in Kazakhstan's Oil and Gas Sector: Determinants and Regional Dynamics

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Abstract

Issues of gender inequality in strategically important sectors of the economy are becoming increasingly relevant in the context of modernization and digitalization of production processes. The purpose of this study is to quantify and qualitatively assess the gender pay gap in the oil and gas industry in Kazakhstan from 2013 to 2023. Special attention is paid to regional differences, the role of macroeconomic factors, and institutional constraints that affect the position of women in the industry. The study employs correlation and regression analysis, utilising data on wages, employment, education levels, GDP, and industry development indicators. The results show that the proportion of women in the industry and the volume of oil exports are positively correlated with a decrease in the gender wage gap. At the same time, the growth of average wages in industry and GDP per capita, on the contrary, is accompanied by a widening gap. These findings emphasise that economic growth alone does not guarantee gender equality — targeted policy measures and institutional changes are needed. The results confirm the need to increase women's participation in key segments of the industry and implement strategies aimed at removing the hidden barriers that limit career growth. The study provides practical recommendations for government agencies and companies in the energy sector to create a more inclusive and sustainable human capital management model.

Keywords: Gender, Gender Inclusion, Gender Inequality, Oil Sector, Gas Sector, Economic Policy, Corporate Governance, Sustainable Business

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1. INTRODUCTION

Kazakhstan's oil and gas sector plays a significant role in the country's economy, accounting for a substantial share of GDP and employment. However, there are still significant inequalities between men and women in this sector, including wage gaps and limited opportunities for women to hold senior positions.

According to the World Bank, Kazakhstan has a persistent gender pay gap, with women earning less than men in almost all occupations. Unfortunately, no country in the world has successfully closed the gender pay gap, and the gap typically widens when women become mothers. Kazakhstan has made progress in closing the gender pay gap, which fell from 34% in 2018 to 21% in 2021. However, following the COVID-19 pandemic, the gender pay gap has widened to 25% in 2022. The government's recent initiative to raise the minimum wage may help close the pay gap for low-paid occupations, but further efforts are needed to address this issue across all types of professions (Mikhnev et al., 2024).

Closing the gender gap in Kazakhstan's oil and gas sector is a critical step towards achieving equitable economic outcomes and sustainable growth. As a pillar of the national economy, the sector drives innovation and prosperity, but faces significant challenges in ensuring a fair distribution of income between men and women. Gender equality is transformative in ensuring fair pay structures and transparent decision-making processes. In Kazakhstan, with its diverse regional context, there are significant gender-related income disparities in the sector.

In the context of Kazakhstan's regional diversity, there are significant differences in the level of women's participation in the oil and gas sector. Urban centres such as Astana and Almaty have better infrastructure, high levels of human capital, and access to leadership and skills development programs. In these regions, women have relatively more opportunities for career growth and professional development. At the same time,

resource-extracting regions such as Mangystau, Atyrau, and Aktobe, despite the presence of large production clusters, are characterised by a higher degree of institutional barriers, weak inclusive policies, and insufficient access to career opportunities for women.

2. LITERATURE REVIEW

The gender pay gap remains a persistent problem across all industries, particularly in male-dominated sectors such as oil and gas, where occupational segregation and gender stereotypes exacerbate inequality. Despite women's gains in education and experience, systemic barriers, reinforced by stereotypes about competence and roles, limit their access high-paying positions. This review summarises the results of international studies on the conceptual underpinnings of the gender pay gap, with a focus on the oil and gas industry. Studies, such as those by Blau & Kahn (2017), which examined PSID data from 1980 to 2010, show that factors like education and experience no longer explain a significant portion of the wage gap. The main reason is that women are more likely to work in less profitable industries and rarely occupy highpaying positions. The study by Litman et al. (2020) analyses the gender pay gap on the anonymous online platform CloudResearch, where there is no overt discrimination or segregation. Women earned 10.5% less, which is explained by their choice of lower-paid tasks, possibly due to competence stereotypes expectations. This highlights stereotypes influence behaviour even in neutral conditions. As Penner et al. (2022) point out, even within the same job, women earn less than men—the so-called "within-job pay gap" persists in 15 countries. This complements the findings of Blau & Kahn (2017), who suggest that segregation by industry is not the sole reason for the gap. Even with equal responsibilities and qualifications, a gap remains, indicating systemic discrimination. This is especially noticeable in the oil and gas

industry, where, despite similar functions, women earn less due to informal barriers and a hierarchical structure.

