

# INCLUSIVE WEALTH REPORT

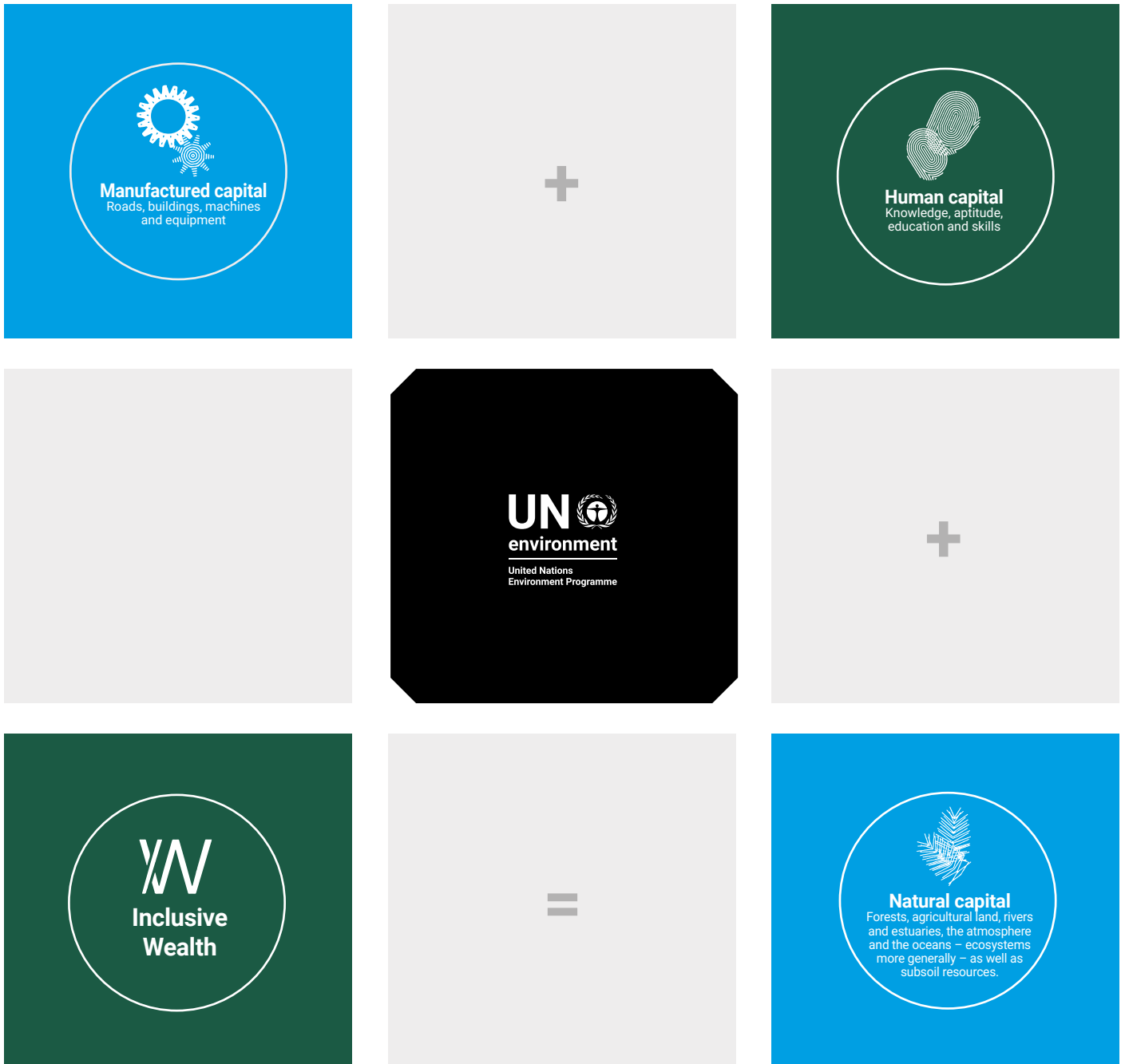
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# WHAT IS INCLUSIVE WEALTH?

