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Financial Conditions, Governance and Gender Differences in Higher Education: Evidence From Kazakhstan

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Abstract

The issue of gender differences in higher education remains significant, as they affect human capital and economic development. The study aims to assess the relationships among banking system financial indicators, governance characteristics, and gender-related differences in higher education. The methodological framework includes the construction of relative indicators, correlation analysis to identify the directions of relationships, and regression modeling to determine statistically significant factors. Time series for the period 2015-2024 were used, including indicators of the gender ratio of graduates (bachelor's and master's degrees), financial indicators, as well as indicators of the quality of public administration. The regression model explains 62.5% of the variation in the gender gap ($R2 = 0.625$; Adjusted $R2 = 0.518$), with an F value of 5.840 and $p = 0.032$. The negative impact of financial indicators was revealed: the coefficients were -1.740 for ROA and -1.335 for DFR, which indicates a decrease in the gender gap with improved financial conditions. The results show that improvements in financial conditions are accompanied by a reduction in the gender gap in higher education, but this effect is complex and not determined by individual factors. The prospects for further research include expanding the set of variables and considering the characteristics of the labor market and access to educational resources.

Keywords: Gender, Gender Gap, Eduction, Higher Education, Human Capital, Finance, Financial Development, Governance Quality

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1. INTRODUCTION

There is a question about how financial conditions and public administration relate to women's participation in higher education and the formation of human capital. This relationship manifests itself differently across countries. In developed economies, expanding financial opportunities are accompanied by women's transition to higher levels of education, including master's degrees, thereby strengthening their position in the labour market. In many developing countries, expanding access to education does not lead to such a transition, and participation is concentrated at the basic level, thereby reducing the return on human capital.

Country experiences show that women's participation in education yields different outcomes depending on how that education is used in the economy. In Southern Africa, including the SADC region, increasing female participation in education is associated with economic growth, specifically a positive impact on GDP per capita (Licumba et al., 2015). In Southeast Asia, India, and China, gender equality in education has been found to enhance economic growth. However, this effect depends on the structure of the economy and the demand for skilled labour (Mishra & Mishra, 2016). In the presence of such demand, women's education increases productivity and income; in its absence, it does not yield comparable results. In Saudi Arabia, an increase in the number of women with higher education is not accompanied by an increase in their employment. In contrast, a significant proportion of women with degrees remain out of the labour force, and economic participation remains low (Koyame-Marsh, 2017). In OECD countries, increasing female economic participation directly contributes to economic growth and improves labour efficiency (Fluchtmann et al., 2024).

Kazakhstan is seeing an increase in participation in higher education for both genders. A high proportion of both women and men complete undergraduate degrees. However, at the next level, a difference emerges: women are more likely to continue their education and enroll in master's programs. Given the comparable levels of undergraduate education, women are more likely to pursue further education and attain higher levels of training.

Financial indicators over this period demonstrated steady growth, a stronger resource base, and increased efficiency in the banking sector. Deposits increased from 14.9 trillion to 45.9 trillion tenge; household deposits grew from 6.3 trillion to 26.6 trillion tenge; banking system assets increased from 22.6 trillion to 68.3 trillion tenge; and liabilities increased from 20.1 trillion to 57.9 trillion tenge. Banks' financial results increased more than tenfold, from 210 billion to 2.5 trillion tenge.

Governance indicators are changing more slowly and remain at a limited level. The Corruption Perceptions Index increased from 28 to 40 but remains below the levels of developed countries. The Voice and Accountability indicator improved from -1.18 to -0.82, but remains negative. Political Stability fluctuates near zero and remains unstable. Government effectiveness changed from negative values to 0.15, while Regulatory Quality fell to 0.05, indicating weak realisation of managerial potential.

Although there is an increase in financial resources and in women's participation in education, accumulated potential does not translate into higher levels of qualifications. Under these circumstances, it is necessary to assess how financial indicators and public administration characteristics relate to the gender gap in higher education and whether they reflect the actual quality of the human capital being developed.

