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Demographic Transition and Education Expenditure in South Asia: Opportunities and Challenges*

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Abstract

Demographic transitions reshape public education spending needs by changing population size and age composition. In South Asia, declining fertility and shrinking school-age cohorts may create opportunities to expand education coverage or improve quality without increasing fiscal effort. This paper examines the fiscal implications of demographic change in eight South Asian countries between 2020 and 2050. Using an accounting decomposition linking demographics, enrollment, public financing, and per-student expenditure, we develop illustrative scenarios rather than expenditure forecasts. Holding enrollment rates and per-student spending relative to GDP per capita constant, demographic change could reduce primary and secondary education spending from 2.7 to 1.8 percent of GDP on average, creating potential fiscal space of 0.9 percentage points. Even with universal enrollment, potential fiscal space would average 0.6 percentage points of GDP, with substantial cross-country variation. However, realizing and effectively using this fiscal space depends on policy choices and education systems' capacity to adapt to demographic change.

Keywords: education, demographic transition, demographic dividend, South Asia.

JEL codes: I22, I25, J11.

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1. Introduction

Demographic transitions reshape the scale and composition of public spending by altering the size and structure of beneficiary populations. In the case of education, declining fertility and the resulting contraction in school-age cohorts are often viewed as creating a "window of opportunity" to expand coverage or improve quality without increasing aggregate fiscal effort. This idea is closely related to the broader notion of the demographic dividend, whereby changes in age structure can generate economic gains through multiple channels, including human capital accumulation (Bloom and Williamson, 1998; Bloom, Canning, and Sevilla, 2003; Rentería et al., 2016; Mason et al., 2022). Yet whether demographic change translates into effective fiscal space for improving education outcomes depends critically on how education systems adjust to these shifts.

This paper studies how demographic change affects public education expenditure in South Asia, a region undergoing a rapid but heterogeneous demographic transition (Navaneetham and Dharmalingam, 2012). While several countries—including Bangladesh, India, Nepal, and Sri Lanka—are experiencing sustained declines in the school-age population, others such as Afghanistan and Pakistan remain at earlier stages of the transition. At the same time, despite substantial gains in access to schooling over recent decades (Béteille et al., 2020), learning outcomes in the region remain low. For instance, the World Bank's Learning Poverty Database shows that in countries like Bangladesh and India, over half of the children at the end of primary school fail to meet minimum reading proficiency levels. This broader pattern of schooling expansion without commensurate learning gains has been widely documented in South Asia (Richards, 2023), and evidence from citizen-led assessments such as ASER further underscores persistent deficits in foundational skills across the region (Richards, 2024).

Public spending on education also remains modest relative to both international benchmarks and countries with similar income levels (Béteille et al., 2020; UNESCO, 2015). This combination of demographic change and persistent education gaps motivates two related questions. First, how might projected demographic changes affect the public resources required to finance education under alternative enrollment and spending scenarios? Second, what policy and institutional conditions would determine whether the resulting potential fiscal space can be realized and used to improve educational outcomes?

A growing literature examines the implications of demographic change for economic growth, fiscal sustainability, and public spending. Recent work emphasizes that population change affects economies through multiple channels, including labor supply, human capital investment, public transfers, and consumption needs over the life cycle (Mason et al., 2022). On the one hand, a large body of work studies how changes in age structure affect macroeconomic outcomes, including growth and savings (Bloom, Canning,

and Fink, 2010; Lee and Mason, 2010; Mason, Lee, and Jiang, 2016). On the other hand, a related literature uses demographic accounting frameworks to quantify how shifts in population structure translate into changes in public spending needs across sectors, consistently showing that population aging increases health care and pension spending while reducing education expenditures (Auerbach, Kotlikoff, and Leibfritz, 2007; Lee and Edwards, 2002; Lee and Mason, 2015). Within education, existing work has emphasized both the expansion of schooling during earlier stages of the demographic transition and the role of cohort size in shaping investments in human capital. For example, Narayana (2018) uses a National Transfer Accounts framework to quantify how changes in age structure affect economic growth through public education spending and human capital accumulation in India, highlighting the potential for reallocating resources across education levels as demographic pressures ease. While this line of work provides valuable insights into the aggregate growth implications of demographic change, it remains largely focused on macroeconomic channels and typically abstracts from the institutional features of education systems that shape how resources are allocated in practice. This paper speaks to these gaps, in particular by considering how enrollment patterns, inefficiencies in educational trajectories, and rigidities in school networks mediate the relationship between demographic change and public expenditure. More broadly, this focus is consistent with work highlighting how accountability relationships and institutional arrangements shape learning outcomes in South Asian education systems (Shields et al., 2021).

Our analysis is based on a decomposition framework that links public education expenditure to demographic structure, enrollment rates, and per-student spending (Miller, Mason, and Holz, 2011), allowing us to isolate the demographic component of changes in education spending while incorporating key features of education systems. The framework expresses education spending as a function of the size and age composition of the population, school participation, and spending per student, making it possible to quantify how each component contributes to overall changes. We apply this framework using harmonized data on population projections from the United Nations, education enrollment from the UNESCO Institute for Statistics, and public education expenditure from World Bank and national sources.

We then construct alternative scenarios for public education expenditure in eight South Asian countries—Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka—between 2020 and 2050. By comparing scenarios that vary in enrollment, efficiency, per-student spending, and assumptions about economic growth, we quantify how demographic change may affect education financing requirements and the extent to which potential fiscal space differs across countries. These scenarios are conditional accounting exercises rather than forecasts of actual expenditure trajectories. Nor should they be interpreted as evidence that demographic change directly improves learning outcomes. Instead, they

provide a transparent framework for understanding the potential fiscal implications of demographic change under alternative policy assumptions.

Our results highlight a central tension. On the one hand, demographic change has the potential to generate substantial fiscal space. Holding enrollment rates and per-student spending constant, the decline in the school-age population would reduce public education spending in South Asia from about 2.7 percent of GDP in 2020 to 1.8 percent by 2050, creating room for reallocating resources equivalent to roughly 0.9 percentage points of GDP on average. Even under a more demanding scenario of universal enrollment, demographic change would still allow for additional resources of about 0.6 percentage points of GDP. However, these averages mask substantial cross-country heterogeneity. Under the demographic-only scenario, Bhutan experiences the largest potential reduction in education expenditure, followed by Nepal and Maldives, while Sri Lanka and Pakistan experience more modest reductions. These differences reflect not only variations in the pace and stage of demographic transition but also differences in initial spending levels and education system characteristics.

On the other hand, this fiscal space is not automatic. For instance, evidence from countries in Europe and Central Asia shows that declining student populations do not necessarily translate into lower spending, as policy responses such as school consolidation, teacher reallocation, and investments in transportation are often constrained by political, social, and geographic factors, leading to persistently high costs and underutilized infrastructure (Capita, 2012; Kuddo, 2009; Lumezi, 2019; Goble, 2010; AllahMorad, 2021; Li et al., 2019). In this sense, demographic change creates an opportunity—but not a guarantee—of improved education outcomes. Consistent with this, we discuss how the realization of this potential fiscal space depends on policy choices related to the organization of school networks, the allocation of teachers and other inputs, and the prioritization of cost-effective interventions to improve learning, drawing on both the existing literature and the institutional features of education systems in South Asia.

By bringing together demographic projections, education system characteristics, and cross-country evidence for all eight countries in the region, this paper contributes to a more systematic understanding of how demographic transitions can reshape education financing requirements across different institutional contexts, while highlighting the policy choices needed to translate these potential fiscal opportunities into improvements in access and learning. It complements largely country-specific evidence and provides a framework to assess how demographic change can support improvements in both coverage and learning. Crucially, realizing this potential requires active policy responses: without adjustments in school networks, teacher allocation, and resource management, demographic change alone is unlikely to generate effective fiscal space. By linking demographic dynamics with institutional constraints, the paper contributes to ongoing

debates on how to turn demographic opportunities into sustained gains in human capital.

