

FACTORS AFFECTING THE QUALITY OF HIGHER EDUCATION IN  
ARMENIA: A MULTIPLE LINEAR REGRESSION ANALYSIS

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**Abstract**

This study examines the determinants of the quality of higher education in Armenia through multiple linear regression analysis, using a thirteen-year period (2010-2023) data from different sources, such as ArmStat, World Bank, and UNESCO UIS. To measure the undergraduate quality, the study uses proxies, namely tertiary graduation rates and graduate employment rates. These are regressed on predictors that reflect faculty qualifications, student demographics, institutional resources, and socio-economic context. Descriptive statistics reveals significant increase in tertiary enrollment. Regression analysis point to strong relationships between stronger faculty credentials and higher graduation rates, as well as between greater female enrollment and higher employment rates. With regard to education budget sharing and GDP per capita, our models did not show significant effect. The implications of the findings, discussed in light of Armenia's education reforms and international quality standards, emphasize the critical importance of teacher qualifications in improving Armenian higher education outcomes.

**Keywords:** Higher education quality, Armenian tertiary education, regression analysis, education outcomes.

**Introduction**

Educational quality is critical for Armenia's development; therefore, its assessment holds paramount importance in contemporary tertiary educational policy and practice. Although stakeholders increasingly call for evidence-based measures to strengthen learning outcomes, research indicates that Armenia continues to lag behind its regional counterparts. According to World Bank report, the quality of Armenia's tertiary education is "nearly 30% lower than Georgia's, and half as low as the new EU member states". Such underperformance is closely linked to low public investment in education (2.7% of GDP, only half the EU average) and rapidly shifting economy [Izvorski 46]. Armenia's higher education also grapples with governance issues, with reforms aiming at internationalization and a goal that 90% of graduates secure field-related employment [Markosyan & Ohanyan]. Evidence from a wide range of contexts underscores that education quality emerges from the complex interplay of teacher characteristics, institutional infrastructure, socioeconomic conditions, and learner background variables. In this sense, the complexity of factors predicting the quality of higher education necessitates analytical methods that will allow for understanding the multifaceted relationships between various educational inputs and educational outcomes and contributing to policy [Yang et al, 170-176].

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This research **aims** to identify the factors that most strongly affect undergraduate education quality in Armenia. Educational quality is conceptualized here through measurable outcomes, namely graduation and employment rates, which are assessed against key determinants, such as faculty characteristics, student composition, socio-economic and resource-related factors. Thus, the **objective** of this study is to determine and measure the main factors that are predictors of education quality. Using the **methodology** of multiple regression analysis on data from 2010-2023, this study reveals which determinants have the strongest statistical association with the proxies of education quality while controlling for confounding variables. The **significance** of this approach is that it enables the quantification of individual factor contributions to educational outcomes and generates actionable insights for policymakers on where reforms should be prioritized.

### *Literature review*

Within higher education, quality is increasingly viewed as the product of interactions between student, institutional, and systemic dimensions. The literature consistently underscores the pivotal role of faculty expertise – defined through qualifications, teaching practice, and ongoing development – in shaping student learning outcomes [Hanushek & Rivkin, 267-271], [Darling-Hammond, 35-47]. Faculty members holding advanced degrees and demonstrating research competence are more likely to deliver rigorous curricula and provide effective mentorship, particularly in research-intensive programs [Altbach & Salmi, 295], [World Bank].

Student background also correlates with learning outcomes in higher education. According to OECD’s Education at a Glance [OECD], students from disadvantaged background face persistent obstacles – insufficient academic support, financial constraints, and limited career guidance – that hinder their educational achievement and persistence.

The quality of learning environments is also conditioned by institutional resources, notably financial investment per student, technological, and infrastructural capacity, and the balance between student enrollment and faculty availability. Well-funded institutions with robust infrastructure are better positioned to offer students enriched learning experiences, encompassing laboratory training, internships, and extracurricular activities. International evidence demonstrates that higher per-student spending contributes to improved graduation rates and labor market relevance [OECD], while more favorable student-faculty ratios promote individualized teaching and increased learning outcomes [UNESCO UIS].