The study aims to examine how indicators of the banking system and the quality of public administration are associated with women's participation in higher education and the formation of the gender gap, and to determine which of them actually have an impact. The following hypotheses were developed:

H1: An increase in the deposit funding ratio (DFR) is associated with a reduction in the gender gap in bachelor's degree graduation.

H2: An increase in the household deposit share (HDS) is associated with a reduction in the gender gap.

H3: An increase in the return on assets (ROA) is associated with a reduction in the gender gap.

H4: An increase in the asset-liability ratio (ALR) is associated with a reduction in the gender gap.

2. LITERATURE REVIEW

Education is one of the key mechanisms that contribute to women's status in society and to their contribution to human capital. The role of education is different across countries. In developed countries, women achieve higher levels of education and are more likely to complete their education, whereas in other countries, access limitations and participation gaps persist (Buchmann et al., 2008). Moreover, differences are formed not only by access but also through academic performance, behaviour, and learning conditions, which influence women's further advancement in the educational system. The experience of countries in Africa and the Middle East has shown that gender inequality in education leads to lower incomes and limits economic development. Consequently, education directly affects the relationship between women's economic activity and economic outcomes (Baliamoune-Lutz & McGillivray, 2015). At the same time, it has been found that even with educational opportunities, women's participation is determined by intra-household decisions and resource allocation, in which women's contributions are valued differently and influence their access to education (Jackson, 2013). However, economic and political constraints hinder women's potential, despite the expansion of educational opportunities (Sen, 2019).

The value of education is revealed through its contribution to human capital formation, as the level of knowledge and skills determines labour productivity and income. An increase in educational attainment leads to higher earnings and greater overall economic growth (Lange & Topel, 2006). Moreover, a higher level of education is associated with the formation of a more skilled labour force and accelerates the adoption of technology, which enhances economic dynamism (Islam et al., 2016). However, this approach is limited to assessing income and productivity. In contrast, other studies consider education more broadly as a factor influencing quality of life, social participation, and individual opportunities, which alters the understanding of its value (Robeyns, 2006; Chiappero-Martinetti & Sabadash, 2014). The difference is that the economic approach is limited to assessing income, whereas broader approaches take into account changes in an individual's situation and the expansion of their opportunities. Educational structure matters: general skills retain their value longer, while highly specialised ones become less relevant more quickly as technology changes (Weber, 2014). In terms of gender, women have higher levels of education, which is linked to the need to compensate for labour-market limitations where income differences persist (Yamauchi & Tiongco, 2013).

Limited access to credit and financial services reduces investment in human capital, as low-income households are unable to finance education despite its high returns (Demirgüç-Kunt & Levine, 2009). This situation changes as the financial system improves: expanded credit and reduced constraints on access to resources increase investment in education and allow more people, including women, to continue their education. However, in the early stages of financial system development, access to its opportunities is primarily gained by wealthier groups, which perpetuates differences in educational opportunities (Beck et al., 2007). With improved access to financial resources, enrollment increases are observed across the secondary level for both genders. However, in higher education, the effect is more evident among women. When financial resources

become available, women are more likely than men to continue their education (Thierry & Emmanuel, 2023). Education results from women gaining the ability to manage their income independently and make decisions about investing in their development. As a result, education is not simply a consequence of increased financial resources, but rather of women gaining the ability to manage their income independently and to make decisions about investing in their development (Cabeza-García et al., 2019).