The rest of the paper is organized as follows. Sections 2 and 3 provide background on demographic trends, socioeconomic conditions, and the education system in South Asia. Section 4 describes the methodological framework and data. Sections 5 to 7 present the results for different education levels and scenarios. Section 8 discusses policy challenges and lessons from international experience, and Section 9 concludes.

2. Demographic and socioeconomic context in South Asia

South Asia (hereafter SAR) is one of the most populated regions in the world, accounting for 23.7% of the global population. The region is highly heterogeneous, encompassing India—the world's most populous country, with approximately 1.4 billion inhabitants—as well as Pakistan and Bangladesh, which are among the ten most populous countries globally. At the same time, it includes much smaller countries such as Bhutan and Maldives, each with populations below one million (see column 1 of Table 1).

SAR is also one of the poorest regions globally. According to World Bank estimates for 2019, 814 million people in SAR lived on less than $3.65 a day, representing 43.7% of the world's poor.[1] The poverty rate in SAR was 46.4%, nearly double the global average of 24.1%. There is significant variation within the region: the poverty rate ranges from 47.5% in India, 43.4% in Bangladesh, and 41.1% in Pakistan, to a negligible 0.5% in Bhutan and 0.3% in Maldives (see column 2 of Table 1).[2] The region has experienced strong economic growth over the past decades, with an average annual GDP per capita growth rate of 3.9% from 1980 to 2019. Growth accelerated to 4.4% annually between 2002 and 2019. Despite a decline in GDP due to the COVID-19 pandemic, the economies have recovered, and the IMF projects that growth rates will continue at similar pre-pandemic levels. The last three columns of Table 1 show the variation in growth rates across countries.

[1] Own calculations based on Poverty and Inequality Platform of the World Bank. The figure raises to 1523 million when taking the $6.85 line, i.e., 41.9% of the total number of poor people in the world.

[2] Most SAR countries are classified as lower-middle-income countries (World Bank, 2022), with two notable exceptions: Afghanistan, a low-income country, and Maldives an upper-middle-income economy. The average GDP per capita in SAR was US$ 9,648 in 2022, ranging from US$ 1,804 in Afghanistan to US$ 28,510 in Maldives (see column 3 of Table 1). Data drawn from the IMF World Economic Outlook Database, released October 2023. Constant values; purchasing power parity; 2017 international dollars.

Demographic transition in SAR

Since 1950, the population of SAR has more than tripled, and it is projected to grow by 24% by 2050, reaching 2.38 billion (United Nations, 2022).[3] Beyond the changes in population size, SAR countries are experiencing a significant and rapid shift in the age composition of their populations. This demographic transition poses several challenges related to population aging but also offers opportunities. Among them is the potential to leverage the demographic dividend to reinvest in education and improve both access and quality.

Over recent decades, fertility rates have been decreasing in all SAR countries, though the timing and rate of decline vary. In the 1950s, SAR countries had a total fertility rate of more than six births per woman. Sri Lanka saw a rapid fertility decline starting in the 1960s, achieving replacement-level fertility (about 2.1 children per woman) between 1995 and 2000. India also began experiencing a fertility decline during the 1960s, but at a more gradual pace, reaching replacement levels only in recent years. Bangladesh witnessed a substantial and rapid decline in fertility rates starting in the late 1980s. Similarly, Bhutan, Maldives, and Nepal have shown comparable trends, with Maldives experiencing a swifter place of decline and Bhutan and Nepal a more gradual one. Currently, nearly all SAR countries have fertility rates around or below replacement levels, except for Pakistan and Afghanistan, where fertility rates remain higher at 3.5 and 4.6 children per woman, respectively.[4]

Due to the decline in fertility rates, the proportion of children and youth under the age of 17 has been decreasing in SAR over the last decades, as shown in Figure 1.a. In countries like Sri Lanka and India, this decline began in the mid-1960s, while in Bhutan, it started in the 1990s. In Afghanistan, the proportion of children only began to decrease around 2010. As of 2022, children under 17 represent about 25% of the population in Maldives, 28% in Bhutan and Sri Lanka, around 31% in Bangladesh and India, 35% in Nepal, 43% in Pakistan, and 50% in Afghanistan.

Figure 1.a also shows the United Nations projections for the proportion of children and youth aged 0 to 17 years over the coming decades. These projections indicate that the decreasing trend in the share of children and youth in the population of SAR countries will continue, providing a 'window of opportunity' for demographic dividends to enhance basic education (Bloom and Williamson, 1998; Bloom, Canning, and Sevilla, 2003). Specifically, the decline in school-age population will create an opportunity for reinvesting resources within the education sector to improve access and quality. Figure 1.b shows that this opportunity also exists in other regions of the world that are undergoing the demographic transition, such as Latin America and the

[3] Median probabilistic projections based on the probabilistic projections of total fertility and life expectancy at birth.

[4] See Navaneetham and Dharmalingam (2012) for a review of the age structural transition and demographic dividend in SAR.

Caribbean (LAC), and the Middle East and North Africa (MENA). This contrasts with regions that have already completed this transition, like ECA, North America (NA), and East Asia and the Pacific (EAP). Conversely, Africa faces a projected increase in the school-age population, which presents a challenge for public education expenditure (Bend et al., 2023).

3. Education in South Asia

Over the past decade, SAR has achieved high levels of school attendance. Nearly all children in the region have access to primary education, and secondary education is steadily increasing (Béteille et al., 2020). Table 2 presents current primary and secondary net enrollment rates across countries. In six out of the eight countries in the region—Bangladesh, Bhutan, India, Maldives, Nepal, and Sri Lanka—net enrollment rates at the primary level exceed 95%. These countries also exhibit high enrollment rates at the lower-secondary level, surpassing 80% and approaching near universality in Maldives, Nepal, and Sri Lanka. However, enrollment rates decline substantially at the upper secondary education. Bangladesh, Nepal, and Sri Lanka show the highest enrollment rates at this level, with rates of 80% or higher. Conversely, Pakistan and, more notably, Afghanistan still face significant challenges in achieving universal primary and secondary education, mainly due to low enrollment rates among girls.[5] Yet expanded participation has not consistently translated into stronger learning, and evidence from the region points to persistent and often widening disparities in foundational skills (Richards, 2023; Alcott and Rose, 2017).

Beyond primary and secondary education, SAR has also witnessed an increase in enrollment rates in both preprimary and tertiary education (Béteille et al., 2020). The average gross enrollment rate in preprimary education stands at 58%, with rates exceeding 80% in Maldives, Nepal, and Pakistan. The higher education system has also expanded considerably in SAR. For example, in India, 40.5 million students were enrolled in tertiary education in 2022, twice as many as in 2010. India now has the second-largest higher education system globally, following China with 53 million students, and surpassing the United States with 18 million. Currently, the gross enrollment rate in tertiary education averages 20% across SAR countries, peaking in Maldives (34%), followed by India (28%), Bangladesh (24%), and Sri Lanka (21%).

[5] Gender gaps in the enrollment of men and women are noticeable in Pakistan and Afghanistan. In Pakistan, the net enrollment rate of 73% in primary education, as shown in Table 2.2, breaks down to 68% for women and 78% for men. The 72% rate in lower secondary education breaks down to 65% for women and 79% for men, and the 51% rate in upper secondary education results in 46% for women and 55% for men. In Afghanistan, the net attendance rate in primary education is 40% for women and 54% for men, in lower secondary education it is 17% for women and 49% for men, and in upper secondary education, it is 8% for women and 35% for men.

A key factor contributing to the increase in enrollment rates in SAR is the growth of private education. SAR has the highest enrollment rate in non-state education among all regions, with approximately 32% of children attending various non-state institutions (Borkowski, Sunny, and Zapata, 2021). On average, 17% of primary-level students and 29% of secondary-level students are enrolled in private schools (see the last two columns of Table 2). Bangladesh, India, Nepal, and Pakistan exhibit the highest participation of private institutions in these two education levels within the region. At the same time, evidence from South Asia suggests that differences in learning outcomes cannot be understood solely in terms of whether schools are public or private, as accountability relationships and institutional context also matter in important ways (Shields et al., 2021).