The Inclusive Wealth Report (IWR) is a biennial effort led by UN Environment to evaluate national capacities and performance in terms of measuring economic sustainability and well-being. Existing national statistical systems use Systems of Environmental and Economic Accounts, which are geared towards measuring the flow of income. These flows critically depend upon the health and resilience of capital assets like manufactured capital, human capital and natural capital.



# PART III: NEW INSIGHTS

## CHAPTER 6: HUMAN CAPITAL: EDUCATIONAL ATTAINMENT PROGRESS



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### 6.1. Introduction

Human capital is an essential component of individual well-being and vital for a country's sustainability (e.g. OECD, 2013; UNU-IHDP and UNEP, 2014). Arguably more worldwide attention has been paid to GDP than any other indicators, including human capital. Although GDP is an important macroeconomic construct, it fails to consider environmental and inequality impacts, and the future viability of a country (e.g. Stiglitz et al., 2010).

Human capital and other wealth measures as presented in this report will help to fill the gaps left by only studying GDP. This chapter focuses on human capital, particularly on those that are captured in levels and trends in country's educational attainment, with reference to the United Nations' Millennium Project and Sustainable Development education goals.

The United Nations Millennium Project, an international effort which operated from 2002 through 2006, established eight goals and 18 technical indicators with 48 associated targets to measure progress towards the Millennium Development Goals (MDGs). Two goals relate to education: Goal 2 - Achieve Universal Primary Education; and Goal 3 - Promote Gender Equality and Empower Women. The stated objective of Target 3 of Goal 2 is to have all boys and girls complete a full course of primary schooling by 2015. The stated objective of Target 4 of Goal 3 is to eliminate gender disparity in primary and secondary education in the short run (2005) and in all levels of education in the intermediate run (2015).

However, as stated in the report of the United Nations Secretary-General, despite progress, the world failed to meet the MDGs of achieving universal primary education by 2015. For instance, in 2013, 59 million children of primary-school age were out of school. Estimates show that, among those 59 million children, 1 in 5 of had dropped out. In addition, recent trends suggest that 2 in 5 of out-of-school children will never set foot in a classroom (UN, 2016).

In 2015, the United Nations Member States reached agreement on 17 SDGs with 169 associated targets. SDG 4 and SDG 5 are similar to MDG 2 and MDG 3, respectively. SDG 4 calls for inclusive and quality education for all and the promotion of lifelong learning by 2030. SDG 5 calls for gender equality by 2030, noting the importance of education and the elimination of discrimination in jobs, unpaid work, and political office in achieving the goal.

Following an indicators-based approach to measuring human capital,<sup>45</sup> human capital developed due to education is frequently proxied by educational attainment, such as average years of schooling. A famous example in this field is the Barro-Lee data set that has been established through many years' research (see Barro and Lee, 2001, 2013). The previous IWRs also used the Barro-Lee data set as one of the primary data sources for calculating monetary estimates of human capital (e.g. IWR 2014, 2016).

This chapter, by using numerical estimates based mainly on the latest Barro-Lee data set (Barro and Lee, 2016), tries to investigate educational attainment progress across major regions in the world, and over the time period of 1950 to 2010. We also investigate what has been achieved during this period, with reference to the educational attainment gender gaps, and age differences in different regions. As the quality of education matters as well as the average years of schooling, discussions are also provided about how the quality side of educational attainment is practically taken into account.

The next section summarizes the methodology for compiling the Barro-Lee data set. This is followed by a section presenting and discussing several numerical results. A subsequent section focuses on the quality of education. By using the implicit quality-adjustment method, the findings drawn from the progress of primary, secondary and tertiary education are presented and discussed.

### 6.2. Barro-Lee methodology

Barro-Lee average years of schooling estimates enter into the IWR human capital (due to education) calculations in two ways. The IWR uses a country representative adult approach. The representative adult's educational attainment by gender (*Edu*) comes from the Barro-Lee average years of schooling. The minimum age of an adult in a country by gender is determined by *Edu*+5. The total number of adults by gender is equal to the number of individuals in the country who are at least the minimum age. All adult individuals are counted whether or not they perform paid work. A complete description of the IWR human capital measuring methodology can be found in the Methodological Annexes

45 For discussions on other approaches to measuring human capital, as well as the strengths and weaknesses associated with each measuring approach, please refer to Liu and Fraumani (2014).

