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Article

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David K. Evans¹, Maryam Akmal² and Pamela Jakiela^{3,*}

Gender gaps in education: The long view¹

Abstract

Many countries remain far from achieving gender equality in the classroom. Using data from 126 countries, we characterize the evolution of gender gaps in low- and middle-income countries between 1960 and 2010. We document five facts. First, women are more educated today than 50 years ago in every country in the world. Second, they remain less educated than men in the vast majority of countries. Third, in many countries with low levels of education for both men and women in 1960, gender gaps widened as more boys went to school, then narrowed as girls enrolled; thus, gender gaps got worse before they got better. Fourth, gender gaps rarely persist in countries where boys attain high levels of education. Most countries with large, current gender gaps in educational attainment have low levels of male educational attainment, and many also perform poorly on other measures of development such as life expectancy and GDP per capita. Fifth, in the youngest cohorts, women have more education than men in some regions of the world. Although gender gaps in educational attainment are diminishing in most countries, the empirical evidence does not support the hypothesis that reducing the gender gap in schooling consistently leads to smaller gender gaps in labor force participation.

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1 Introduction

Investing in girls' education has long been held up as an antidote to the manifold challenges of the developing world. Researchers, international agencies, and politicians have all championed the value—both inherent and instrumental—of girls' education. For example, a review of evidence from 15 years ago concluded that “extensive research confirms that investing in girls' education delivers high returns not only for female educational attainment, but also for maternal and children's health, more sustainable families, women's empowerment, democracy, income growth, and productivity” (Herz and Sperling, 2004). Likewise, a review of the relationship between education and women's labor force participation in low- and middle-income countries found a positive association “more often than not” (Psacharopoulos and Tzannatos, 1989). Former World Bank president Jim Yong Kim said that “investing in gender equality and girls' education isn't just the right thing to do; economically, it's one of the smartest things to do” (World Bank, 2018a). Politician Hillary Clinton, in her capacity as first lady of the United States, said that “if women are healthy and educated, their families will flourish” (Minerva, 2012).

Despite these promised gains, adult women still have less education than men in more than two-thirds of the world's countries.² In this article, we examine 50 years of data from 126 countries to characterize the evolution of educational gender gaps over time and identify key trends in girls' education.

This study complements earlier work documenting advances in girls' education around the world. Most recently, Psaki et al. (2018) have identified low- and middle-income countries where girls' education is advancing. Our data cover a much broader range of countries and years and complements their work, which uses individual-level microdata for a smaller set of countries. Bertocchi and Bozzano (2019) examined the gender gap in education for an earlier period (1850–1950) and their data also cover a smaller group of countries; Baten et al. (2020) examined the gender gap in sub-Saharan Africa specifically over the twentieth century. Our study also complements two other literatures, one on the impacts of girls' education on outcomes for girls and others (Mensch et al., 2019; Psaki et al., 2019; Qureshi, 2017), and another on what interventions are most effective at improving girls' education (Sperling and Winthrop, 2015; Evans and Yuan, 2019). In this article, we focus on years of schooling, which is associated with a range of positive outcomes (Oye et al., 2016). However, this does not downplay the importance of quality in education (World Bank, 2018b; Pritchett, 2013).

2 Data and methods

The principal source of data for this analysis is the Barro–Lee educational attainment dataset (Barro and Lee, 2013). It provides a measure of educational attainment of the adult population (15 years and above). Coverage is for 146 countries at 5-year intervals from 1950 to 2010, disaggregated by age and gender. The underlying data come from available census and survey data provided by national statistical agencies, UNESCO, Eurostat, and other sources.³ Although

2 The pattern is similar if we exclude high-income countries. Adult women have less education than adult men in 72 of 93 low- and middle-income countries for which data is available.

3 In Table A1 in the Appendix, we compare the countries included in the Barro–Lee dataset to the full sample of 193 UN member states. Countries in the Barro–Lee dataset have comparable income levels and adult literacy rates relative to the excluded countries.

census-based data, like the Barro–Lee dataset, have limitations relative to data based on household surveys, no other source of data on educational attainment documents historical trends going back so far for such a large number of countries.⁴

We use a sample of 126 countries, excluding all countries (mostly high-income) that were founding members of the Organisation for Economic Co-operation and Development (OECD).⁵ We use data from 1960 to the most recent available year, 2010.⁶

We calculate the gender gap by subtracting the average level of educational attainment among men from the average level of educational attainment among women. Hence, a negative number indicates that men are more educated than women and vice versa. We use the difference in education levels rather than the ratio of male years of schooling to female years of schooling because doing so is less likely to suggest that gender gaps are declining when they may not be: a fixed difference in the levels of educational attainment would imply a declining proportional gender gap as the level of male educational attainment increases, whereas a fixed ratio of education levels will suggest an increasing gender gap in absolute years of education as the level of male attainment increases.

Because our focus is on long-term changes in gender gaps, we use the average of the adult population, which is slower to change than if we were to focus only on a single age cohort. For that reason, countries where current cohorts achieve many years of education may still have relatively low average years of schooling overall if previous cohorts had little education. In Section 3.5, we examine gender gaps among younger cohorts (age 20–24), both because this is more likely to reflect recent education investments and because it is less sensitive to country-level differences in life expectancy.

3 Results

3.1 Fact 1: Women are more educated today than at any point in history

In 1960, adult women across the 126 countries in our sample had an average of 2.6 years of education. By 2010, that number had nearly tripled to 7.7 years of education. Women have more education today than in 1960 in every single country in our sample. Education for men has also increased, from 3.5 years of schooling in 1960 to 8.2 years in 2010. Figure 1 shows the trajectory of male and female educational attainment in each of the 126 countries in our sample. The country with the largest gain in female schooling, the United Arab Emirates, began at the low level of 0.9 years of schooling for the average woman and shot to 10 years by 2010, but even the country with the smallest gain in adult female schooling over the 50 years, Senegal, shows a marked improvement for women.⁷ In every country, women have more education now than ever before.

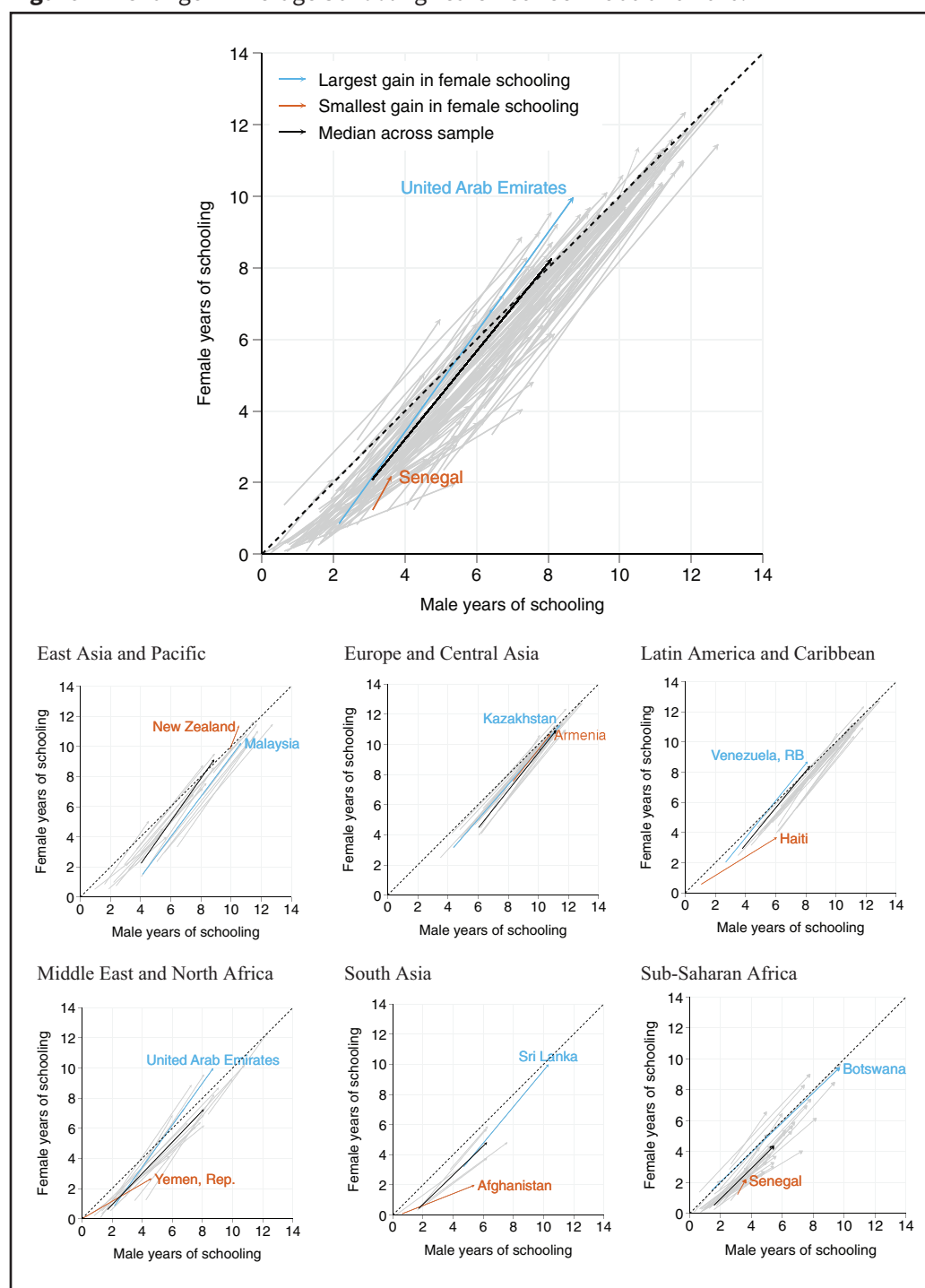
In most countries, increases in women's education have been accompanied by increases in men's education. Figure 1 illustrates this: most of the country-level trajectories are

4 Alternative data sources based on household surveys, such as the Education Attainment and Enrollment around the World database (Filmer, 2018), rely on surveys that extend back only to the 1990s for most countries, so inferences about earlier cohorts may be heavily influenced by selection in who survives to report attainment.