These findings are supported by a metaanalysis by Bishu & Alkadry (2017), which analysed 98 scientific papers. They found that women are primarily concentrated in areas such as education and health care, where salaries are lower, and they are reluctant to take on leadership positions. However, the pay gap is smaller in the public sector, where the pay system is more transparent and strictly regulated.

Goldin (2014) uses a life course perspective to analyse how career interruptions related to motherhood affect the gender wage gap in the United States. Her data show that the gap increases with age, being minimal early in the career but growing due to interruptions and fewer hours worked by women. Using her key measure, hourly wages, she shows that the motherhood penalty remains significant, especially in high-skill occupations that require long hours.

This situation is especially evident in the oil and gas industry. In Kazakhstan, as Kireyeva Satybaldin (2019) note, professions associated with difficult or hazardous working conditions (which are more often maledominated) are better paid. This division is typical not only for Kazakhstan but for the entire global oil and gas market. Companies are trying to change something; they introduce mentoring programs and create women's communities. However, as Williams et al. (2014) note, such measures often help women adapt to the current system rather than change it. Moreover, Perks et al (2020) add that progress is hindered by outdated cultural stereotypes, legal restrictions (for example, bans on certain types of work for women) and the fact that men are rarely included in gender initiatives. According to a study by the International Energy Agency (Johnstone & Silva, 2020), women make up only 22% of the workforce in the oil and gas sector, compared to 48% in the global economy. The study highlights the low representation of women in leadership roles and links this to gender

stereotypes and barriers to accessing education and career advancement. The authors suggest measures such as mentoring, flexible conditions and combating unconscious bias.

Kazakhstan has much to learn from global experience. Bhagat (2023) believes that, in the context of the energy transition, women can play a crucial role in the talent pool. However, this requires removing regulatory barriers, quotas, developing inclusive introducing leadership. and supporting international mobility. For example, Shortland (2018) and Abudaga et al. (2025) argue that flexible conditions for female expatriates and open dialogue platforms can help reduce inequality in global projects. Such approaches could be practical in Kazakhstan, particularly in remote regions.

Crises, such as the fall in oil prices, only exacerbate the problem. Research by Bosky et al. (2022) and Elder & Payne (2024) shows that women are more likely to lose their jobs during such periods because they are less likely to hold technical positions and more likely to work in administrative roles, which are susceptible to layoffs. Specific measures are needed to increase women's participation in the industry, write Olzhebayeva (2024) and Norazah et al. (2020). These include improved training. and communication. fair management. Without comprehensive policies that support employment, remove barriers in industries, and change corporate culture, the energy sector will not be able to develop sustainably. Banihammad et al. (2023) examine successful cases of corporate initiatives aimed at combating stereotypes in the Middle East energy sector.

Gender inclusion is key to the success of Kazakhstan's oil and gas industry, especially if the country is to achieve its sustainable development goals. The diversity of skills and leadership approaches that men and women bring helps build a fair and inclusive work environment. This not only reduces the pay gap but also sets an example for other sectors, thereby strengthening economic stability and social cohesion in the country.