Access to financial services differs between men and women and is directly related to the ability to use these instruments in everyday economic activity. Women are less likely to own bank accounts and to use credit and financial instruments. Therefore, their economic activity is limited, as is their ability to manage resources independently (Demirgüç-Kunt et al., 2020). Nevertheless, even if they have an account, women are more likely to use it for basic transactions. Men, by contrast, engage in more complex financial instruments, including lending and investment (Antonijević et al., 2022). At the country level, differences are exacerbated by social and institutional constraints. In developing countries, there is a tendency for women's employment levels. Thus, they are excluded from credit transactions due to insufficient income (Mohammady & Vepa, 2025). Even with the formal availability of financial instruments, women continue to be limited in their ability to manage their resources, including investment in education. At the same time, men have more stable access to financial mechanisms and are more likely to use them to expand economic activity.

Some studies examine the impact of public governance. This influences women's ability to use financial services, particularly in terms of opportunities for learning and economic activity. State effectiveness, regulatory quality, and rule enforcement are important because they shape account-opening processes, identity verification, savings protection, access to services without unnecessary costs, and the use of formal instruments (Kaufmann et al., 2011). Acemoglu and Robinson (2019) noted the distinction between inclusive and extractive institutions. Resources, rights, and opportunities are distributed more broadly, creating a basis for investment in human capital. Access is concentrated among narrow groups, so education and finance do not serve as universal tools for advancement. Figart (2013) demonstrated that the problem lies in financial literacy and in barriers to entry into the formal sector. In particular, fees, requirements, geographical inaccessibility, and the poor suitability of standard services for low-income groups. This has even more severe consequences for women, as weak regulation and service delivery leave them more likely to be excluded from formal services. Therefore, good regulations and their enforcement expand women's access to safe financial services. At the same time, weak governance perpetuates dependency, limited control over resources, and reduced opportunities to invest in their own education.

Research on the relationship between access to financial resources, education, and gender differences employs a quantitative approach that constructs relative indicators. Klasen and Lamanna (2009) examined gender differences in educational attainment and employment to assess the economic costs of underutilising human capital. Kim et al. (2018) construct financial inclusion indicators through a system of relative proxies, such as access to financial services, to assess differences in economic activity levels. Evans et al. (2020) calculated the gender gap in education over a long period, allowing them to track changes in men's and women's participation rates and identify persistent differences. Linear regression is used to test hypotheses, allowing the assessment of the impact of these indicators on economic outcomes (Zhang & Posso, 2019). The use of relative indicators and regression analysis allows us to assess how various factors are associated with changes in the gender gap in higher education, making this approach fundamental for analysing its dynamics.

3. METHODOLOGY

The methodological approach is based on the analysis of the relationship between financial indicators of the banking system, governance-related indicators, and women's participation in higher education. The study examines how changes in the economic and institutional environment are reflected in the gender structure of educational outcomes. For this purpose, an indicator system is constructed that captures both the gender dimension of human capital formation and key characteristics of the financial sector. Table 1 presents the variables used in the analysis and the corresponding constructed coefficients.

Table 1. Variables and constructed indicators

Indicator	Coefficient	Based on variables
Gender gap in education (Master's)	GG_EDU_MA	Female graduates (MA) / Male graduates (MA)
Gender gap in education (Bachelor's)	GG_EDU_BA	Female graduates (BA) / Male graduates (BA)
Advanced education gap	EDU_ADVANCED_GAP	GG_EDU_MA − GG_EDU_BA
Deposit funding ratio	DFR	Deposits / Liabilities
Household deposit share	HDS	Household deposits / Total deposits
Asset-liability ratio	ALR	Assets / Liabilities
Return on assets	ROA	Financial result / Assets

Note: compiled by the author

The study uses indicators presented as relative coefficients, which ensure data comparability and eliminate the influence of differences in the scales of the underlying variables. Gender indicators are constructed as the ratio of female to male graduates, reflecting the structure of female participation in higher education. The gap between educational levels is also calculated, allowing us to assess changes in the gender ratio across higher levels. Financial indicators are compiled from aggregated banking system data and presented as coefficients reflecting the funding structure, the role of household deposits, the asset-liability ratio, and the efficiency of resource use. This approach allows us to move from absolute values to an analysis of proportions and relationships. The use of coefficients ensures the accuracy of subsequent statistical analysis.