The Barro-Lee data set (2016) is available by gender in five calendar year increments from 1950 to 2010, for five year age groups from age 15 to 74, and for age 75 and over, for 146 countries. The data used in this chapter by age groups and gender include population, the no school percentage, and the average years of total schooling, as well as the average years of primary, secondary, and tertiary schooling, respectively.

The Barro-Lee benchmark data is collected from various census and/or survey information and compiled by UNESCO, Eurostat, national statistic agencies, and other sources.<sup>46</sup> The Barro-Lee data set uses a variety of techniques to fill in gaps in observations and educational attainment subcategories, with the purpose to avoid misestimating of average years of schooling.

To fill in missing observations (as benchmarks are not available for all five-year periods), they begin by calculating the distribution of educational attainment among four broad categories: no formal education ( $h_u$ ), primary ( $h_p$ ), secondary ( $h_s$ ), and tertiary education ( $h_h$ ). Primary and tertiary are further divided into complete and incomplete; secondary is further divided into lower secondary and upper secondary.

Most missing observations are filled in with backward or forward extrapolation with an appropriate time lag. The 13 five-year age groups are referred to by  $ag = 1$  (15-19 years old) through to  $ag = 13$  (75 years and over). The forward extrapolation method assumes that the educational attainment distribution of the age group  $ag$  at time  $t$  is identical to that of the age group that was five years younger at time  $t - 5$ .

EQUATION 1 
$$h_{j,t}^{ag} = h_{j,t-5}^{ag-1}$$

where  $j = u, p, s, h$ , and  $ag = 3$  (25-29 years old), through to  $ag = 11$  (65-69 years old).

This forward extrapolation applies to individuals who have completed their schooling by time  $t - 5$ . As those younger than 25 are potentially still in school, a different methodology is employed. Similarly, the backward extrapolation assumes that the educational attainment distribution of the age group  $ag$  at time  $t$  is the same as that of the age group that is five years older at time  $t + 5$ .

EQUATION 2 
$$h_{j,t}^{ag} = h_{j,t+5}^{ag+1}$$

This forward extrapolation applies to individuals who have completed their schooling by time  $t - 5$ . As those younger than 25 are potentially still in school, a different methodology is employed. Similarly, the backward extrapolation assumes that the educational attainment distribution of the age group  $ag$  at time  $t$  is the same as that of the age group that is five years older at time  $t + 5$ .

As a result, the net effect of this methodology is to hold an individual's educational attainment constant from age 25 through to 64. For older individuals, the probability of dying is observed to differ by educational attainment level. Accordingly, for the three oldest age groups;  $ag = 11$  (65-69 years old),  $ag = 12$  (70-74 years old), and  $ag = 13$  (75 years and over), survival probabilities are estimated by educational attainment level. Highly educated individuals live, on average, longer than their less educated peers; this correction is necessary to ensure accurate estimations of average educational attainment for older age groups. For all younger age groups ( $ag = 10$  (60-64 years old) and below), it is assumed that survival rates do not differ by educational attainment.

The process for creating subcategories of educational attainment (complete and incomplete for primary and higher education; lower and upper for secondary school) depends upon the age level. For primary school, the Barro-Lee data set uses country and age-specific completion ratio profiles to estimate the subcategories for  $ag = 1$  (15-19 years old) and  $ag = 2$  (20-24 years old). For  $ag = 3$  (25-29 years old), the primary school completion rate is set equal to the ratio of the number of individuals who completed primary school, but did not enter secondary school, to the number of individuals who entered primary school.

Backward and forward extrapolation and other methods are used to fill in any missing observations for  $ag = 3$  (25-29 years old) and above.

When there are missing observations, secondary-school enrollees for  $ag = 1$  (15-19 years old) are assumed to be incompletely educated at the secondary level, and higher-school enrollees for  $ag = 2$  (20-24 years old) are assumed to be incompletely educated at the higher level.

