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An Analysis of the Gender Gap in GCC Educational Attainment

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Abstract

This paper investigates gender disparities in educational attainment across the Gulf Cooperation Council (GCC) countries using data from recent rounds of internationally benchmarked assessments (TIMSS and PIRLS). Contrary to global trends where boys typically outperform girls in mathematics and show parity in science, GCC countries exhibit a persistent and sizable gap favoring girls across grades and subjects, especially in science and language. The paper identifies a hump-shaped trajectory in the gap, peaking around 2015–2016 before narrowing slightly post-COVID. While Bahrain, Kuwait, Oman, and Saudi Arabia mirror the GCC average, Qatar and the UAE show smaller gaps and occasional reversals. Drawing on international literature and regional specificities, the paper explores biological, environmental, and biopsychosocial factors, as well as GCC-specific dynamics such as gender-segregated networks and women’s empowerment initiatives. The findings challenge dominant global narratives and call for targeted research and policy to address the potential long-term social and economic consequences of persistent male underachievement.

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Introduction

The countries of the Gulf Cooperation Council (GCC) are all currently restructuring their economies with the goal of decreasing the importance of hydrocarbons to GDP and to state budgets, under the umbrella of national strategic documents known as “economic visions” (Beutel, 2021). The architects of these visions have correctly diagnosed two long-standing impediments to the development of non-hydrocarbon activity within the GCC economies: the need to reform and modernize the education systems (Mosly, 2022); and the need to increase female labor force participation (Young, 2016). Accordingly, the visions of all six countries explicitly state the importance of improving educational attainment and of empowering women to play a larger role in the economy.

Though these two issues are ostensibly disconnected, the vast scholarly literature on human capital affirms the inextricable link between education and employment (Becker, 2002). Prior to the 19th century, mass education was largely absent all over the world, and highly selective tuition functioned as a career stepping stone for a small minority of elites, such as physicians and priests. However, following the conclusion of the Second World War, the primary role of education has transformed into preparing successive generations of youth for the needs of the labor market (Allmendinger, 1989). The mission statements of the educational ministries of all six GCC countries reflect this modern interpretation of education.

In light of this, and given the prominence attached to the issue of women’s economic empowerment inside and outside the GCC countries, this paper seeks to answer the following question: do boys and girls perform equally well in the educational systems of the GCC countries? If systematic gender differences exist, the paper explores how they vary by subject and age group, in addition to examining any heterogeneity within the GCC.

Understanding this gap - if it exists - is crucial because it allows policymakers and educators to identify the root causes of educational inequality (Buchmann et al., 2008). These causes may be economic, such as differences in household income, or structural, such as the alignment of curricula with student needs, teaching methodologies, or the quality of the learning environment. By analyzing these factors,

researchers and decision-makers can formulate more effective interventions to reduce gender inequality and promote social justice and economic development through equitable access to quality education (Hu and Morgan, 2024).

While the scholarly literature on the gender gap in education is very large, the GCC-centric component is quite small and mostly focuses on the narrow analysis of specific countries, specific subjects, or specific age groups. This paper presents secondary data from the latest rounds of several standardized international assessments that allow for a reasonably comprehensive evaluation of the educational gender gap for school children in the GCC.

The key findings are as follows. The data show that the GCC consistently exhibits a gender gap in favor of girls across grades, subjects, and years, with particularly large gaps in science and language at both primary and secondary levels. While math shows smaller gaps and even near parity in the most recent data, girls still outperform boys in most cases. A hump-shaped trend is observed, with the largest gaps around 2015–2016, followed by a gradual narrowing post-COVID. Country-level analysis reveals Bahrain, Kuwait, Oman, and Saudi Arabia closely mirror GCC averages, while Qatar and the UAE display smaller gaps and occasional reversals favoring boys. Moreover, the GCC gender gap is at odds with what is observed at the global level and in a selection of comparator countries that have educational systems to which the GCC countries aspire to emulate, wherein the gender gap is either small, absent, or slightly in favor of boys.

These unexpected findings run counter to the global narrative regarding the systemic pro-male, anti-female bias in educational systems (Bertocchi and Bozzano, 2020). If girls persistently outperform boys in school, it can create long-term social imbalances that extend beyond education (Houtte, 2004). Boys' lower academic achievement may translate into reduced access to higher education, fewer professional opportunities, and declining economic prospects, potentially fueling frustration, disengagement, and higher rates of delinquency or unemployment. Over time, this could widen social inequalities between genders in unexpected ways, with men becoming less competitive in knowledge-based economies. It may also strain traditional social roles and family dynamics, leading to identity and self-esteem issues

among men and reinforcing harmful stereotypes about male underachievement. Addressing this imbalance is therefore critical for social stability in the GCC countries.

This paper also synthesizes the vast existing literature on the gender gap that is not specific to the GCC to analyze the likely causes of the identified gender gaps. In particular, the role of biological, environmental, and biopsychosocial factors is explored. Understanding these causes constitutes a critical first step toward proposing countermeasures, which we hope that future research can address.

The rest of this paper is organized as follows. Section 1 explains how the educational gender gap is identified and reviews the relevant literature. Section 2 presents the most recent statistics on the gender gap in the GCC. Section 3 analyzes the likely causes of the identified gender gaps.

1. Background and Literature Review

1.1. Definition and Identification

The concept of the educational attainment gender gap refers to a persistent gender-based disparity in academic outcomes. It is not a temporary fluctuation but a consistent pattern observed in test scores and academic achievements. According to the U.S. National Center for Education Statistics (NCES), an attainment gender gap exists when one gender consistently outperforms another gender in a statistically significant manner (NCES, no date).

In principle, any test can be used to detect an educational gender gap. However, since we are interested in the GCC gender gap and how it compares to the global gender gap, we need a test that is consistent across the six member states (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, the UAE) and a large sample of other countries, i.e., we need a benchmarked international assessment.

Two prominent international assessments are the Trends in International Mathematics and Science Study (TIMSS) and the Progress in International Reading Literacy Study (PIRLS), both conducted by the International Association for the Evaluation of Educational Achievement (IEA, no date). As of 2023, more

than 70 countries had participated in these assessments, which aim to evaluate students' skills in mathematics, science, and reading (TIMSS and PIRLS International Study Center, no date).

TIMSS is conducted every four years and focuses on 4th and 8th-grade students, assessing their proficiency in mathematics and science. PIRLS, on the other hand, is administered every five years and evaluates reading literacy among 4th-grade students. These assessments are designed to generate detailed data on student performance, allowing policymakers to track progress and compare results across countries (IEA, no date). They also disaggregate results by gender, enabling researchers to examine the gender gap in educational achievement across different subject areas (Mullis and Martin, 2012).

Despite their usefulness, these international assessments are not without limitations. One major concern is the challenge of translating and adapting test items across multiple languages and cultural contexts, which can affect the clarity and fairness of the questions. Language nuances and cultural differences may lead to misinterpretation and inaccurate results (Hambleton, 1993). Furthermore, these assessments primarily focus on core academic subjects and often neglect broader competencies essential for holistic student development.

Another criticism is that some countries may overemphasize performance in these tests, tailoring their education policies to meet test requirements rather than addressing local educational needs. In some cases, students are specifically trained to excel in these assessments, which may not reflect their everyday educational experience or the true quality of their national education system (Morgan and Ibrahim, 2020). Nevertheless, in spite of these challenges, TIMSS and PIRLS still constitute an instructive departure point for determining the size of the educational gender gap in the GCC.

1.2. Existing Literature

The existing scholarly literature on the gender gap is extremely large. This section does not constitute an effort at conducting a systematic or structured review of the literature. Instead, we present a selection of papers that highlight key findings, organized by geographical focus.

1.2.1. Studies of the GCC Countries

Several studies across the GCC region have explored gender disparities in academic performance. A study by Al-Badri and Al-Kindi (2019) in Oman investigated the reasons behind female students outperforming males from the perspective of educators and parents. Using a descriptive methodology and a questionnaire distributed to 528 participants from South Al Batinah, the study found that girls showed higher discipline, better listening skills, and more consistent adherence to instructions than boys. Girls were also more motivated, attentive, and skilled in self-regulation and fine motor tasks. Additional factors included higher male dropout rates, more effective teaching strategies used by female teachers, and stronger family support for girls' education.

In Saudi Arabia, Al-Shahri (2019) studied the relationship between leadership skills and creative problem-solving among gifted middle school students in Tabuk. The study, which surveyed 150 students, revealed a positive correlation between the two skill sets and found that girls scored higher than boys in both leadership and problem-solving abilities.

Al-Enezi and Al-Kandari (2004) conducted research in Kuwait examining the relationship between academic performance and self-confidence among high school students. Comparing students in two systems - credit-based and semester-based - the study found that girls outperformed boys in the credit-based system, which requires continuous assessment and greater student commitment. The researcher attributed this to girls' stronger motivation, consistent attendance, and societal norms granting them more home-based study time. However, boys scored higher in self-confidence, which was linked to traditional gender roles that associate decision-making responsibilities with men.

Alomair and Almethen (2021) adopted a qualitative approach to study Saudi teachers' perspectives on gender and reading comprehension. Interviews with ten experienced female teachers revealed that girls mature earlier, spend more time at home reading, and are more attentive and detail-oriented. In contrast, boys were more easily distracted and sought shortcuts. The study recommended tailoring teaching strategies to suit gender-specific learning needs.

Barry (2019) analyzed data from the 2015 TIMSS assessment in Saudi Arabia to examine academic achievement by gender, perceived importance of subjects, and expected achievement levels. Based on a sample of approximately 3,800 eighth-grade students, the study confirmed that girls outperformed boys academically and placed a higher value on their education.