The private sector has also played a crucial role in meeting the demand for preprimary and higher education in SAR. According to the latest data from the UNESCO Institute for Statistics (UIS), an average of 39% of children are enrolled in preprimary private institutions, with variations ranging from 76% in Sri Lanka to 19% in Bhutan (no data available for Afghanistan). In higher education, private institutions accommodate an average of 36% of students, ranging from 58% in India to 12% in Sri Lanka.[6]

Regarding education financing, SAR has witnessed significant growth in percentage terms, with per-student public spending on education increasing by 54% from 2013 to 2021 in constant 2021 US dollars (Bend et al., 2023). However, the proportion of public expenditure allocated to education in SAR countries remains relatively low compared to countries with similar income levels and a comparable share of the school-age population (Béteille et al., 2020). The Education 2030 Framework for Action (UNESCO, 2015) recommends that countries allocate a minimum of 4% to 6% of their GDP to education. On average, SAR countries allocate only 3.5% of their GDP to education, with nearly half of this directed towards the primary level. Bhutan (5.7%) and Maldives (4.2%) are the only countries in the region that surpass the 4% threshold.

Various strategies have been employed to distribute public funds to non-state actors involved in education, such as outsourcing auxiliary services, providing subsidies, implementing voucher programs, and forming public-private partnerships. These approaches typically involve government funding with private institutions serving as the implementing entities (Borkowski, Sunny, and Zapata, 2021). Additionally, private household spending on education in SAR is among the highest in the world.

[6] See Borkowski, Sunny, and Zapata (2021) for a description of the diversity of institutional arrangements that make up the non-state education provision in SAR.

4. Methodology and data

4.1. Decomposition

The outcome of interest throughout the analysis is public expenditure on education as a share of GDP, denoted by *g*. This aggregate can be decomposed into four distinct margins: how much a country spends per student relative to its income per capita, what share of students it finances publicly, what share of the school-age population is enrolled, and how large that school-age population is relative to the population as a whole. The first three margins capture, respectively, the generosity, public–private composition, and coverage of the education system, while the fourth reflects purely demographic forces. Any change in *g* must operate through one or more of these margins.

Formally, this decomposition can be written as:

$$\frac{G}{Y} = \frac{\left(\frac{G}{E_P}\right)}{\left(\frac{Y}{N}\right)} \cdot \frac{E_P}{E} \cdot \frac{E}{N_S} \cdot \frac{N_S}{N} \quad (1)$$

where G represents public expenditure on education, Y is the GDP, E_P is the total number of students attending public schools or subsidized private institutions, E is the total number of enrolled students, N_S is the number of school-age individuals, and N is the total population. [7]

The four factors in equation (1) correspond, respectively, to: (i) expenditure per student whose education is publicly subsidized (b) as a percentage of GDP per capita (y); (ii) the proportion of subsidized students (p); (iii) the gross enrollment rate (m), defined as the number of students as a percentage of the school-age population; and (iv) the proportion of school-age individuals in the total population (n). Letting $g = G/Y$, equation (2) restates the decomposition in the compact notation used throughout the paper.

$$g = (b/y).p.m.n \quad (2)$$

Equation (1) is an accounting identity: it holds by construction and imposes no behavioral restrictions. It is therefore silent on how the four components are determined and on how they interact. At the same time, this mechanical relationship allows the contribution of each component—and of demographic change in particular—to be isolated without additional assumptions. Decompositions of this type have a long tradition in the literature on demographic change and public spending (Miller, Mason, and Holz, 2011; Mason et al., 2022).

[7] This decomposition strongly relies on the methodology proposed by Marchionni and Vazquez (2019) for Latin American countries.

The gross enrollment rate (m) can also be expressed as the product of the net enrollment rate (the percentage of the school-age population attending school, $c=E_s/N_s$) and the overage ratio (the ratio between the total number of students and those whose age corresponds to the theoretical age for their level, $s=E/E_s$). In other words, $m=c.s$. Therefore, the gross enrollment rate in equation (2) serves as a summary measure of both the system net coverage (c) and the efficiency of educational trajectories (s), i.e., the extent to which students follow the expected age-grade progression. When $s = 1$, all students are enrolled at the theoretically appropriate age for their level. Values above 1 indicate inefficiencies due to overage enrollment, which may result from late school entry, grade repetition, or delayed progression.

Education expenditure is estimated separately by education levels: pre-primary, primary, secondary, and tertiary. For each educational level, we assume that the resource requirements depend on the level of education but not on the age of students within the same level. The total education expenditure is obtained by summing across the educational levels.

4.2. Constructing the scenarios

Because equation (2) holds in every year, it can be evaluated under alternative assumptions about its components. We use this property to construct scenarios for public education expenditure as a share of GDP over the next 30 years.[8] Each scenario is designed to isolate the effect of a specific factor—such as demographic change, improvements in enrollment, or shifts in efficiency—on projected education spending. By holding other factors constant, we can assess the individual contribution of each component to the fiscal space that could be created. The scenarios are not combined with one another. Combining them could offer a broader perspective, but it would make it difficult to disentangle the distinct influence of each factor, limiting the usefulness of the analysis for targeted policy design.

Furthermore, none of the scenarios incorporate adjustments related to teacher bargaining, school-network consolidation, or potential indirect effects of improved learning outcomes on enrollment behavior. The scenarios are meant to illustrate the potential fiscal space that could be generated with deliberate education policy actions, rather than automatic savings that would materialize in the absence of reform.

[8] There are multiple ways to analyze education expenditure, including expressing it as a share of government revenues or using public spending per pupil instead of the share of GDP. Each of these approaches provides valuable insights, but they also come with trade-offs. We focus on public education spending as a share of GDP because it is the most widely used metric for tracking spending trends in the education sector, allowing for comparability across countries and over time. However, this measure does not account for variations in government revenue constraints or per-student investment levels. Future research using alternative metrics could help deepen the understanding of the fiscal dynamics of education spending and its implications for access and quality.

We start by decomposing education expenditure in a base year t_0 or *status quo*, which, due to data availability issues discussed in the following section, is set in 2020. Thus, the projections cover the period from 2020 to 2050. Based on equation (2), we propose various exercises that differ in terms of the assumptions on the evolution of the different variables considered for the projections. In each scenario, there are three types of variables:

Fixed variables: These variables are kept at their status quo values and are labeled with a subscript 0 (e.g., p_0).

Trend variables: These variables are assumed to follow a certain trend or defined trajectory and are labeled with a superscript a (e.g., $n^a{}_t$ represents the projected value of variable n for year t). This group includes: variables moving according to external projections, such as UNESCO population projections for n, and variables set to attain specific policy goals, such as enrollment targets m. For simplicity, both types are labeled with a superscript a.

Outcome variables: These variables are determined by the other variables within the framework of equation (2) and are denoted with a superscript e (e.g., g^e).

4.3. Scenarios

We conduct the projections under four alternative scenarios.

Scenario 1: Demographic change only. In this first scenario, we assess how changes in the share of school-age individuals in the total population (n) affect the public resources allocated to education provision (g), while keeping all the other variables fixed at their status quo values. Equation (3) describes this exercise:

$$g_t^e = (b/y)_0 . p_0 . m_0 . n_t^a \qquad \text{Scenario (1)} \tag{3}$$

Although this scenario may not fully reflect real-world dynamics, as it assumes constant education system coverage and practices, it serves as a useful benchmark for comparing results across different scenarios. This scenario isolates the effects of demographic change alone, under the assumption that current education policies and practices remain unchanged in response to the demographic transition. In practice, shrinking student cohorts often raise unit costs (b/y) unless staffing levels and school infrastructure adjust; subsidy policies (p) are shaped by political pressures; and enrollment and repetition rates (m) tend to improve as class sizes decline.