Other estimation problems arise because some countries do not report the proportion of the population with formal education, but do report on the proportion of the educated population who have achieved primary, secondary, or tertiary level of education. Alternatively, the proportion of the population with no formal education, or those who have achieved at most some level of primary education, is often reported as a single number. The Barro-Lee data set uses illiteracy rate, primary enrolment ratio, and/or data from other census years to resolve such inconsistencies.

Finally, estimations are made for the average number of years of schooling for the population aged 15 and above, and separately for each of the 13 five-year age groups. For those aged 15 and above, the average years of total schooling at time  $t$ ,  $S_t$ , is measured as:

EQUATION 3 
$$S_t = \sum_{ag} l_t^{ag} s_t^{ag}$$

where the summation is over all age groups (i.e.  $ag = 1$  (15-19 years old),  $ag = 2$  (20-24 years old), ...,  $ag = 13$  (75 years old and over));  $l_t^{ag}$  is the population share of the group  $ag$  in the total population aged 15 and

46 The description of the Barro-Lee methodology draws heavily from Chapter 4 of the 2014 Inclusive Wealth Report (Fraumeni & Liu, 2014), which is the description of the methodology applied in Barro and Lee (2013).

above;  $s_t^{ag}$  is the average number of years of schooling for age group  $ag$ .

The average number of years of schooling by age group  $ag$  at time  $t$  is:

$$\text{EQUATION 4} \quad s_t^{ag} = \sum_j h_{j,t}^{ag} d_{j,t}^{ag}$$

where the summation is over educational attainment levels  $j = p, s$  (incomplete, complete),  $h$  (incomplete, complete);  $h_{j,t}^{ag}$  is the fraction of the group  $ag$  with the educational level  $j$ ;  $d_{j,t}^{ag}$  is the corresponding duration of school attendance in years.

### 6.3. Educational Attainment, Gender Gaps and Age Differences

To examine educational attainment progress in the world and across the different regions, the 146 countries covered by the Barro-Lee data set are divided first into two broad groups: Advanced and other economies. The Advanced Economies consist of 24 countries, other economies are divided into six regions: East Asia and the Pacific (19 countries or special administrative districts); Europe and Central Asia (20 countries); Latin America and Caribbean (25 countries); Middle East and North Africa (18 countries); South Asia (7 countries); and sub-Saharan Africa (33 countries).<sup>47</sup>

In Table 6.1, information on the educational attainment (in terms of the average years of total schooling) is presented for the total population aged 15 and above, for both males and females, in all the seven regions over the period covered by Barro and Lee (2013), i.e. 1950 to 2010. As shown, all regions in the world have made significant progresses in educational attainment during this period.

By 2010, the Europe and Central Asia region has almost caught up with the Advanced Economies, and its average educational attainment levels for both males and females are just slightly lower than those of the latter. Until the most recent period of 2000 to 2010, the average rate of percentage increase per year for the Europe and Central Asia exceeds that for the Advanced Economies.

Unsurprisingly, the sub-Saharan Africa region has the lowest average 2010 educational attainment, and for the period as a whole (1950 to 2010), and in the first subperiod (1950 to 2000), its average percentage increase per year is not among the highest in all regions. This is also true for males in the second subperiod (2000 to 2010). Only for females and in the second subperiod has its average percentage increase per year reached the second place among all regions.