In the UAE, Marquez et al. (2022) used PISA 2015 and 2018 data to explore how geographic, socio-economic, and school-related factors affected adolescent well-being and academic competence. The analysis, involving over 19,000 students, found that girls reported higher levels of psychological stress and anxiety but had lower life satisfaction than boys. However, higher student well-being was positively correlated with better academic performance, underscoring the importance of supporting students' mental health.

Otayf (2019) studied English language learning strategies among male and female high school students in Jazan, Saudi Arabia. Although no significant gender differences were found overall, girls tended to favor cognitive and affective strategies. The study attributed this to the shared importance of English for both genders' future careers.

Finally, Thomas et al. (2012) examined the impact of gender and marital status on academic performance at Zayed University in the UAE. Quantitative data from around 3,700 students and interviews with seven revealed that female students outperformed males, while older and married students, mostly male, achieved higher GPAs. Marriage was seen as increasing maturity and academic focus.

1.2.2. Studies of the Arab Countries

Studies from non-Gulf Arab countries are relevant to the GCC countries not just because the GCC countries are Arab countries with shared customs and traditions; it is also due to the fact that the GCC countries' education systems are relatively young (none predate the 20th century), meaning that during their establishment and to this day, teachers from other Arab countries - especially Egypt, Jordan, Palestine, Syria, and Tunisia - have made an important contribution to the teaching corps. This provides an additional channel for transmitting any educational gender gaps that may exist in non-Gulf Arab countries.

Research from various Arab countries has identified consistent patterns in gender-based educational performance, with female students generally outperforming their male counterparts. A study by Tartir (2003) in the West Bank explored the causes of low academic achievement among students in grades 1–4, based on teachers' perspectives. The study, which surveyed 617 teachers, identified key factors such as overcrowded classrooms, outdated teaching methods, and misaligned curricula. Girls were perceived to perform better than boys due to stronger mental focus and better school environments. Teachers suggested that female educators were more attuned to the needs of girls, especially given their specialized training in early childhood education.

Salman (2021) examined the role of multiple intelligences in Arabic grammar acquisition among 4th-grade literary track students in Iraq. The study involved 97 students across gender-segregated schools and found that students taught using multiple intelligences strategies outperformed those taught using traditional methods. Girls scored higher overall, especially in linguistic intelligence, while boys excelled in bodily-kinesthetic intelligence, indicating the effectiveness of tailored teaching methods for each gender.

In Syria, Suleiman (2021) studied the reasons behind low achievement among early primary students in Homs. Based on a survey of 80 teachers, the findings highlighted insufficient instructional time, overcrowded classes, limited use of educational technology, and a lack of teacher motivation. More experienced and better-qualified teachers were more accurate in diagnosing the causes of students' academic struggles.

A study by Aqqouni and Behadi (2020) in Algeria emphasized the role of motivation in student success. Working with 30 high school students aged 17–19, the researchers concluded that despite the presence of supportive family, social, and economic environments, a lack of internal motivation had a detrimental effect on academic performance.

Ali Ahmed (2014) surveyed 115 educational supervisors and counselors in the Palestinian districts of Salfit and South Nablus to understand the causes of low achievement. Female respondents cited more contributing factors than males, including high teaching loads, lack of parental involvement, student distraction, and weak foundational skills in early education.

Alsindi (2013) conducted a large-scale analysis of 2007 TIMSS data across Iran, Syria, Jordan, and Oman, involving approximately 19,000 eighth-grade students. The study found that girls in single-sex schools scored lower in mathematics than both boys in single-sex schools and girls in co-educational settings. In contrast, boys in single-sex schools outperformed their peers in mixed environments, suggesting that school type interacts with gender in complex ways.

Bouhlila and Hentati (2022) analyzed 2012 PISA data from Jordan, Qatar, Tunisia, and the UAE to explain the reversal of the gender gap in academic achievement. With a sample of approximately 34,000 students, they found that girls demonstrated a stronger desire to learn, which was linked to limited social mobility. Conversely, boys showed lower motivation due to local employment opportunities that de-incentivized academic effort. Expatriate students were found to have stronger educational motivation than nationals.

Finally, Khwaileh and Zaza (2010) examined academic performance at the University of Jordan using data from over 26,000 students. Female students had consistently higher GPAs, attributed to their greater study time, social constraints that kept them focused on academics, and a stronger drive to succeed as a means of empowerment and entry into the workforce.

1.2.3. Other Studies

Though the influence of non-Arab educational systems on those of the GCC is understandably smaller than that of Arab ones owing to linguistic considerations, they still have a significant impact due to the perception that Western educational systems are an exemplar to be emulated. Moreover, in the GCC, it is common for children in private schools to receive instruction for a subset of classes in English, leading to the employment of expatriate teachers from countries such as Ireland, South Africa, and the UK. These tendencies affirm the importance of reviewing the literature on the educational gender gap outside the Arab world, while noting that this is by far the largest subset of the literature and spans literally thousands of papers. A succinct and selective exposition follows.

International studies on gender gaps in educational attainment reveal diverse patterns shaped by socioeconomic, cultural, and psychological factors. In Italy, Castagnetti and Rosti (2010) examined

academic and labor market outcomes for graduates from the class of 2004. Using data from the Italian National Statistics Office and a graduate survey, they found that while women outperformed men academically, men had higher labor market participation and wages by 2007. The authors suggested that women work harder academically to signal competence to future employers, particularly given persistent wage disparities.

In Australia, Cobb-Clark and Moschion (2017) investigated early academic achievement in third grade, focusing on reading and numeracy across different income groups. Their analysis of the 2004 Longitudinal Survey of Australian Children showed no gender gap in reading among high-income families. However, in low- and middle-income families, girls outperformed boys in reading, likely due to stronger early literacy skills developed in kindergarten. Boys from wealthier families outperformed girls in mathematics, indicating that environmental advantages and school quality may disproportionately benefit boys in numeracy.

In Ghana, Kyei et al. (2011) explored gender differences in high school mathematics performance. The study combined surveys from 250 students and interviews with 15 teachers in mixed-gender schools. Results showed boys outperforming girls in math, largely due to girls' low self-confidence and teaching practices that favored boys. Mathematics was perceived as a male subject, and cultural expectations discouraged girls from engaging fully. The researchers concluded that psychological, pedagogical, and social factors underpinned the performance gap and recommended confidence-building and inclusive teaching approaches.

Steinmayr and Spinath (2008) conducted an experimental study in Germany to explore how personality traits and motivation affected academic performance. Using data from 342 upper-secondary students, they found that girls outperformed boys in German due to traits such as agreeableness, conscientiousness, and fear of failure. Girls were more motivated to succeed academically and placed greater value on language learning, while boys displayed lower academic effort and a stronger interest in mathematics. The study highlighted how intrinsic motivation and personality contribute to gendered performance patterns.

Zuze (2015) analyzed gender disparities in sixth-grade mathematics performance across Kenya, Tanzania, and Uganda using multilevel analysis of data collected by the Southern and Eastern Africa Consortium for Monitoring Educational Quality. Boys outperformed girls across all three countries. Socioeconomic status played a critical role: students from wealthier households performed better regardless of gender, though Kenyan girls benefited more due to better national conditions. Cultural and institutional biases were also significant, including early marriage, school dropout among rural girls, and the social undervaluation of female education. The study called for gender-responsive curricula and support mechanisms to improve girls' educational opportunities, especially in mathematics.

Collectively, these international findings confirm that while girls often outperform boys in language-based subjects, boys maintain advantages in mathematics, particularly in regions where gender norms and teaching practices reinforce male dominance in STEM fields.

2. Recent Statistics

2.1. The GCC in Isolation

The data we present in this section is based on the raw country-level TIMSS and PIRLS data available online. GCC figures represent a weighted average using World Bank population data. Our focus is on the gender gap and not the absolute performance of each gender; however, to provide readers with context on the size of the gender gap, we also report the absolute average across time and gender for each group of figures. In all figures, the numbers presented are the gender gap in favor of girls, which is calculated by subtracting the average for boys from the average for girls.

We begin by presenting GCC-level data, and then proceed to present selected figures disaggregated by GCC member state to explore the existence of any notable intra-GCC heterogeneity. The math and science statistics presented include data from the last pre-Covid year (2019) and the first full post-Covid year (2023), while the language statistics include the pair of years 2016 and 2021, the latter of which is

during COVID-19. It is important to bear this in mind when interpreting the data, given the acute disruption to education caused by the pandemic.

Figure 2.1.1 shows the GCC educational gender gap in favor of girls for grade 4 math. In 2011, girls outperformed boys slightly (16 points), and the gap rose to 29 in 2015. It then fell back to 16 in 2019 before being reversed and favoring boys slightly in 2023 (-6), though this is negligibly different from zero, suggesting an elimination of the gender gap for the most recent year of data.