Scenario 2: Changes in enrollment. This scenario simulates changes in gross enrollment rates (m) as the population structure changes. Equation (4) represents the estimation of g under this scenario:

(4) $$g_t^e = (b/y)_0 . p_0 . m_t^a \, . n_t^a$$ Scenario (2)

To set the trajectories for education coverage (*m)*, we establish target levels for 2050 and compute the linear trajectory needed to reach those levels. For pre-primary, primary, and secondary levels, the goal is to achieve universal net enrollment (c=1), and eradicate overage (s=1), which implies a convergence of gross enrollment rates (m) to 1. In contrast, since tertiary education is neither mandatory nor inherently a universally desirable goal, achieving universal enrollment at this level is not deemed necessary. Furthermore, due to the lack of clearly defined age limits for tertiary education enrollment, we refrain from establishing net enrollment targets. Instead, we set the current average level of gross coverage prevailing in upper-middle-income countries as the objective for SAR countries in 2050.

Scenario 3: Changes in benefits. In this third scenario, we assess the impact of changes in expenditure per student as a percentage of GDP per capita (b/y) combined with changes in the share of school-age individuals in the total population, while keeping the coverage rates fixed. This scenario is represented by equation (5):

(5) $$g_t^e = (b/y)_t^a . p_0 . m_0 \, . n_t^a$$ Scenario (3)

To simulate the trajectory of expenditure per student as a percentage of GDP per capita (b/y), we set the current average level in upper-middle-income countries as the target level for SAR countries and simulate a linear convergence to that level by 2050.

Scenario 4: Economic growth. In this last scenario, we assess the impact of increases in GDP per capita annual growth rates of 2% and 4%. In Scenario (4.1), it is assumed that expenditure on education per student (b) remains fixed with economic growth, while Scenario (4.2) assumes it evolves according to its income elasticity with respect to GDP per capita. Scenario (4.3) extends Scenario (4.2) by allowing increases in b to improve human capital (proxied by harmonized test scores) and the resulting gains in human capital to feed back into GDP per capita growth. The three scenarios are represented by equations (6), (7), and (8):

(6) $$g_t^e = (b_0 / \, y_t^a) \, . p_0 . m_0 \, . n_t^a$$ Scenario (4.1)

(7) $$g_t^e = (b_t^a / y_t^a) \, . p_0 . m_0 \, . n_t^a$$ Scenario (4.2)

(8) $$g_t^e = (b_t^a / y_t^e) \, . p_0 . m_0 \, . n_t^a$$ Scenario (4.3)

The income elasticities of expenditure per student are obtained from regressions with country fixed effects, estimated using data from the UNESCO Institute for Statistics (UIS) database, which includes a panel with annual information for over 170 countries since the 1970s. These elasticities of expenditure per student with respect to GDP per capita (η) for each educational level are reported in Table A1 in the Appendix. By combining these elasticities with projected GDP per capita growth rates (γ), assumed to be 0.02 or 0.04, we obtain the simulated trajectories for b. Formally,

$$y_t^a = y_0(1+\gamma)^t \quad (9)$$

$$b_t^a = b_0(1+\eta.\gamma)^t \quad (10)$$

In Scenario (4.3), increases in expenditure per student are allowed to feed back into economic growth through their effect on human capital:

$$y_t^e = y_{t-1}^e[1+\gamma+\lambda\Delta H_t] \quad (11)$$

where ΔH_t denotes the increase in human capital, measured by harmonized test scores in standard-deviation units, generated by the accumulated increase in b, with a four-year lag.[9] We use 0.07 standard deviations for a 10% increase in real expenditure per student, the median estimate reported by Handel and Hanushek (2023), and set $\lambda = 0.016$, the midpoint of the 1.2-2.0 percentage-point range reported by Hanushek and Woessmann (2012) for the increase in annual GDP per capita growth associated with a one-standard-deviation increase in cognitive skills. The resulting growth increment is added to γ, and y_t^e is updated recursively.[10]

To summarize the previous discussion, Table 3 provides details of the assumptions for each of the four scenarios.

The framework is applied separately to each country. All scenarios use country-specific inputs: the projected share of the school-age population (n), the initial gross enrollment rate (m), the share of students whose education is publicly financed (p), and per-student expenditure relative to GDP per capita (b/y). These inputs are reported for each country and education level

[9] Changes in expenditure per student are not assumed to affect human capital contemporaneously, since additional resources take time to translate into changes in educational inputs and student learning. The four-year lag aligns the simulation with the horizon used by Handel and Hanushek (2023) to make the estimates in their review comparable: they generally select effects measured four years after a policy change or the beginning of the study period and, when these are unavailable, use the longest available horizon of up to four years.

[10] Operationally, $y_{2020}^e = y_0$. For each educational level ℓ, the simulation sets $\Delta H_{\ell,t} = 0$ through 2024 and $\Delta H_{\ell,t} = 0.07\, ln(b_{\ell,t-4}^a/b_{\ell,0})/ln(1.10)$ thereafter. ΔH_t is the unweighted average across pre-primary, primary, secondary, and tertiary education.

in Sections 5 to 7. Each country therefore follows its own expenditure trajectory, even in the scenarios that set a common objective. In Scenarios (2) and (3), the 2050 targets are common by construction. These common targets are illustrative benchmarks rather than normative or optimal levels. That is what makes the comparison informative: it shows what a given education objective would require in countries that start from different demographic and education conditions. The linear convergence toward those targets is an illustrative path: the pace at which countries could move toward them depends on political and institutional conditions that the framework does not represent. Section 8 discusses those conditions.

These scenarios should be read as accounting calculations that isolate the demographic channel under explicit assumptions, rather than as forecasts of education spending. Because equation (2) is an identity, it imposes no behavioral relationship among its components, and the scenarios do not capture the dynamic interactions that a general-equilibrium framework would represent. For instance, higher and more effective education spending raises human capital, which in turn affects growth and the fiscal capacity available to finance education. Rising income and educational attainment also affect fertility and hence the size of future cohorts. Enrollment rates and per-student spending respond to the demographic transition itself: shrinking cohorts tend to raise unit costs when staffing levels and school networks do not adjust. These interactions are not incorporated into the framework, but we assess the sensitivity of the results to two of them in Scenario (4.3) and Appendix B. Scenario (4.3) allows higher per-student spending to raise human capital and, through it, economic growth. Appendix B allows enrollment rates and per-student spending in basic education to respond to the decline in the school-age population share.

4.4. Data

As a starting point, we conduct the decomposition of public education expenditure from equation (2) for the year 2020, which we take as the base year or status quo. For this decomposition, we use data from UIS for educational variables, including expenditures and enrollment.[11] Since 2020 was significantly impacted by the COVID-19 pandemic, we use data from 2019 for expenditures and enrollment rates, or from the most recent available year if 2019 data is not available. For population data, we use the 2022 Revision of the World Population Prospects (WPP) produced by the Population Division of the Department of Economic and Social Affairs of the United Nations (United Nations, 2022), which provides population statistics from 1950 to the present. This was the latest available version at the time this study was conducted. Table 4 provides the definitions for each variable

[11] We use international databases instead of relying on country-specific administrative data to facilitate cross-country comparisons.

in equation (2) and their sources, while Table A2 in the Appendix shows the years of data used for each variable in the status quo.

To determine the school-age population, we use the theoretical age ranges for starting and completing each educational level. The most common theoretical age ranges in the region are 3 to 4/5 years for pre-primary, 5/6 to 9/10 years for primary, and 10/11 to 16/17 years for secondary. However, there are differences across countries, as shown in Table 5. For higher education, where there are no clear age limits, we set an ad hoc age range of four years starting from 17/18 years, which is the theoretical age for completing secondary education.

Public education expenditures typically include financing of public education and public subsidies to private education. Due to lack of updated information on these components, we make two extreme assumptions to assess the robustness of the results: (i) all students are subsidized with public funds, either in public or private schools; therefore, $E_P=E$ in equation (1) and then p in equation (2) is equal to 1; and (ii) only students in public schools benefit from public spending in education, thus $p= p_u <1$, where p_u is the share of students in public schools. Assumption (i) provides a lower bound for b, as its base year value is obtained as a residual from the decomposition, while assumption (ii) provides an upper-bound for b.