5 The excluded countries are Austria, Belgium, Canada, Denmark, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom, and the United States. We use this criterion rather than country income status since the latter changes over time.

6 A large number of countries in the sample became independent in the 1960s.

7 Between 1960 and 2010, the average level of educational attainment among Senegalese women rose from 1.2 years to 2.2 years. The average level of educational attainment among Senegalese men rose from 3.1 years to 3.6 years.

Figure 1 Change in Average Schooling Years Between 1960 and 2010.

Notes: Sample includes 126 countries, all those included in the Barro–Lee educational attainment data set that were not founding members of the OECD. Female years of schooling is the average educational attainment among adult women aged 15 and over; male years of schooling is the average educational attainment among adult men aged 15 and over. For each country, the arrow connects the average level of educational attainment in 1960 to the average level of attainment in 2010. Countries are assigned to regions based on the World Bank’s classifications. The dashed line is the 45-degree line.

concentrated around the 45-degree line, suggesting similar gains for both sexes. There are, of course, outliers. Women’s relative gain (as compared to men’s) was worst in Afghanistan, where women’s educational attainment increased by only 0.4 years for every year increase in

men's attainment.⁸ In Yemen and the Central African Republic, women's schooling increased by less than 0.6 years for every year increase in men's schooling. However, these countries are exceptions. Women's educational attainment increased by more than a year for every year of increase in male attainment in 94 of 126 countries.

The pattern of marked gains for women over the last 50 years is remarkably consistent around the world. In most regions, even countries with the smallest gains in women's education have shown sizable improvements. For example, the smallest gain in Latin America and the Caribbean was in Haiti, where women's education increased more than sixfold, from a little more than half a year to more than 3 years. In Yemen, the country with the smallest gain in the Middle East and North Africa, women's education increased from an average of virtually no education in 1960 to more than 2 years in 2010. New Zealand, the country with the smallest gains in East Asia and the Pacific, made smaller absolute gains (1.6 years), but average women's education was already very high in 1960, at 9.8 years.

In each region, there are countries where women's educational attainment has improved dramatically. In Malaysia, adult women's education jumped from 1.5 years in 1960 to more than 10.2 years in 2010. In Botswana, women's education leaped from 1.5 years to 9.4 years, a sixfold increase. As Figure 1 illustrates, there are standout countries in every region, but almost all countries in our sample saw substantial improvements. Women's educational attainment more than doubled in 107 of 126 countries (85%); it increased by more than 5 years in 70 countries (or 56% of our sample).

The region with the largest average gain over time is the Middle East and North Africa, where women's education has increased by more than 6 years.⁹ The Europe and Central Asia region had the highest level of female educational attainment in 1960 and still saw the second largest increase (from 5.1 years to 11.1 years). The two regions with the lowest levels of women's education in 1960—South Asia and sub-Saharan Africa, with just over one year each—also had the smallest absolute gains in women's education, with an increase of under 4 years each. Furthermore, those are the only two regions in which a year's increase in men's education over that time was not accompanied by at least a year's increase in women's education. Even there, however, women's education has more than quadrupled over time. Thus, across all countries and regions, women are more educated now than ever before.

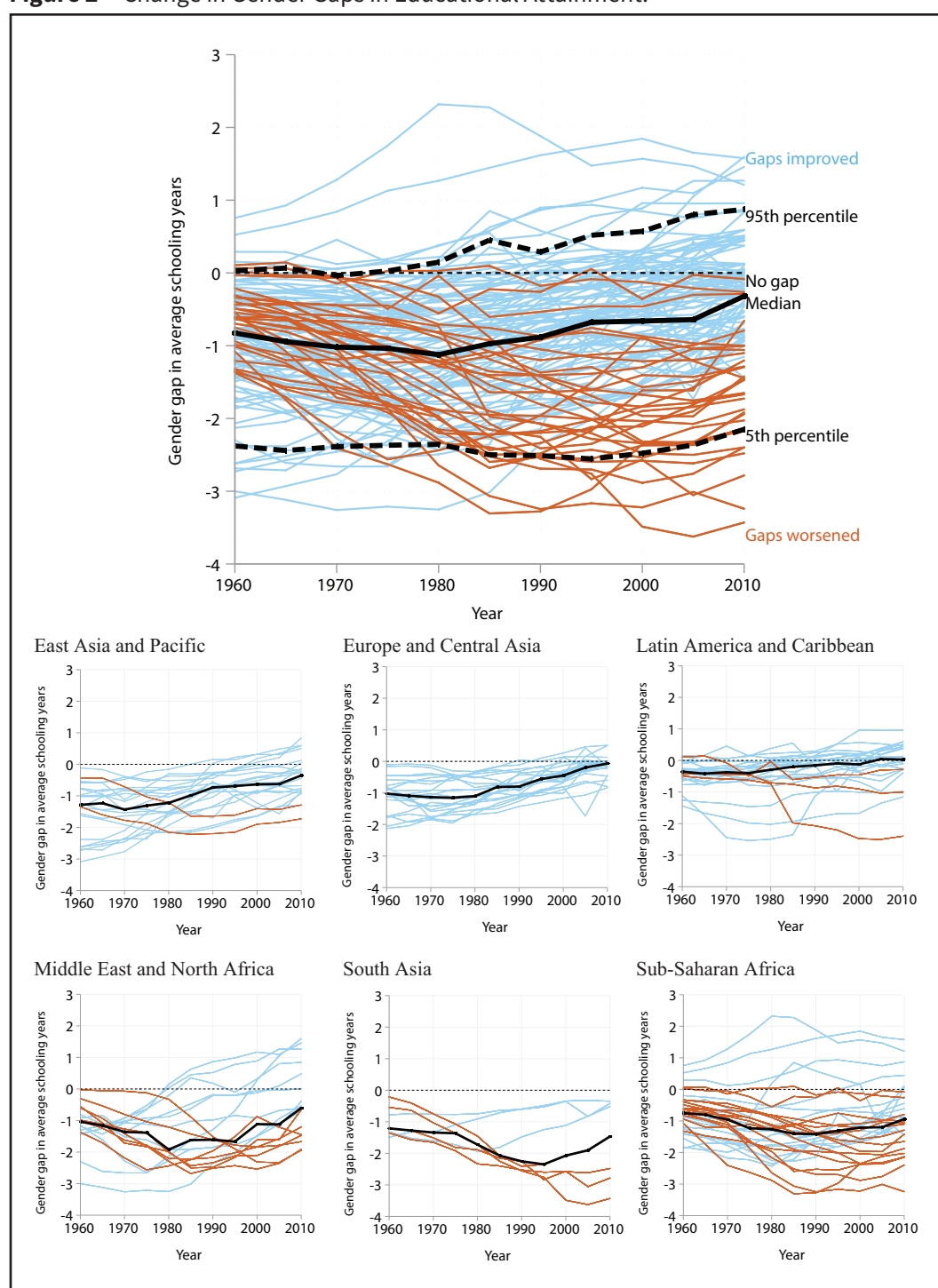
3.2 Fact 2: Women are still not as educated as men

While women's education increased dramatically around the world between 1960 and 2010, the gender gap in educational attainment persists in most countries. During that period, the gender gap narrowed in 94 countries but widened in 32 countries. Across all countries in our sample, the median gender gap improved from -0.8 in 1960 to -0.3 in 2010 (as shown in Figure 2)—so women in our sample countries had 0.8 fewer years of schooling than men in 1960, and they had 0.3 fewer years of schooling than men in 2010.

Some regions made very clear progress in reducing educational gender gaps between 1960 and 2010. In Europe and Central Asia, every single country experienced a shift

8 Between 1960 and 2010, women's educational attainment in Afghanistan increased from 0.1 years to 2.0 years, while men's attainment increased from 0.6 years to 5.4 years.

9 Table A2 in the Appendix summarizes the gains by region.

Figure 2 Change in Gender Gaps in Educational Attainment.

Notes: Sample includes 126 countries, all those included in the Barro–Lee educational attainment data set that were not founding members of the OECD. The gender gap is the difference between average educational attainment (years of schooling) among adult women and average educational attainment among adult men. Orange indicates countries where women’s educational attainment grew more slowly than men’s between 1960 and 2010; light blue indicates countries where women’s educational attainment grew faster than men’s. Countries are assigned to regions based on the World Bank’s classifications.

in the gender gap in favor of women. In East Asia and the Pacific, all but two countries (Cambodia and Papua New Guinea) saw gender gaps diminish, and in Latin America and the Caribbean, all but three countries (Cuba, Guatemala, and Haiti) observed the same. Progress

Table 1 Ratio of Females to Males at Various Education Levels in 2010.

Region	Ratio of females to males		
	No formal education	Complete primary	Complete secondary
East Asia and Pacific	1.89	0.99	0.93
Europe and Central Asia	2.13	0.99	0.94
Latin America and Caribbean	1.48	0.97	1.02
Middle East and North Africa	1.79	0.91	1.08
South Asia	1.84	0.73	0.88
Sub-Saharan Africa	1.52	0.86	0.77

Note: No formal education denotes the ratio of percent of the female population with no schooling divided by percent of the male population with no schooling. Complete primary denotes the female–male ratio of percent of the population that completed at least primary education. Complete secondary is defined analogously. The source of the data for this analysis is the Barro–Lee educational attainment dataset, and data come from all 126 countries that were not founding members of the OECD.

was more mixed in other regions. In the Middle East and North Africa—the region that experienced the largest increase in educational attainment among women—gender gaps in attainment grew in 7 of 17 countries. In both South Asia and sub-Saharan Africa, the median worsened. The country with the largest average gap in 2010—Afghanistan—went from -0.5 in 1960 to -3.4 in 2010.

In every region of the world, women are still more likely to have no schooling than men. Table 1 shows the ratio of women at each level of education relative to men in 2010. Across our entire sample, there are 1.73 women who have no schooling for every man with no schooling. Even in Latin America and the Caribbean, where women are slightly more likely than men to have completed secondary education (1.02 women for every man), women are also more likely to have no schooling at all (1.48 women for every man). In the regions with the largest gaps, South Asia and sub-Saharan Africa, for every man who has completed primary schooling, 0.73 and 0.86 women have, respectively.