Figure 2.1.1: GCC educational gender gap in favor of girls for grade 4 math according to TIMSS, average score = 415

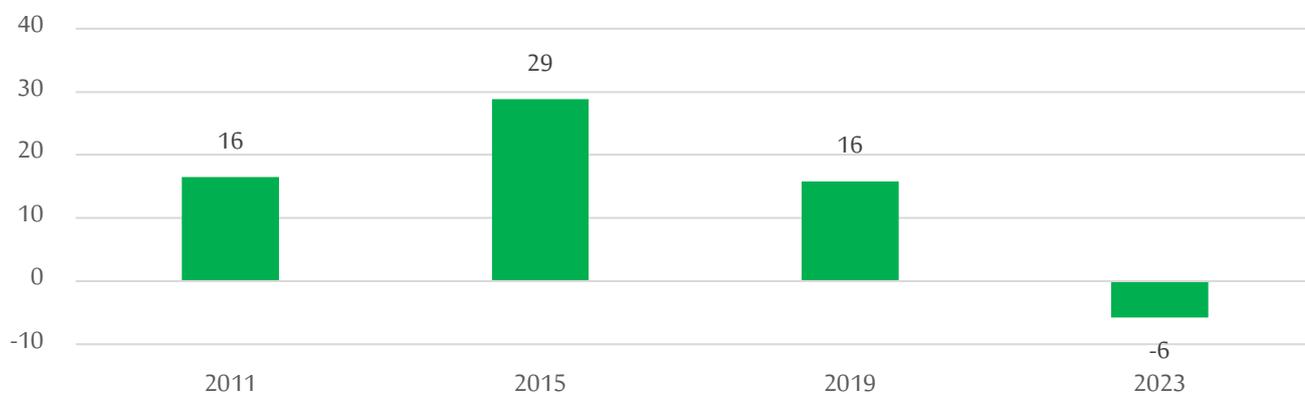


Figure 2.1.2 shows the GCC educational gender gap in favor of girls for grade 4 science. In 2011, girls outperformed boys by a considerable margin (40 points), and the gap rose to 57 in 2015. It then fell back to 43 in 2019 and then to 22 in 2023. In general, these numbers indicate a persistent gender gap in favor of girls for grade 4 science.

Figure 2.1.2: GCC educational gender gap in favor of girls for grade 4 science according to TIMSS, average score = 421

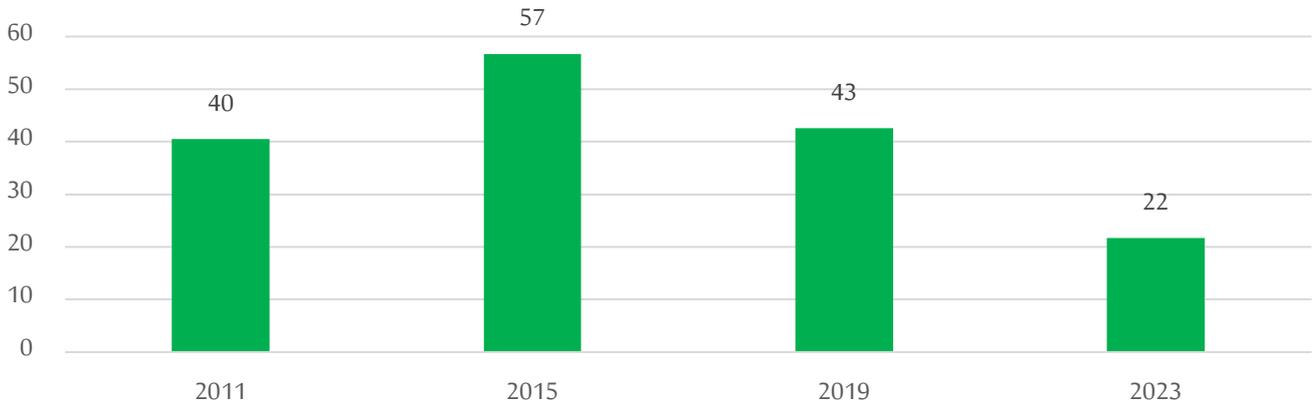
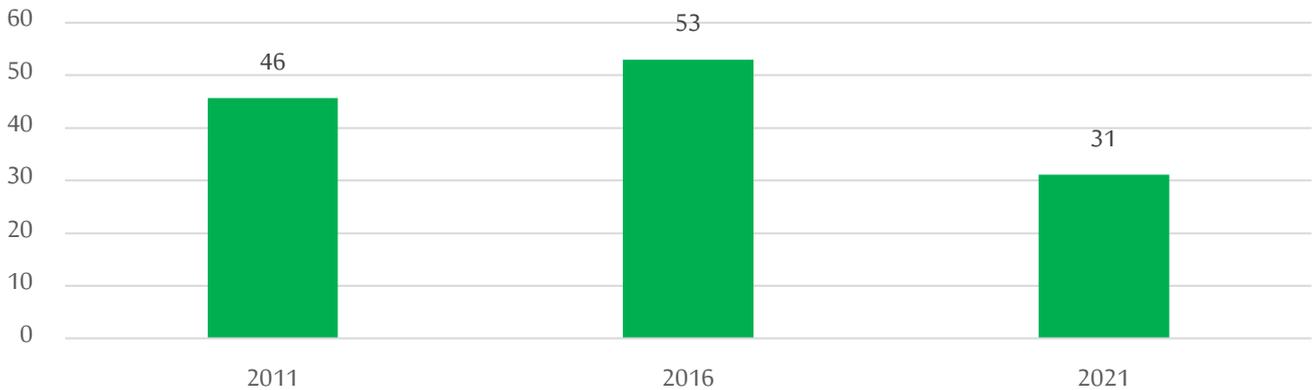


Figure 2.1.3 shows the GCC educational gender gap in favor of girls for grade 4 language, indicating a similar pattern to grade 4 science. In 2011, girls outperformed boys by a considerable margin (46 points), and the gap rose to 53 in 2016. It then fell back to 31 in 2021, though still affirming the superiority of grade 4 girls' performance in the language assessment.

Figure 2.1.3: GCC educational gender gap in favor of girls for grade 4 language according to PIRLS, average score = 421



Moving on to grade 8, Figure 2.1.4 shows the GCC educational gender gap in favor of girls for math. While girls outperform boys every year (18 points in 2011, 16 points in 2015, 16 points in 2019, and 1 point in 2023), the gap is generally small, indicating the existence of a near-negligible gender gap at the level of the GCC.

Figure 2.1.4: GCC educational gender gap in favor of girls for grade 8 math according to TIMSS, average score = 399

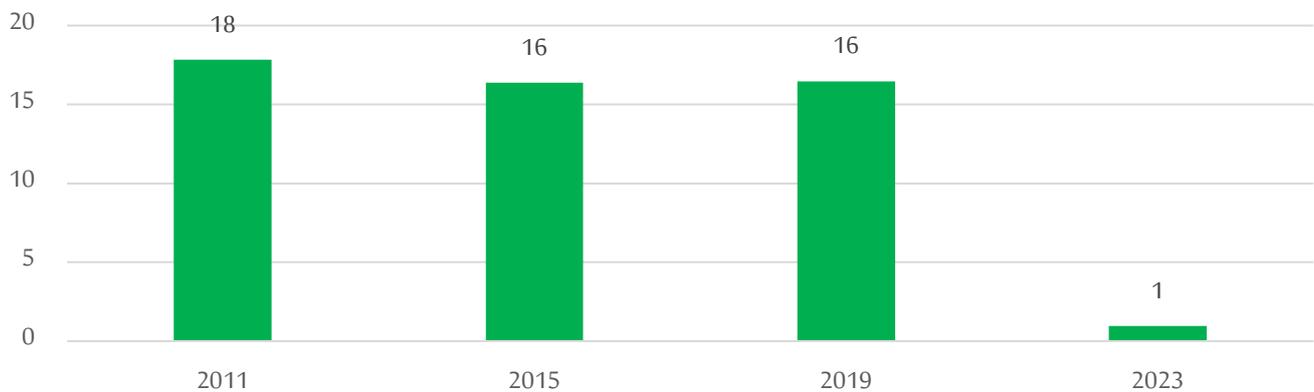
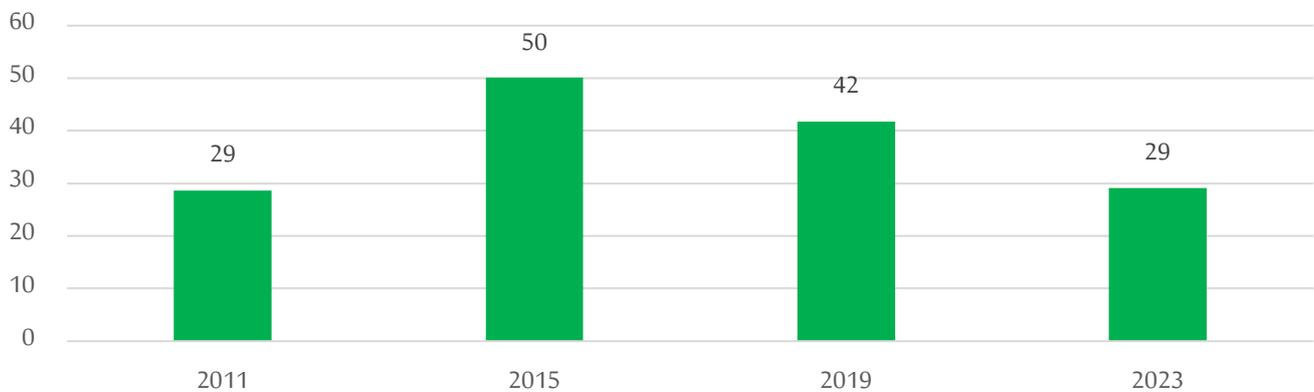


Figure 2.1.5 shows the final major time series, which is the GCC educational gender gap in favor of girls for grade 8 science. Like math, there is a persistent imbalance in favor of girls, but unlike math, the gap is substantive: 29 points in 2011, 50 points in 2015, 42 points in 2019, and 29 points in 2023.

Figure 2.1.5: GCC educational gender gap in favor of girls for grade 8 science according to TIMSS, average score = 428



Taking the five figures 2.1.1-2.1.5 together, it is notable that all generally exhibit two features: girls outperforming boys (either significantly or negligibly), and a hump-shaped pattern over time, with the maximum coming in 2015-2016. However, GCC data represent an aggregate over six countries that have significant homogeneity yet still retain important idiosyncratic characteristics in the cultural and educational domains. Accordingly, it is important to examine the breakdown by country in case the averages exhibited above are concealing significant country-level variation.