The analysis is conducted in stages. The first stage examines the current dynamics of the indicators to identify changes in women's participation in higher education and in the financial characteristics of the banking system. The second stage involves a correlation analysis that refines the hypotheses and selects variables for further modeling. The correlation between variables is calculated using the Pearson correlation coefficient (1):

$$r_{xy} = \frac{\sum_{i=1}^{n}(x_i-\bar{x})(y_i-\bar{y})}{\sqrt{\sum_{i=1}^{n}(x_i-\bar{x})^2 \times \sum_{i=1}^{n}(y_i-\bar{y})^2}} \quad (1)$$

where:

r_{xy} – correlation coefficient between variables x and y;

x_i, y_i – observed values;

$\bar{x}$, $\bar{y}$ – sample means;

n – number of observations.

Next, a regression analysis is used to refine further the model: variables that do not demonstrate a significant relationship are excluded, and the final specification is formed. The regression model is specified by formula (2):

$$Y_t = \beta_0 + \beta_1 X_{1t} + \beta_2 X_{2t} + \beta_3 X_{3t} + \beta_4 X_{4t} + \varepsilon_t \quad (2)$$

where:

Y_t – dependent variable (education indicator);

X_{1t},X_{2t},X_{3t},X_{4t} – independent variables;

β_0 – intercept;

β_1, β_2,β_3 ,β_4 – regression coefficients;

ε_t – error term.

Figure 1 shows the initial hypothesis structure and the final model after variable selection.

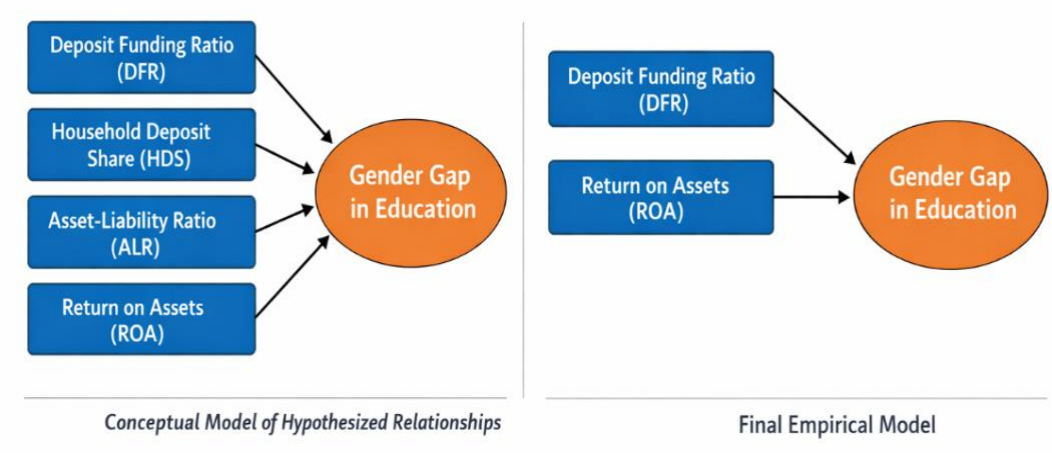

Figure 1. Initial hypotheses and final model specification

As a result, key independent indicators were identified and used in the further assessment. After evaluating the model, a Q-Q plot is analysed to verify that the residuals are normally distributed. The final stage involves interpreting the results and drawing conclusions about the nature of the relationship between financial indicators and women's participation in higher education.

4. ANALYSIS AND RESULTS

The gender structure of higher education graduates reflects not only the distribution of human capital but also the characteristics of access to higher levels of qualifications. Differences between bachelor's and master's degrees allow us to identify the stage of the educational trajectory at which the gender gap widens or narrows. This differentiation has practical significance, as master's degrees serve as the foundation for the human resources required for research, management, and expert work.