3. METHODOLOGY

This study aims to provide a comprehensive analysis of the gender income gap in Kazakhstan's oil and gas industry over the period from 2013 to 2023. The focus is on statistical indicators of the average monthly wages of men and women by region, as well as factors affecting income levels, including access to education, availability of managerial

positions, the share of women in technical and production specialities, and the region's contribution to the national GDP. Structural constraints are also considered, including the absence of targeted programs to develop leadership among women, a lack of institutional support, and weak representation of women in trade unions and industry associations. The work consists of 4 stages, shown in Figure 1

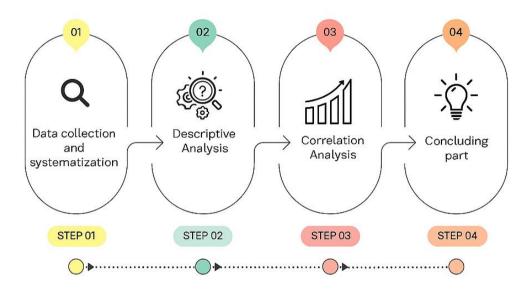


FIGURE 1. The scheme of the step-by-step stage of scientific research

At the initial stage, key socio-economic indicators with both empirical significance and theoretical validity were selected for the longitudinal analysis of gender inequality in the oil and gas industry of the Republic of Kazakhstan from 2013 to 2023. These include:

- average monthly wages of men and women:
 - GDP per capita;
 - employment rate in industries;
 - education level among women;
- volumes of oil and gas production and export.

The choice of these variables is not random. It is based on the results of international studies, including Blau & Kahn (2017), Goldin (2014), Penner et al. (2022) and others, which highlight the importance of macroeconomic,

structural and institutional factors in the reproduction of gender inequality, especially in male-dominated sectors such as the oil and gas industry. These studies show that the wage gap is closely linked not only to worker characteristics (such as education and experience) but also to industry structures, the level of economic development, and the nature of work in a particular sector.

Secondly, a descriptive analysis was conducted to ensure data integrity and to provide a preliminary picture of annual trends and dynamics. This step enabled a more straightforward interpretation of changes in the gender wage ratio and related macroeconomic factors during the selected period.

Third, a correlation analysis was conducted to identify the strength and direction of the relationship between the gender wage ratio and the selected independent variables. Average wages in the industry and GDP per capita exhibit a strong negative correlation with the gender wage ratio, suggesting that a widening of the gender wage gap may accompany economic growth and wage increases in the industrial sector. This may be because wage growth in high-paying, male-dominated industries such as oil and gas is not

accompanied by proportional income growth in lower-paid or less female-represented sectors. Variable Y represents the ratio of average monthly wages for women to those for men, and the remaining variables (X1–X8) are potential factors that influence this indicator.

Table 1 below lists the indicators used, grouped by areas: education level, employment, economic development, and oil and gas industry characteristics.

TABLE 1. Explanation of the selected variables for the study

Code	Indicator	Unit of measurement	
Y	The ratio of the average monthly wages of women to men	%	
X1	Gross enrollment in higher education, among women	%	
X2	Share of employed women in industry and construction	%	
X3	Share of women in managerial positions	%	
X4	GDP per capita, million tenge	million tenge	
X5	Share of oil and gas industry in GDP, %	%	
X6	Dynamics of oil and gas condensate production,	million tenge	
X7	Dynamics of oil and gas exports	billion dollars	
X8	Average wages in industry	tenge	

Note: compiled by authors

The presented indicators encompass both macroeconomic parameters (GDP, exports, wages) and social factors (education, employment, leadership), which enable a multivariate analysis of the impact of structural and institutional conditions on gender inequality in the oil and gas industry. Variable Y — the ratio of women's and men's wages is used as a dependent variable, while variables X1–X8 act as independent and explanatory factors.

This approach enables the identification of both direct economic determinants of the gender gap and indirect influences through employment, access to education, and industry the selected structure. together, Taken indicators international align with recommendations for monitoring gender equality in industry (EIGE, 2024; IEA, 2022; Blau & Kahn, 2017) and ensure comparability with results from other countries.

