



Gender Composition of STEM Programs in Albania vs EU: A Comparative Analysis

Eglantina Zyka¹, Etleva Leskaj²

Abstract: Objectives: This study examines gender disparities in STEM (Science, Technology, Engineering, and Mathematics) higher education by comparing female participation in Albania with European Union (EU) averages. It aims to identify field-specific gender patterns and evaluate whether Albania demonstrates a more gender-inclusive STEM structure. **Prior Work:** Existing research highlights the persistent underrepresentation of women in engineering, ICT, and technology-related disciplines across Europe. However, limited comparative research has examined Albania's STEM gender composition in relation to EU benchmarks or explored the distinctive trends observed in Albanian higher education. **Approach:** The study employs a quantitative comparative design based on official statistical data from INSTAT and Eurostat. Descriptive longitudinal analysis, convergence indicators, and trend regression analysis are used to evaluate changes in female participation across STEM subfields over time. **Results:** Findings indicate that Albania exceeds EU averages in overall female participation across most STEM disciplines, particularly in natural sciences, mathematics, and life sciences. The analysis also reveals narrower gender gaps in traditionally male-dominated fields such as engineering and ICT. Trend analysis demonstrates relatively stable or improving female representation across several STEM categories. **Implications:** The findings provide evidence for policymakers, higher education institutions, and researchers seeking to promote gender equity in STEM education and reduce occupational segregation within scientific and technological fields. **Value:** The study addresses a significant research gap by positioning Albania within a European comparative framework and contributes original empirical evidence on gender patterns in STEM participation using longitudinal and convergence-based analysis.

Keywords: STEM education; female participation; Albania; European Union

JEL Classification: I23; I24; J16; J24; O15; Z13

¹ Associate Professor, Ph.D., Faculty of Economy, University of Tirana, Albania, Address: Rruga Elbasanit, Tirana, Albania, Corresponding author: eglantina.zyka@unitir.edu.al.

² Professor, Ph.D., Faculty of Economy, University of Tirana, Albania, Address: Rruga Elbasanit, Tirana, Albania, E-mail: etleva.leskaj@unitir.edu.al.



Copyright: © 2026 by the authors.
Open access publication under the terms and conditions of the
Creative Commons Attribution-NonCommercial (CC BY NC) license
(<https://creativecommons.org/licenses/by-nc/4.0/>)

1. Introduction

STEM education has become a strategic priority for the European Union due to its growing importance for innovation, digital transformation, economic competitiveness, and sustainable development. Across Europe, policymakers increasingly view STEM not only as a mechanism for workforce development, but also as an educational framework that promotes creativity, critical thinking, problem-solving, and adaptability within rapidly changing technological societies (Roinioti et al., 2025). At the same time, European labor markets continue to experience significant shortages of STEM-qualified professionals, particularly in engineering and ICT sectors.

Despite growing policy attention, gender inequality in STEM education remains a persistent challenge across Europe. Although women represent approximately half of tertiary graduates overall, they continue to be underrepresented in many STEM disciplines, especially engineering, ICT, and technology-related fields (European Commission, 2022; Eurostat, 2021). This imbalance has important implications not only for gender equality, but also for workforce diversity, innovation capacity, and inclusive economic growth. Existing research highlights the influence of gender stereotypes, social norms, educational expectations, and institutional barriers in shaping women's participation in STEM pathways.

Within this broader European context, Albania represents a distinctive and underexplored case. Unlike many Western European countries, Albania demonstrates comparatively high female participation in several STEM fields, particularly natural sciences and mathematics. These patterns may partly reflect post-socialist educational legacies characterized by historically strong female participation in scientific education and labor force integration. However, important gender disparities persist in technology-oriented fields such as engineering and ICT, suggesting the continued presence of horizontal gender segregation similar to broader European trends.

Albania's position as a candidate country for European Union membership further increases the relevance of examining STEM gender dynamics. The country is undergoing gradual alignment with EU educational standards, statistical frameworks, and gender equality policies through processes associated with European integration. Participation in initiatives such as Erasmus+ and broader educational reforms may contribute to expanding opportunities for women in STEM, while simultaneously reshaping educational aspirations, labor market expectations, and migration patterns among younger generations.