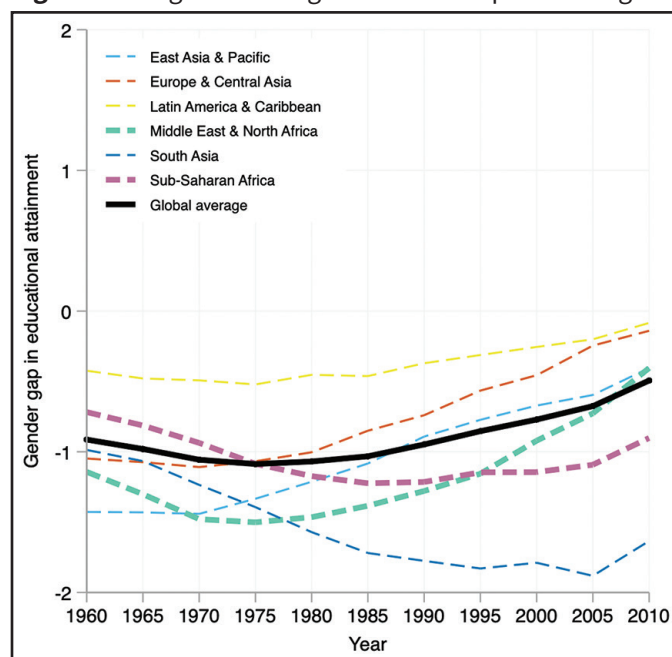
As shown in Table A4 in the Appendix, this pattern is still apparent when we restrict attention to the younger age cohorts. Among adults aged 25–29, women were more likely than men to have no schooling in every region of the world except Europe and Central Asia. Women aged 25–29 are substantially less likely to have completed primary school than similarly aged men in South Asia and substantially less likely to have completed secondary school than similarly aged men in sub-Saharan Africa, though other regions are now quite close to parity on both margins.¹⁰

3.3 Fact 3: Gender gaps often got worse before they got better

While the global trend has been positive over the last 50 years, gender gaps widened before beginning to narrow in many countries.¹¹ As shown in Figure 3, this trend is most apparent in

¹⁰ Interestingly, in the younger age cohorts of adults, we see evidence that women in Europe and Central Asia and, to a lesser extent, Latin America and the Caribbean are more likely than men to have completed secondary education.

¹¹ Baten et al. (2020) refer to this as the “educational gender Kuznets curve.”

Figure 3 Regional Change in Gender Gaps in Average Schooling Years, 1960–2010.

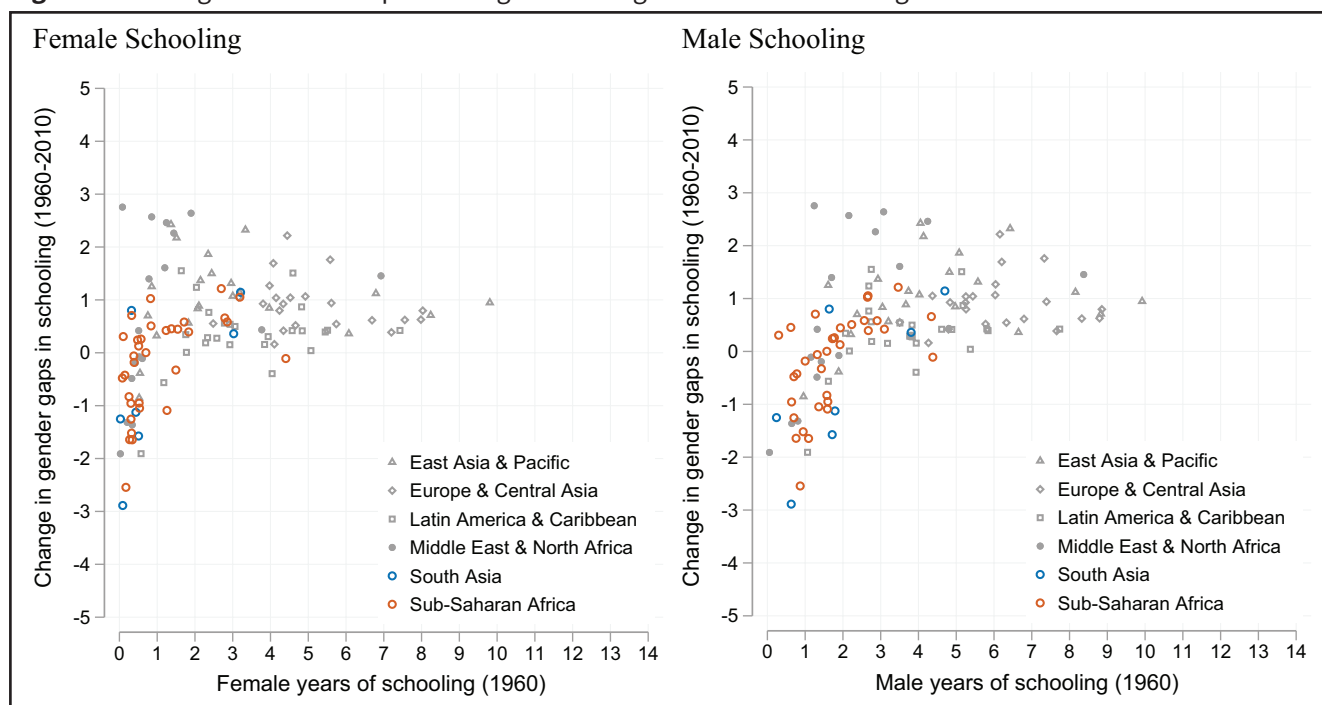
Notes: Sample includes 126 countries, all those included in the Barro–Lee educational attainment data set that were not founding members of the OECD.

the Middle East, North Africa, and sub-Saharan Africa. In the Middle East and North Africa, the gap deteriorated from -1.1 years in 1960 to -1.4 years in 1985 before rising to -0.4 years in 2010. In sub-Saharan Africa, the gap deteriorated from -0.72 years in 1960 to -1.22 years in 1985 before beginning to improve, reaching -0.90 years by 2010.¹² This pattern contrasts with the experience of regions that were, on average, more educated in 1960. In Europe and Central Asia, the gender gap was -1.05 years in 1960, and it decreased (in magnitude) steadily over the next 50 years, reaching -0.14 in 2010. Similarly, in East Asia and the Pacific, the gap was -1.43 years in 1960 and improved steadily to -0.40 years in 2010. In Latin America and the Caribbean, women were 0.42 years behind men in terms of educational attainment in 1960; the gap increased only slightly from -0.42 to -0.46 by 1985 before improving, reaching -0.08 by 2010.

In total, the gender gap deteriorated before beginning to improve for 96 (76%) of the 126 countries in our sample (Figure A1).¹³ Of these 96 countries, the gender gap was larger in 2010 than in 1960 in 31 countries. In these countries, the largest gender gap occurred sometime between 1960 and 2010, but recent improvements have not fully eliminated the increases in the gap that occurred after 1960. In the remaining 65 of the 96 countries where things got worse before they got better, gender gaps were smaller in 2010 than they were in 1960, but they grew larger before beginning to shrink. In some cases, this “it gets worse before it gets better” trajectory is particularly marked. In Nicaragua, for example, the gap doubled between 1960 and 1975, from -1.1 to -2.5 , before completely closing and shifting to favor girls by 2010. In Zambia, the gap nearly doubled from -1.2 to -2.3 between 1960 and 1985 before narrowing

¹² In South Asia, the gap has been widening since 1960, so the “getting better” part remains in the future. Current data on school enrollment suggests that things may be getting better in parts of South Asia. In 2013, the most recent year for which data are available, the net primary enrollment rate in India was 93.0 percent for girls and 91.6 percent for boys (World Bank, 2020).

¹³ Table A5 in the Appendix shows the year of the largest gender gap for all 96 countries.

Figure 4 Change in Gender Gap in Average Schooling Years Given Schooling Levels in 1960.

Notes: Sample includes 126 countries, all those included in the Barro–Lee educational attainment data set that were not founding members of the OECD.

to -0.6 in 2010. In most of the countries where the gap got worse before improving (72%), the nadir occurred at or before 1985.

Why is it so common for gender gaps to get worse before they get better? Most countries that experience this phenomenon had low levels of both men's and women's education in 1960. As educational opportunities begin to expand, those countries tended to invest first in education for men. Eloundou-Enyegue et al. (2009) observed, using household survey data from across Africa in the 1990s and early 2000s, that as countries' total enrollment increased, so did the gender gap.

Across our sample countries, we observe that countries with lower rates of female and male schooling in 1960 are much more likely to experience a subsequent widening of the gender gap (Figure 4). Thirty of 43 countries where the average level of male educational attainment was less than 2 years in 1960 experienced worsening gender gaps in education over the next 50 years, compared to two of the 83 countries where the average level of male educational attainment was above 2 years in 1960. Thus, the countries where gender gaps have been worsening over time are precisely those countries where both men and women had very little education to begin with.

What explains when the gap begins to narrow? There is enormous variation in this across countries, and the reasons may vary. For those countries that experienced a widening of the gap followed by a narrowing, we calculate the level of male and female schooling for the entire population 15 and older as well as for a young adult cohort (age 20–24) at the turning point, the year that the gap was at its widest (Table A6 in the Appendix). We find that years of schooling of young adult men was between 5.6 years of education (25th percentile) and 8.6 years of education (75th percentile), with a median of 6.7. This may suggest that once men

are completing primary school, countries were more likely to begin expanding girls' education. The years of education for young adult women at the turning point varies much more widely across countries. This may imply that households view boys' and girls' education as substitutes at very low levels of education and income, and later—as education becomes more available—as complements.

3.4 Fact 4: Gender gaps rarely persist in educated countries

There are very few countries where men are highly educated but women are not; once men become highly educated, women tend to become highly educated as well. A simple regression in Table 2 illustrates that an additional year of schooling for men is highly statistically significantly associated with more than a year of schooling for women. In 1960, just seven countries in our sample (Armenia, Australia, the Czech Republic, Israel, Japan, New Zealand, and Slovakia) had at least 8 years of male educational attainment (what we will call “high-education countries”), and only two of those (Israel and Japan) had gender gaps of at least one year (what we will call “large” gender gaps). The other 119 countries had low levels of men's education in 1960; 42% of those countries also had substantial gender gaps in educational attainment.¹⁴

Table 2 Regression of Female Schooling and Gender Gap in Schooling on Key Variables.