To that end, Figure 2.1.6 shows the pre- and post-COVID gender gap in grade 4 math by GCC country. Note that the GCC gender gap in both years was modest: 16 points in favor of girls in 2019, and 6 points in favor of boys in 2023. In 2019, there were two notable deviations: Saudi girls outperformed Saudi boys by a moderate margin (27 points), while Emirati boys outperformed Emirati girls by a small margin (9 points). In 2023, Bahraini girls continued to outperform Bahraini boys substantively (14 points), while Qatari boys outperformed Qatari girls by a margin (21 points) that exceeded the GCC-level one (6 points) by some distance.

Figure 2.1.6: Pre- and post-Covid educational gender gap in favor of girls for grade 4 math according to TIMSS, average score = 427

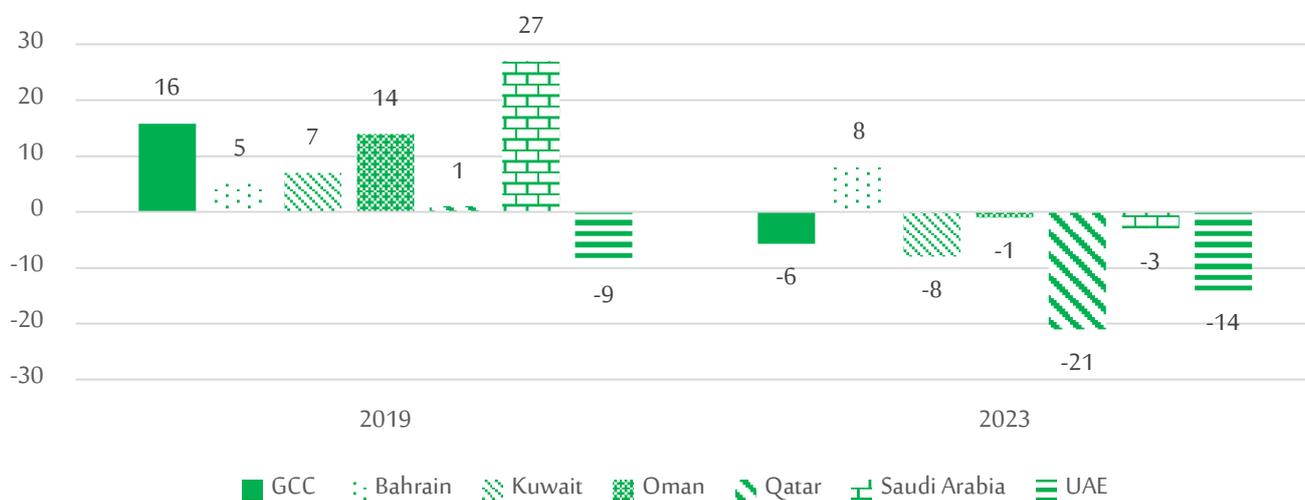


Figure 2.1.7 shows the pre- and post-COVID gender gap in grade 4 science by GCC country. In 2019, when the GCC gap in favor of girls was considerable (43 points), three of the individual member states mimicked this average pattern: Bahrain (34 points), Kuwait (39 points), and Oman (24 points). In contrast, Qatar (13 points) and the UAE (4 points) had negligible gender gaps, while Saudi Arabia (61 points) had a very large one. This pattern was broadly replicated in 2023: Bahrain (33 points), Kuwait (20 points), and Oman (13 points) were comparable to the GCC average (22 points), while Qatar (3 points in favor of boys) and the UAE (2 points in favor of boys) retained negligible gender gaps. The only notable difference is that Saudi Arabia (32 points) no longer deviates significantly from the GCC average.

Figure 2.1.7: Pre- and post-Covid educational gender gap in favor of girls for grade 4 science according to TIMSS, average score = 431

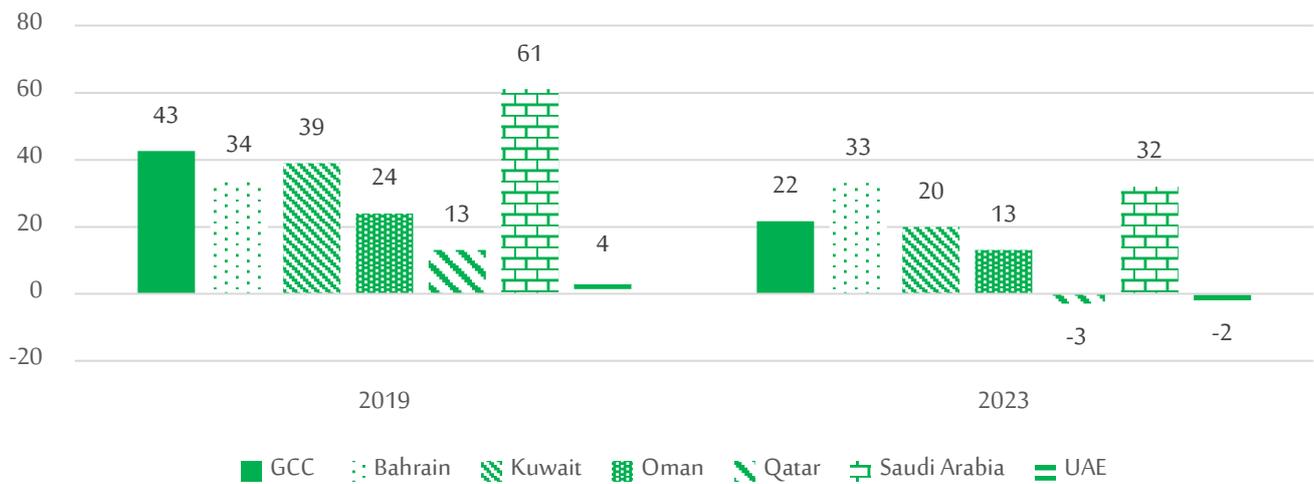
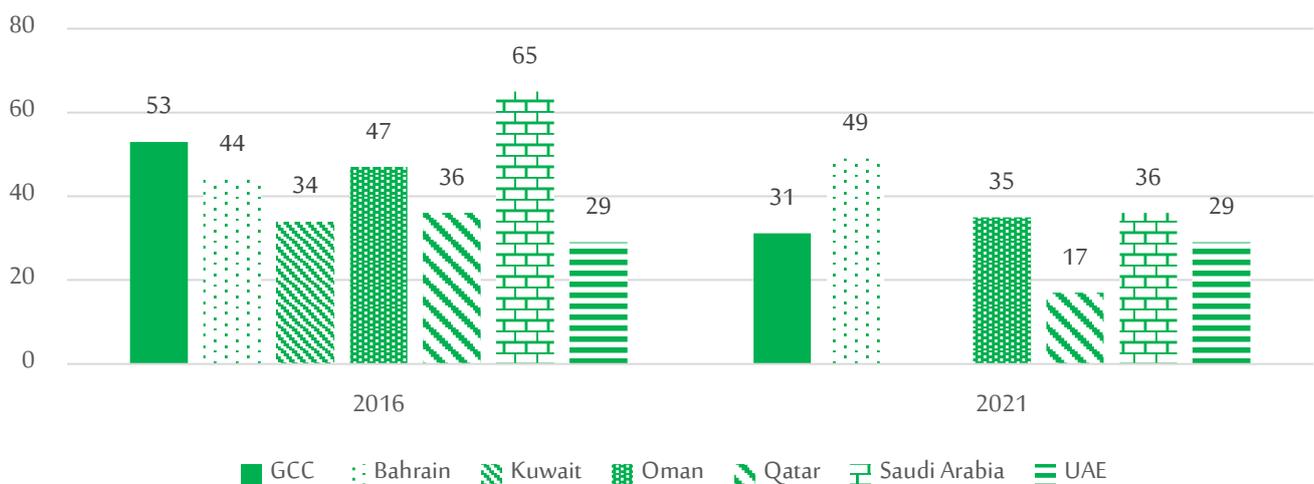


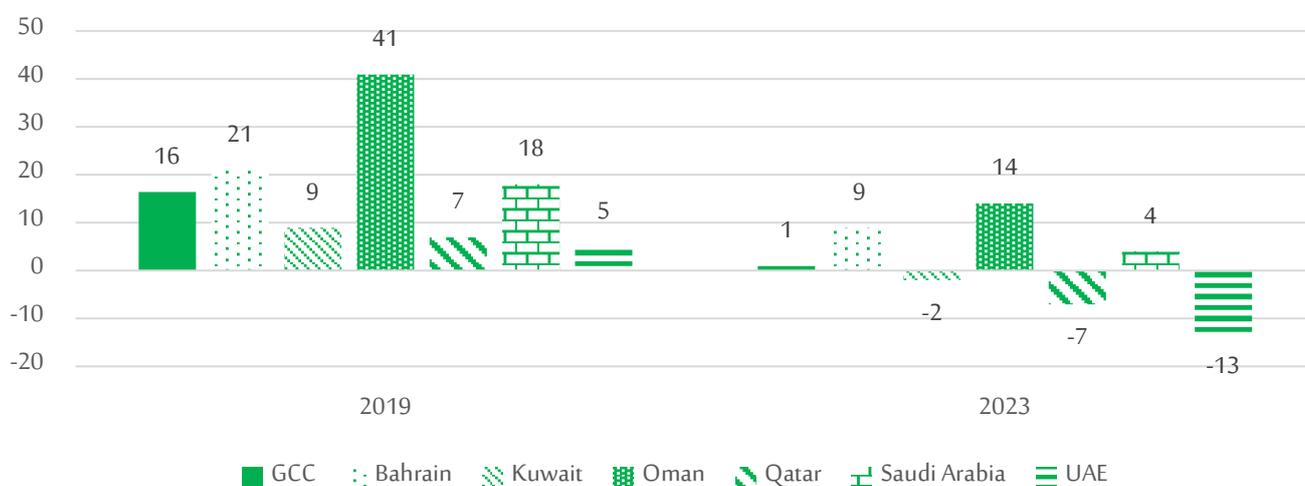
Figure 2.1.8 shows the pre- and post-COVID gender gap in favor of girls for grade 4 language by GCC country. Here, the GCC average in both years (53 points for 2016, 31 points for 2021) is reflective of the performance of each of the six member states, with the exception of Kuwait in 2023, for which no data was available. In other words, across the entire GCC, grade 4 girls outperform grade 4 boys persistently in the language component of international assessments.