47 The 24 Advanced Economies include: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom, and the United States. The 19 East Asia and the Pacific countries or special administrative districts include: Brunei Darussalam, Cambodia, mainland China, China – Hong Kong, China – Macao, Fiji, Indonesia, Lao People's Democratic Republic, Malaysia, Mongolia, Myanmar, Papua New Guinea, Philippines, Republic of Korea, Singapore, Taiwan, Thailand, Tonga, and Viet Nam. The 20 Europe and Central Asia countries include: Albania, Armenia, Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Poland, Republic of Moldova, Romania, Russian Federation, Serbia, Slovakia, Slovenia, Tajikistan, and Ukraine. The 25 Latin America and Caribbean countries include: Argentina, Barbados, Belize, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Trinidad and Tobago, Uruguay, and Venezuela. The 18 Middle East and North Africa countries include: Algeria, Bahrain, Cyprus, Egypt, Iran (Islamic Republic of), Iraq, Israel, Jordan, Kuwait, Libyan Arab Jamahiriya, Malta, Morocco, Qatar, Saudi Arabia, Syrian Arab Republic, Tunisia, United Arab Emirates, and Yemen. The 7 South Asia countries include: Afghanistan, Bangladesh, India, Maldives, Nepal, Pakistan, and Sri Lanka. The 33 sub-Saharan Africa countries include: Benin, Botswana, Burundi, Cameroon, Central African Republic, Congo, Cote d'Ivoire, Democratic Republic of the Congo, Gabon, Gambia, Ghana, Kenya, Lesotho, Liberia, Malawi, Mali, Mauritania, Mauritius, Mozambique, Namibia, Niger, Reunion, Rwanda, Senegal, Sierra Leone, South Africa, Sudan, Swaziland, Togo, Uganda, United Republic of Tanzania, Zambia, and Zimbabwe.

**Table 6.1: Educational attainment, aged 15 and above, by region and gender**

	Average Years				Average increase per year (%)			
	2010		1950–2010		1950–2000		2000–2010	
	Female	Male	Female	Male	Female	Male	Female	Male
Advanced Economies	11.4	11.7	1.03	0.96	1.04	1.01	1.00	0.71
East Asia & the Pacific	7.6	8.3	3.17	2.21	3.48	2.48	1.67	0.87
Europe & Central Asia	11.2	11.4	1.72	1.35	1.90	1.51	0.82	0.54
Latin America & Caribbean	8.3	8.3	2.04	1.77	2.14	1.85	1.55	1.37
Middle East & North Africa	6.8	7.9	4.75	3.39	5.18	3.80	2.66	1.35
South Asia	4.8	7.3	4.23	2.62	4.68	2.86	2.03	1.41
Sub-Saharan Africa	4.8	5.9	2.81	2.19	2.94	2.40	2.19	1.14

For the whole period (1950 to 2010) and the first subperiod (1950 to 2000), the Middle East and North Africa region has the highest average percentage increase per year for both males and females, but in the last subperiod (2000 to 2010), although its average percentage increase per year is still the highest for females, it drops to third place for males in all regions. The South Asia region has the second highest average percentage increase per year both for the whole period (1950 to 2010) and the first subperiod (1950 to 2000), but in the second subperiod (2000 to 2010), its average percentage increase per year is the highest for males, while it falls to third place for females in all regions. For all seven regions, the average percentage increase per year is lower in 2000 to 2010 than in 1950 to 2000, regardless of gender.

The slowdown in percentage growth rate of educational attainment progress is quite noticeable in the East Asia and the Pacific, Europe and Central Asia, the Middle East and North Africa, and the South Asia regions, where the average percentage increase per year in 2000 to 2010 roughly halved for females, and more than halved for males, compared to the corresponding 1950 to 2000 percentage rates. For males in the sub-Saharan Africa region, the average percentage increase per year in 2000 to 2010 more than halved its 1950 to 2000 percentage rate.

Average yearly percentage increases tend to fall as the level of educational attainment rises, indicating that advancement relative to existing levels may be significantly easier when educational attainments are low compared to when they are higher.

Apparently, a variety of external factors in a number of countries may add to the difficulty of realizing educational gains, such as conflicts, poverty, and recessions. Since the general state of many countries in the world points to the difficulty in attaining MDGs or SDGs educational attainment goals, especially in the three aforementioned regions, more efforts are needed in order to catch up in the future.

Both MDGs and SDGs call for gender equity. As also shown in Table 6.1, in all regions, the average educational attainment of females is, in general, less than that of males in 2010. Only in the LAC region is there gender parity. In the Advanced Economies, East Asia and the Pacific, Europe and Central Asia, the difference is at most 0.7 of a year of total schooling, but in the Middle East and North Africa, sub-Saharan Africa and the South Asia regions, it is substantially greater, i.e. 1.1, 1.1 and 2.5 years of total schooling, respectively.