For population projections, we use the 2022 Revision of the United Nations' WPP, which offers projections up to 2100 based on various assumptions about the evolution of fertility, mortality, and international migration. This was the latest available version at the time this study was conducted. The WPP includes nine alternative projection variants summarized in Table A3 in the Appendix. We use the *medium variant*, which represents the most plausible scenario with intermediate changes in fertility, normal declines in mortality, and standard migration movements.

The WPP's single-age population projections allow us to track the projected evolution of the age groups corresponding to each educational level (N_S) as well as the total population (N) in each country. Figure 2 illustrates the projected evolution of the school-age population's share in the total population (n^a) for the eight countries in SAR. The figure shows a gradual decline in the share of the school-age population over the next few decades, with significant heterogeneities across countries. For instance, in Bangladesh, Nepal, Bhutan, India, and Sri Lanka, the proportion of children and youth of primary or secondary school age was around 23% in 2020 (Figure 2). This level is projected to be reached by Afghanistan and Pakistan only by 2050 and is expected to decrease to around 16% by 2050, a level already reached by the Maldives in 2020.

5. Results for primary and secondary education

In this section, we focus on primary and secondary education, which have the bulk of students and have the most complete and reliable data. For simplicity, we refer to primary and secondary education as *basic education*. Although pre-primary education is often regarded as part of basic education, we analyze it separately in Section 6. Also, the analysis of tertiary education is deferred to Section 7.

5.1. Characterization of the status quo

Based on the information described in the previous section, we characterize the decomposition of education expenditure in the status quo using equation (2). Table 6 presents this decomposition for primary and secondary education in each country, along with regional mean values. These means are not weighted by population to avoid being skewed by India, which accounts for nearly 75% of the SAR population.

The average public expenditure on basic education is 2.7% of GDP, distributed as 1.5% for primary and 1.2% for secondary education. However, there is considerable heterogeneity across countries. For instance, total public spending in basic education as a share of GDP ranges from just 1.5% in Sri Lanka to 5.1% in Bhutan. Typically, spending is highest in primary education, except for India and Sri Lanka.

According to equation (2), public expenditure on education as a share of GDP (g) is the result of four factors: the proportion of the school-age population (n), the gross enrollment rates (m), the share of students financed with public funds (p), and per student public expenditure as a percentage of GDP per capita (b/y). For the decomposition in the base year, we have the following values:

Demographic term (n): On average, 23.5% of the SAR population is of school age and potentially users of the public education system. This varies depending on the stage in the demographic transition, from 30.9% in Afghanistan, a country in an early stage of the demographic transition, to 16.3% in Maldives, a country where the demographic transition is almost over.

Access to education (m): The mean gross enrollment rate for basic education in the region is 89.4%, ranging from 105.3% in Nepal to 67.1% in Pakistan. Primary school enrollment is nearly universal, often exceeding gross enrollment rates of 100% due to overage enrollment. Secondary school enrollment averages 75%, ranging from 44.9% in Pakistan to over 100% in Sri Lanka.

Public sector participation (p): Column 5 in Table 6 shows the share of students in public schools (pu). On average, 76% of students in the region attend public schools at the basic education level. This share ranges from over 90% in Afghanistan, Bhutan, Maldives, and Sri Lanka to just 33.5% in

Bangladesh. On average, participation of public schools in total enrollment is higher at the primary level (82.9%) than at the secondary level (71.2%).

Generosity of public spending (*b*/*y*): The degree of generosity of public spending per student as percentage of GDP per capita (*b*/*y*) depends on subsidies to private education. Assuming all students benefit from public expenditures, *b*/*y* averages 13% for the region for the two educational levels. If only public-school students benefit, *b*/*y* increases to 18%. The generosity of the fiscal effort in basic education is lowest in Sri Lanka (7.1% to 7.5%, depending on the assumption about *p*), and the highest in Bhutan (23.5% or 25.3%).[12]

To characterize the status quo in each country, we compare each term in equation (2) as a proportion of the (unweighted) regional mean. Table 7 shows these results for basic education. For instance, in Pakistan, public expenditure on basic education as a share of GDP is 72% of the regional mean. This is not due to the demographics, as *n* in Pakistan is 22% higher than the regional mean. Instead, it is due to a low enrollment rate (75% of the regional mean) and a low expenditure per student (78% to 85% of the regional mean, depending on *p*).

Based on the results in Table 7 for the rest of the countries, we conclude that Sri Lanka's low expenditure share (*g*) is due to low generosity per student (*b*/*y*). Instead, *g* is relatively high in Bhutan due to high (*b*/*y)*, and high in Nepal due to high enrollment – i.e., high (*m)*. Afghanistan's expenditure *(g)* is near the regional mean due to factors that compensate each other – a large school-age population (*n)* balanced by low (*b*/*y)* and (*m)*. Instead, in Maldives *g* is also not far from the regional mean but for different reasons – a low (*n)* offset by a high (*b*/*y)*. Finally, India's expenditure *(g)* is relatively low due to low values for (*n)*, (*m)* and (*p*).[13]

5.2. Scenario results

Table 8 presents a summary of the main results for primary and secondary education. The first column shows public expenditure as a share of GDP (*g*) in the base year, which are the same values presented in the first column of Table 6. Subsequent columns report projected changes in (*g*) between the base year and 2050 under alternative scenarios. For instance, the value of -0.6 in the second column for Afghanistan means that *g* would be 0.6 points lower in 2050 compared to 2020 (i.e., *g* would fall from 2.9% to 2.3%) under scenario 1, which assumes only demographic changes (*n*) occur. For scenario 3, the table includes results for two alternative assumptions about *p*. However, the projections under scenarios 1 and 2 are not affected by the assumption about

[12] In general, the assumption on *p* has a minor impact on the estimates for *b*/*y*. The only notable exceptions are observed in the case of India, where the estimates for b/y double when p decreases from 1 to p_u. Moreover, Bangladesh stands out, as the estimates for b/y in secondary education experience a substantial growth ranging from 7.2% to 117%.

[13] The results for Bangladesh are highly dependent on the assumptions for *p*.

p because both p and b/y remain constant in these scenarios. Therefore, the value of the product $(b/y)\times p$ is the same whether $p=1$ or $p=p_u$.

Scenario 1: Demographic change only

In the first scenario, we assess changes in fiscal effort in education (g) due to changes in the share of school-age individuals in the population (n), while holding other factors constant at their status quo values (equation 3). These provide projections that capture the effects of demographic trends alone under the assumption that current education policies and practices remain unchanged as a result of the demographic transition. The results, presented in column (1) of Table 8 for 2050 and Figure 3 for the dynamics over time, indicate that g decreases for all countries. With enrollment rates (m) and generosity per student (b/y) remaining constant, the demographic transition would reduce education spending from 2.7% of GDP in 2020 to 1.8% in 2050. As a result, by 2050, the region would have resources available for reinvestment equivalent to 0.9 GDP points on average. This illustrates the enormous opportunity that the demographic transition opens to reallocate funds within the education sector to improve enrollment rates and learning outcomes.[14]

The impact of demographic change with constant enrollment rates and "quality" varies significantly across countries, with Bhutan experiencing the largest decrease in education spending (-2.1) and Sri Lanka and Pakistan the smallest (-0.4 and -0.5, respectively). This variation is explained by differences in projected demographic trends and current b/y levels. As mentioned earlier, Bhutan is one of the most advanced countries in the region in terms of the demographic transition, but it still anticipates a significant decline in the share of the school-age population (n) over the next 30 years – see Figure 2. At the same time, Bhutan has the highest value of b/y in the region, so reducing the number of students in schools would result in significant opportunities to reallocate resources. In contrast, Sri Lanka is not expected to undergo such substantial changes in the share of school-age children in the future. Moreover, Sri Lanka has low values of b/y, so reducing the number of students at school would not translate into substantial reinvestment opportunities. This also explains the low values of reinvestment opportunities estimated for Pakistan. The impact of the demographic

[14] To assess how sensitive the projected savings are to potential adjustments in education policies and practices, we estimate the elasticities of coverage (m) and benefits per student (b/y) with respect to demographic changes (n) in basic education, and then allow those elasticities to operate in the projections. The estimated elasticities are obtained from regressions with country fixed effects using data from the World Population Prospects and the UNESCO Institute for Statistics (UIS), which provide a panel with annual information for over 170 countries since the 1970s. The results show that the headline saving of 0.9 GDP points is reduced to 0.6 if m is allowed to adjust according to the estimated elasticities, and to 0.3 if b/y adjusts. The details of this exercise are reported in Appendix B, while the following subsections present additional scenarios with alternative trajectories for b/y and m.

transition on *g* would also be mild in Afghanistan and Bangladesh due to low values of *b*/*y*, while the impact would be around the regional mean in India, Maldives, and Nepal.