Figure 2.1.8: Pre- and post-Covid educational gender gap in favor of girls for grade 4 language according to PIRLS, average score = 424



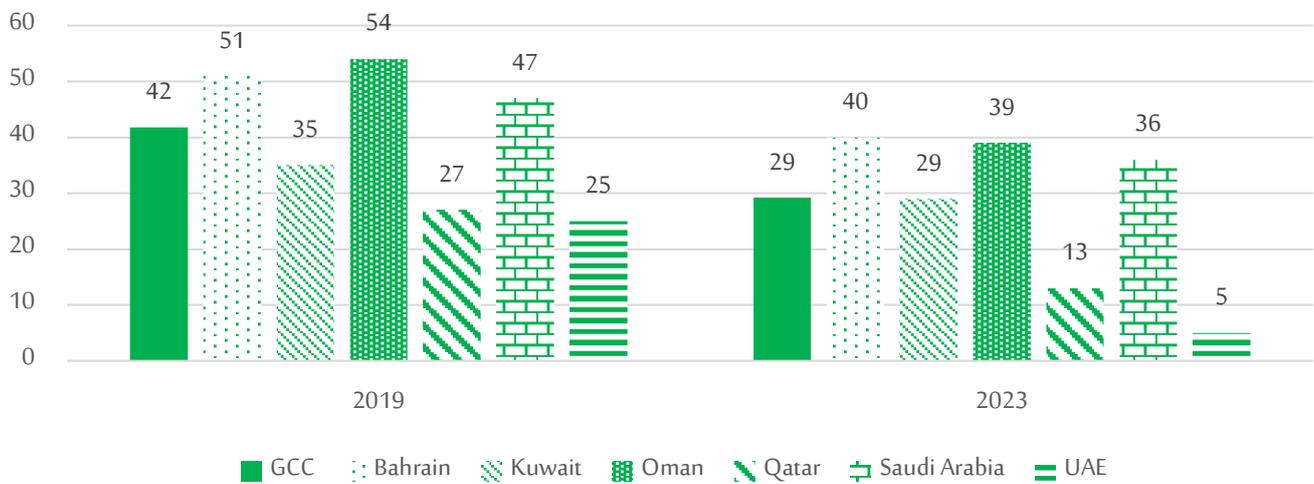
Moving on to grade 8, Figure 2.1.9 shows pre- and post-COVID gender gap data in favor of girls for math. At the GCC level, there was a modest gender gap in favor of girls in 2019 (16 points), followed by a near-absent one in 2023 (1 point). There were only three notable deviations from this average at the sub-regional level: Oman in 2019 (41 points), which had a large gap in favor of girls; Oman in 2023 (14 points), which had a modest gap in favor of girls; and the UAE in 2023 (13 points in favor of boys), which had a modest gap in favor of boys when the GCC one was negligible.

Figure 2.1.9: Pre- and post-Covid educational gender gap in favor of girls for grade 8 math according to TIMSS, average score = 415



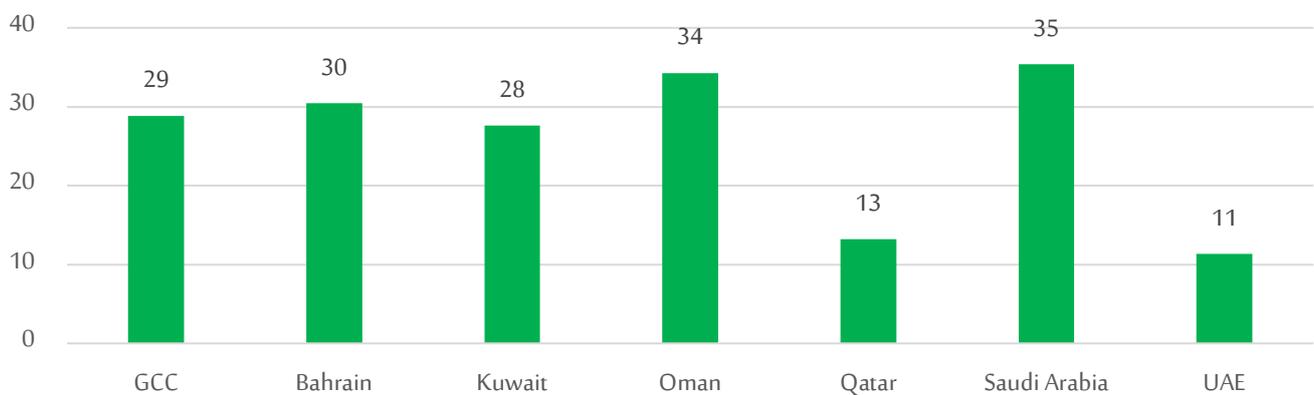
In the final subject-specific snapshot, Figure 2.1.10 shows pre- and post-COVID gender gap data in favor of girls for grade 8 science. In 2019, the large GCC-level gap (42 points) in favor of girls was present in all six member states, while the considerable GCC-level gap in 2023 (29 points) was present in five member states, with only the UAE (5 points) exhibiting near equality of the two genders.

Figure 2.1.10: Pre- and post-Covid educational gender gap in favor of girls for grade 8 science according to TIMSS, average score = 442



Overall, the GCC averages are broadly consistent with the performance of the individual states, but there are some notable country-level tendencies that merit citation. These can be seen in Figure 2.1.11, which shows the simple average of the educational gender gap in favor of girls across all grades, subjects, and years. In particular, Bahrain, Kuwait, Oman, and Saudi Arabia have a gender gap in favor of girls in every subject in every grade in every year (virtually), and mimic the GCC closely. In contrast, Qatar and the UAE have a smaller gender gap in favor of girls, and on several occasions, exhibit a gender gap in favor of boys.

Figure 2.1.11: Average educational gender gap in favor of girls across all grades, subjects, and years



A concise synthesis of all of the data presented in this section is that the GCC countries exhibit a substantive and persistent gender gap in favor of girls, notwithstanding the existence of some variation

by country, subject, grade, and year. The literature review conducted above indicated that historically and at the global level, boys tend to outperform girls in certain subjects, especially math, suggesting a deviation by the GCC from these general tendencies. However, those conclusions were derived from studies conducted across decades and do not necessarily represent the most recent rounds of formal data collection. The next section compares the GCC to a selection of other countries using the same international assessments (TIMSS, PIRLS) cited above, and for the same recent collection of years (2011, 2015, 2016, 2019, 2021, 2023).

2.2. The GCC Compared to Other Countries

When seeking to benchmark the GCC's performance in the educational gender gap, the natural starting point was the world-level figures provided by TIMSS and PIRLS. However, we also selected four individual comparison countries (Chile, Finland, Singapore, and the US) based on several criteria. First, all have high-quality educational systems according to global rankings, and represent countries that the GCC economic visions are looking to emulate in at least some regards. Second, with the exception of the world's most powerful economy (the US), all have population levels that are comparable to those of the GCC countries. Finally, the four countries are from four different continents, in the interests of geographical variation.

Figure 2.2.1 shows the pre- and post-COVID gender gap in favor of girls for grade 4 math. In 2019, the GCC's positive gap in favor of girls (16) is at considerable odds with the small gap that exists in favor of boys in all of the comparison countries, in addition to the gap at the level of the world (4 points in favor of boys). However, in 2023, the GCC gap (6 points in favor of boys) is in line with all of the comparators.

Figure 2.2.1: Pre- and post-Covid educational gender gap in favor of girls for grade 4 math according to TIMSS

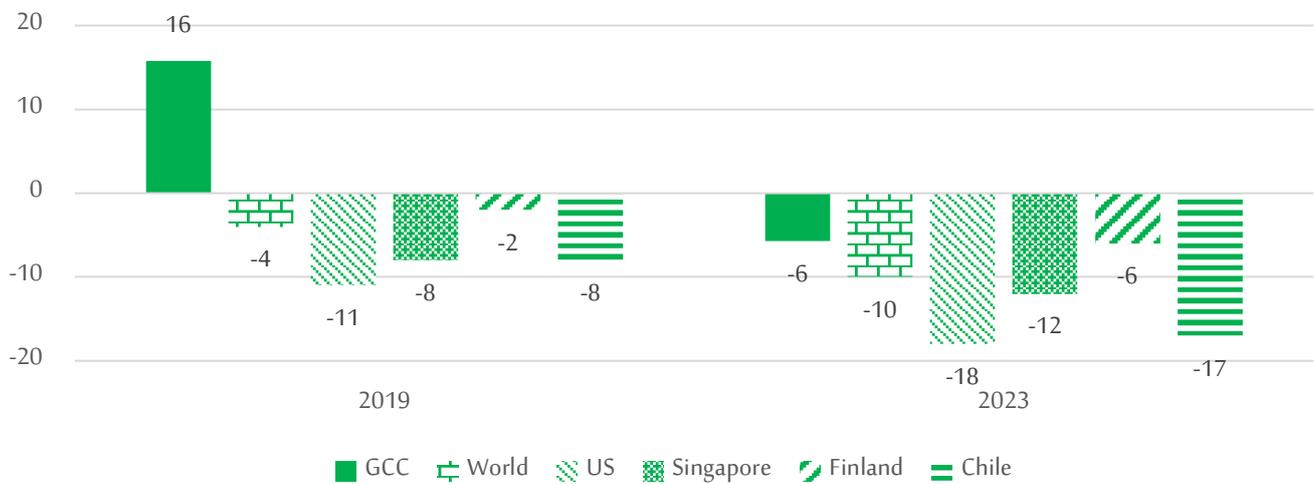


Figure 2.2.2 shows the pre- and post-COVID gender gap in favor of girls for grade 4 science. The clear pattern emerging is that, among the comparators, the GCC is the only territory that has a large and persistent gender gap in favor of girls (43 points in 2019, 22 points in 2023). For example, at the world level, the gap is essentially absent (4 points in 2019, 1 point in 2023)..