The GG_EDU_MA and GG_EDU_BA values reflect the gender ratio of graduates at each education level. At the same time, the EDU_ADVANCED_GAP indicator captures the difference between levels and allows determination of the stage at which the greatest deviation occurs. Table 1 presents the gender ratios of bachelor's and master's degree graduates, as well as the gap between the two levels for 2015 and 2024.

Table 2. Gender ratio of higher education graduates and the gap between levels of education in Kazakhstan

Indicator	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
GG_EDU_MA	1,81	1,65	1,46	1,43	1,46	1,48	1,71	2,00	1,88	1,70
GG_EDU_BA	1,34	1,34	1,32	1,29	1,25	1,25	1,21	1,24	1,28	1,25
EDU_ADVANCED_GAP	0,47	0,31	0,14	0,14	0,21	0,23	0,51	0,77	0,60	0,45

Note: compiled by the author

The presented data demonstrate that a widening gender gap at higher levels of education appears at the master's degree level, with higher values than at the bachelor's degree level, indicating. In 2015, the GG_EDU_MA value was 1.81, while34 at the bachelor's level, it was 1.34; and in 2022, the gap reached its maximum: 2.00 and 1.24, respectively. Thus, the EDU_ADVANCED_GAP indicator increased from 0.47 in 2015 to 0.77 in 2022. In subsequent years, the gap narrows to 0.45 in 2024, but the difference between levels remains.

To assess the structure of banks' resource base and changes in financial indicators, coefficients are used that reflect the deposit-to-liability ratio, the role of household deposits, the asset-to-liability ratio, and the return on assets (Table 3).

Table 3. Financial stability and funding structure indicators of the banking sector in Kazakhstan for 2015–2024

Indicator	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Deposit Funding Ratio	0,74	0,77	0,79	0,77	0,77	0,79	0,79	0,79	0,78	0,79
Household Deposit Share	0,42	0,44	0,48	0,50	0,52	0,50	0,51	0,52	0,57	0,58
Asset-to-Liability Ratio	1,12	1,12	1,15	1,14	1,16	1,15	1,14	1,14	1,16	1,17
ROA	0,01	0,02	0,00	0,02	0,03	0,02	0,03	0,03	0,04	0,04

Note: compiled by the author

At the beginning of the period, the deposit funding ratio increased slightly (0.74-0.79), and after 2017, the role of deposits in the formation of bank liabilities became more stable. The share of household deposits increased from 0.42 to 0.58 at the beginning of the period. In 2020, due to the COVID-19 lockdown, this indicator declined briefly. The asset-liability coverage ratio increased from 1.12 to 1.17 with minor fluctuations; the excess of assets over liabilities remained throughout the period. Return on assets increased slightly to 0.04 at the end of the period.

An increase in the deposit funding ratio indicates reliance on internal resources, including bank liabilities and client funds. Dependence on external sources is decreasing. The increase in the share of household deposits indicates greater household participation in building the resource base, which is associated with the accumulation of savings and their placement in the banking system. An increase in the asset-to-liability ratio signifies a greater volume of assets relative to funds attracted and indicates a continued positive gap between assets and liabilities. An increase in return on assets reflects higher profit per unit of assets and indicates greater efficiency in banking operations. Taken together, these changes indicate a strengthening of the internal nature of funding, an increasing role of the population in bank financing, and an increase in the profitability of the banking system.

The analysis revealed a strong positive correlation between GG_EDU_MA and EDU_ADVANCED_GAP ($r = 0.975$). Their simultaneous inclusion in the model will reduce the interpretability of the results. The GG_EDU_BA indicator showed stable negative relationships with financial variables (-0.63, -0.67, -0.64), suggesting a link between the gender gap at the undergraduate level and the banking sector. Therefore, GG_EDU_BA will be considered the dependent variable, as it is the indicator that best explains the relationship with the selected factors.