Despite growing international attention to gender inequality in STEM education, Albania remains insufficiently examined within comparative European scholarship. Existing studies primarily focus on descriptive enrollment patterns or broader discussions of gender inequality, with limited comparative analysis of Albania's STEM gender composition in relation to European trends. Furthermore, few studies examine how post-socialist legacies, educational transformation, and European integration interact to shape female participation across different STEM subfields over time.

Addressing this gap, the present study comparatively analyzes female participation in STEM education in Albania and the European Union during the period 2015–2023. Using official data from INSTAT and Eurostat, the study examines gender patterns across major STEM subfields, including natural sciences and mathematics, engineering, and ICT. Particular attention is given to longitudinal trends, horizontal gender segregation, and Albania's convergence or divergence from broader European patterns.

The study addresses the following research question: “How has female participation in STEM education in Albania evolved relative to the EU during 2015–2023, and what do these trends reveal about horizontal gender segregation and post-socialist educational transformation?”.

By examining Albania within a comparative European and post-socialist perspective, the study contributes to broader debates on gender inequality, educational transformation, and STEM participation in contemporary Europe. The findings also provide evidence-based insights relevant for higher education policy, gender equality strategies, and European integration processes.

2. Literature Review

2.1. Gender Inequality in STEM: European and Post-Socialist Perspectives

Gender inequality in STEM education remains a major challenge across Europe, particularly in fields such as engineering, ICT, and computer science, where women continue to be underrepresented despite their overall high participation in tertiary education (European Commission, 2022; Eurostat, 2021). This imbalance affects not only gender equality but also innovation, workforce diversity, and economic development.

Existing research explains gender disparities in STEM through a combination of cultural, institutional, and social factors. Gender stereotypes and social expectations influence educational aspirations from an early age, shaping perceptions of which academic fields are considered “appropriate” for women and men (Eccles, 2011). STEM disciplines, especially engineering and ICT, are often associated with masculine identities, while women are more frequently encouraged toward socially oriented professions.

Research also highlights the role of peer influence and social environments. Van der Vleuten et al. (2019) show that friendship networks and gender norms strongly affect girls’ educational choices, reducing the likelihood that they continue into STEM pathways when traditional expectations are reinforced within peer groups.

Another important concept is horizontal gender segregation, which refers to the unequal distribution of men and women across academic disciplines rather than overall educational participation (Charles & Bradley, 2009). Women may achieve high participation in higher education overall while remaining concentrated in specific fields such as biology or natural sciences, whereas engineering and ICT continue to be male-dominated.

Patterns of STEM gender participation differ considerably between Western and post-socialist European countries. In many Western European societies, gender segregation in STEM has remained relatively stable over time, particularly in engineering and ICT. By contrast, post-socialist countries historically encouraged women’s participation in scientific and technical education as part of broader modernization and industrialization policies. As a result, women in many Eastern European countries achieved comparatively stronger representation in mathematics and natural sciences.

However, post-socialist societies are not homogeneous. Following the transition to market economies after the 1990s, many countries experienced changes in labor markets, migration, and social norms that contributed to renewed gender segregation, particularly in technology-oriented fields. Consequently,

many Eastern European and Western Balkan countries today display hybrid patterns in which women remain strongly represented in natural sciences but underrepresented in ICT and engineering.

Within the Western Balkans, research on gender participation in STEM remains limited. Ferati et al. (2023) argue that patriarchal norms and traditional expectations continue to shape women's orientation toward STEM fields, especially engineering and ICT. Despite policy efforts to improve gender inclusion, structural and cultural barriers continue to influence educational choices.

The European Union has increasingly promoted STEM education and women's participation through initiatives such as Erasmus+, Horizon Europe, the European Skills Agenda, and the Digital Education Action Plan (Binder, 2025). Nevertheless, Eurostat data show that women still account for only around one-third of STEM graduates across the EU, with particularly low participation in ICT and engineering.