Figure 2.2.2: Pre- and post-Covid educational gender gap in favor of girls for grade 4 science according to TIMSS

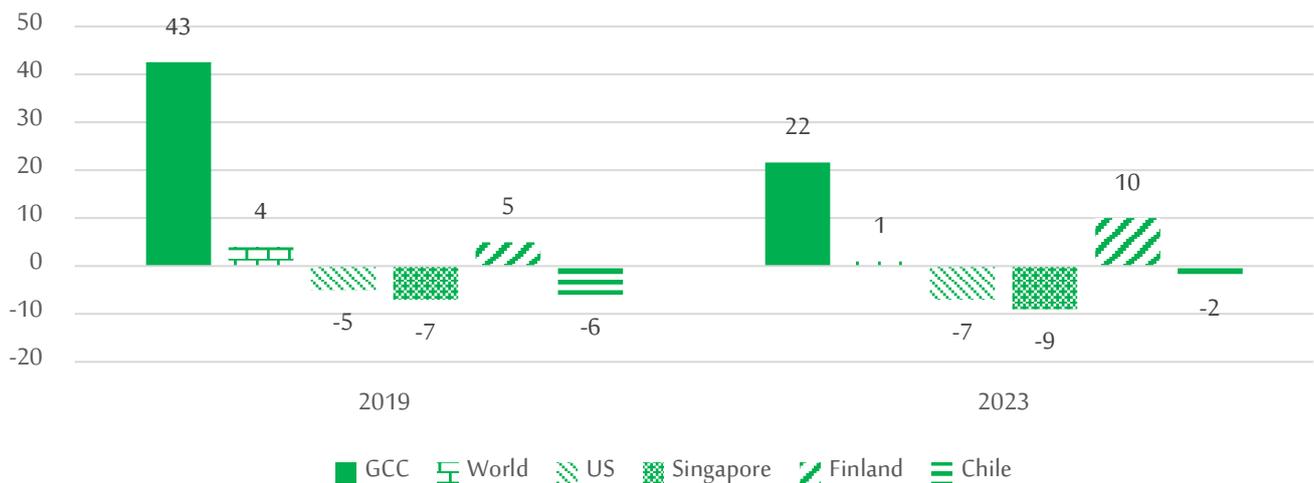
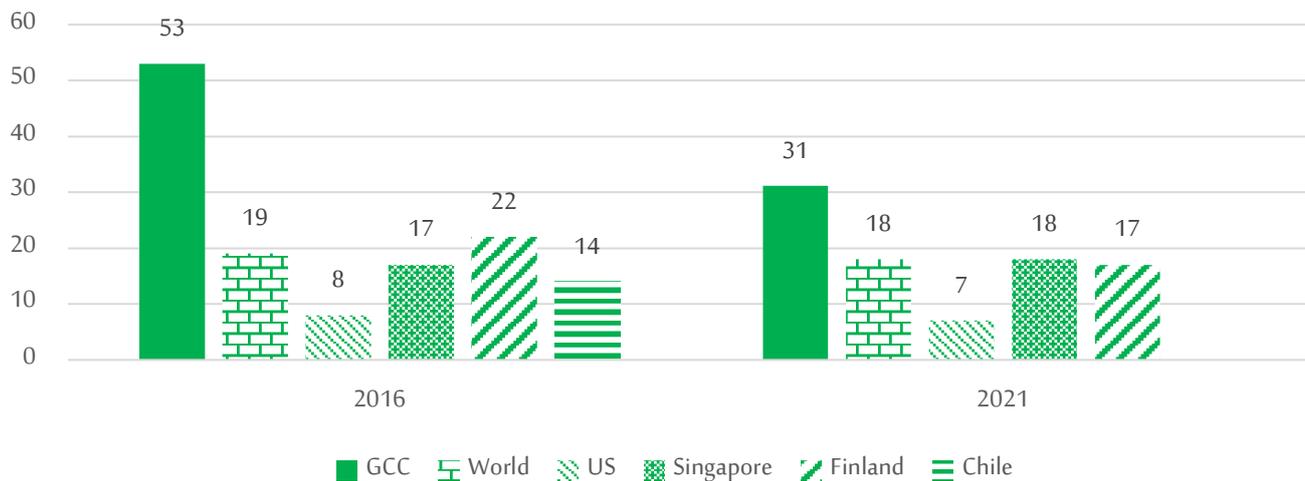


Figure 2.2.3 shows the pre- and post-COVID educational gender gap in favor of girls for grade 4 language. Here, the picture among the presented sample is much more uniform: a persistent gender gap in favor of

girls (19 points in 2016 at the world level, and 18 points in 2021). In both years, the GCC is notable for having a substantively larger gender gap in favor of girls (53 points in 2016 and 31 points in 2021), while the US has a marginal one (8 points in 2016 and 7 points in 2021).

Figure 2.2.3: Pre- and post-Covid educational gender gap in favor of girls for grade 4 language according to PIRLS



Moving on to grade 8, Figure 2.2.4 shows the pre- and post-COVID gender gap in favor of girls for math. Here, the GCC data (16 points in 2019, 1 point in 2023) is starkly different from the comparators, where the gap is either negligible or in favor of boys. For example, at the world level, the gap is 3 points in favor of girls in 2019 and 6 points in favor of boys in 2023. Chile is notable for having a gap in favor of boys, which starts small (9 points in 2019) and grows (22 points in 2023). The US gap in favor of boys in 2023 (14 points) is also non-trivial.

Figure 2.2.4: Pre- and post-Covid educational gender gap in favor of girls for grade 8 math according to TIMSS

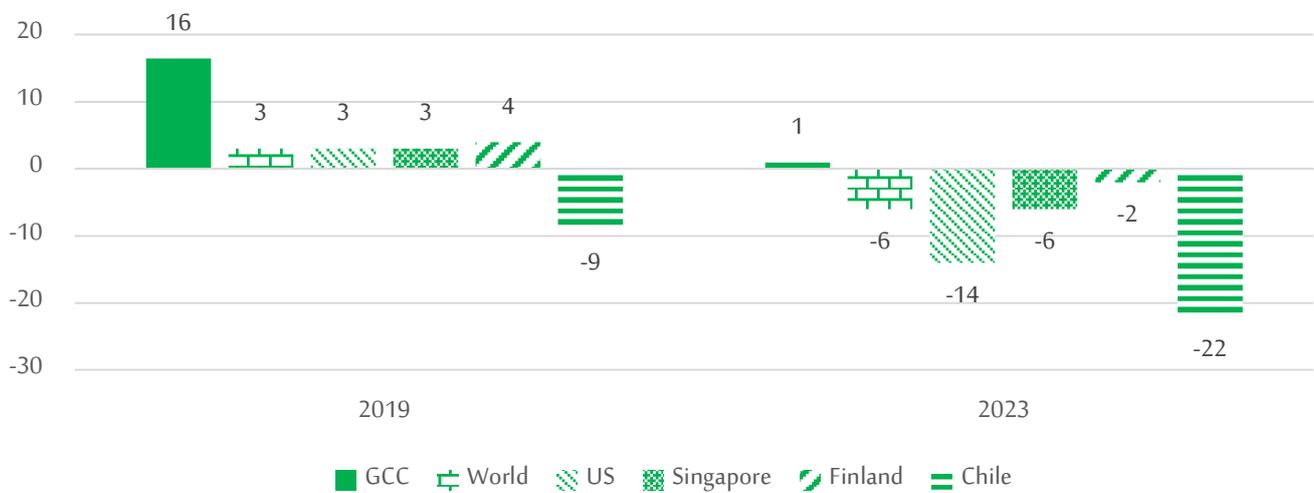
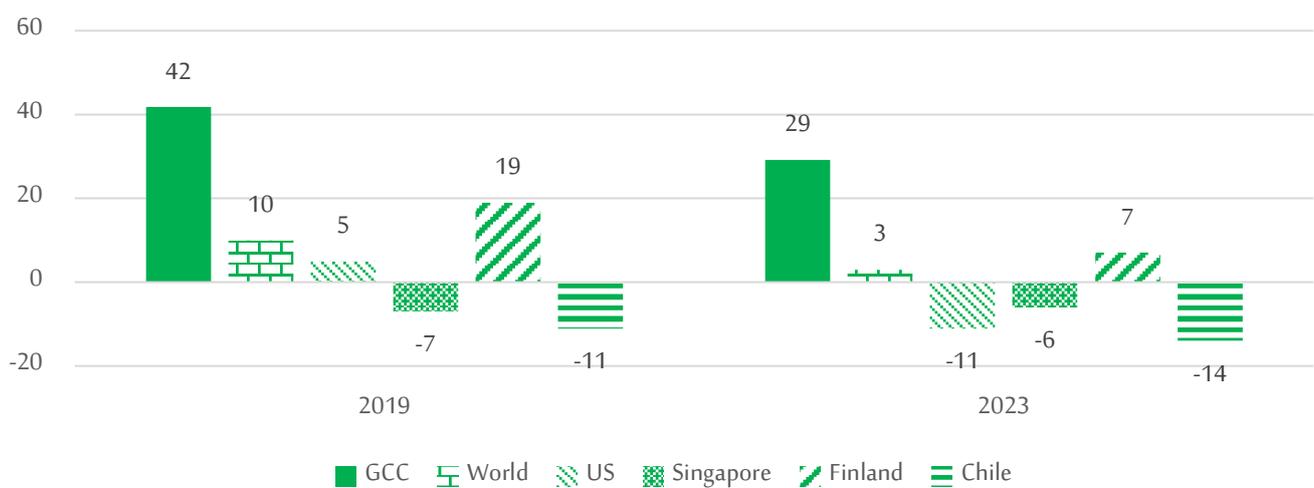