To identify the relationships between the gender structure of education and the financial performance of the banking sector, a correlation analysis was conducted to determine the direction and strength of linear relationships between variables (Figure 2).

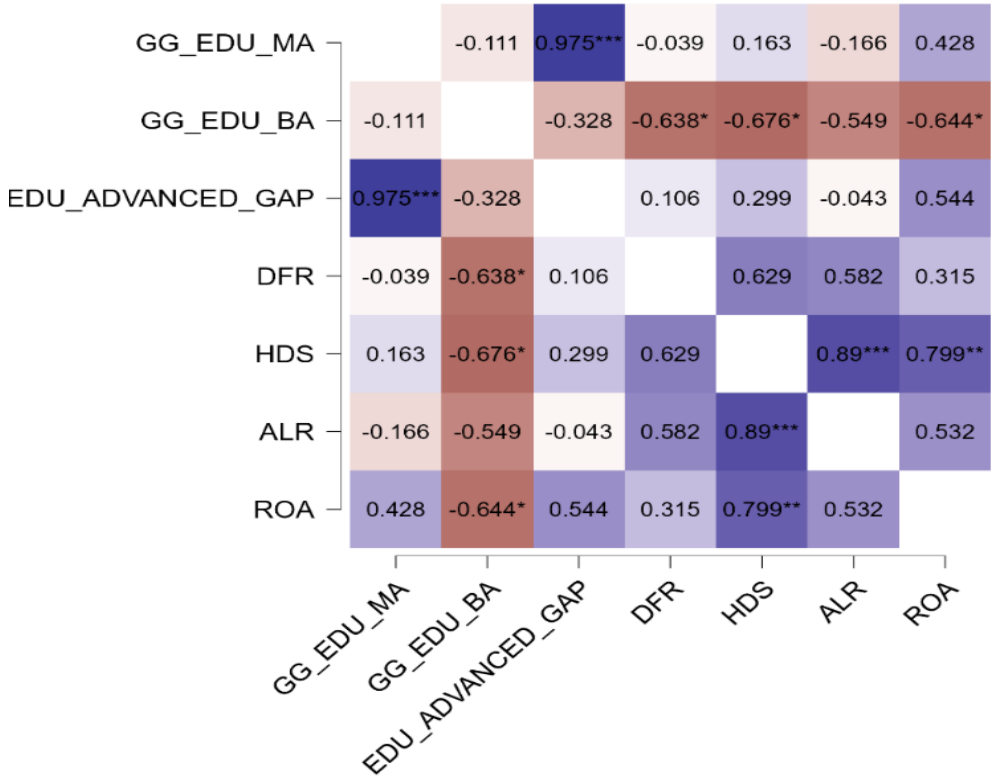

Figure 2. Correlation analysis results

At the regression stage, variables that did not demonstrate a statistically significant relationship with the dependent variable were removed. Thus, hypotheses 2 and 3 regarding the excluded variables were not confirmed during model selection (Table 4).

Table 4. Model Summary - GG_EDU_BA

Model	R	R^2	Adjusted R^2	RMSE
M_0	0.000	0.000	0.000	0.045
M_1	0.791	0.625	0.518	0.031

Note: compiled by the author

Model M_1 is characterised by $R2 = 0.625$, which explains 62.5% of the variance in the dependent variable. The $Adjusted\ R2$ maintains sufficient explanatory power given the number of factors. The decrease in RMSE from 0.045 to 0.031 reflects improved model accuracy. The value R = 0.791 indicates a strong relationship between the dependent variable and the included factors (Table 5).

Table 5. ANOVA

Model		Sum of Squares	df	Mean Square	F	p
M_1	Regression	0.011	2	0.006	5.840	0.032
	Residual	0.007	7	9.641×10^{-4}	-	-
	Total	0.018	9	0.006	-	-

Note: compiled by the author

The ANOVA results demonstrated the model's statistical significance. The F-statistic is 5.840 at a significance level of p=0.032, which is below the threshold of 0.05. Therefore, the results confirmed the model's validity (Table 6).