Within this broader context, Albania represents an interesting and underexplored case. Compared to many Western European countries, Albania demonstrates relatively high female participation in STEM overall, especially in natural sciences and mathematics. At the same time, gender disparities persist in engineering and ICT, reflecting broader patterns of horizontal segregation observed internationally.

Examining Albania comparatively therefore contributes not only to understanding national educational dynamics but also to broader debates on post-socialist transformation, gender segregation, and European integration.

2.2. Post-Socialist Transformation and Theoretical Approaches to Gender Segregation in STEM

Research on post-socialist societies suggests that women's comparatively strong participation in STEM education is closely linked to historical educational and labor policies. During the socialist period, women's integration into education and employment was actively promoted, particularly in scientific and technical sectors considered important for economic modernization. Unlike many Western societies, scientific professions were often framed as collective national priorities rather than gender-specific occupations.

These historical legacies continue to influence educational patterns in many Eastern European countries today, particularly in natural sciences and mathematics. However, post-socialist transformation has also reshaped educational aspirations and labor market opportunities. Economic liberalization, migration, and changing gender norms have contributed to new forms of inequality, especially in ICT and engineering fields.

Several theoretical approaches help explain these patterns. The Gender Parity Perspective focuses on balanced representation between women and men in education, while Horizontal Segregation Theory emphasizes that gender inequality also exists through the concentration of women and men in different academic fields (Charles & Bradley, 2009). Human Capital Theory further argues that underrepresentation of women in STEM represents not only a social inequality issue but also a loss of economic and innovative potential.

These perspectives are particularly relevant for Albania. The country's relatively high female participation in STEM may partly reflect the legacy of socialist-era educational expansion, while the

gradual decline observed during 2015–2023 may indicate the growing influence of labor market changes, migration, and evolving educational preferences.

Despite increasing attention to gender and higher education in Albania, existing research remains limited and largely descriptive. Few studies have examined long-term trends across STEM subfields or compared Albania systematically with EU averages.

2.3. EU Integration and the Reshaping of STEM Participation

European integration has increasingly influenced educational systems and gender equality policies across both EU member states and candidate countries. Through educational reforms, policy harmonization, and participation in European initiatives, the EU has promoted STEM education as central to innovation, digital transformation, and economic competitiveness.

For candidate countries such as Albania, EU integration involves gradual alignment with European educational standards, statistical systems, and gender equality frameworks. Participation in initiatives such as Erasmus+ and broader higher education reforms may contribute to expanding opportunities for women in STEM.

However, the influence of EU integration is not always straightforward. While European initiatives may improve educational access and institutional support, broader economic integration can also reshape labor market incentives and migration dynamics. Increased mobility opportunities and changing economic expectations may influence educational preferences among younger generations.

The Albanian case reflects these complexities. Although European integration may have strengthened institutional attention toward gender equality in education, the decline in female STEM participation observed during 2015–2023 suggests that broader structural transformations are also influencing educational choices and career expectations.

2.4. Albania and Female Participation in STEM

Albania represents a distinctive case within Europe because female participation in STEM education remains significantly higher than the EU average, particularly in natural sciences and mathematics (INSTAT, 2023). Nevertheless, important gender imbalances persist in engineering and ICT, although female representation in these fields still exceeds EU averages.

Research on STEM participation in Albania is still developing. Xhindi and Gjika (2022) identify a relationship between broader gender inequality patterns and women’s participation in STEM education, suggesting that socio-cultural and structural dynamics continue to shape educational choices.

Other studies emphasize the importance of institutional support, educational environments, and gender equality frameworks in higher education (Kalaja et al., 2015). Leskaj and Gjika (2024) further highlight the growing role of Gender Equality Plans (GEPs) and university reforms linked to Albania’s European integration process. Initiatives such as the Network of Albanian Women in STEM (NAW-STEM) also promote mentorship, visibility, and participation of women in STEM-related professions and research.

Overall, Albania's experience highlights the interaction between post-socialist educational legacies, contemporary social transformation, and European integration in shaping women's participation in STEM education.