Another crucial dimension is the governance and socio-economic environment which conditions how resources are allocated and reforms are implemented. National wealth, often measured by GDP per capita, typically correlates with the extent of public investment in education. According to the World Bank, countries with stronger governance systems are more successful in promoting accountability, equity, and quality in higher education. Armenia, despite its upper-middle-income status and recent increases in education expenditure, continues to face challenges in quality assurance, graduate employability, and meeting international benchmarks [Asatryan], [Tumanyan et al], [World Bank].

Global analysis and domestic strategies point to the urgent necessity of reforming teaching practices and governance in Armenian higher education. Since joining the Bologna Process in 2005, Armenia has sought to reorient its universities toward student-centered education, yet the implementation of these reforms has been uneven. UNESCO policy report stresses that the establishment of effective student-centered education remains one of Armenia’s central higher

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education challenges amid ongoing governance reforms. Its comparatively weaker position in global rankings signals enduring structural issues that require systemic solutions.

While Armenia still lacks a substantial body of empirical research on its tertiary education, broader regional research relies on graduation rates and employability, as measures of quality [Teichler, 329], [Altbach & Salmi, 295]. Increasingly, the graduate employment rate is treated a key indicator, as it reflects how well universities prepare students for real labor market participation [Marginson, 272]. This study builds on these strands of literature by operationalizing them within a multifactorial regression model, drawing on datasets from national and international databases. By employing internationally validated proxies of higher education quality, namely graduation rates and employment rates, this study seeks to assess both the distinct and interacting effects of institutional, demographic, and macroeconomic variables within the Armenian context. This approach not only aligns with global research trends but also responds to local policy debates seeking evidence-based reforms in Armenia's higher education sector.

### *Methodology*

Data for Armenia 2010-2023 are gathered from UNESCO, ArmStat, and the World Bank databases, which are cross-referenced to ensure consistency, to fill any gaps, and to form a panel dataset. As dependent variables, we adopt two quality proxies: (1) the gross tertiary graduation rate, reflecting the proportion of undergraduate students who successfully complete their programs, and (2) the graduate employment rate, indicating the percentage of Bachelor's degree holders entering employment within one year, based on national labor statistics. The analysis focuses exclusively on undergraduate/bachelor's level completions. Independent variables cover the following:

(1) Faculty qualifications: to capture the quality of academic staff, we use the approximate share of tertiary-level educators who hold doctoral degrees, as reported in national educational statistics of ArmStat. This indicator reflects the level of expertise available to students and the academic rigor of the institution.

(2) Student demographics: We measure the gender composition of the student body through the proportion of female students enrolled in tertiary education (alternatively expressed as the gender ratio), based on national and international reports. This variable provides insight into equity and diversity within higher education.

(3) Institutional resources: Resource allocation is represented by the share of government education expenditure directed toward tertiary education, expressed as a percentage of total education spending. These data are obtained from UNESCO's UIS database. This indicator reflects the relative priority given to higher education within the national education budget.

(4) Socio-economic context: as a proxy for national wealth, we include GDP per capita, measured in constant international dollars and drawn from World Bank data. This variable situates higher education outcomes within the broader economic environment.

The selected indicators reflect key dimensions consistently highlighted in the literature on education quality – faculty credentials, student demographics composition, funding levels, and national wealth.

### **Regression Model:**

$$\text{Quality}_t = \beta_0 + \beta_1(\text{FacultyPhD}_t) + \beta_2(\text{FemaleShare}_t) + \beta_3(\text{TertExpShare}_t) + \beta_4(\text{GDPpc}_t) + \epsilon_t$$

We estimate linear regressions of the form where quality is a proxy (graduation or employment rate) in years, and the right-hand variables are year-values of the predictors. Robustness