	Female schooling	Female–Male gap
Male years of schooling	1.121*** (0.028)	0.121*** (0.028)
Log GDP per capita (PPP-adjusted)	1.985*** (0.155)	0.428*** (0.066)
Poverty index	−0.104*** (0.010)	−0.016*** (0.005)
Life expectancy at birth	0.298*** (0.024)	0.052*** (0.013)
Infant mortality index	−0.126*** (0.010)	−0.025*** (0.005)
Corruption index	0.107*** (0.011)	0.019*** (0.005)

Notes: Male and female years of schooling are taken from the Barro–Lee educational attainment dataset, using data from 2010. Log GDP per capita is PPP-adjusted to reflect 2011 dollars, using the most recent available year from the World Bank's World Development Indicators data. Poverty index is the poverty headcount ratio (so that smaller numbers indicate less poverty), using the most recent available year from the World Bank's World Development Indicators data. Infant mortality index and life expectancy at birth data are for the most recent available years from the World Bank's World Development Indicators data. Corruption index is measured using the Corruption Perceptions Index 2018 from Transparency International, with lower numbers indicating higher corruption. Standard errors are listed in parentheses below the point estimates. The sample size ranges from 121 to 126, depending on availability of data, except for the poverty regression, for which we have data for only 103 countries.

¹⁴ 15 countries did not have a gender gap because both men and women had, on average, less than one year of education — making a gender gap defined in terms of a difference of at least one year of schooling impossible.

By 2010, the number of high-education countries had increased to 68. More than half of the countries in the sample had high levels of education and small gender gaps by 2010, and almost half the countries that had low levels of male and female educational attainment in 1960 had high levels of (male) attainment and small gender gaps by 2010.¹⁵ In countries that had low levels of male educational attainment in both 1960 and 2010, the gender gap widened in some countries and narrowed in others. As long as male educational attainment remains low, the direction of future changes in the gender gap remains unpredictable.

In contrast, the evolution of gender gaps in countries where men are highly educated is quite predictable: gender gaps (in educational attainment) tend to diminish over time.¹⁶ All seven countries that had high levels of male educational attainment in 1960 had high levels of attainment and small gender gaps in attainment in 2010. The two high-education countries that had substantial gender gaps in 1960—Israel and Japan—no longer had meaningful gaps in 2010.¹⁷

Our analysis illustrates the common historical pattern: men's educational attainment initially surges ahead, but women's attainment tends to catch up in countries with high levels of men's education. Figure 5 shows, for each 5-year period, the number of countries with high levels of male educational attainment (greater than eight years of schooling, on average) and the share of those countries where there is a gender gap of more than a year. The number of high-education countries (for men) has increased steadily over time, from 7 in 1960 to 68 in 2010, as discussed above. The number of countries where men have greater than 8 years of schooling and women's educational attainment lags behind men's by more than a year rises and falls over time—it peaked at 12 in 1990 and then dropped to five in 1995, but was back up to 10 in 2005 before falling again (to five) in 2010. However, the proportion of high-education countries with substantial gender gaps in attainment peaked at 62.5% in 1965 and has been declining fairly steadily since then; it has remained below 50% since 1985 and below 20% since 1995.

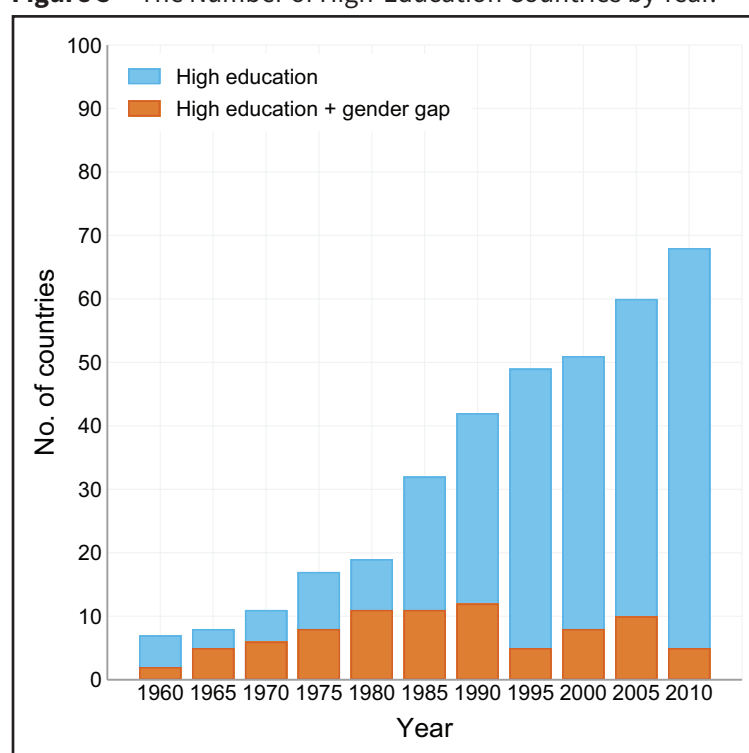
Countries do transition through periods with high levels of male educational attainment (an average of more than 8 years) and gender gaps of more than 1 year: 28 countries were in this state at some point between 1960 and 2010 (Figure A2 in the Appendix). However, many of these countries—for example, China, Iran, Malaysia, and Peru—exist as highly educated countries with substantial gender gaps for very short periods before gender gaps begin to disappear. Gender gaps take longer to diminish in other countries—for example, Croatia and South Korea—but these countries appear to be the exception rather than the rule; moreover, even in these countries, gender gaps in educational attainment do become smaller eventually.

Where do the largest gaps remain? Table 2 shows the relationship—in a series of bivariate regressions—between female schooling and a series of other indicators of societal well-being. Countries with low levels of female schooling and large gender gaps also have low levels of

15 29 of 51 countries (57 percent) that had low educational attainment and substantial gender gaps in 1960 had transitioned to high educational attainment without meaningful gender gaps; and 27 of 68 countries (40 percent) that had low educational attainment without substantial gender gaps in 1960 had transitioned to having high attainment and small gender gaps.

16 Psaki et al. (2018) document the converse, in a smaller sample of 43 countries, that “both males and females were worst off in countries with female disadvantages.”

17 In 2010, the average level of educational attainment in Japan was 11.7 years for men and 11.5 years for women. The average level of educational attainment in Israel was 11.3 years for both men and women.

Figure 5 The Number of High-Education Countries by Year.

Notes: Sample includes 126 countries, all those included in the Barro–Lee educational attainment data set that were not founding members of the OECD. “High education” indicates countries where men have an average of more than eight years of education. “Gender gap” indicates a difference in male vs. female educational attainment (mean years of schooling) that is greater than one year.

male schooling.¹⁸ Most of these countries also perform poorly on other measures of human development: levels of female schooling are higher and gender gaps are narrower in countries with higher GDP per capita and life expectancy.¹⁹ Alternatively, women’s educational attainment is lower, and gender gaps are wider in countries with higher poverty rates, infant mortality, and corruption. Fourteen of the 30 countries with large gender gaps (i.e., greater than 1 year) were classified as “fragile situations” by the World Bank in 2019. Nine countries had ongoing peacekeeping or peace-building missions in 2019, and 11 countries were classified as “not free” by Freedom House in 2018.

Poor performance on other development outcomes does not justify a large gender gap in education, but it underscores the complex challenges hampering progress on girls’ education in many of the countries where gender gaps in attainment persist. Existing evidence suggests that interventions focused exclusively on girl’s education may not be the most effective or efficient way to improve educational outcomes for girls (Evans and Yuan, 2019). This is particularly true in weak, fragile states that are struggling to address multiple developmental crises simultaneously. There are outliers: gender gaps in India, Morocco, South Korea, and Tunisia are larger than one would expect relative to performance on other measures of governance and

18 Figure A3 in the Appendix shows that gender gaps are largest where male educational attainment is the lowest, and they are quite small in the overwhelming majority of highly educated countries. Table A3 in the Appendix shows that the pattern holds across regions. South Korea and India appear to be exceptions, but the gap has halved even in South Korea as men’s education has doubled.

19 The positive associations between per capita income, girls’ education, and boys’ education suggest that both are normal goods, although anticipated returns to educational investments mean that the association is likely endogenous.

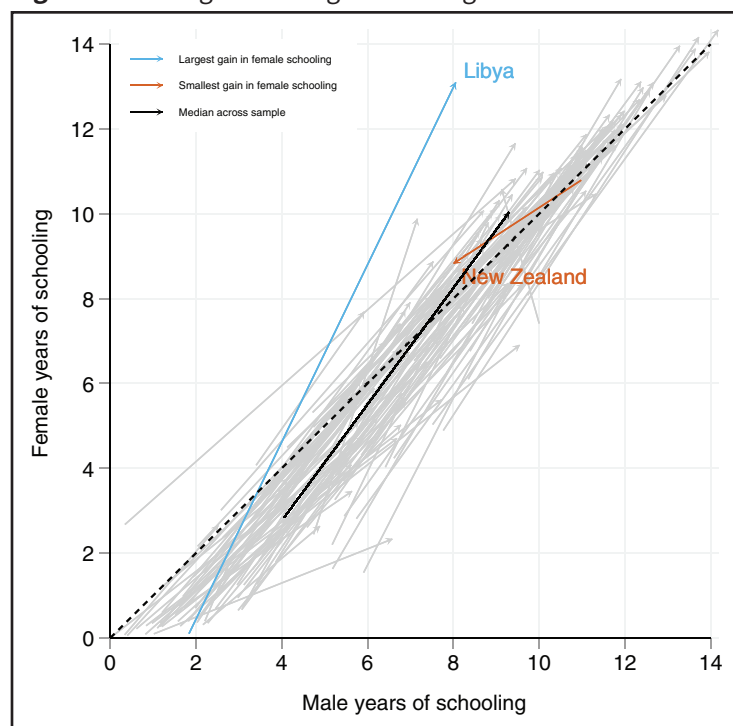
development. However, in most cases, gender gaps in educational attainment are a symptom of a broader failure of growth, governance, and development—and thus they are unlikely to be eliminated by policies focused exclusively on girls' education.