3. Methodology

This study employs a quantitative descriptive-comparative research design to examine gender disparities in STEM tertiary education in Albania relative to the EU during the period 2015–2023. The analysis focuses on identifying patterns of female participation in STEM fields, comparing Albania with the EU average, and assessing changes in gender representation over time. The unit of analysis is the country-year observation, with annual comparisons conducted between Albania and the aggregated EU average.

The empirical analysis is based exclusively on secondary data obtained from official statistical institutions. Data for Albania were collected from INSTAT, while comparative European data were retrieved from Eurostat. Both institutions compile educational statistics according to the UNESCO/OECD/Eurostat (UOE) framework and the International Standard Classification of Education (ISCED 2011 and ISCED-F 2013). The use of harmonized classifications ensures methodological consistency and comparability across countries and over time.

The dataset covers annual observations from 2015 to 2023 and includes graduation statistics disaggregated by gender and field of study for Albania and the EU average. The study focuses on the period 2015–2023 because this interval provides the most consistent and comparable STEM education data available from both INSTAT and Eurostat using harmonized international education classifications. Beginning in 2015, Albania's higher education statistics became more systematically aligned with Eurostat reporting standards and the ISCED-F 2013 (International Standard Classification of Education – Fields of Education and Training) framework, allowing more reliable comparison with European Union averages across STEM subfields. Additionally, the selected period captures an important phase of Albania's European integration process, characterized by increasing alignment with EU educational, statistical, and gender equality frameworks. The timeframe also enables the analysis of medium-term longitudinal trends before and after major developments in digitalization, labor market transformation, and post-pandemic educational change.

STEM fields are defined according to the ISCED-F 2013 classification and include: F05 – Natural sciences, mathematics, and statistics; F06 – Information and Communication Technologies; and F07 – Engineering, manufacturing, and construction. These categories are aggregated to create a broader STEM classification for comparative analysis.

The primary indicator used in the study is the Female Share in STEM, calculated as the percentage of female graduates among total STEM graduates:

Equation 1
$$\text{Female Share}_{t} = \frac{\text{Female STEM Graduates } t}{\text{Total STEM Graduates } t} \times 100$$

This indicator serves as a direct measure of gender composition and gender parity within STEM education and allows assessment of whether gender balance corresponds to substantive levels of participation across different STEM subfields.

The study applies descriptive statistical and comparative trend analysis to evaluate changes in female participation over time. Annual percentage shares of female and male graduates are calculated for each STEM field and for the aggregated STEM category across the period 2015–2023. Simple linear trend models were estimated separately for Albania and the EU using year as the independent variable and female STEM participation as the dependent variable. Regression analysis was used to evaluate the direction and statistical significance of longitudinal trends. The analysis focuses on overall gender composition in STEM education, field-specific gender disparities, longitudinal trends in female participation, and comparative differences between Albania and the EU average.

Limitations of the Study. This study relies exclusively on aggregated secondary data, limiting the ability to examine causal relationships or individual-level factors influencing gender disparities in STEM. Although harmonized Eurostat and INSTAT classifications improve comparability, differences in national higher education systems may still affect field-specific distributions. In addition, the analysis focuses on quantitative participation patterns and does not address qualitative dimensions such as educational experiences, career trajectories, or labor market outcomes of STEM graduates. Despite these limitations, the use of official longitudinal data provides a reliable framework for analyzing gender dynamics in STEM education in Albania within a comparative European context.

4. Results

Between 2015 and 2023, the total number of tertiary graduates in STEM fields evolved differently in Albania and the European Union (EU). In Albania, the total number of STEM graduates changed from 6,058 in 2015 to 6,306 in 2023, increasing by 4%, while the EU average increased from 989,131 to 1,098,486 or by 11% over the same period.

Table 1. Female Share of STEM Graduates (%) in Albania and the EU (2015–2023)

Year	Albania (%)	EU Average (%)	Gap (AL – EU)
2015	53.1	33.2	19.9
2016	48.7	33.4	15.3
2017	48.7	33.4	15.3
2018	46.7	33.3	13.4
2019	48.1	32.3	15.8
2020	44.7	32.5	12.2
2021	42.3	32.8	9.5
2022	44.8	33	11.8
2023	44.3	33.6	10.7

Source: Authors' calculations based on data from Eurostat, dataset educ_uoe_grad02

The table provides comparative evidence on the female share of STEM graduates in Albania and the European Union during the period 2015–2023, while also illustrating the size of the gap between Albania and the EU average.