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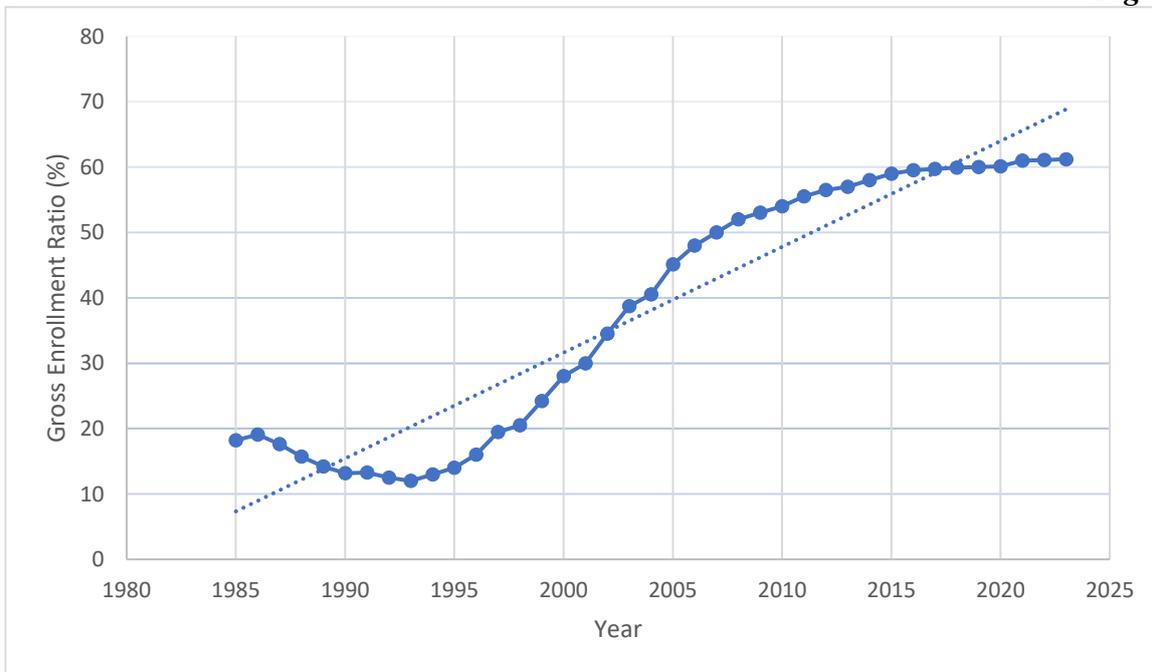
checks are conducted by testing alternative model setups, such as excluding GDP per capita or by estimating regressions separately for female and student populations. Standard diagnostics, including variance inflation factors (VIF) and residual plots help verify that the model does not suffer from major misspecification. This is supported by VIF values below five, indicating only low to moderate correlation among the independent variables. Likewise, the Durbin-Watson test results led us to retain the null hypothesis of no residual correlation, suggesting that the residuals are independent of one another.

### **Results and Discussion**

#### *Trends in Key Predictors*

Descriptive patterns are first examined before running the regression. Time-series plots of the key predictors used in the regression model depict steady upward trends. Armenia's tertiary gross enrollment ratio has shown a notable increase in recent years. Figure 1 indicates that enrollment rose to nearly 61.2% by 2023. This growth illustrates the massification of higher education, which could put pressure on quality unless resources such as faculty and funding expand accordingly.