Scenario 2: Changes in enrollment rate

This scenario examines if reinvesting the resources resulting from the demographic transition estimated in scenario 1 would be sufficient to reach the goals of universal net enrollment and eradication of overage (equation 4). These objectives together imply a convergence of gross enrollment rates (*m*) to 1 by 2050. Column (2) of Table 8 shows the resulting impact of these combined changes on *g* while Figure 4 displays the dynamics over time. On average, demographic changes in the region would allow reinvesting educational resources equivalent to 0.6 percentage points of GDP even after achieving universal enrollment in primary and secondary education. In other words, on average, and for most countries, leveraging the demographic dividend would be enough to finance an expansion of coverage to reach universal enrollment in primary and secondary, and still have additional resources – 0.6 percentage points of GDP on average – to improve educational quality.[15]

The results reveal substantial differences in the fiscal implications of pursuing the same education objective across countries. For example, Bhutan could achieve universal enrollment in primary and secondary education while still having potential fiscal space equivalent to approximately 2 percentage points of GDP. This reflects its relatively high initial enrollment rates and the substantial decline in the share of the school-age population. In contrast, Pakistan would need to increase public education expenditure by approximately 0.3 percentage points of GDP to achieve the same enrollment target by 2050, given its considerably lower initial enrollment rate (67.1 percent) and more gradual demographic transition. These contrasting results illustrate how differences in countries' demographic trajectories and education system characteristics translate into different financing requirements, even when the same policy benchmark is applied. They also point to distinct policy challenges: countries such as Bhutan may need to focus on adapting school networks and teacher allocation to declining enrollment while preserving or improving education quality, whereas countries such as Pakistan must continue prioritizing the expansion of access alongside improvements in efficiency. The feasibility of these adjustments, however, depends on institutional and policy factors that are not explicitly modeled in the scenarios.[16]

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[15] These results are similar to those obtained in the robustness exercise shown in Scenario b1 of Appendix B, where enrollment rates (*m*) are allowed to adjust endogenously to demographic changes according to the estimated elasticities.

[16] There is a twist in the results of column (2) worth mentioning. The goal in scenario 2 is to reach *m*=1 by attaining both universal net enrollment and eradication of overage. In countries such as Nepal and Sri Lanka overage is high so gross enrollment rates (*m*) are in

Scenario 3: Changes in per student expenditure

This scenario assesses how changes in expenditure per student as a percentage of GDP per capita (b/y) impact reinvestment opportunities within the education system through the demographic transition, while maintaining current gross enrollment rates (see equation 5). Expanding benefits or per student expenditure in terms of GDP per capita to the level of the upper-middle-income countries would require a substantial increase in resources. However, for some countries, the demographic transition would allow for the reallocation of a sufficient volume of resources within the education system. Column (3a) of Table 8 shows that, on average, g would decrease by 0.1 percentage points of GDP even after reaching the upper-middle-income countries' b/y goal, under the assumption of p=1.[17] [18]

Reinvesting resources from the demographic transition would be more than enough to finance the expansion of per pupil spending relative to GDP per capita (b/y) in Bhutan, India, Maldives, and Nepal – see Figure 5 for the dynamics over time.[19] In contrast, countries with a low initial b/y ratio, such as Afghanistan, Bangladesh, Pakistan and Sri Lanka, would still need significant additional resources to reach this ambitious target. For instance, even after reallocating resources from the demographic dividend, Sri Lanka would need to increase public education expenditure by 1.3 percentage points of GDP to achieve the goal of raising per-pupil spending relative to GDP per capita.

In general, the results are similar under the assumption that public spending in education only benefits students at public schools ($p=p_u$) – see column (3b) of Table 8 and Figure 6 for the dynamics over time.[20] On average, the resources generated by the demographic transition in the region would be more than enough to finance an expansion in benefits to reach the level of b/y of the upper-middle-income countries. In a few countries the difference between columns (3a) and (3b) is sizeable. The case of Bangladesh is helpful to illustrate these gaps. Bangladesh has a very low share of students in secondary level enrolled in public schools – just 6%. If we assume that public spending benefits all students regardless of the school type, the level of b/y would be low, and hence it would be very costly for Bangladesh to reach the

fact higher than 1. In those cases, reaching m=1 might actually imply a fall in the fiscal resources needed. That is in fact what happens when comparing column (2) and (1) for Nepal, although the changes are negligible.

[17] In contrast, Scenario b2 in Appendix B shows that if b/y adjusts to demographic change in the same way it has responded in the past, the available savings would amount to 0.3 GDP points.

[18] Using high-income-country benchmarks instead, the average change in g would be an increase of 0.2 percentage points of GDP under p=1 and approximately zero under $p=p_u$.

[19] In fact, the level of b/y in Bhutan is higher than in upper-middle-income countries, so this goal does not imply any additional fiscal effort.

[20] To simulate this scenario, the goal of reaching the value of b/y of upper-middle-income countries was modified to consider only spending aimed at public schools in those countries.

target of the upper-middle-income countries' per-student public expenditure – 0.6 percentage points of GDP according to the estimates in column (3a). Instead, if we assume that public spending benefits only students at public schools, then b/y would be high, and the goal set would be easier to attain. In fact, the additional resources generated by the demographic transition would be enough in Bangladesh to reach the goal – see column (3b).

Scenario 4: Economic growth

To enhance clarity in the presentation, we have thus far assumed no growth in GDP per capita. However, SAR countries did grow in the past and are expected to continue growing in the future. In this scenario, we work with two assumptions about economic growth. The first one assumes a rate of 4%, which is similar to the mean GDP per capita growth rate observed in previous decades. The second one assumes a more conservative rate of 2%. We consider three alternatives: (i) benefits (b) remain constant (equation 6); (ii) benefits adjust according to some estimated elasticities (equation 7); or (iii) benefits follow the same path as in (ii), while the resulting gains in human capital feed back into economic growth (equation 8). For simplicity, the six last columns of Table 8 show the results under the assumption of p=1 (see Figures 7, 8 and 9 for the dynamics over time).[21]

The combined effects of the demographic transition and economic growth result in significantly more resources available for reinvestment to improve educational outcomes. Assuming a fixed b, on average, g would decrease in the region by 1.7 percentage points of GDP in a scenario with a 2% growth rate and by 2.1 percentage points of GDP with a 4% growth rate. These resources could be used to enhance enrollment and accelerate learning.

Alternatively, if we assume that b responds to economic growth, the decrease in g would be smaller but still non-negligible. For instance, with a 4% growth rate, the average fall in g is 0.4 percentage points of GDP. Moreover, all countries are expected to experience a decrease in g, except for Afghanistan, where g would remain unchanged.[22]

Allowing increases in per-student spending to improve human capital and feed back into economic growth would further expand potential fiscal space (Scenario 4.3). With real expenditure per student following the same path as in Scenario (4.2), the additional growth would reduce expenditure as a share of GDP. The average decline in g would reach 0.8 and 0.7 percentage points of GDP under baseline growth rates of 2% and 4%, respectively, compared with 0.7 and 0.4 points without the feedback (Table 8 and Figure 9). The feedback would lower the expenditure-to-GDP ratio relative to Scenario (4.2) in all eight countries.

[21] Most results are similar under the assumption $p=p_u$. Results are available upon request.

[22] It is important to keep in mind that although the drop in g is smaller in this scenario, it is also a scenario where benefits (b) increase.