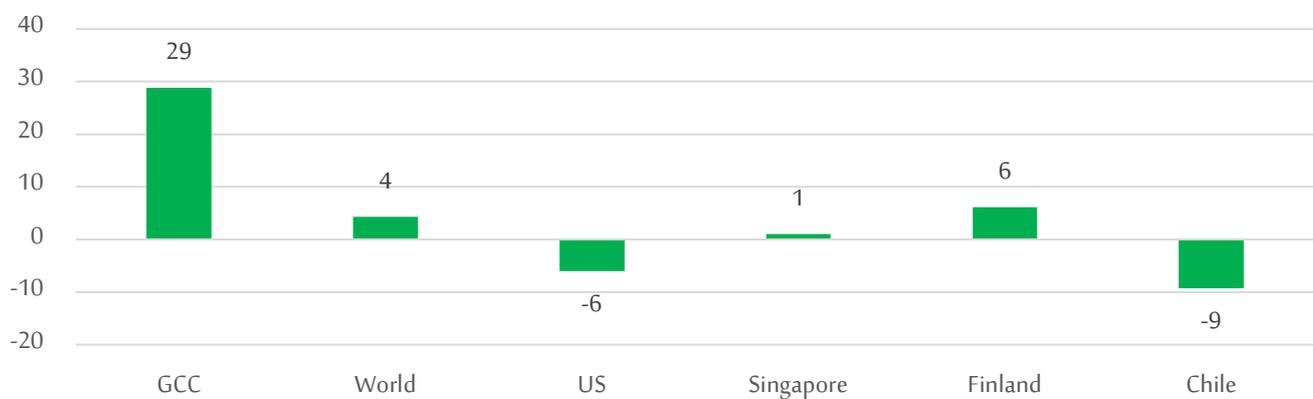
Figure 2.2.5 shows the pre- and post-COVID gender gap in favor of girls for grade 8 science. These results are somewhat isomorphic to the grade 8 math ones: a strong gap in favor of girls for the GCC (42 points in 2019, 29 points in 2023), a weak gap at the world level (10 points in 2019, 3 points in 2023), negligible gaps in the US, Finland, and Singapore, and a non-trivial gap in favor of boys in Chile (11 points in 2019, 14 points in 2023).

Figure 2.2.5: Pre- and post-Covid educational gender gap in favor of girls for grade 8 science according to TIMSS



Overall, the GCC averages seem quite distinct from the rest of the world and the individual comparator countries. This can be seen in Figure 2.2.6, which shows the simple average of the educational gender gap in favor of girls across all grades, subjects, and years for the sample. The GCC has a significant gap in favor of girls (29 points), while the other territories have small ones, including 4 points at the level of the world. Chile (9 points in favor of boys) and the US (6 points in favor of boys) are notable for having aggregate gaps reflecting boys outperforming girls.

Figure 2.2.6: Average educational gender gap in favor of girls across all grades, subjects, and years



In light of the above, a concise synthesis is that the world and the various comparator countries exhibit modestly sized educational gender gaps that tend to favor boys in math, girls in language, and approximate equality in science. In contrast, the GCC shows a consistent and persistent gender gap in favor of girls across all subjects and years, with the exception of math in the most recent year (2023). Moreover, as explained at the end of Section 2.1, the GCC averages are largely representative of the six GCC states, with the exception of Qatar and the UAE, which deliver results that are closer to equality and therefore more consistent with the world and comparator countries. The next section explores the potential causes of these findings.

3. Causes

In the literature reviews presented above in Section 1.2, some unstructured musings regarding the causes of gender gaps were presented. In this section, we present the causes of girls outperforming boys in a

more systematic manner, distinguishing between the generic factors that have been identified in the literature across a wide variety of domains and those that are likely to reflect idiosyncratic properties of the GCC countries.

3.1. Generic Causes of Girls Outperforming Boys in Education

Understanding the gender gap in academic achievement requires moving beyond single-factor explanations to a more nuanced framework that captures the complexity of its underlying causes. This paper adopts a tripartite classification of factors - biological, environmental, and biopsychosocial - to better explain why girls tend to outperform boys, particularly in reading and language-based subjects. Biological factors focus on innate developmental differences, such as the earlier cognitive and linguistic maturity observed in girls. Environmental factors encompass the social, cultural, economic, and institutional conditions that shape how students engage with learning. Biopsychosocial factors bridge these two domains, highlighting how inherent predispositions, such as self-regulation and motivation, interact with social expectations and educational contexts to produce varying outcomes. Together, these three dimensions provide a comprehensive lens for understanding the interplay of nature, nurture, and their overlap in shaping the observed gender disparities in educational performance.

3.1.1. Biological Factors

The academic gender gap, particularly the superior performance of girls in reading and related skills, can partly be traced to biological factors that shape developmental trajectories. Research consistently shows that girls reach cognitive and linguistic maturity earlier than boys, giving them an advantage in foundational skills such as reading and comprehension. Alomair and Almethen (2021) highlight that this earlier maturity enables girls to process texts more efficiently, which aligns with the global patterns reflected in PIRLS 2021 results that show a reading gap favoring girls in most countries. Similarly, Cobb-Clark and Moschion (2015) argue that girls demonstrate a heightened readiness to acquire language during the early schooling years, which enhances not only their literacy skills but also contributes to more positive early educational experiences.

This developmental advantage has cumulative effects. Girls who experience early success in reading tend to build stronger academic confidence, which reinforces their engagement with learning tasks. In contrast, boys, who often face delayed cognitive readiness, may encounter initial struggles in reading and comprehension that lead to frustration and lower motivation. These early negative experiences can accumulate, creating a long-term performance gap. PIRLS 2021 further supports this interpretation by showing that boys lag in reading across diverse educational systems, suggesting a universal developmental pattern that transcends cultural context (Alomair and Almethen, 2021).

Moreover, early linguistic development is closely linked with social interaction and the ability to derive meaning from texts. Girls' advanced readiness for these tasks means they are more likely to derive enjoyment and satisfaction from literacy-based activities. Cobb-Clark and Moschion (2015) note that girls exhibit a higher propensity for acquiring language and interpreting nuanced meaning in texts at younger ages. This not only boosts their immediate academic achievement but also establishes a positive feedback loop in which success breeds greater effort and engagement.

The biological differences in maturity also affect how boys and girls experience the initial phases of formal education. Girls, due to their advanced cognitive readiness, are more likely to align with the structured expectations of school during the critical early years. Conversely, boys' delayed maturity can lead to misalignment with these expectations, resulting in a pattern of underachievement that begins early and persists through later stages of schooling. As Steinmayr and Spinath (2008) suggest, these early developmental advantages in girls contribute significantly to their sustained academic success.

It is therefore evident that biological factors, particularly the earlier maturation of girls in cognitive and linguistic domains, create a foundational advantage that is especially visible in reading and comprehension. While this does not solely determine the academic gap, it serves as an initial condition that interacts with social and institutional factors to produce the observed disparities. Importantly, these biological differences do not imply fixed limitations for boys but rather highlight the need for pedagogical approaches that account for their developmental timelines (Cobb-Clark and Moschion, 2015).

3.1.2. Environmental Factors

While biological differences establish an initial foundation for the gender gap in academic performance, environmental factors significantly shape how these disparities manifest and persist. Social and cultural contexts play a central role in defining how boys and girls allocate their time, prioritize learning, and respond to educational expectations. In many Arab societies, for example, girls are more likely to remain at home for longer periods, which affords them greater opportunities for reading and focused study. By contrast, boys typically enjoy more freedom of movement and are encouraged to participate in outdoor or social activities that compete with their study time (Alomair and Almethen, 2021). Alenazi and AlKandari (2004) highlight how Kuwaiti girls outperform boys in reading largely because they spend more time at home, while boys' greater social engagement reduces their available time for academic work.

Cultural expectations further amplify these patterns. Girls often face stronger social pressure to excel academically as a way of proving their competence and securing future opportunities. Khwaileh and Zaza (2010) note that in many contexts, girls dedicate more time to libraries and study spaces compared to boys, whose attention is fragmented across a broader range of social engagements. This dynamic reinforces girls' academic focus, especially in subjects such as reading and language acquisition, which benefit from sustained attention.

The structure of the school system and the prevailing teaching methods also play a decisive role. Alenazi and AlKandari (2004) observed that course-based systems, which emphasize continuous effort, assignments, and homework, tend to favor girls because they align with their disciplined study habits. Boys, on the other hand, perform better in stricter systems where opportunities for laxity are minimized, such as those that enforce mandatory attendance and rigid schedules. Salman (2021) similarly found that teaching models based on multiple intelligences can help mitigate the gap by recognizing and developing different skill sets in both genders. Yet, when teaching methods are implicitly gendered, such as treating mathematics as a "male" subject, girls' confidence and performance decline, further perpetuating the gap (Kyei et al., 2011).