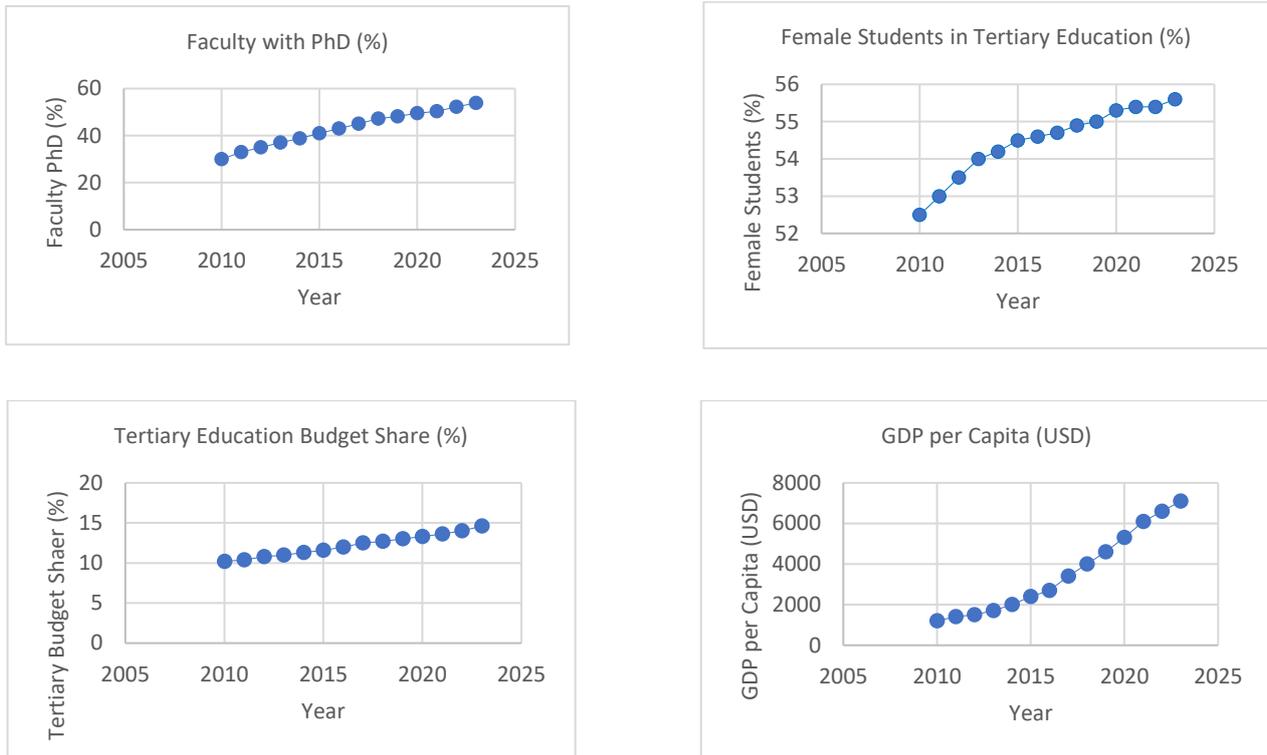
*Figure 1.*



***Tertiary Enrollment in Armenia (1986 - 2023)***

The share of faculty holding a PhD rose from about 30% in 2010 to nearly 54% in 2023, representing more than 1.5-fold increase. Female representation in tertiary education remained fairly stable, with women accounting for about 53-55% of total enrollment between 2010 and 2023, corresponding to a female-to-male ratio of roughly 1.12-1.20. The share of government education expenditure allocated to higher education increased from around 10-11% in 2010 to approximately 13-14% by 2023. Over the same period, Armenia's economy expanded significantly, with GDP per capita increasing from around \$1200 in 2010 to approximately \$7100 in 2023, creating greater potential for investment in higher education. These contextualized developments are depicted in Figure 2 and provide the basis for our regression analysis of quality outcomes.

Figure 2.



*Trends in Key Predictors of Higher Education Quality (2010 - 2023)*

**Regression Coefficients: Predictors of Graduation and Employment Rates**

Coefficients are estimated from multivariate regressions predicting graduation rate and graduate employment rate and presented together with their corresponding p-values in Table 1.

Faculty qualifications, measured as the share holding a PhD, exert the strongest positive influence on graduation outcomes. The regression coefficient is  $\beta \approx +1.41$  ( $p=0.022$ ) for graduation, which implies that a one-percentage point increase in PhD share corresponds to about a 1.4-point rise in the graduation rate ( $p<0.05$ ). A higher female student share is also positively related to graduation ( $\beta \approx 0.34$ ,  $p<0.02$ ) suggesting that cohorts with more women tend to graduate at higher rates. By contrast, the share of education spending on tertiary level has a small positive coefficient ( $\beta \approx +0.150$ ), which is not statistically significant. Likewise, GDP per capita has no significant positive effect on graduation. Even more, economic growth shows virtually zero or slightly negative effect on graduation in the model ( $\beta \approx -0.0068$ ,  $p=0.080$ , likely due to collinearity among trends) and is not significant.

For graduate employment, the effects follow a similar but weaker pattern: the share of female students appears as a significant positive predictor ( $\beta \approx +0.604$ ,  $p=0.021$ ), whereas the faculty PhD share shows a positive coefficient ( $\beta \approx +0.73$ ,  $p=0.082$ ) but reaches only marginal significance. This suggests that cohorts with more women tend to graduate and find jobs at higher rates. Tertiary budget share and GDP per capita do not have a statistically significant effect on employment rate ( $\beta \approx +0.493$ ,  $p \approx 0.091$  and  $\beta \approx +0.0003$ ,  $p=0.916$ , respectively). Thus, after controlling for other factors, macroeconomic has no robust effect on the quality proxies.