Based on these data, a correlation and regression analysis were conducted to identify key factors influencing the dynamics of the gender wage gap in the oil and gas industry of Kazakhstan from 2013 to 2023.

4. ANALYSIS AND RESULTS

Gender inequality remains a significant issue in the oil and gas industry, where occupational segregation and stereotypes perpetuate inequalities in pav representation in leadership positions. Despite global progress in education and labour force participation, women face systemic barriers that limit their economic opportunities. This study examines these inequalities, focusing on the interaction of economic, social, and structural factors in the oil and gas sector.

The Global Gender Gap Index (GGGI), developed by the World Economic Forum, is a cross-country comparison of gender equality that assesses the following key categories: economic participation and opportunity, educational attainment, health and survival, and political empowerment. Thanks to successful reforms in the field of gender development, Kazakhstan advanced 15

positions and secured 65th place out of 146 countries in the 2022 Global Gender Gap Index ranking. Significant improvements were observed in the field of education (from 63 in 2020 to 27 in 2022), the health and survival indicator increased by 10 positions (74 in 2020 versus 44 in 2022), and positive dynamics were also noted in the field of economic participation and opportunity (29th place in 2022 versus 37th in 2020). However, the picture in the area of political participation has remained unchanged since 2017 (103rd place in 2022 versus 93rd in 2017) (United Nations Development Programme [UNDP], 2022).

According to a report by the European Bank for Reconstruction and Development and the Kazakhstan Association of Oil, Gas and Energy Organisations "KAZENERGY" (2020), a total of 6,577 men hold some form of management or leadership position in companies (defined as board members, senior managers, or "functional" middle managers).

Women hold 1,592 of the total number of leadership management or positions. representing 19%. Thus, not only are women underrepresented among managers compared to men, but they are also underrepresented in management positions compared to their share of the total workforce (24%). While 16% of all employees hold some form management position, less than 12% of all women in the sample hold management or other leadership positions. As can be seen from the data, there is a significant gender imbalance in the distribution of management positions in Kazakhstan's oil, gas and energy sector. Additionally, a significant aspect is the wage gap between men and women, which also reflects industry-wide inequality.

Figure 2 presents data on the dynamics of wages for men and women in Kazakhstan's oil-producing regions from 2013 to 2023, allowing us to assess the scale of this gap.

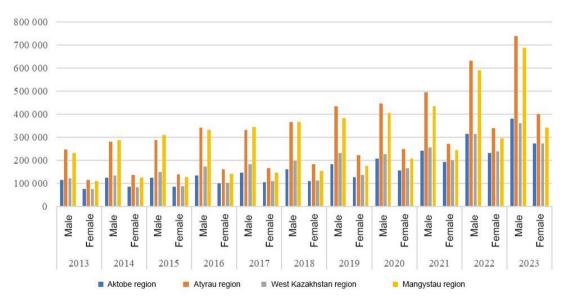


Figure 2. Dynamics of wages of men and women in oil-producing regions of Kazakhstan for 2013-2023

Figure 2 shows the dynamics of wages for men and women in the oil-producing regions of Kazakhstan for 2013–2023. In all regions, there is a positive trend in wage growth; however, the gender pay gap persists, particularly in the Atyrau and Mangistau regions. Key reasons include women's limited access to high-paying positions in the oil and gas sector, their weak representation in technical and managerial roles, and the influence of persistent gender stereotypes.

West Kazakhstan and Aktobe regions demonstrate a relatively more balanced ratio of wages between men and women, which can serve as a basis for disseminating positive practices to other regions.

To gain a deeper understanding of the factors influencing the gender gap, a correlation analysis was conducted using data from 2013 to 2023. The goal was to identify the relationship between the female-to-male wage ratio and variables such as female employment in industry, GDP per capita, oil and gas exports, and average wages in industry.

