Gender inequality in STEM in Europe and Central Asia region: Key barriers to women’s advancement in STEM careers

Summary Brief

Gender inequality in STEM fields is influenced by the country or region’s socio-economic gender inequalities. While the ECA countries and territories score high in educational attainment and health and survival in some measures, they continue to struggle in closing the gender gap in economic participation and opportunity and political empowerment. Traditional patriarchal structures and social norms have led to unequal distribution of both political and economic power (Figure 2). Women make up only 23.6 percent of members of parliaments in Central and Eastern Europe and 25.1 percent in Central Asia. On average, only 46.93 percent of adult women worldwide are in the labour market, versus 74 percent of men. Similarly, women in the ECA region participate in the labour force (48.6 percent) less than men.

(69.8 percent). They also have unequal access to finance, to the internet, to land ownership, and to legal protection from gender-based discrimination or violence – barriers which stand in the way to starting their own tech companies or to advancing to a leadership role in a company in a traditionally male-dominated industry. Women’s participation in public administration is positively correlated with economic development as well as gender equality in society and gender equality in work. Gender-responsive and inclusive policies include measures to incentivize women-founded start-ups, penalize all forms of gender-based discrimination and violence and introduce social policies to encourage a more shared approach between men and women to the unpaid work of childcare, care for the elderly and long-term sick and household duties. Private employers have a similarly key role to play in promoting gender diversity and equal opportunity to career growth. Unless discriminatory social norms are addressed collectively, the systems which consistently deny women’s equal access to employment, decision-making, education and justice will persist.

Figure 2. World Economic Forum Global Gender Gap Index rankings of ECA countries out of 153 countries.

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8 The Global Gender Gap Index examines the gap between men and women across four fundamental categories (sub-indexes): Economic Participation and Opportunity, Educational Attainment, Health and Survival, and Political Empowerment.

9 Data for Kosovo, Turkmenistan and Uzbekistan not available.
Barriers in primary education

According to UNICEF, every country in the ECA region has primary school enrollment rates over an impressive 95 percent among girls and boys. However, when adjusted for the rate of enrollment of population groups in vulnerable situations, such as girls and boys who are poor, live in rural areas, live with disabilities, or who are refugees or migrants, this figure drops to a much lower true enrollment percentage. Children in these groups may be considered officially enrolled but are often absent from class or drop out of school altogether, thus widening learning and opportunity gaps.

Due to discrimination, underdeveloped education systems unable to support children with disabilities and language barriers, or traditional social norms at home serve as obstacles to entry for marginalized girls on STEM pathways starting at a young age. COVID-19 could exacerbate the problem, as many families may see their income decrease and resort to child labour: this will most likely affect girls in a disproportionate way, as they are particularly vulnerable to exploitation in domestic work and agriculture.

Despite some progress in women’s and girls’ access to STEM education and professional opportunities in the 20th century, gender stereotypes, including occupational stereotypes, still run deeply in the region. In Moldova, for example, an overwhelming majority of children surveyed in an opinion poll reported strong associations with gender and professions, e.g., women are teachers and men are in business or technology. Gendered roles start at home and continue at school and suppress the development of a STEM identity among girls. Gender stereotypes that suggest STEM is for boys influence how girls perceive STEM even though girls perform equally or outperform boys in these fields during secondary education.

Parents are more likely to expect their sons than daughters to work in STEM fields. Even girls who think about working in scientific careers are expected to work mainly in the health and social fields, as opposed to boys. Stereotypical images and messages in the media portraying people working in technology as anti-social men crunching numbers in a dark basement have also steered girls and women away from STEM. In the Western Balkans, a lack of gender mainstreaming in education leads to gender stereotyped curricula which then leads to gender segregation in the work force.

Globally, in societies with patriarchal norms, gender bias influences the way children are raised and the choices they make, and the ECA region is no exception. This is especially true in rural areas where gender norms tend to be more conservative, expecting girls and women to work at home and family before education and career. In Turkey, for example, women’s labour force participation rate is the lowest (33.9 percent) among OECD countries.