3.5 Fact 5: In the youngest cohorts, women have more education than men in some regions of the world

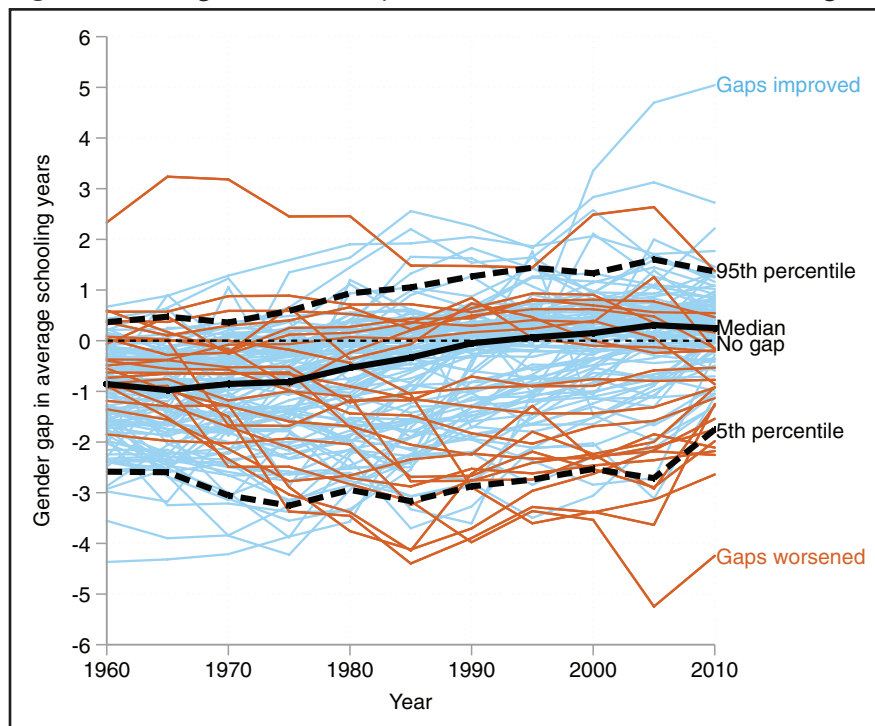
By 2010, women had more education than men in 36 of the 126 countries in our data set, and many more countries were well on their way to eliminating gender gaps in educational attainment. As one indicator of what the future holds, we look at younger cohorts of women and men rather than the entire adult population. We re-examine our main findings, focused only on the cohort aged 20–24, as this cohort will have completed their education in much of the world. Education has still risen for women in almost every country in the world (Figure 6), but the median gap has risen above zero around the developing world (Figure 7). In other words, for those cohorts of women and men just entering the labor market, women have more education than men in more than half the countries in our sample.

This trend is driven by countries in Europe and Central Asia, Latin America, the Caribbean, East Asia, the Pacific, the Middle East, and North Africa (Figure A4 in the Appendix). Researchers have proposed both cognitive and behavioral hypotheses to explain the reversal of the gender gap in education. Bossavie and Kanninen (2018) found the strongest evidence

Figure 6 Change in Average Schooling Years between 1960 and 2010 for Younger Cohort.



Notes: Sample includes 126 countries, all those included in the Barro–Lee educational attainment data set that were not founding members of the OECD. Female years of schooling is the average educational attainment among adult women aged 20–24; male years of schooling is the average educational attainment among adult men aged 20–24. For each country, the arrow connects the average level of educational attainment in 1960 to the average level of attainment in 2010.

Figure 7 Change in Gender Gaps in Educational Attainment for Younger Cohort.

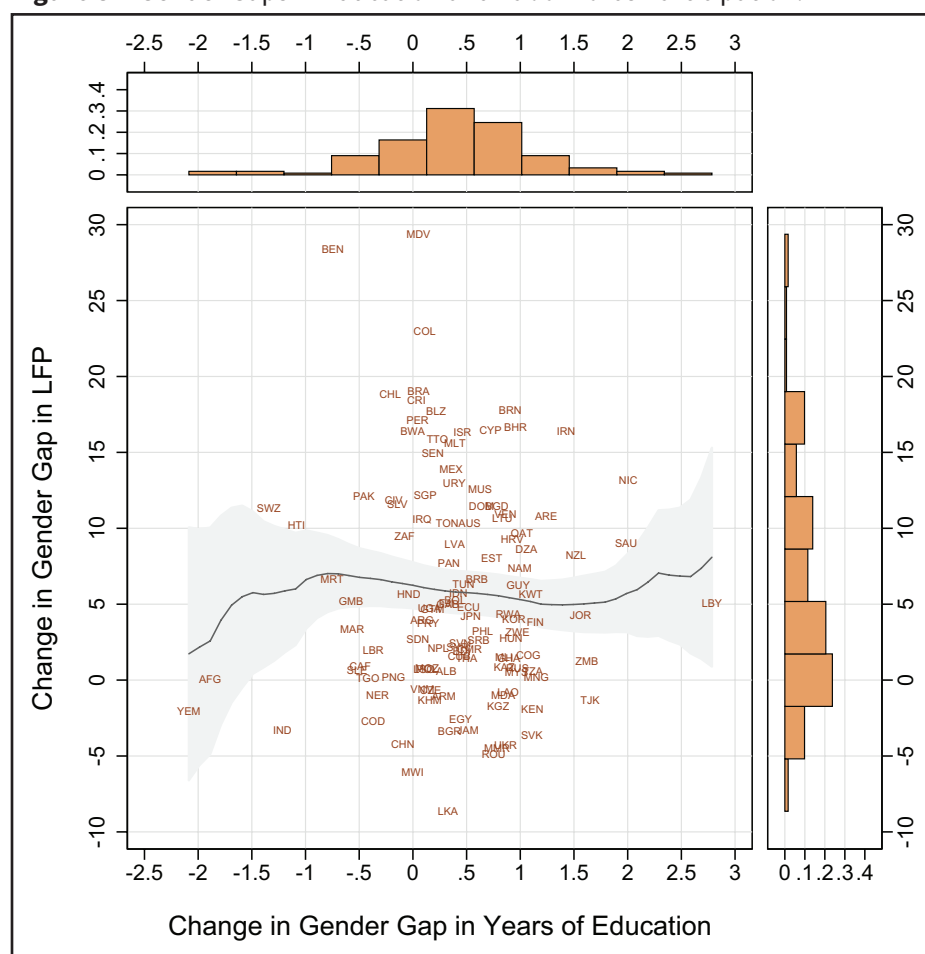
Notes: Sample includes 126 countries, all those included in the Barro–Lee educational attainment data set that were not founding members of the OECD. The gender gap is the difference between average educational attainment (years of schooling) among women aged 20–24 and average educational attainment among young men aged 20–24. Orange indicates countries where women’s educational attainment grew more slowly than men’s between 1960 and 2010; light blue indicates countries where women’s educational attainment grew faster than men’s.

for what they term the “tail hypothesis” in low- and middle-income countries, which is that girls have a smaller variance in academic performance, which generates a higher return to school enrollment. Alternatively, Bertocchi and Bozzano (2019) discussed that due to boys’ later puberty and maturation, boys are more likely to demonstrate behavioral problems in secondary school, so as average education levels rise, boys may be more likely to drop out. In South Asia and sub-Saharan Africa, the gaps continue to favor men. Finally, the pattern that gender inequality fades in countries with high levels of education for men manifests more strongly in the younger cohort. Only 3 out of 86 countries (3.5%) with high levels of education for men have a gender gap larger than a year, whereas 14 out of 40 countries (35%) with lower levels of education for men have large gender gaps.

4 Discussion: Girls’ education and women’s equality

Education is a human right and has been recognized as such by the international community since the Universal Declaration of Human Rights in 1948 (United Nations, 1948). Educating girls yields a range of benefits—for the girls themselves, their dependents, and society as a whole.²⁰ Yet, education is not a silver bullet leading to women’s empowerment and gender

²⁰ Education (for both boys and girls) increases the human capital embodied in the workforce, increasing economic growth (Hanushek and Woessmann, 2012). Education also yields benefits beyond the economic. More educated women experience reduced child mortality (Mensch et al., 2019). They have lower fertility and better sexual health (Psaki et al., 2019).

Figure 8 Gender Gaps in Education and Labor Force Participation.

Notes: Sample includes 126 countries, all those included in the Barro–Lee educational attainment data set that were not founding members of the OECD. Data on labor force participation comes from the World Development Indicators database. Gender gaps are calculated in the difference in levels between female and male labor force participation and educational attainment. The change is the difference between the gender gap in 2010 and the gender gap in 1990. Positive changes indicate that the gender gap shrunk over time.

equality: education is an end in itself, but there is little evidence that achieving gender equality in education will lead to gender equality in other domains.²¹

Figure 8 shows the relationship between the country-level change in the gender gap in educational attainment between 1990 and 2010 and the change in the gender gap in labor force participation over the same period.²² There is no systematic relationship between the two. Gender gaps in education have fallen some, and gender gaps in labor force participation have declined substantially over the same period, but there is no evidence that one predicts the other. This empirical pattern is consistent with existing evidence from both reviews (Klasen, 2019) and studies from individual countries. Cameron et al. (2001) found an inconsistent relationship between education and labor market participation across five Asian countries. In China, more educational attainment among women did lead to more labor force participation, but the same pattern did not hold in India (Azam and Han, 2019). There is some evidence that female labor

21 Dufló (2012) defines women's empowerment as "improving the ability of women to access the constituents of development – in particular health, education, earning opportunities, rights, and political participation."

22 Labor force participation data is from the World Bank's World Development Indicators from 1990 to the present.

force participation declined as education levels increased in India, perhaps because husbands' rising incomes allowed wealthier women to abstain from the labor market (Bhargava, 2018). Heath and Jayachandran (2017) examined various natural experiments increasing female education and found inconsistent impacts on labor force participation, ultimately concluding that a labor market that rewards education is likely essential for female education to translate into female employment.