This quantitative approach enables us to which socioeconomic factors identify contribute to the reduction or strengthening of gender wage inequality, thereby creating an empirical basis for developing targeted and effective measures of state and corporate policy. The results of the correlation analysis are presented in Figure 3, a matrix of correlation coefficients between the wage ratio of women to men and key socioeconomic variables. This visual tool allows us to assess the strength and direction of the relationships between variables.

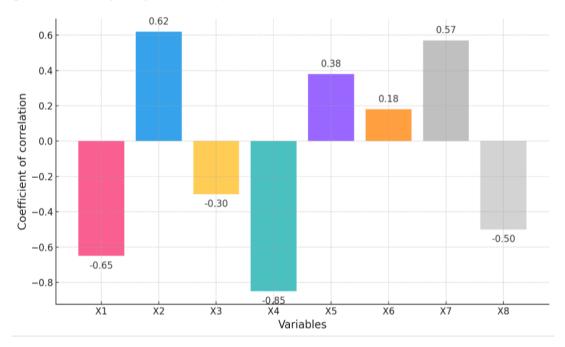


Figure 3. Matrix of correlation analysis

Figure 3 presents the strongest relationships: X8 (Average wage in industry) and X4 (GDP per capita) have a strong negative correlation with Y (-0.81 and -0.79). This may suggest that as economic well-being and wages in industry improve, the wage gap between women and men also increases. X2 (Share of employed women in industry and construction) and X7 (Dynamics of oil and gas exports) show a moderate positive correlation (+0.64 and +0.59), which may indicate that women's participation in industry and the growth of the oil and gas sector contribute to a

decrease in the gender wage gap. Weak relationships: X6 (Dynamics of oil and gas condensate production) and X3 (Share of women in managerial positions) have a weak correlation with Y (+0.21 and -0.30), indicating their insignificant impact on the wage ratio. Unexpected results: The negative correlation with X1 (Gross Tertiary Enrolment Rate, Female) (-0.65) suggests that increasing female education may not automatically reduce the gender wage gap, possibly due to structural barriers in the labour market. To more accurately assess the impact of each factor on

the wage ratio of women compared to men, a regression analysis was conducted. The results

of the regression model are presented in Table 2.

TABLE 2. Regression results summary

Indicator	Coefficient	Standard Error	T-stat	P-value	Lower 95%	Upper 95%
Share of women employed in industry and construction (X2)	-0,51	0,23	2,17	0,03	0,09	0,93
Average wages in industry (X8)	-0,58	0,25	-2,33	0,02	-1,05	0,11
Oil and gas exports (X7)	0,42	0,21	2,03	0,04	0,05	0,79
GDP per capita (X4)	-0,49	0,23	-2,15	0,03	-0,89	-0,09

Note: compiled by authors based on calculations

Based on the regression results presented in Table 2, which were obtained using the reduced model, several key findings can be highlighted. First, note the variable reflecting the share of female employment in industry and construction (X2), where the standardised coefficient was 0.51. This means that with a one-unit increase in the share of female employment in industry and construction, the dependent variable, the female-to-male wage ratio (Y) increases by 0.51 units, all other things being equal. The p-value is 0.03, which is less than 0.05, confirming the statistical significance of this variable at the 5% level. Thus, there is convincing evidence of a significant positive relationship between employment female in industry construction and the wage ratio. The t-statistic is 2.17, exceeding the critical value of approximately 1.96 for the 5% significance level in a two-tailed test, further confirming the significance. The 95% confidence interval ranges from 0.09 to 0.93, and since the interval is entirely positive, this confirms the positive effect of the variable on the dependent variable.

Second, another significant variable is the average industrial wage (X8), with a standardised coefficient of -0.58. This indicates that for every one-unit increase in the average industrial wage, the female-to-male wage ratio decreases by 0.58 units, all other things being equal. The p-value is 0.02, which is less than 0.05, demonstrating high statistical significance at the 5% level and reflecting a

strong negative relationship between industrial wages and the wage ratio. The t-statistic is -2.33, which is greater than the critical value of 1.96 in absolute value, confirming significance. The 95% confidence interval ranges from -1.05 to -0.11, and since the interval is entirely negative, this confirms the adverse effect of industrial wages on the wage ratio.