Table 6. Coefficients

Model		Unstandar-dized	Standard Error	Standar-dized	t	p	Collinearity Statistics	
							Tolerance	VIF
M_0	(Intercept)	1.277	0.014	-	90.272	< .001	-	-
M_1	(Intercept)	2.357	0.518	-	4.553	0.003	-	-
	ROA	-1.740	0.862	-0.492	-2.019	0.083	0.901	1.110
	DFR	-1.335	0.673	-0.483	-1.983	0.088	0.901	1.110

Note: compiled by the author

The coefficient estimates showed a negative influence of both variables. The coefficients for ROA (−1.740) and DFR (−1.335) are negative, indicating that GG_EDU_BA decreases as these indicators increase. The values of the standardised coefficients are close (−0.492 and −0.483), with a minimal gap between them. No dominant factor is observed, and the contribution of ROA and DFR is distributed almost evenly. Neither indicator individually produces a significant effect; their combined effect is significant. The p-values (0.083 and 0.088) exceed 0.05 but remain within 0.1, allowing for interpretation at a more relaxed significance level. VIF values near 1 indicate the absence of multicollinearity between the variables (Figure 3).

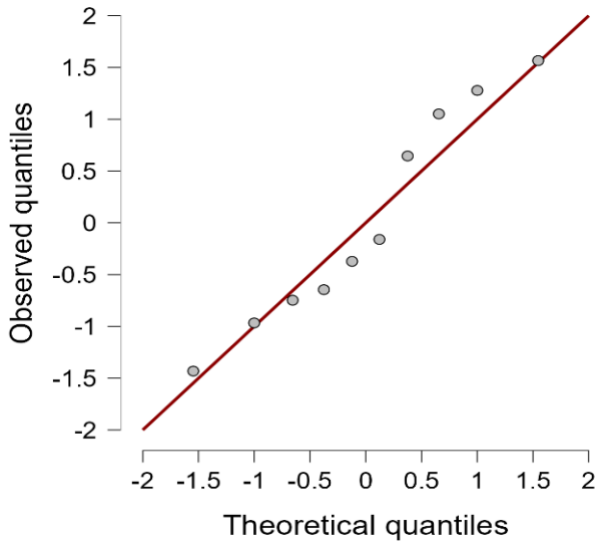

Figure 3. Q-Q Plot standardised residuals

The points on the graph lie along a diagonal line, with small deviations in the central and right parts of the distribution. In contrast, no strong deviations are observed, and the extreme values do not deviate from the general line. The residuals are approximately normally distributed, the normality condition is met, and the error distribution does not distort the model. The hypotheses for ROA and DFR are partially confirmed. The influence of each factor is weak, and the hypotheses regarding the previously excluded variables are not supported because they lack statistical relationships (Table 7).

Table 7. Hypotheses testing results

Hypothesis	Statement	Result
H1	Increase in deposit funding reduces the gender gap in bachelor's graduation	Partially confirmed
H2	Increase in household deposits reduces the gender gap	Not supported
H3	Increase in the profitability of banks reduces the gender gap	Partially confirmed
H4	Increase in asset coverage reduces the gender gap	Not supported

Note: compiled by the author

The results show that the selected dependent variable reflects the gender gap in bachelor's degree completion, that is, the ratio of women's and men's participation in the formation of a basic level of human capital. A narrowing of this gap means that the share of women in higher education approaches or exceeds that of men. The obtained estimates indicate that such shifts accompany changes in financial indicators, but the connection manifests itself not through individual indicators, but through their combined change. For example, increases in bank stability and profits occur simultaneously with increases in women's participation in education. Still, it is not possible to identify a single factor responsible for this result. The lack of confirmation for some hypotheses suggests that not every change in the financial system is reflected in women's educational outcomes. Women's participation in human capital formation increases not through targeted measures, but in the context of a generally improving economic situation, when educational opportunities expand. In such a situation, the role of the state is limited, as improved macroeconomic indicators do not directly translate into targeted changes in women's access to education and their participation in its outcomes.