Around the world, 129 million school-aged girls are not enrolled in school. Girls of primary school age are 1.2 times more likely to be out of school than boys (UNESCO, 2019). Gender gaps in education are both a symptom and a cause of gender inequality. Households that cannot afford to educate all of their children often favor boys, but families (or societies) where boys get as much education as they desire while women and girls remain uneducated are rare. More often than not, gender gaps in educational attainment persist in countries that are struggling to progress on many fronts—in educating boys and girls, in other dimensions of human development, and in political and economic domains as well. Gender gaps in educational attainment tend to disappear as countries grow, but this does not mean that educational parity leads to gender equality.²³

5 Conclusions

With data on women's and men's education across 126 countries and 50 years, we identify five broad facts about education. First, women's education has increased in every country in the world. Second, in the vast majority of countries, it still lags behind that of men. Third, in many countries, the gap between women's and men's education widens before it narrows. Fourth, it is rare that large gender gaps in education persist in countries where men achieve high levels of education. We further observe that equalizing education will be insufficient to equalize economic opportunities for men and women. Fifth, in some regions of the world, younger cohorts of women have more education than men.

Because gender gaps rarely persist in countries with high levels of educational attainment, policies that expand education for all children may also help to close the gender gap. Indonesia embarked on a massive school-building exercise in the 1970s, which yielded long-term benefits in education and other life outcomes for both women and men (Duflo, 2001; Akresh et al., 2018; Mazumder et al., 2019). In Ghana, reducing the cost of secondary school increased educational attainment and other outcomes for women and men (Duflo et al., 2019). Eliminating school fees led to reductions in early fertility in Nigeria and Kenya (Osili and Long, 2008; Brudevold-Newman, 2019), though eliminating school fees can sometimes exacerbate gender gaps (Lucas and Mbiti, 2012). A review of interventions to improve access and learning found that general interventions—not targeted by gender—were often among the most effective at boosting girls' education (Evans and Yuan, 2019). In countries with persistent gender gaps despite high levels of male education—for example, South Korea—more targeted programs may be needed; however, our analysis suggests that these countries

²³ While education as currently provided does not translate into gender equality in adulthood, some scholars propose that reforms to education systems could boost women's empowerment by building critical thinking skills as well as productive, personal, and social competencies that will pay off later in life (Ashraf et al., 2020; Buvinic and O'Donnell, 2019; Murphy-Graham and Lloyd, 2016).

are the exception and not the rule. Even in settings where gender gaps in attainment are closing over time, policy makers may choose to prioritize rapid elimination of gender gaps over expanding access to education more broadly.

Many questions remain for future research. One question is what constrains girls' participation in school in settings where gender gaps in attainment remain large, and which strategies are most appropriate to address these constraints. Many countries with large gender gaps in educational attainment are also struggling to recover from conflict, build state capacity, strengthen democratic institutions, and provide security and social protection to all citizens. In these settings, it is unclear whether the main obstacles to girls' education are legal, political, economic, or social. When obstacles are legal or political, advocacy is likely to play a key role in pressuring governments to level the playing field. When the primary issue is the cost of schooling, policies that are gender-sensitive but not gender-targeted may be more critical—for example, aid to governments, reductions in school fees, and social protection programs that relax household budget constraints (Evans and Yuan, 2019). When cultural and social issues constrain girls' education, grassroots advocacy is likely to play a key role in changing attitudes—but donors and other external actors may be limited in their ability to drive change from outside.

Our results resonate with previous work demonstrating that gender gaps often get larger before they begin to shrink (Eloundou-Enyegue et al., 2009), but we still know relatively little about when and why countries begin to shift from a widening attainment gap to a narrowing one. We show that countries that first experienced a widening are those that began with low levels of education for both men and women. But why the gap begins to narrow when it does and whether there are policy actions that can precipitate that shift are important, unanswered questions.

A final question is how we get from gender equality in education to gender equality in life outcomes. The United States achieved gender parity in educational attainment by 1870, 50 years before women's right to vote was enshrined in the constitution and almost 100 years before the Civil Rights Act made workplace sex discrimination illegal. There are still legal obstacles—for example, a lack of laws prohibiting the expulsion of pregnant girls, child marriage laws, and inadequate protection against labor market discrimination—in many countries where gender gaps in attainment persist. Nevertheless, the experience of high-income countries shows that education alone is insufficient to close the earnings gap between men and women. In many countries, the more challenging task of changing social and cultural norms remains (Colclough et al., 2000)—and we have limited evidence on what factors drive increased support for gender equality beyond the classroom.

Although we present evidence that increasing levels of education alone will not be enough to achieve economic equality by gender, not enough is known about the complementarities between educational investments and other reforms. For example, Hallward-Driemeier et al. (2014) examine the impact of reforms of property rights and legal capacity of women across 100 countries over 50 years and observe positive associations with both educational enrollment and a range of economic outcomes. Legal reforms may not only increase educational enrollment but also increase the return on educational gains. Other reforms—such as those that encourage entrepreneurship—may increase the return on education for women. Beyond reforms, urban areas often have smaller gender gaps (Evans, 2019) and one reason for that may be higher returns

to education in areas with more formal sector employment. If so, then ongoing urbanization in many countries may affect investments in women's education.

In this study, we focus on educational attainment. But even where dramatic gains in attainment have been achieved, the quality of education often lags, with startlingly low learning outcomes in many low- and middle-income countries (World Bank, 2018b). Even low-quality schooling confers gains (Oye et al., 2016), but an analysis of schooling and literacy across 54 countries suggests that the gains from schooling in terms of child survival, fertility, and female empowerment are higher when schooling results in increased literacy (Kaffenberger et al., 2018). Even as the world seeks to close the remaining gaps in girls' access to education, it will have to consider how to ensure that education is worth girls' time.

Declarations

Availability of Data and Materials

The datasets generated and/or analyzed during the current study are available in the Barro–Lee educational attainment dataset repository, <http://www.barrolee.com/>, and the World Bank's World Development Indicators repository, <https://databank.worldbank.org/data/source/world-development-indicators>.

Competing Interests

Not applicable.

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Author Contributions

All authors contributed equally to this article.

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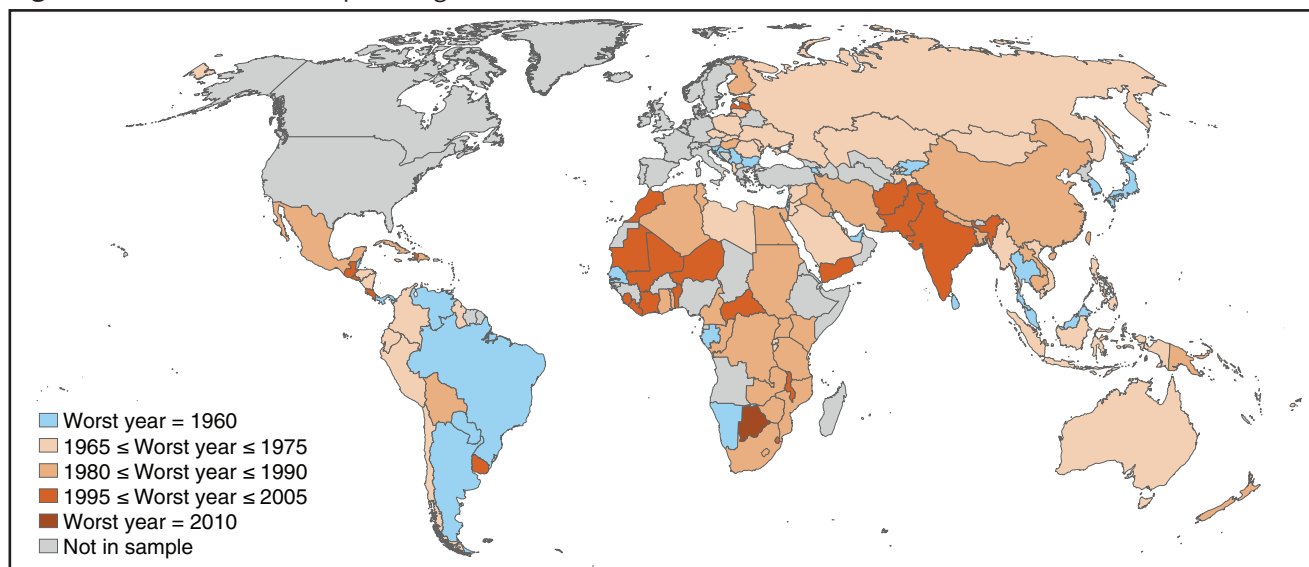
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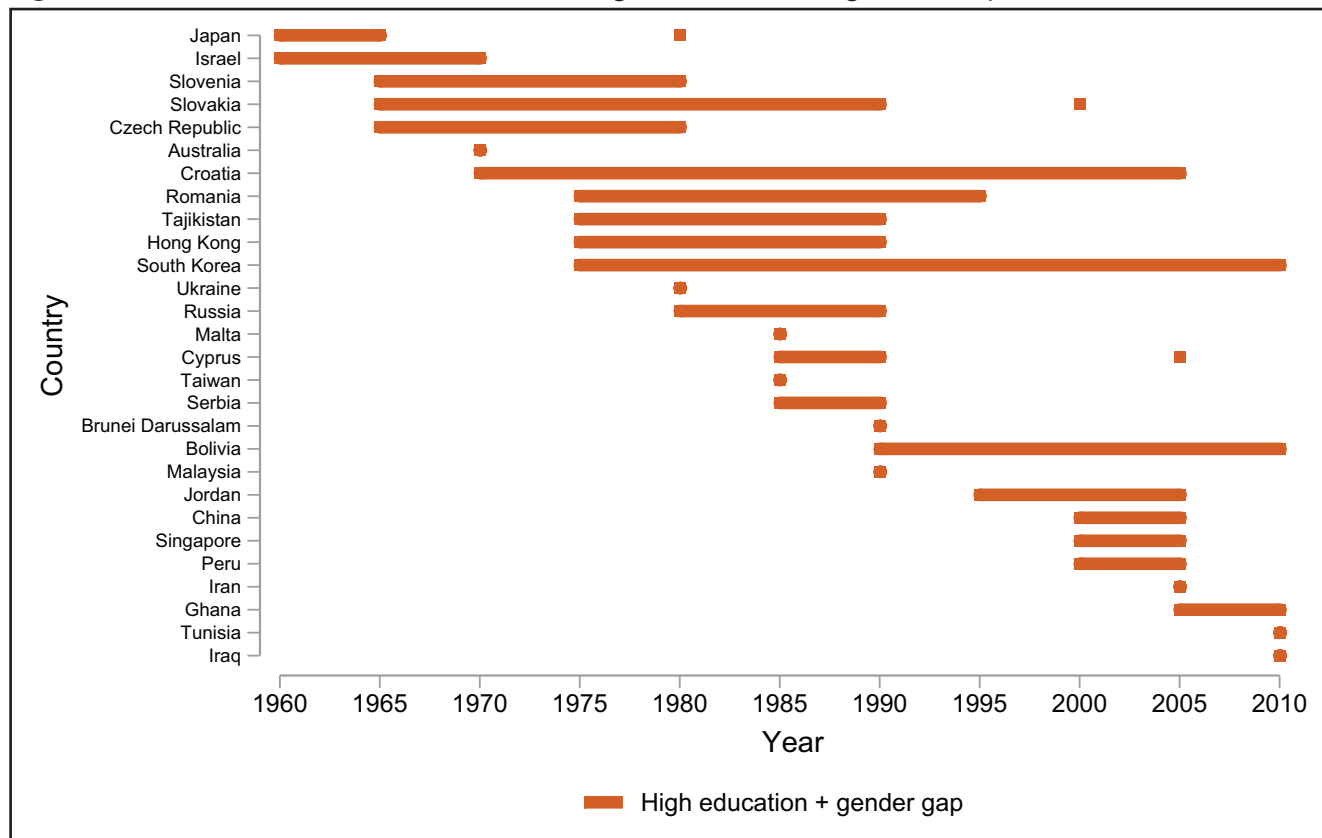
Appendix