Several important findings emerge from the data:

- Albania consistently records a higher share of female STEM graduates than the EU average throughout 2015–2023, indicating comparatively strong female participation in STEM education.

- However, a declining trend is evident in Albania, where the female share decreases from 53.1% in 2015 to 44.3% in 2023, despite minor fluctuations and temporary recoveries in some years.
- By contrast, the EU average remains relatively stable, fluctuating only slightly between approximately 32% and 34% during the observed period.
- As a result, the Albania–EU gap narrows considerably, declining from 19.9 percentage points in 2015 to 10.7 points in 2023.

Overall, the table suggests that while Albania continues to perform above the EU average in terms of female representation in STEM graduates, its comparative advantage has weakened considerably over the study period.

To assess convergence dynamics, Figure 1 displays the female share in STEM for Albania and the EU across 2015–2023.

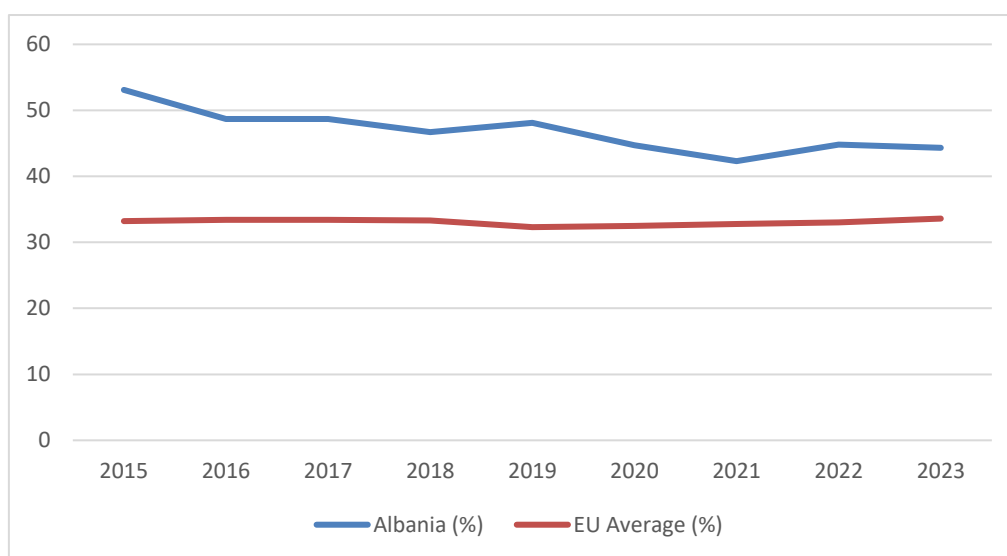


Figure 1. Trends in Female STEM Participation: Albania vs EU (2015–2023)

Source: Authors' calculations based on data from Eurostat, dataset educ_uoe_grad02

The figure shows two distinct trends in the female share of STEM graduates in Albania and the EU during 2015–2023. Albania demonstrates an overall declining trend, with female participation falling from approximately 53% in 2015 to 44% in 2023. In contrast, the EU average remains relatively stable at around 33–34% throughout the period.

The sharpest declines in Albania occur between 2015–2016 and 2019–2021, followed by periods of relative stabilization and a modest recovery in 2022. The EU average fluctuated only slightly between approximately 32% and 34% during the observed period.

As a result, the gap between Albania and the EU average gradually narrows, decreasing from nearly 20 percentage points in 2015 to around 10 percentage points in 2023. This convergence is driven mainly by the decline in Albania rather than significant improvement in the EU average. Despite this trend, Albania continues to maintain higher female representation in STEM than the EU throughout the observed period.

Beyond descriptive comparison, the data also reveal important quantitative trend dynamics in female STEM participation between Albania and the European Union during the period 2015–2023.