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11 Ibid.
(52 percent). This figure is even lower for women with children: a 2015 World Bank study on childcare found that among non-employed women taking part in a household survey, 45 percent previously worked but decided to leave the labour force, 71 percent of them due to childcare responsibilities.\(^1\)

More recently, a time-use survey conducted in Turkey has shown that, during the COVID-19 lockdown, the time women spent on unpaid activities increased from 2.9 hours to 4.5 hours per day.\(^2\) Furthermore, a much higher proportion (70 percent) of surveyed women living in couple households with children reported an increase in their unpaid workload, compared to that of men (42 percent). In Central Asia, child marriage and bride kidnapping, while becoming less common, puts an end to girls’ education. In Kyrgyzstan, an estimated 13.8 percent of women aged 24 and under are married through some form of coercion.\(^3\) As a result, fewer women role models in STEM emerge, which research shows is critical to helping girls develop a STEM identity and motivating them to stay excited about STEM.

Finally, the quality of STEM curriculum and instruction in the ECA region varies based on location and access to resources and is often not in step with the needs of a 21\(^{st}\) century economy in terms of content, teaching approach, and equipment.

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Barriers in higher education

The ECA countries and territories have achieved gender parity in formal education enrollment. However, young mothers and women and girls in vulnerable situations such as persons with disabilities, ethnic minorities, caregivers, and those at the lowest income quintile are likely to lag behind their healthy, well-off, ethnic majority counterparts. Moreover, women tend to enroll in education, arts and humanities, business, administration and law faculties rather than in STEM. Some young women say they stay away from STEM fields on the grounds that they prefer to work in sectors that allow more interactions with people. It is, however, important to break down STEM when discussing the gender differentials across disciplines. For instance, although the gross average gender parity index for ICT skills is 0.80 for this region, the share of women students in ICT departments ranges from 15 percent in Georgia to 38.5 percent in Albania (Figure 3).

Figure 3. Percentage of women students in tertiary programmes in ECA, by field of study (UNECE).

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22 United Nations Educational, Scientific and Cultural Organization (UNESCO). Institute for Statistics (2017). Gross attendance ratio of women for tertiary education adjusted wealth parity index ranges from 0.19 to 0.54 in ECA countries implying that women at the lowest income quintile are much less likely to enroll in a university compared to their female peers at the highest income quintile.
23 United Nations Economic Commission for Europe (UNECE). Tertiary students by field of study (ISCED-F 2013) and sex. Most recent data available no older than 2013. STEM fields used in these statistics are engineering, manufacturing and constructions; natural sciences, mathematics and statistics; and information and communication technologies (ICT). The data is available for the following countries: Albania, Azerbaijan, Belarus, Bosnia and Herzegovina, Georgia, Kazakhstan, North Macedonia, Serbia, Turkey, Ukraine.
24 The value of 1 implies that the level of women’s ICT skills is equal to men’s.
25 United Nations Economic Commission for Europe (UNECE). Tertiary students by field of study (ISCED-F 2013) and sex. Most recent data available no older than 2013. Data is available for the following countries: Albania, Azerbaijan, Belarus, Bosnia and Herzegovina, Georgia, Kazakhstan, North Macedonia, Serbia, Turkey, Ukraine.
26 Ibid.
In addition, the relatively promising picture of women’s ICT skills in the ECA region does not manifest itself in faculty enrolment rates. While in Central Asia and South Caucasus, researchers in the health and life sciences are close to parity, only a minority of women STEM students in higher education in the ECA region enroll in information and communications technology (ICT). 27 In the Western Balkans, even though women outnumber men in enrolment in higher education and women students possess comparable math literacy and ICT skills to men, women tend to favour non-STEM courses. Women are only 37 percent of students in engineering, manufacturing, and construction classes and 30 percent in ICT classes.28 Globally, only a few countries have reached gender parity in STEM subjects at tertiary level. In the ECA region, women’s share of STEM tertiary graduates is 45 percent in Bosnia and Herzegovina and North Macedonia and 44 percent in Georgia,29 while in Albania, the proportion of women STEM graduates increased from 32.4 per cent in 2000 to 53.1 per cent in 2016.30 Conversely, women constitute only 35 percent of STEM graduates in Turkey.31

**Women encounter several barriers to their engagement, preparation, persistence and completion of STEM degrees:**

- Gender stereotypes around women in STEM (lack of role models, mentors, network, family support, teacher encouragement, etc.).
- Exclusionary environment (mostly men and/or curriculum and teaching approaches designed for men).
- High levels of prejudice and negative stereotyping towards ethnic and religious minorities, lesbian, gay, bisexual, transgender, and intersex (LGBTI) people, and persons with disabilities.