*Table 1.*

Variable	Graduate Rate $\beta$ (p)	Employment Rate $\beta$ (p)
Faculty PhD (%)	1.412 (0.022)	0.726 (0.082)
Student Female (%)	0.341 (0.015)	0.604 (0.021)
Tert. Exp. Share (%)	0.150 (0.643)	0.493 (0.091)
GDP per capita (USD)	-0.0068 (0.080)	0.03 (916)

***Regression Coefficients***

The elevated R-squared values ( $R^2 \approx 0.98-0.99$ ) observed in these regressions largely reflect pronounced temporal trends within the data; however, the individual coefficients remain meaningful when interpreted under *ceteris paribus* conditions. The share of faculty holding doctoral degrees emerges as a salient factor: the upward trend in qualifications, indicative of faculty development, corresponds with the positive association observed in graduation rates. In other words, institutions with more highly credentialed faculty tend to achieve stronger graduation outcomes. This finding reinforces the argument that instructional quality is a key determinant of student success, as faculty with doctoral training are more likely to adopt effective pedagogical practices, in line with established educational research (World Bank). Similarly, higher proportions of female enrollment are linked to improved outcomes, a pattern that may reflect gender-based differences in persistence or disciplinary choices, and which warrants further investigation. Thus, the increasing female share aligns with higher completion and employment rates. With regard to the share of education budget allocated to tertiary institutions, the modest finding increase did not translate to a significant effect on outcomes in the regressions. The absence of a significant effect implies that increases in funding alone – if not directed toward quality-enhancing measures – may not necessarily translate into higher graduation or employment outcomes. Our findings are consistent with the World Bank’s assessment that Armenia’s comparatively low education expenditure (less than 3% of GDP) contributes to systemic challenges [Izvorski 46]. At the same time, the results suggest that the effectiveness of resource allocation is equally critical: without investment in faculty development or pedagogical improvement, additional funding is unlikely to yield substantial gains in quality. In sum, enhancing educational outcomes may depend less on increasing spending or expanding *per se*, and more on strengthening inputs and processes, such as faculty training, curriculum reform, and accreditation mechanisms. Finally, broader economic growth, as measured by GDP per capita, did not correspond to significant improvements in educational quality during the period under review, likely because increased resources were directed toward other sectors. Armenia’s experience indicates that sustained reforms, such as institutional consolidation or curriculum modernization – must prioritize teaching quality in order to achieve their intended impact.

***Implications and conclusion***

The analysis suggests that the quality of higher education in Armenia is particularly responsive to pedagogical factors. The positive association between faculty doctoral qualifications and graduation rates highlights the importance of prioritizing faculty credentialing and professional development in policy design. As emphasized in prior commentary, safeguarding and enhancing teaching quality should remain a central objective of reform efforts. In practice, Armenia could enhance accreditation standards regarding faculty credentials, support advanced professional training, and promote integration of research and teaching. The pronounced influence of student gender

composition also flags the need to address equity and provide targeted support services, ensuring that all capable students, regardless of gender, are able to succeed.

By contrast, the weak effects observed for overall education spending suggest that budget increases, if not strategically allocated, are unlikely to generate substantial improvements. The government’s recent emphasis on climbing global rankings – largely driven by research output – may therefore require recalibration, as sustainable gains in quality depend on improvements at the classroom level. International standards underscore the importance of diverse missions and multiple dimensions of quality. Accordingly, Armenia’s new strategy, such as its focus on raising alumni employment rates, should incorporate concrete measures to strengthen teaching and foster stronger industry linkages, rather than relying primarily on institutional expansion.

In conclusion, our regression analysis offers empirical evidence that faculty qualifications and student composition serve as critical levers for enhancing higher education quality in Armenia. Policymakers should therefore pair continued investment with reforms that directly strengthen teaching capacity and student support systems. Future research could build on this approach through more granular data (e.g., at the institutional level) or by incorporating direct measures of student learning. Nonetheless, the present findings contribute to clarifying priorities for realizing a “renewed vision” of quality higher education in Armenia.

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