The Average Annual Percentage Change (AAPC) is used to estimate the average yearly rate of change in female STEM participation over time. The indicator captures the overall direction and intensity of long-term trends.

The AAPC is calculated as:

Equation 2.
$$AAPC = \left[\left(\frac{Y_t}{Y_0} \right)^{1/n} - 1 \right] \times 100$$

where:

- Y_0 is the initial value (2015),
- Y_t is the final value (2023),
- n represents the number of years between observations.

Based on the data, Albania’s female STEM participation declined from 53.1% in 2015 to 44.3% in 2023, producing an estimated average annual decline of approximately 2.3%.

Albania experienced a clear decline in the female share of STEM graduates over time. Female participation decreased from 53.1% in 2015 to 44.3% in 2023.

This indicates that the reduction in female representation was not temporary but reflects a broader downward trend over time.

The trend coefficient further confirms this decline. To complement percentage-based trend analysis, the study also estimates a simple linear trend coefficient, representing the average annual change in percentage points over the study period.

The coefficient is calculated as:

Equation 3.
$$\text{Trend Coefficient} = \frac{Y_t - Y_0}{Y_0}$$

Using Albania’s observed values 53.1% in 2015 and 44.3% in 2023, the estimated trend coefficient equals approximately (–1.1) percentage points per year, indicating a gradual but persistent decline in female participation in STEM education.

By contrast, the EU average remained relatively stable throughout the period, fluctuating only slightly around 32–34%, indicating limited structural change in female STEM participation at the European level.

The analysis also demonstrates a significant process of convergence between Albania and the EU average. The Albania–EU gap declined from 19.9 percentage points in 2015 to 10.7 percentage points in 2023.

The convergence rate measures the extent to which the gender gap between Albania and the EU average narrowed during the observed period. It is calculated by comparing the reduction in the Albania–EU gap between the initial and final year:

Equation 4.
$$\text{Convergence Rate} = \frac{\text{Gap}_{2015} - \text{Gap}_{2023}}{\text{Gap}_{2015}} \times 100$$

where:

- Gap₂₀₁₅ represents the difference between Albania and the EU female STEM participation rate in 2015,
- Gap₂₀₂₃ represents the corresponding difference in 2023.

Using the observed values Convergence Rate of the estimated convergence rate is approximately 46.2%, indicating that Albania reduced its relative advantage over the EU by nearly half during the study period.

This suggests that Albania reduced its comparative advantage over the EU by approximately 46.2% during the observed period. However, this convergence was driven primarily by declining female participation in Albania rather than substantial increases at the EU level.

The study primarily applies descriptive longitudinal analysis rather than inferential statistical modeling. Consequently, the trends identified should be interpreted as indicative patterns rather than statistically causal relationships. Given the relatively small number of annual observations (2015–2023), the analysis focuses on direction, magnitude, and stability of changes over time rather than formal hypothesis testing.

Nevertheless, the consistency of the observed decline in Albania, combined with the relative stability of the EU average, suggests that the identified trends are substantively meaningful and reflect broader structural developments affecting gender participation in STEM education.

Overall, the trend analysis confirms that although Albania continues to maintain higher female participation in STEM compared to the EU average, its relative advantage has weakened considerably over time.

Regression trend analysis further confirms the divergence between Albania and the EU regarding female participation in STEM education during 2015–2023. In Albania, the estimated regression coefficient indicates a statistically significant negative trend ($\beta=-0.872$, $p=0.002$), suggesting a persistent decline in the female share of STEM graduates over time. By contrast, the EU average demonstrates no statistically significant trend ($\beta=-0.165$, $p = 0.671$), indicating relative stability in female STEM participation throughout the observed period. These results strengthen the conclusion that convergence between Albania and the EU is driven mainly by declining female participation in Albania rather than substantial structural change at the European level.

To identify horizontal segregation patterns, STEM is disaggregated into subfields.