Tables 9 and 10 show the results for primary and secondary education separately. To facilitate the interpretation of these results, Figure 10 summarizes the contribution of the two educational levels to the changes in *g* for the regional mean. Given the greater weight of primary education in public spending, its relevance in the results for demographic and enrollment changes is higher. In contrast, secondary education is more relevant in simulations of changes in benefits. This is primarily because the goal of achieving upper-middle-income countries' *b*/*y* is further away from being met for secondary education.

Sensitivity to coverage and benefit responses

The scenarios discussed so far hold coverage and per-student spending either at their status quo values or on a predetermined path. In practice, both tend to rise as the school-age population share declines. Appendix B examines how the results change when each of them is allowed to respond to the projected decline in the school-age population share, using elasticities estimated from a panel of more than 170 countries with annual data since the 1970s (Table B1). When coverage responds, the regional average potential fiscal space under Scenario (1) falls by about one third; when per-student spending responds, it falls by about two thirds, to 0.3 percentage points of GDP (Table B2). The direction of the demographic effect is unchanged in all eight countries, and the ordering across countries is broadly preserved: Bhutan continues to show the largest potential fiscal space and Sri Lanka the smallest under both responses. Demographic change therefore relaxes the resource constraint throughout the region, but the size of the opportunity depends on how education systems absorb the decline in student numbers.

6. Results for pre-primary education

Before delving into the results, it is important to highlight two key points. First, there is a lack of available information regarding public expenditure on pre-primary education in Afghanistan, Bangladesh, and Sri Lanka, leading to their exclusion from this analysis. Second, as illustrated in Table 5, there is considerable variability in the mandatory age range for pre-primary education across countries. To ensure comparability, we have adopted a standardized age range of three years, counting backward from the last year of mandatory pre-primary education. Consequently, we utilize the 3-to-5 age range for Bhutan, India, and Maldives, and the 2-to-4 age range for Nepal and Pakistan.

6.1. Status quo

Table 11 characterizes the status quo (equation 2) for pre-primary education in SAR countries. The average regional public expenditure at this level stands

at 0.43 percentage points of GDP, ranging from a mere 0.09 percentage points of GDP in India to 0.80 percentage points of GDP in Maldives.

This significant variation in public spending at the pre-primary level does not seem to be driven by demographics (i.e., n in equation 2). For instance, the share of children aged 3 to 5 in India is 5.1% – just slightly below the regional average of 5.6% – despite being the country that allocates the least public resources to this educational level. On the other hand, in Maldives, one of the countries in the region more advanced in the demographic transition, the share of children aged 3 to 5 is 4.6%. However, it is the country that invests the most in pre-primary education.

There are also contrasts in access and coverage of pre-primary education (m). The mean pre-primary gross enrollment rate is 70.6%, with figures ranging from a modest 35.7% in Bhutan to 82.6% in Pakistan, and up to 86% in Maldives and Nepal.

Public education predominates in pre-primary education, similar to primary and secondary education levels. On average, across the five SAR countries in Table 11, 70% of students attend public institutions, while the remaining 30% are in private schools. The role of the private sector is less prominent in Bhutan and India – covering around 20% of the total students – whereas it constitutes between 35% and 39% in Maldives, Nepal, and Pakistan.

Public spending per student in terms of GDP per capita (b/y) hinges on assumptions regarding subsidies to private education. If all students benefit from public expenditures, regardless of the type of school they attend, b/y averages around 11.2% for the region, ranging from just 2.9% in India to 20.4% in Maldives. Conversely, if public spending exclusively benefits students at public institutions, b/y increases by almost 50%, on average. The impact of this assumption varies across countries, with the estimate for b/y multiplying from 1.24 times in Bhutan to 1.63 times in Pakistan.

Table 12 provides a breakdown of each term in equation (2) as a proportion of the (unweighted) mean for the entire region. The table suggests that g at the pre-primary level is particularly low in India, mostly due to very low generosity per student (b/y). In contrast, Maldives shows the highest g –82% above the regional average – due to both very high enrollment and generosity per student (b/y). Pakistan also exhibits relatively high g at the pre-primary level because of a high enrollment rate, a large share of children in the population, and close-to-average generosity of public spending at that level.

6.2. Scenario results

Table 13 provides an overview of the key findings from the simulations for the pre-primary level. Column (1) focuses on scenario 1 – i.e., demographic changes alone. Across the five countries in the table, the demographic transition is anticipated to reduce the resources necessary to sustain a pre-primary education system with current enrollment rates and per-student investment levels. On average, the demographic transition would allow for

reallocating resources within the education system amounting to 0.14 percentage points of GDP, spanning from a marginal 0.03 percentage points of GDP in India – characterized by very low spending per student– to more pronounced reallocation opportunities in Pakistan (0.16 percentage points of GDP) and Maldives (0.28 percentage points of GDP), where enrollment rates and spending per student in pre-primary education are relatively high.

In scenario 2, demographic changes are coupled with adjustments aimed at achieving a target of a 100% gross enrollment rate in pre-primary education by 2050. Column (2) of Table 13 illustrates the change on g associated to these combined modifications. While demographic changes contribute to facilitating the attainment of the enrollment target on average for the region, they prove insufficient for some countries. The simulation indicates an average decrease of 0.04 percentage points of GDP in g, with values peaking at 0.18 percentage points of GDP in Bhutan, which is a country considerably distant from the desired goal.

These results also illustrate how a common enrollment objective can imply very different challenges across countries. In Bhutan, where pre-primary gross enrollment is relatively low (35.7 percent), reaching universal coverage would require substantial expansion of education provision, even as demographic pressures ease. In contrast, countries such as Maldives and Nepal, where pre-primary enrollment already approaches 86 percent, face a smaller initial coverage gap, although challenges related to quality, resource allocation, and adaptation to demographic change remain. Differences in the starting points of education systems, therefore, matter not only for the fiscal resources required to achieve common targets, but also for the types of policy adjustments needed to pursue them.

Setting the objective of aligning benefits per student in pre-primary education with the levels of upper-middle-income countries is an ambitious aspiration for SAR countries. The target for 2050 is 18% higher than the current average b/y for these five countries assuming p=1, or 46% higher if $p=p_u$. Column (3a) shows that, assuming p=1, the surplus resources generated by the demographic transition would more than adequately fund the expansion of b/y only in Bhutan and Maldives. Similar results are observed when considering the scenario where public spending in education exclusively benefits students at public schools ($p=p_u$), as shown in Column (3b).[23]

Finally, the combined impact of demographic transition and economic growth results in significantly more resources available for reinvestment to improve pre-primary education outcomes. On average for the region, if b remains fixed, g would decrease by 0.27 (0.34) percentage points of GDP in the scenario of a 2% (4%) growth rate. Alternatively, if we consider that b responds to economic growth, the decrease in g would be smaller but still present: 0.11

[23] Using high-income-country benchmarks instead, the average change in g would be an increase of 0.01 percentage points of GDP under p=1 and 0.07 points under $p=p_u$.

(0.08) percentage points of GDP without the human-capital growth feedback and 0.14 (0.13) points with it, under the 2% (4%) baseline growth assumption.

7. Results for tertiary education

This section focuses on the analysis of the tertiary education level. The considerable heterogeneities across countries are magnified at the tertiary level of education. SAR countries substantially differ in enrollment at that level, the role of the private sector in service provision, and the size of public education spending. In addition, information gaps are more serious than at other levels, and thus conclusions should be drawn more cautiously.

7.1. Status quo

Table 14 presents the status quo (equation 2) for tertiary education in each country. The average public expenditure on this level in the region is 0.50 percentage points of GDP, with significant variation across countries. For instance, Pakistan spends just 0.14 percentage points of GDP in tertiary public education, while India allocated 1.33 percentage points of GDP. This enormous gap does not seem to be driven by demographics (n). On average, 7.5% of the region's population is of tertiary education age, with most countries aligning closely with this figure.[24] Notable exceptions include Sri Lanka (6.1%) and Maldives (5.4%), where the more advanced stages of the demographic transition results in a smaller proportion of youth in the tertiary education age range.