Figure A1 Year of Worst Gap Among Countries Where It Got Worse Before It Got Better.

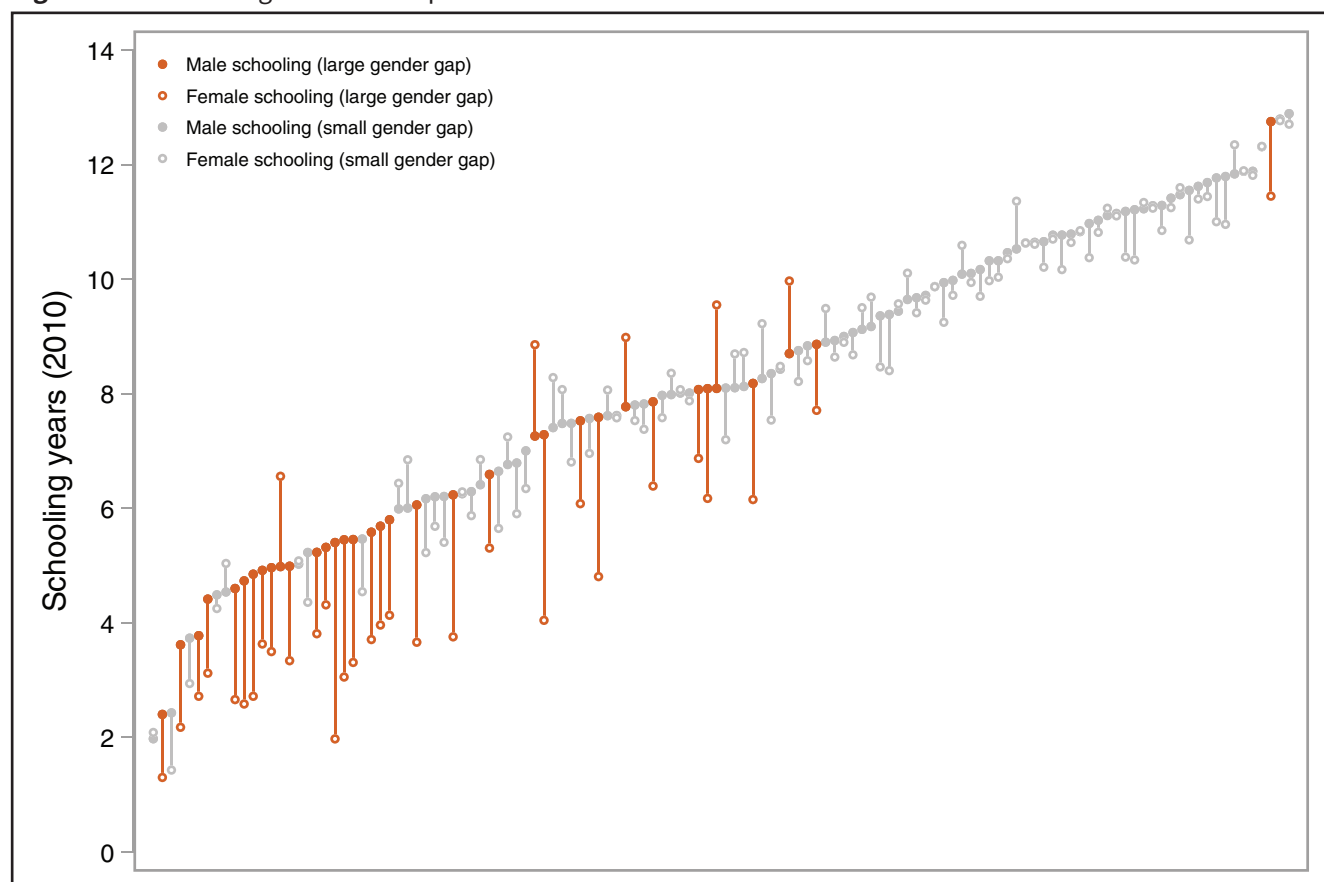


Notes: Sample includes 126 countries, all those included in the Barro–Lee educational attainment data set that were not founding members of the OECD. Countries are classified as experiencing the “worse before better” phenomenon if the year of the worst gap is after 1960 and the gap in 2010 is smaller than the worst gap. Countries where the gap “did not get worse before better” either had their worst gap in 1960 or 2010.

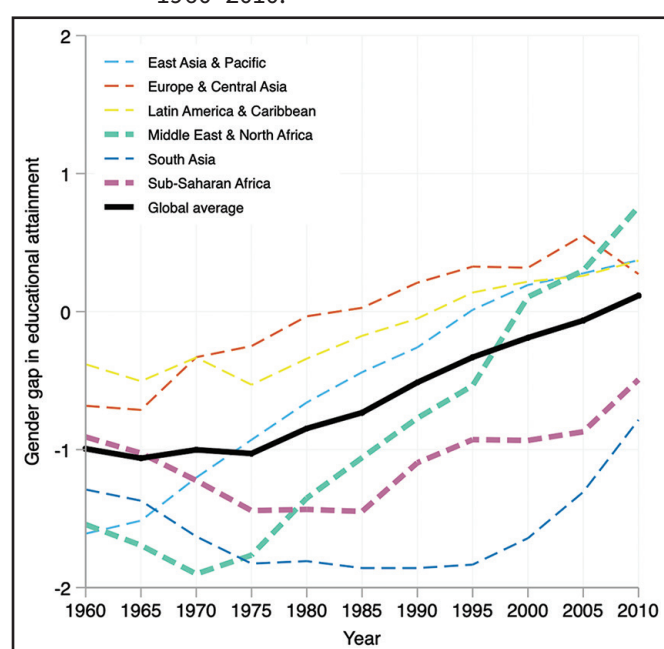
Figure A2 Countries' Transition to and from the High Education and Big Gender Gap Status.



Notes: Sample includes 126 countries, all those included in the Barro–Lee educational attainment data set that were not founding members of the OECD. “High education” indicates countries where men have an average of more than eight years of education. “Gender gap” indicates a difference in male vs. female educational attainment (mean years of schooling) that is greater than one year.

Figure A3 Schooling Years and Gaps.

Notes: Sample includes 126 countries, all those included in the Barro–Lee educational attainment data set that were not founding members of the OECD. “Large gender gap” indicates a difference in male vs. female educational attainment (mean years of schooling) that is greater than one year.

Figure A4 Regional Change in Gender Gaps in Average Schooling Years for Younger Cohort, 1960–2010.

Notes: Sample includes 126 countries, all those included in the Barro–Lee educational attainment data set that were not founding members of the OECD.

Table A1 Barro–Lee Sample Compared to UN Member State Sample.

	Barro–Lee Sample	UN Sample	Difference
GDP per capita (Mean)	20535	18453	2082
GDP per capita (SE)	1764	1432	2250
Number of countries	139	182	
Literacy (Mean)	86	85	1
Literacy (SE)	2	1	2
Number of countries	109	143	

Note: Barro–Lee sample includes all the countries from the Barro–Lee dataset that have available data on PPP-adjusted GDP per capita (constant 2011 international \$) (2017) or literacy (most recent year available since 2008) in the World Bank’s World Development Indicators. Similarly, UN sample includes all such countries that are members of the United Nations. The calculation excludes from the Barro–Lee sample Hong Kong, Macao, and Taiwan—the only three states that are originally in the Barro–Lee sample but not in the UN sample.

Table A2 Change in Female Schooling Years.

Region	Female schooling			
	1960	2010	Change	Slope
East Asia and Pacific	3.04	8.67	5.63	1.22
Europe and Central Asia	5.07	11.08	6.00	1.18
Latin America and Caribbean	3.37	8.34	4.97	1.07
Middle East and North Africa	1.24	7.63	6.39	1.13
South Asia	1.09	5.08	3.99	0.86
Sub-Saharan Africa	1.05	4.90	3.85	0.95

Note: The figures in the 1960 column denote average schooling years for the female population in 1960. The figures in the 2010 column denote average schooling years for the female population in 2010. Change is calculated by subtracting female schooling years in 1960 from female schooling years in 2010. Slope is calculated by dividing the change in female schooling years between 1960 and 2010 by the change in male schooling years over the same period. The source of the data for this analysis is the Barro–Lee educational attainment dataset, and data come from all 126 countries that were not founding members of the OECD.