Table 2. Female Share (%) by STEM subfield, 2015-2023

Years	Natyral science & mathematics (F05)		ICT (F06)		Engineering manufacturing & construction (F07)	
	Albania (%)	EU Average (%)	Albania (%)	EU Average (%)	Albania (%)	EU Average (%)
2015	73.3	53.6	49.4	19.2	41.2	28.2
2016	69.3	53.7	48.5	18.8	37.4	28.4
2017	68.6	53.1	44.5	19.5	39.8	28.6
2018	69.9	52.7	43.7	20.3	38.3	28.2
2019	75.9	52.9	45.7	20.3	37.4	26.9

2020	74.5	53.1	40.9	20.8	36.1	26.9
2021	76.2	53.9	36.6	21.4	35.6	27.6
2022	76.5	53.9	41.8	21.4	37.1	27.6
2023	80.5	54.2	41.5	21.8	37.5	28.1

Source: Authors' calculations based on data from Eurostat, dataset educ_uae_grad02

Several important findings emerge from the data. First, Albania consistently records higher female participation than the EU average across all STEM subfields throughout 2015–2023. This suggests that women’s representation in STEM education in Albania remains comparatively strong, even in traditionally male-dominated fields such as ICT and engineering.

The highest female participation is observed in Natural Sciences and Mathematics (F05). In Albania, women account for between 68.6% and 80.5% of graduates in this field, compared to around 53–54% in the EU average. Female participation also increases over time, reaching its highest level in 2023.

By contrast, ICT (F06) shows a different pattern. Although Albania continues to perform above the EU average, female participation declines from 49.4% in 2015 to 41.5% in 2023. Meanwhile, the EU average remains low but relatively stable at around 20–22%. Female participation in ICT remained lower than in other STEM fields across both Albania and the EU.

Engineering, Manufacturing, and Construction (F07) also remain male-dominated in both Albania and the EU. Female participation in Albania fluctuates between 35.6% and 41.2%, remaining consistently above the EU average of around 27–28%. However, unlike natural sciences, engineering does not show a clear upward trend, suggesting that structural gender imbalances continue to persist in technical disciplines.

Overall, the findings confirm the persistence of horizontal gender segregation within STEM education. Women in Albania remain strongly concentrated in natural sciences and mathematics, while ICT and engineering continue to display lower female representation. The gap between Albania and EU averages in ICT and engineering narrowed over time.

5. Discussion

5.1. Factors Explaining Albania’s STEM Gender Patterns

The findings show that Albania consistently records higher female participation in STEM education than the EU average during 2015–2023, particularly in natural sciences and mathematics. Although the gap between Albania and the EU has narrowed over time, women’s participation in STEM remains comparatively strong in Albania.

One possible explanation is the historical legacy of the socialist period, when women’s participation in education and scientific fields was actively encouraged. Some of these educational patterns appear to have continued, especially in mathematics and natural sciences. Socio-cultural factors may also play a role, as higher education is often viewed as an important path toward economic security and social mobility, particularly for women.

At the same time, important differences exist across STEM subfields. Female participation remains high in natural sciences and mathematics, while ICT and engineering continue to have lower female

representation. This reflects broader patterns of horizontal gender segregation observed internationally, where women remain underrepresented in more technology-oriented disciplines.

Educational reforms, expanded access to higher education, and alignment with European educational frameworks may also have contributed to women's participation in STEM. However, the gradual decline in female STEM participation observed during 2015–2023 suggests that Albania's comparative advantage may be weakening over time. Factors such as labor market changes, migration, evolving educational preferences, and gender stereotypes may partly explain this trend.

Overall, Albania represents a distinctive case within Europe. While female participation in STEM remains relatively high, persistent gender imbalances and recent downward trends raise questions about the long-term sustainability of women's participation in science and technology fields.

5.2. Policy Implications

The findings have important implications for education policy and gender equality strategies in Albania and beyond. Albania demonstrates that relatively high female participation in STEM is achievable, particularly in natural sciences and mathematics. This suggests that educational structures, cultural perceptions, and institutional support can significantly influence women's participation in scientific fields.

However, important gender imbalances remain in ICT and engineering. Policies should therefore focus not only on increasing women's overall participation in STEM but also on reducing field-specific inequalities in traditionally male-dominated disciplines.

Possible measures include early STEM orientation programs for girls, mentorship initiatives, scholarships in ICT and engineering, career guidance programs, and stronger cooperation between schools, universities, and technology industries.