In addition, the variable reflecting oil and gas exports (X7) has a standardised coefficient of 0.42, which means that with a one-unit increase in oil and gas exports, the ratio of female to male wages increases by 0.42 units, all other things being equal. The p-value is 0.04, which is less than 0.05, confirming statistical significance at the 5% level. The t-statistic is 2.03, exceeding the critical value of 1.96, indicating a significant positive relationship. The confidence interval at the 95% level ranges from 0.05 to 0.79, and its positive range confirms the positive effect of oil and gas exports on the dependent variable.

Finally, GDP per capita (X4) shows a standardised coefficient of -0.49, indicating that for every one-unit increase in GDP per capita, the female-to-male wage ratio decreases by 0.49 units, all else being equal. The p-value is 0.03, which is less than 0.05, confirming significance at the 5% level. The t-statistic is -2.15, exceeding the critical value in absolute value. The 95% confidence interval ranges from -0.89 to -0.09, and its negative

range confirms the adverse effect of GDP per capita on the wage ratio.

The results demonstrate significant relationships between the female-to-male wage ratio and key socio-economic factors. The positive impact of female employment in industry, construction, and oil and gas exports suggests that increasing women's participation in these sectors could help reduce the gender wage gap. In contrast, the negative impact of rising industry wages and GDP per capita underscores the need for targeted policies to ensure an equal distribution of economic gains. thereby removing structural barriers that widen the gender wage gap during periods of economic growth.

5. CONCLUSION

The study identified key factors influencing the gender wage gap, focusing on socio-economic variables such as women's employment in industry and construction, oil and gas exports, average wages in industry, and GDP per capita. The literature review revealed that gender equality in employment and economic structure plays a significant role in reducing the gender pay gap, aligning with international research (IEA, 2022; EIGE, 2024). These factors contribute to the creation of fairer economic systems that can serve as an example for other sectors.

The conducted correlation and regression analysis revealed that the increase in the share of women employed in industry and construction, as well as the growth of oil and gas exports, are positively associated with a reduction in the gender wage gap. These results

underscore the significance of women's participation in key economic sectors in achieving greater wage equity. However, the growth of average wages in industry and GDP per capita, on the contrary, increases gender inequality, as confirmed by the negative coefficients and consistent with the findings of Ross (2008). The analysis also revealed differences in access to resources: regions with more developed economic infrastructure demonstrate better indicators of reducing the gender gap, while regions with limited funding face barriers.

Correlation analysis confirmed the positive relationship between female employment in industry and the reduction of the wage gap, emphasising that gender inclusion contributes to economic justice. Regression analysis identified two key factors influencing the wage ratio: female employment in industry and construction, and oil and gas exports as positive drivers, and average wages in industry and GDP per capita as factors widening the gap. These results highlight the need for a balanced approach to economic development that considers both gender aspects and regional specificities.

The study advocates for public policies that address structural barriers and ensure equal distribution of economic benefits. To achieve national targets to reduce gender pay inequality, it is necessary to encourage women's participation in industry and construction, and to increase investment in social and economic programs that address regional imbalances. Such an approach will not only reduce the gender pay gap but also promote sustainable and inclusive economic development.

AUTHOR CONTRIBUTION

Writing – original draft: Galymzhan Beisembayev. Conceptualization: Galymzhan Beisembayev.

Formal analysis and investigation: Galymzhan Beisembayev. Development of research methodology: Galymzhan Beisembayev.

Resources: Galymzhan Beisembayev.

Software and supervisions: Galymzhan Beisembayev.

Data collection, analysis and interpretation: Galymzhan Beisembayev.

Visualization: Galymzhan Beisembayev.

Writing review and editing research: Galymzhan Beisembayev.

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