**Table 6.2: The gender educational attainment gap\*, aged 15 and above, by region**

	Average gap (%)				Average reduction per year (%)			
	2010		1950–2010		1950–2000		2000–2010	
	Female	Male	Female	Male	Female	Male	Female	Male
<b>Advanced Economies</b>	11.4	11.7	1.03	0.96	1.04	1.01	1.00	0.71
<b>East Asia &amp; the Pacific</b>	7.6	8.3	3.17	2.21	3.48	2.48	1.67	0.87
<b>Europe &amp; Central Asia</b>	11.2	11.4	1.72	1.35	1.90	1.51	0.82	0.54
<b>Latin America &amp; Caribbean</b>	8.3	8.3	2.04	1.77	2.14	1.85	1.55	1.37
<b>Middle East &amp; North Africa</b>	6.8	7.9	4.75	3.39	5.18	3.80	2.66	1.35
<b>South Asia</b>	4.8	7.3	4.23	2.62	4.68	2.86	2.03	1.41
<b>Sub-Saharan Africa</b>	4.8	5.9	2.81	2.19	2.94	2.40	2.19	1.14

\* The gender educational attainment gap in percentage points is defined as  $(1 - (\text{female educational attainment} / \text{male educational attainment})) * 100$ .

Source: Authors' calculations based on Barro-Lee February 2016 version (<http://www.barrolee.com/>)

However, for all periods and regions considered, the average percentage increase in educational attainment per year for females is, without exception, greater than that for males (see Table 6.1). As Table 6.2 shows, for the overall period, the Middle East and North Africa region is the leader in closing the gender gap in education, but progress is notable for all regions except in the Advanced Economies and in the LAC region, which have the smallest average educational gender gaps already in 1950.

Regions which have the largest educational attainment gender gaps in 2010 (the South Asia and the sub-Saharan Africa regions) as shown in Table 6.2 are also those that have the lowest average years of total schooling as shown in Table 6.1. For the sub-Saharan Africa region, the 2010 educational attainment gender gap could be virtually eliminated by 2030 if the latest rate of average annual reduction continues, while for the South Asia region, even faster (than that shown in Table 6.2) annual reductions are needed to fill the 2010 gap, which is the largest among all regions in 2010. A literature review of private returns to schooling has demonstrated that annual reductions seem to be higher in low- or middle-income economies than in high-income economies.

Moreover, estimated returns to schooling are higher for females than for males (e.g. Psacharopoulos, 1994; Psacharopoulos and Patrinos, 2004). This conclusion holds both for the world as a whole and for all regions individually (Montenegro and Patrinos, 2014). Therefore, investments in education are more rewarding in these regions than in others, as well as for females than for males.



**Table 6.3: Country distribution by educational attainment differences of younger (25–34) versus older (55–64) in 2010**

Percentage range (%)	(100-500]	(50-100]	(20-50]	(0-20]	(-∞-0]	No. of countries
Advanced Economies	0	2	9	12	1	24
East Asia & the Pacific	3	7	7	2	0	19
Europe & Central Asia	0	0	1	13	6	20
Latin America & Caribbean	2	9	9	4	1	25
Middle East & North Africa	6	3	4	2	2	17
South Asia	4	2	1	0	0	7
Sub-Saharan Africa	16	11	5	1	0	33
SUM						145

**Notes:**

1. The educational attainment differences of younger (25–34) versus older (55–64) in percentage points are defined as (educational attainment of aged 25–34 – educational attainment of aged 55–64)/ educational attainment of aged 55–64.

2. Yemen (in Middle East & North Africa) is excluded from this table as its educational attainment of 25–34-year-olds is approximately 5,000 percent higher than that of 55–64-year-olds.