Table A3 Top Three Countries for Male Schooling Years by Region.

Region	Country	Male Schooling Years in 1960	Gap in 1960	Male Schooling Years in 2010	Gap in 2010
East Asia and Pacific	South Korea	5.57	-2.62	12.76	-1.30
	Hong Kong	6.43	-3.09	11.77	-0.77
	Japan	8.16	-1.37	11.69	-0.24
Europe and Central Asia	Czech Republic	8.80	-0.81	12.89	-0.18
	Slovakia	8.86	-0.82	12.80	-0.03
	Hungary	7.66	-0.46	11.89	-0.07
Latin America and Caribbean	Belize	7.74	-0.31	11.23	0.11
	Trinidad and Tobago	5.84	-0.39	10.64	0.00
	Cuba	3.94	0.11	10.32	-0.29
Middle East and North Africa	Israel	8.37	-1.45	12.32	0.01
	Malta	4.81	-1.04	10.77	-0.60
	Jordan	3.50	-2.30	9.94	-0.69
South Asia	Sri Lanka	4.70	-1.49	10.32	-0.35
	India	1.72	-1.21	7.59	-2.78
	Maldives	3.81	-0.78	6.29	-0.42
Sub-Saharan Africa	South Africa	4.38	0.03	9.72	-0.08
	Botswana	1.43	0.06	9.68	-0.26
	Mauritius	4.34	-1.55	9.36	-0.89

Notes: Male schooling years in 1960 denotes average schooling years for the male population in 1960. Gap in 1960 denotes the female-male gap in average schooling years in 1960. Male schooling years in 2010 denotes average schooling years of the male population in 2010. Gap in 2010 denotes the female-male gap in average schooling years in 1960. The source of the data for this analysis is the Barro–Lee educational attainment dataset, and data come from all 126 countries that were not founding members of the OECD.

Table A4 Ratio of Females to Males at Various Education Levels in 2010 (25–29 Year Olds).

Region	Ratio of males to females		
	No formal Education	Complete Primary	Complete Secondary
East Asia and Pacific	1.27	1.03	1.03
Europe and Central Asia	0.84	1.00	1.06
Latin America and Caribbean	4.56	0.99	1.10
Middle East and North Africa	1.64	0.97	1.24
South Asia	1.80	0.78	0.93
Sub-Saharan Africa	3.06	0.90	0.79

Notes: No formal education denotes the ratio of percent of 25–29-year-old female population with no schooling divided by percent of 25–29-year-old male population with no schooling. Complete Primary denotes the female-male ratio of percent of population aged 25–29 that completed at least primary education. Complete Secondary is defined analogously. The source of the data for this analysis is the Barro–Lee educational attainment dataset, and data come from all 126 countries that were not founding members of the OECD.

Table A5 Countries Where The Gender Gap Got Worse Before It Got Better.

Country	Gap in 1960	Worst Gap	Year of Worst Gap	Gap in 2010
Brunei Darussalam	-2.69	-2.71	1965	-0.26
Honduras	-0.31	-0.36	1965	0.03
Kazakhstan	-1.22	-1.25	1965	-0.17
Philippines	-0.55	-0.57	1965	0.59
Singapore	-2.38	-2.38	1965	-0.88
Myanmar	-0.75	-0.86	1965	0.50
Qatar	-1.18	-1.43	1965	1.46
Trinidad and Tobago	-0.39	-0.43	1965	-0.00
Vietnam	-1.56	-1.71	1965	-0.68
Guyana	-0.55	-0.79	1965	0.96
Barbados	-0.36	-0.46	1965	0.51
Bahrain	-0.92	-1.36	1970	0.48
Australia	-0.59	-1.12	1970	0.12
Jamaica	0.15	0.05	1970	0.46
Fiji	-1.00	-1.18	1970	-0.16
Czech Republic	-0.81	-1.59	1970	-0.18
Mongolia	-0.78	-1.47	1970	0.59
Slovakia	-0.82	-1.43	1970	-0.03
Jordan	-2.30	-2.66	1970	-0.69
Albania	-1.02	-1.20	1970	-0.47
Saudi Arabia	-3.00	-3.26	1970	-0.54
Russia	-1.02	-1.42	1970	-0.22
Ukraine	-1.11	-1.54	1970	-0.04
Indonesia	-1.23	-1.53	1970	-0.90
Reunion	0.29	0.12	1970	0.87
Ecuador	-0.58	-0.71	1970	-0.04
Poland	-0.59	-0.62	1970	-0.04
Chile	-0.30	-0.35	1970	-0.26
Mauritius	-1.55	-1.99	1970	-0.89
Lithuania	-0.91	-0.93	1975	0.02
Libya	-1.16	-2.65	1975	1.60
Nicaragua	-1.11	-2.54	1975	0.44
Colombia	-0.26	-0.35	1975	-0.10
Romania	-1.11	-1.89	1975	-0.60
Peru	-1.26	-1.47	1975	-0.98
Tajikistan	-1.71	-1.96	1975	0.50
Syria	-1.37	-2.56	1975	-1.45
Rwanda	-0.95	-1.27	1975	-0.24
Moldova	-1.03	-1.12	1975	-0.11
Burundi	-0.61	-1.23	1975	-0.79
Mexico	-0.48	-0.82	1980	-0.29

(Continued)

Table A5 Continued

Country	Gap in 1960	Worst Gap	Year of Worst Gap	Gap in 2010
China	-1.38	-1.57	1980	-0.81
Iran	-0.81	-1.92	1980	-0.39
South Africa	0.03	-0.55	1980	-0.08
Rep. of Congo	-1.41	-2.36	1980	-1.29
New Zealand	-0.11	-0.52	1980	0.83
Bangladesh	-1.32	-1.94	1980	-0.52
Tanzania	-1.83	-2.43	1980	-0.80
Cameroon	-1.24	-1.80	1980	-1.00
Estonia	-0.11	-0.32	1980	0.51
Dominican Republic	0.03	-0.65	1980	0.59
Kenya	-1.39	-2.16	1980	-0.89
Laos	-1.62	-2.18	1980	-0.92
Bolivia	-1.44	-2.02	1980	-1.15
Mozambique	-0.94	-1.27	1980	-1.00
Malta	-1.04	-1.22	1980	-0.60
Egypt	-0.99	-2.44	1985	-1.47
Zimbabwe	-0.84	-1.57	1985	-0.44
Uganda	-1.20	-1.86	1985	-0.94
Cambodia	-1.34	-2.22	1985	-1.73
Tunisia	-1.01	-2.22	1985	-1.20
Papua New Guinea	-0.43	-1.64	1985	-1.29
Cuba	0.11	-0.61	1985	-0.29
Algeria	-0.55	-2.50	1985	-0.66
Sudan	-0.64	-1.40	1985	-1.06
Ghana	-1.08	-3.31	1985	-2.03
Iraq	-0.60	-2.68	1985	-1.92
Zambia	-1.19	-2.28	1985	-0.61
Dem. Rep. of Congo	-1.32	-2.60	1985	-2.15
Finland	-0.16	-0.92	1990	-0.00
Togo	-0.70	-3.24	1990	-3.24
Hungary	-0.46	-0.94	1990	-0.07
Nepal	-0.21	-2.41	1990	-1.46
Uruguay	-0.04	-0.98	1995	0.37
Liberia	-0.75	-2.88	2000	-2.40
Morocco	-0.30	-1.84	2000	-1.67
Malawi	-0.87	-1.64	2000	-0.87
Gambia	-0.34	-1.57	2000	-1.29
Benin	-0.63	-2.35	2000	-2.15
Niger	-0.62	-1.21	2000	-1.10
Latvia	-0.45	-0.60	2000	-0.03
Yemen	-0.03	-2.33	2005	-1.94

(Continued)

Table A5 Continued

Country	Gap in 1960	Worst Gap	Year of Worst Gap	Gap in 2010
Afghanistan	-0.54	-3.62	2005	-3.43
Maldives	-0.78	-0.83	2005	-0.42
Sierra Leone	-0.40	-1.75	2005	-1.65
Central African Republic	-0.49	-2.35	2005	-2.13
Pakistan	-1.35	-2.62	2005	-2.48
Haiti	-0.49	-2.50	2005	-2.40
Eswatini	-0.39	-1.34	2005	0.06
El Salvador	-0.40	-0.98	2005	-0.39
Guatemala	-0.44	-1.04	2005	-1.00
Mauritania	-0.33	-1.97	2005	-1.42
Costa Rica	-0.10	-0.15	2005	0.06
Mali	-0.20	-0.76	2005	0.11
India	-1.21	-3.05	2005	-2.78
Cote d'Ivoire	-0.83	-2.08	2005	-1.87

Notes: Gap in 1960 denotes the female-male gap in average schooling years in 1960. Worst Gap denotes the magnitude of the largest gap in favor of men among countries where the largest gap is after 1960 and gap in 2010 is smaller than the “worst” gap. Year of Worst Gap denotes the year when the largest gap in favor of men appears. Gap in 2010 denotes the female-male gap in average schooling years in 2010. The source of the data for this analysis is the Barro–Lee educational attainment dataset, and data come from all 126 countries that were not founding members of the OECD.

Table A6 Schooling Characteristics in the Year of Widest Gender Gap for Countries Where Gender Gap Got Worse Before It Got Better.

	25th Percentile	50th Percentile	75th Percentile
Female schooling (15+)	2.07	3.20	4.93
Male schooling (15+)	4.12	4.93	6.40
Female schooling (20–24)	3.27	4.83	7.09
Male schooling (20–24)	5.59	6.74	8.62

Notes: Male and female years of schooling are taken from the Barro–Lee Educational Attainment Dataset, excluding OECD countries. The sample is restricted to the 96 countries where the gender gap got worse before it got better between 1960 and 2010. The statistics are for the year where the gender gap was widest between 1960 and 2010. The numbers in the parentheses indicate the age group of the sample.