Economic conditions also shape the extent of the gender gap. Cobb-Clark and Moschion (2015) report that in higher-income families, where resources and private schooling are more accessible, the gender gap in reading narrows because boys benefit more directly from these advantages. Conversely, in middle- and lower-income families, girls often outperform boys, particularly in literacy, as they tend to make better use of limited resources. Zuze (2015) confirms that students from economically advantaged backgrounds - regardless of gender - achieve higher outcomes, underscoring the role of economic support in academic success.

Finally, awareness of the subject's value significantly influences performance. Girls are more likely to recognize the broader importance of academic subjects and invest effort accordingly. Bary (2019) demonstrates that girls' conscious understanding of the value of what they study enhances their academic achievement, while boys tend to focus selectively on subjects like mathematics, often neglecting language-based disciplines. Steinmayr and Spinath (2008) similarly found that girls' heightened awareness of the importance of language subjects contributed to their superior performance in German language studies.

Thus, environmental factors - encompassing cultural norms, social expectations, teaching methods, and economic resources - act as powerful amplifiers of the initial biological differences. They either reinforce or mitigate the gender gap by shaping opportunities, motivation, and the alignment between students' behaviors and the demands of the educational system.

3.1.3. Biopsychosocial Factors

Some of the most influential contributors to the gender gap lie at the intersection of biology and environment, where innate predispositions interact with cultural norms and institutional expectations. Motivation is a central biopsychosocial factor. While girls may have a biological predisposition toward higher self-regulation and early maturity, their intrinsic motivation to excel academically is also shaped by social expectations and the perceived role of education in improving their social standing. Al-Badri and Al-Kindi (2019) argue that girls often view education as a primary vehicle for upward mobility and social recognition, which fuels their sustained effort and determination. Boys, by contrast, are more likely

to withdraw from academic engagement when they perceive alternative routes to success, such as employment or social networks that do not require strong academic credentials (Bouhlila and Hentati, 2022).

Motivational differences are not merely about the presence or absence of effort but also about its underlying nature. Girls' motivation is frequently driven by a desire to prove competence and avoid failure, leading to consistent engagement with academic tasks. Castaghetti and Rosti (2010) found that girls' drive to demonstrate their ability translated into higher academic achievement. Steinmayr and Spinath (2008) further confirmed that girls tend to exhibit a stronger avoidance of failure, resulting in greater persistence, whereas boys show a higher tendency to avoid effort altogether. Khwaileh and Zaza (2010) also noted that girls are more motivated to succeed to meet familial expectations, reinforcing their sustained commitment to learning.

Behavior and discipline within the school environment represent another key biopsychosocial factor. Girls are generally more aligned with the behavioral expectations of formal education systems. They attend classes more regularly, complete assignments on time, and adhere to classroom rules, which translates into better academic outcomes (Al-Badri and Al-Kindi, 2019). Boys, on the other hand, are more prone to impulsive behaviors, absenteeism, and school dropout patterns, partly rooted in developmental differences in self-regulation but also encouraged by social leniency toward boys' non-academic pursuits (Alenazi and AlKandari, 2004). Alomair and Almethen (2021) observed that boys are more easily distracted and tend to seek shortcuts in understanding material, while girls demonstrate greater focus and attention to detail, which aligns more closely with the structured nature of traditional schooling.

These biopsychosocial dynamics highlight how the same biological predispositions can yield different outcomes depending on the surrounding environment. Girls' early maturity in self-regulation becomes advantageous in environments that reward discipline and sustained effort, while boys' later development of these traits may be further hindered by cultural norms that place fewer academic expectations on them. Conversely, when school systems are structured in ways that reduce opportunities

for disengagement, boys' performance can improve, suggesting that institutional adjustments can mitigate the gap (Alenazi and AlKandari, 2004).

Ultimately, biopsychosocial factors explain why the gender gap cannot be understood through a purely biological or purely environmental lens. Motivation, behavior, and self-regulation emerge from a complex interplay between innate developmental trajectories and the social pressures, expectations, and institutional frameworks in which students operate. Recognizing this interaction is critical for designing educational interventions that address the distinct needs of both boys and girls, rather than assuming a uniform approach will yield equitable outcomes.

3.2. GCC Idiosyncrasies

Much of the above is based on studies that are done either in the Arab world or outside the Arab region, with GCC-centered studies making a limited contribution. In light of the apparently anomalously large gender gap in favor of girls observed in the GCC (Section 2.2), in this section, we speculate on some additional idiosyncratic factors that help us understand the observed data.

First, it is evident that in all six GCC countries, since the start of the 21st century (and especially during the last decade), there has been a systematic, government-led effort at women's empowerment (Albadry, 2024). In some cases, such as Bahrain, this is enshrined in the constitution. The top-down policies include tacit or explicit female employment quotas and a broad range of labor market reforms facilitating female labor force participation, such as nursing hours and favorable maternity leave options. Moreover, the public sector in the GCC countries offers working conditions that are very appealing to women who are looking to maintain a good work-life balance when compared to the employment options typically available in high-income countries (Langworthy and Naguib, 2023).

Collectively, these efforts are likely to increase the extrinsic motivation that girls have to perform well in school, as the probability of a tangible material reward for that effort is perceived to be higher. Moreover, these material channels are likely reinforced by the impact of the broader women's empowerment movement on the subconscious motivation of girls in school, as they feel more positive about their role

in society. These issues are particularly important when comparing the GCC to the rest of the Arab world, as the GCC has become ostensibly less patriarchal than many other countries in the region over the course of the last three decades.

When comparing the GCC countries to Western ones, an additional idiosyncratic factor to consider is the role of gender-segregated social networks (Meijer, 2010). Due to religious and social norms, people socialize according to their gender, creating social networks that are almost completely closed within their gender group. Notably, professional networks are strongly related to social networks, and relational and tribal considerations play a more important role in career advancement in the GCC than in Western ones (Gold and Naufal, 2012). Combining these phenomena with the legacy underrepresentation of women in senior positions in the GCC countries yields a situation where girls have an enhanced incentive to invest in their education compared to boys, as they are less able to leverage social networks in the pursuit of career advancement.

It is important to note that the arguments made in this subsection are speculative and are not derived from studies that are designed to ascertain the sources of the educational gender gap in the GCC countries. We hope that future studies are able to contribute to this intellectual gap in the literature.

Finally, Section 2.1 found that the educational gender gap in favor of girls was significantly smaller in Qatar and the UAE than in the remaining GCC countries. While we were not able to find any explanation in the case of Qatar, in the case of the UAE, we were able to find several official press releases indicating that the government was aware of the existence of this gender gap and was implementing policies aiming to correct the imbalance (WAM, 2020). Unfortunately, we were unable to find details about the nature of the interventions adopted, and we hope that future studies can shed light on this matter, as there are likely to be many useful lessons that can be extracted from the UAE's success.

Conclusion

This paper set out to answer a straightforward but underexplored question: do boys and girls perform equally well in the educational systems of the GCC countries? To address this, we relied on secondary

analysis of the most recent rounds of internationally benchmarked assessments, namely TIMSS and PIRLS, which provide a consistent and comparable basis for examining gendered patterns of academic attainment across grades, subjects, and time.

The results were unambiguous. Across the GCC, girls consistently outperform boys, with the gap particularly pronounced in science and language subjects at both primary and secondary levels. Mathematics showed smaller gaps and even near parity in the most recent data, yet girls generally maintained the upper hand. While the gap followed a hump-shaped trajectory, peaking around 2015–2016 before narrowing slightly after Covid, it remains persistent. Moreover, Bahrain, Kuwait, Oman, and Saudi Arabia largely mirror the GCC average, while Qatar and the UAE display smaller gaps and occasional reversals favoring boys.

These findings run counter to the dominant global narrative, which emphasizes systemic biases that traditionally favor boys and disadvantage girls, especially in STEM fields. In most comparator countries and at the world level, boys tend to outperform girls in mathematics, girls maintain a modest edge in language, and science shows approximate parity. The GCC, by contrast, represents an inversion of this pattern, revealing a gender gap that is both larger and consistently pro-girl.

Such a persistent pro-girl gap is not merely a statistical curiosity; it carries potentially destabilizing social consequences. If boys continue to underperform, they risk diminished access to higher education, reduced employability in increasingly knowledge-based economies, and a growing sense of social and economic marginalization. Over time, this could fuel disengagement, higher dropout rates, and increased delinquency among young men, while also reinforcing harmful stereotypes about male underachievement. These dynamics may strain family structures and disrupt traditional social roles, creating broader challenges for social cohesion and long-term economic stability in the GCC.

Future research must move beyond descriptive analysis to identify the precise mechanisms driving this imbalance. In particular, studies should investigate the developmental trajectories of boys and girls in the GCC, examining how biological, environmental, and biopsychosocial factors interact with region-specific idiosyncrasies, such as labor market incentives and gender-segregated social networks. Equally important is the need for longitudinal research to track the long-term implications of the current gender

gap on labor market outcomes and social mobility. Finally, policy-oriented studies are needed to evaluate targeted interventions that can raise boys' academic engagement without undermining the gains made by girls.

In short, the GCC experience challenges global assumptions about gender and education, highlighting the need for a more nuanced understanding of how context-specific factors shape academic outcomes. Addressing this imbalance is critical not only for ensuring equitable educational opportunities but also for safeguarding the social and economic stability of the region.

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