3. The symbol “>” denotes greater than and the symbol “≥” denotes less than or equal to.

Source: Authors' calculations based on Barro-Lee February 2016 version (<http://www.barrolee.com/>)

A comparison of educational attainment of 25–34-year-olds with 55–64-year-olds gives a sense of what the future might look like, given current levels of educational attainment of younger potential workers. Younger workers have longer remaining working years than their elder counterparts, thus they will contribute more to future economic growth. Table 6.3 reports on the educational attainment of those aged 25–34 relative to those aged 55–64 by percentage range groups. The individual cells of Table 6.3 show how many countries in each region fall in the five percentage range categories. For example, there are two countries in the Advanced Economies that have calculated percentage points between 50 percent and 100 percent, and nine countries in the range of 20–50 percent, etc.

As shown in Table 6.3, the largest concentrations of countries in sub-Saharan Africa and South Asia are in the range of greater than 50 percent to at most 500 percent. The largest concentrations of countries in Latin America & the Caribbean and East Asia & the Pacific are in the range of greater than 20 percent to at most 100 percent. The largest concentration

of Advanced Economies, however, is in the range of greater than 0 percent to at most 50 percent. Finally, the largest concentration of countries in Europe and Central Asia is in the range of 0 percent or less to at most 20 percent, while the countries in the Middle East and North Africa regions are more or less evenly distributed over the 5 percent range categories.

These results in particular point towards the future educational attainment potential gains of the sub-Saharan African countries, and the potential slowdown in educational attainment gains in Europe and Central Asia, as well as in Advanced Economies.

One of the SDG 4 targets is for all youth to achieve literacy and numeracy by 2030. The facts and figures section of SDG 4 notes that almost half of all children not in school are in the sub-Saharan Africa region. This comment is also reflected in analysis results based on the Barro-Lee data set.<sup>48</sup> In 2010, the sub-Saharan Africa region still has a larger number of countries than other regions with a high share of individuals aged 15–19 who have no years of schooling: 17 of 33 countries with no school percentages over 20 percent. In contrast, the other regions each have at most three countries with such a high percentage of individuals aged 15–19 with no schooling.

On the other hand, almost 25 percent (eight countries) of the sub-Saharan African countries have at most 2 percent of individuals aged 15–19 without schooling. For all other regions in the Barro-Lee data set, the no-schooling category contained much larger shares of countries in each region, from a low of about 43 percent of countries for the South Asia data set to a high of 85 percent of countries for the Europe and Central Asia data set. In many countries in the regions considered, the target of universal literacy has essentially been accomplished, but in others, progress has yet to be made.

## 6.4. Conclusions

Based on the Barro-Lee data set, this chapter focuses on the level and trend of educational attainment progress, with reference to the MDGs and SDGs. In terms of the average years of total schooling, educational attainment has made significant progress in the world and across the regions over 1950-2010. However, in 2010 the distribution of educational attainment is still uneven across the regions considered in chapter, with some regions significantly lagging behind, if compared with Advanced Economies.

Filling these gaps by 2030 is challenging, especially for the Latin America and Caribbean, the South Asia, and the sub-Saharan Africa regions. Although some of these regions have shown considerable progress during the period 1950-2010, because of a low starting level in 1950, their educational attainment levels in 2010 are still lower than that in Advanced Economies by a sizeable margins.

The MDGs and SDGs strongly support the reduction of gender disparity in education. Over the period 1950 to 2010, the observed educational attainment gender gaps have been decreasing. In particular, significant progress has been achieved in the Middle East and North Africa, and the East Asia and the Pacific regions. However, large gaps are visible in the South Asia and the sub-Saharan Africa regions in 2010, even though annual reduction of gender gaps in the two regions has accelerated and are the highest among all regions in the last subperiod (2000 to 2010). Thus, filling these gender gaps by 2030 demands more active actions.

In many regions considered in the chapter, the goal of universal literacy had essentially been accomplished in 2010, reflected by the very low share of individuals aged 15 to 19 who have no years of schooling in the countries of these regions. Unfortunately, in other regions, and in particular, in the sub-Saharan Africa region, there are a large number of countries where youth aged 15 to 19 are without schooling, and thus substantial progress needs to be made for these countries.

As economic development necessitates a highly educated workforce in the future, and research results have shown that private economic returns on investments in higher education are larger than primary education, and the returns are highest in the least developed regions, such as the South Asia and the sub-Saharan Africa regions, more investments in higher education in these regions would provide the greatest returns.

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