The results are consistent with the findings of the literature review. Limited access to financial resources reduces investment in education, while increased access increases the likelihood of continuing education, including for women (Demirgüç-Kunt & Levine, 2009). According to the obtained results, when financial opportunities arise, women continue their education. For women, it is a means of improving their social status and achieving financial independence and control over resources (Cabeza-García et al., 2019; Thierry & Emmanuel, 2023). The result supported that improved financial characteristics are accompanied by a narrowing of the gender gap at the bachelor's level. At the same time, it has been established that not every change in the financial system is reflected in educational outcomes, since access to financial resources is retained by wealthier groups at the early stages of development (Beck et al., 2007). Thus, the results support that women's participation in education is determined by access to finance and the conditions under which it is used, including resource distribution within households and constraints on educational decisions (Jackson, 2013; Sen, 2019). As a result, the influence of financial factors manifests itself through overall improvements in conditions. Therefore, women's education expands with financial opportunity but is not determined by a single factor.

The results for public administration do not show a consistent relationship with changes in the gender gap in education, which is at odds with some assumptions in the literature. Studies have noted that government effectiveness determines access to financial services and, through them, women's participation in education (Kaufmann et al., 2011; Figart, 2013). It has also been shown that with a broader distribution of resources and opportunities, education and finance act as channels to increase women's participation, whereas this does not occur when access is concentrated (Acemoglu & Robinson, 2019).

The results obtained did not reveal such a relationship, indicating no direct correlation between governance characteristics and changes in women's educational outcomes. Even in the presence of formally favourable conditions, the impact is not realised at the educational level and does not reduce the gender gap.

5. CONCLUSION

The results show that the relationship between women's participation in higher education and the banking system's financial indicators is significant, whereas governance indicators have no significant effect. Improved financial performance is accompanied by a narrowing of the gender gap and an increase in women's participation. Still, this result is determined by the overall change in conditions, not by individual factors. The lack of a significant effect from governance indicators suggests that changes at the public system level do not directly translate into women's educational outcomes or their participation in human capital formation.

The results show that increasing financial resources and women's participation in education do not, by themselves, ensure a transition to a higher level of human capital, and these changes are not reflected in public administration indicators. Under these conditions, the key task of the state is not to expand education coverage, but to change the structure and conditions of its use. It is necessary to stimulate the transition to the master's level, as it is associated with the development of managerial, analytical, and research competencies. This requires redistribution of educational and financial resources in favour of continuing education, including targeted funding for master's programs, grant support, and the alignment of educational programs with labour-market requirements.

The next area concerns the use of the financial system. The growth of deposits and resources in the banking system should be linked to education financing mechanisms. This requires developing tools to allocate funds for education, including student loans and special programs for households that view education as an investment.

Public administration is of particular importance. Indicators of regulatory efficiency and quality remain at levels that do not translate educational potential into economic outcomes. There is a need to simplify procedures for accessing financial services, reduce costs, and create conditions that allow women to use financial instruments independently to invest in education and development. Thus, a key area of public policy is the transition from quantitative growth of education to its qualitative use. Education, financial instruments, and public administration conditions must be linked so that the training acquired can be realised in the economy and build sustainable human capital.

Future research should expand the dataset and include additional variables that consider conditions affecting women's participation in education, such as labour market characteristics, income, and access to educational opportunities.

AUTHOR CONTRIBUTION

Writing – original draft: Makpal T. Kurmasheva.
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Software and supervision: Makpal T. Kurmasheva.
Data collection, analysis, and interpretation: Makpal T. Kurmasheva.
Visualization: Makpal T. Kurmasheva.
Writing – review and editing: Makpal T. Kurmasheva.

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