The declining trend in female STEM participation in Albania also highlights the need for continuous monitoring and long-term strategies aimed at sustaining women's engagement in STEM education and careers.

Conclusion

This study examined gender composition in STEM tertiary education in Albania compared with the EU average during 2015–2023 using official data from INSTAT and Eurostat. The findings show that Albania consistently records a higher share of female STEM graduates than the EU average across all STEM fields. Female participation is especially strong in natural sciences and mathematics, while ICT and engineering continue to have lower female representation, although Albania still performs above EU averages in these areas.

At the same time, the study identifies a gradual decline in female STEM participation in Albania over the observed period. As a result, the gap between Albania and the EU has narrowed, mainly because of declining participation in Albania rather than major improvement at the EU level. This raises concerns about the long-term sustainability of women's participation in STEM education in the country.

The findings also confirm the persistence of horizontal gender segregation within STEM disciplines. Women remain concentrated in natural sciences and mathematics, while ICT and engineering continue to be more male-dominated. These patterns reflect broader international trends and show that higher overall female participation does not necessarily mean equal representation across all STEM fields.

More broadly, the Albanian case suggests that relatively high female participation in STEM can develop within post-socialist and transitional educational contexts. Historical educational legacies, socio-cultural attitudes toward higher education, and expanded access to tertiary education may all contribute to Albania's comparatively strong position.

Nevertheless, the study has some limitations. Because it relies on aggregated statistical data, it cannot fully explain the institutional, cultural, or labor market factors shaping gender differences in STEM participation. Future research could explore these dynamics through qualitative methods, surveys, or interviews with STEM students and graduates.

Overall, while Albania continues to outperform the EU average in female STEM participation, maintaining and strengthening this position will require continued educational support, gender-sensitive policies, and targeted efforts to increase women's participation in ICT and engineering fields.

References

- Binder, K. (2025). *STEM education high on the EU agenda*. European Parliamentary Research Service.
- Charles, M., & Bradley, K. (2009). Indulging our gendered selves? Sex segregation by field of study in 44 countries. *American Journal of Sociology*, 114(4), 924–976.
- Eccles, J. S. (2011). Gendered educational and occupational choices: Applying the Eccles et al. model of achievement-related choices. *International Journal of Behavioral Development*, 35(3), 195–201.
- European Commission. (2022). *She figures 2021: Gender in research and innovation*. Publications Office of the European Union.
- Eurostat. (2021). *Women in science and technology*. European Commission. <https://ec.europa.eu/eurostat>
- Eurostat. (2026). *Graduates by education level, programme orientation, sex and field of education (educ_uoe_grad02)*. Eurostat Database. <https://ec.europa.eu/eurostat>
- Ferati, M., Xhaferi, G., & Imeri, V. (2023). Gender stereotypes and women's participation in STEM fields in the Western Balkans. *Journal of Balkan Social Studies*, 7(2), 55–72.
- INSTAT. (2023). *Education statistics 2023*. Institute of Statistics of Albania. <https://www.instat.gov.al>
- Kalaja, E., Xhafa, E., & Çela, A. (2015). Gender indicators in Albanian higher education: Challenges and perspectives. *Mediterranean Journal of Social Sciences*, 6(3), 457–465.
- Leskaj, E., & Gjika, A. (2024). Gender equality plans and higher education reforms in Albania within the European integration process. *European Journal of Education Studies*, 11(1), 88–104.
- Roinioti, E., Cherouvis, S., Filipowicz, S., Addis, A., Chappell, K., & Karpouzis, K. (2025). A scoping review of STEAM policies in Europe. *Education Sciences*, 15(6), 779.
- Van der Vleuten, M., Jaspers, E., Maas, I., & Van der Lippe, T. (2019). Boys' and girls' educational choices in secondary education. The role of gender ideology. *Educational Studies*, 45(2), 181–200.
- Xhindi, E., & Gjika, A. (2022). Gender inequality and women's participation in STEM education in Albania. *Academic Journal of Interdisciplinary Studies*, 11(4), 145–156.