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27 Ibid. STEM fields used in these statistics are engineering, manufacturing and constructions; natural sciences, mathematics and statistics; and information and communication technologies (ICT). Data is available for the following countries: Albania, Azerbaijan, Belarus, Bosnia and Herzegovina, Georgia, Kazakhstan, North Macedonia, Serbia, Turkey, Ukraine.
Barriers in the STEM workforce

Despite high numbers of women with tertiary education in the ECA region, women are less likely to participate in the labour force than men. If employed, women tend to work in services, sales work and other professional activities, with often informal participation in the labour market, making up 36 percent of women’s employment.

Men managers more than double the number of women managers in ECA, including in STEM companies.

However, the number of women professionals and mid-level managers has increased in some countries. The tech sectors and start-up scenes in Turkey, Armenia, Moldova, Serbia, and Ukraine have been growing rapidly, with the number of women specialists and managers increasing in some of the leading companies in the tech sector: at Telon Serbia, a mobile network operator, almost half of the company’s management positions are held by women (47 percent), while in the Armenian office of Synopsys, one of the world’s top software companies, 33 percent of engineers are women, compared to less than 15 percent in their office in the United States.

But in Ukraine, a recent survey of the IT industry shows that only 24 percent of employees are women, a third of them holding junior positions and only 12 percent working as senior specialists (half as many as men).

Women’s underrepresentation in STEM occupations often goes with wide gender pay gaps. For instance, in North Macedonia the gender pay gap varies from 22 percent in the sector of software development to 44 percent in digital marketing, while in the technology sector, women occupy low-paid positions – only 21 percent of executives are women.

The gender pay gap is also noticeable in the ‘gig economy’, mostly because of shorter contracted hours, lower per-hour payment and a high share of freelancers, which reaches a peak of 30 percent.

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32 It is important to note that participation in the labour force among women varies in the region due to traditional social norms, e.g. 52 percent of women in Kyrgyzstan and 75 percent in Belarus, according to the World Economic Forum Global Gender Parity 2020 Index.


34 International Labour Organization (ILO) (2019). Women and men in the informal economy: a statistical brief. January 2019 [Accessed: 30 December 2020]. The data is available for the following countries: Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Montenegro, North Macedonia, Serbia, Tajikistan, Turkey, Turkmenistan, Ukraine, Uzbekistan. The regional average includes data from other countries (Bulgaria, Croatia, Romania and the Russian Federation), which are not UNDP Europe and Central Asia programming countries.

35 International Labour Organization (ILO) (2018). ILOSTAT. Data is available for the following countries and territories: Azerbaijan, Bosnia and Herzegovina, Belarus, Kosovo, Moldova, North Macedonia, Montenegro, Serbia, Tajikistan, Turkey and Ukraine.


38 YouControl (2020). Female individual entrepreneurs In Ukrainian IT: 25% are from Kyiv, almost 60% - programmers. 11 March 2020 [Accessed: 21 August 2020].
There are several reasons for this disparity in employment rates and remuneration:

- Cultural norms and practices reinforce the tertiary education degree specialization of men and women, which leads to occupational segregation both as a concentration of employees across industries (horizontal) and as percentage of women in different positions within the industry (vertical).
- Gender biases in recruitment materials and strategies, hiring (nepotism is also tolerated), retention, promotion, and pay. In some countries such as Montenegro, women are sometimes asked during job interviews about their marital status, about the number of children they had and their plans to have children.\(^{39}\)
- Gender discrimination is tolerated and therefore there are no formal structures, starting with state legislation, to protect women. In fact, Bosnia and Herzegovina is the only country in the region whose constitution has sexual orientation as a ground of discrimination in its anti-discrimination law.\(^{40}\)
- Although women in STEM report sexual harassment, they face barriers in seeking justice and legal accountability due to the lack of clear company policies as well as legal provisions, complicated court procedures, and social stigma. For example, while sexual harassment is illegal in Ukraine, women who are harassed at work report they do not trust the authorities to take their side, so few report the incidents.\(^{41}\)
- Women are often expected to be the primary care providers and therefore their professional work is interrupted to take care of their children. In Montenegro, survey participants in the Gender Equality Index 2019 reported the following challenges preventing women from gaining leadership positions in companies: women have greater family responsibilities than men; women lack sufficient work experience and managerial competence; and men are not encouraged to take leave for family reasons.\(^{42}\) The lack of attention to inclusion creates isolating, exclusionary, and unwelcoming environments for women, which directly impact satisfaction, retention and turnover.
- Women tend to have less social capital and are often excluded from informal out-of-hours networking, arguably necessary for advancement in STEM careers. The lack of professional and support networks further confines the career progression – reserving managerial and decision-making positions for men. Even at mid-level positions, there is a gender pay gap between men and women of similar skills and experience.


Barriers to women’s entrepreneurship in STEM sectors

Governments in the ECA region are implementing programmes which support the development of entrepreneurship in STEM fields. For example, the “Digital Kazakhstan” programme aims to improve the competitiveness of the country’s economy by developing a digital ecosystem, including increasing access to affordable, high-speed, secure digital infrastructure and updating education and training for the tech sector. Kazakhstan, along with Georgia and North Macedonia, are among the countries in the ECA region that have made notable strides in simplifying the steps to start a business. In the Western Balkans, many countries are currently developing Smart Specialization Strategies and embracing digital transformation, supported by the European Union and the Regional Cooperation Council.

It is of paramount importance to ensure that these strategies and programmes address gender inequalities and promote women’s entrepreneurship, as in the case of Kosovo, where the Strategy for Innovation and Entrepreneurship (2019-2023) defines as priority areas the ICT and digital industry, and focuses on mobilizing the potential of women and youth’s entrepreneurship.43

With the rise of coworking spaces, incubators and accelerators, such as TechMinsk in Belarus supported by USAID and Google, there has been a surge in the start-up scene and growth of entrepreneurship opportunities in the ECA region, ranging from agricultural tech in Kyrgyzstan to GovTech and FinTech in Kazakhstan to logistics and digital services in Turkey. Lviv, Ukraine, was ranked #4 in the top 10 fastest growing tech hubs based on year-on-year growth in active members of tech-related Meetup groups.44 Turkey has produced two of the top 10 Venture Capital backed exits in Europe in 2018: Trendyol, a mobile commerce company and Gram Games. Istanbul-based Peak Games was recently acquired by San Francisco’s social games developer Zynga for USD 1.8 billion, making it Zynga’s largest acquisition in its history.45 Tech is now the largest foreign investment in Armenia, home to the start-up PicsArt, which is now one of the world’s top photo editing companies.46

However, opportunities tend to gravitate towards the cultural and urban centers and women remain underrepresented overall. In Europe, 93 percent of venture capital goes to all-men founding teams and accounts for 85 percent of deals.47 Similarly, in the ECA region, women’s entrepreneurial opportunities remain scarce: for instance, in South Caucasus and Western CIS only 16 percent of founders in the ICT sector are women.48

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The underlying reasons for the gender gap in founders can be attributed to the following:

- Entrepreneurial activities in STEM sectors require high human capital proven through formal education, industrial experience and accredited skills. The STEM ecosystem, known to favor men entry and upward career growth path, may pose greater entry costs for women with formal STEM-related educational attainment.
- The finance required to start a business is more accessible to men than women. The share of women borrowers is low as they face many constraints when applying for bank loans including high collateral requirements. Often coupled with the gender wage gap, which prevents women from accumulating financial capitals, the unequal access to financial products constitute a major barrier. While legally, men and women have equal rights to property in Uzbekistan, people typically acquire homes through inheritance which traditionally go to men. Most rural households in Uzbekistan are headed by men which usually means the property is registered under their names; only 22 percent of land is owned by women. Additionally, lack of sex-disaggregated information on credit opportunities impairs the loan assessment process. Social capital is directly linked to the acquisition of venture capital. Given that social networks are highly segregated by ethnicity and gender, women and minority entrepreneurs have fewer opportunities to connect with the venture capital networks to secure investment.
- Unconscious biases affect investor judgement and decision-making and therefore impact pathways to entrepreneurship and the launch of new initiatives and innovations.
- Stereotype threats and hostile “boys’ club” environments can lead to decreased interest and sense of belonging in entrepreneurship and the workplace. For example, women are less likely to indicate interest and intention in pursuing entrepreneurship, particularly when it is associated with stereotypically masculine characteristics.
- Women are often expected to be the primary providers of childcare, which serves as a barrier to starting their own businesses.

Isolated efforts to attract, retain and advance women in the STEM workforce and STEM entrepreneurship, without a gendered, coordinated and collective approach by the range of actors in the STEM ecosystem, will not bring about transformative change.