Differences in access to tertiary education (m) across countries are quite large. The average gross enrollment rate is 19.8%, ranging from 9.7% in Afghanistan to 34.1% in Maldives. Bangladesh (24%) and India (28.6%) are also countries with enrollment rates well above the regional average.

Although public education is still dominant, the share of students in public institutions is the lowest among all educational levels (64.2%). Around 36% of tertiary students attend private institutions. The role of the private sector is minimal in Sri Lanka and Pakistan, whereas it represents half of the enrollment in Afghanistan and Maldives and 58% in India. Public spending in education per student in terms of GDP per capita (b/y) depends on the assumption about subsidies to private education. If we assume that all students benefit from public expenditures, irrespective of the type of school they attend, b/y would be around 35% on average, with values ranging from 13.4% in Pakistan to 63.5% in India. Conversely, if only public students benefit, b/y nearly doubles on average. The impact of the assumption on p is particularly large in India, where the estimate for b/y is multiplied by 2.4 when assuming $p = p_u$.

[24] See Table 3.3 for the official age of entrance and completion of the tertiary level in each country.

Table 15 shows each term in equation (2) as a proportion of the (unweighted) mean for the region. The table suggests that g at the tertiary level is particularly low in Pakistan due to both very low enrollment and generosity per student (b/y). The opposite occurs in India, a country with high enrollment rates (relative to the region) and very generous public spending per student.

7.2. Scenario results

Table 16 presents a summary of the main results of the simulations. The results for scenario 1 (only demographic changes) show that the demographic transition would reduce the demand for public funds, maintaining current enrollment rates and spending per student. On average, the demographic transition would allow for reallocating resources within the education system amounting to 0.14 percentage points of GDP, ranging from 0.02 percentage points of GDP in Pakistan, a country with low enrollment and low spending per student, to 0.39 percentage points of GDP in India, a country with relatively high enrollment rate and spending per student in tertiary education.

Scenario 2 incorporates demographic changes and a target to reach a 45% gross enrollment rate by 2050, which is the current average in upper-middle-income countries. Column (2) of Table 16 shows that demographic changes alone would not suffice to reach this target in most countries. On average, g would need to increase by 0.37 percentage points of GDP to reach this goal, with Afghanistan needing an increase of 1.60 percentage points of GDP, as the country is currently very far from this target.[25]

The fiscal implications of expanding tertiary education are particularly sensitive to differences in countries' initial conditions. For example, Afghanistan starts from a gross tertiary enrollment rate of less than 10 percent, compared with approximately 34 percent in Maldives and 29 percent in India. Consequently, moving toward a common enrollment benchmark represents a substantially larger expansion of coverage for countries starting from lower enrollment levels. At the same time, differences in the role of private institutions and in public expenditure per student further shape the fiscal resources required. These variations suggest that the policy challenges associated with expanding tertiary education are unlikely to be uniform across the region. While the scenarios provide a common basis for comparing financing requirements, they do not capture differences in countries' institutional capacity or the feasibility and pace of expanding tertiary provision.

On average, SAR countries currently have levels of per-student benefit as a percentage of GDP per capita that are 1% lower than in upper-middle-income countries assuming p=1 (27% higher if we assume p= p_u). Bangladesh and

[25] Using the high-income-country gross enrollment target of 65% instead, the average increase in g would be 0.76 percentage points of GDP, with Afghanistan requiring an increase of 2.54 points.

Pakistan would still need additional resources to reach this goal, even after taking advantage of the demographic transition. Column (3a) shows that, under the assumption of p=1, reinvesting resources from the demographic transition would allow an expansion in b/y in most countries. The results are similar under the assumption that public spending in education only benefits students in public schools ($p = p_u$) – see column (3b).[26]

Finally, the combined effect of the demographic transition and economic growth would further increase reinvestment opportunities. Assuming that b remains fixed, g would, on average decrease by 0.3 percentage points of GDP in the scenario of 2% growth rate (and by 0.39 percentage points of GDP in the scenario of 4% growth rate). The decrease in g would be slightly smaller if we assume that b responds to economic growth: 0.29 (0.37) percentage points of GDP without the human-capital growth feedback and 0.30 (0.39) points with it, under the 2% (4%) baseline growth assumption.

8. Policy challenges and lessons from international experience

The scenarios presented in Sections 5–7 quantify how demographic change could affect public education expenditure requirements under alternative assumptions about enrollment and per-student spending. These estimates identify potential fiscal space rather than resources that would automatically become available as school-age populations decline. For primary and secondary education, the results suggest that demographic change alone could reduce expenditure requirements by approximately 0.9 percentage points of GDP on average, while around 0.6 percentage points could remain available under a scenario that also achieves universal enrollment. Translating this potential fiscal space into actual resources that governments can reallocate requires education systems to adjust their organization and allocation of inputs as student populations change. Whether these resources subsequently contribute to better educational outcomes depends on how they are invested. Two sets of policy choices are therefore particularly relevant: first, adjustments in school networks, teacher deployment, and resource management that could help realize potential efficiency gains; and second, the allocation of available resources toward interventions that effectively improve access and learning. The following discussion draws on international experience to examine these opportunities and the institutional constraints that may affect their realization.

However, international experience shows that realizing this potential is far from automatic. Evidence from countries in Europe and Central Asia—regions that have already undergone similar demographic transitions—illustrates the challenges of adapting education systems to declining student

[26] Using high-income-country benchmarks instead, the average change in g would be a decrease of 0.10 percentage points of GDP under p=1 and 0.09 points under $p=p_u$.

populations. A central constraint is the presence of fixed costs in school networks, staffing, and infrastructure, which do not adjust proportionally to falling enrollment. As a result, shrinking cohorts do not necessarily translate into lower spending or improved efficiency.

Country experiences point to a range of policy responses, as well as the obstacles they face. School consolidation has been a common strategy to reduce underutilized capacity and improve efficiency, but its implementation is often politically and socially contested, as schools serve as key community institutions. The case of Moldova illustrates the costs of delayed adjustment: despite a decline of more than 40 percent in primary school enrollment, the school network remained largely unchanged, and education spending rose to nearly 10 percent of GDP (Capita, 2012). Similarly, in Armenia, falling enrollment initially led to overstaffing, requiring subsequent large-scale teacher rationalization efforts to restore efficiency (Kuddo, 2009).

Other experiences highlight how political, institutional, and geographic factors can hinder adjustment. In Kosovo, school expansion continued despite declining enrollment, reflecting political incentives in education planning (Lumezi, 2019). In Bosnia and Herzegovina, ethnic divisions have limited school consolidation, while in Kazakhstan, geographic constraints make it difficult to close small rural schools despite very low utilization (Goble, 2010; AllahMorad, 2021). In response, some countries have introduced complementary policies—such as transportation systems and boarding facilities—to facilitate consolidation, though progress has often been gradual (Kuddo, 2009; Li et al., 2019).

Taken together, these experiences underscore that demographic change creates an opportunity—but not a guarantee—of improved education outcomes. Realizing this potential requires active policy responses that align education systems with changing demographic conditions. In particular, governments need to adjust school networks, rationalize teacher allocation, and adopt flexible staffing policies that respond to declining enrollment. Complementary investments in student transportation and infrastructure are critical to ensure that efficiency gains do not come at the cost of reduced access, especially in rural and remote areas.

The implications of these experiences for South Asia are likely to differ considerably across countries, given their different stages of demographic transition and education system characteristics. In countries such as Bhutan, where declining school-age populations create relatively large potential fiscal space and basic education enrollment is already high, a key challenge may be to adjust school networks, teacher deployment, and resource allocation as student populations decline, while preserving access and improving learning outcomes. In contrast, countries such as Pakistan and Afghanistan, where demographic pressures remain greater and significant enrollment gaps persist, will continue to face substantial demands for expanding education provision. In these settings, demographic change may help ease future fiscal pressures but is unlikely to eliminate the need for additional investments in

access and quality. The role of non-state education provision introduces further differences. In Bangladesh, for example, the substantial participation of private institutions in secondary education means that the implications of demographic change for public expenditure also depend on how public financing and subsidies are distributed across providers. These examples underscore that, although the scenarios provide a common framework for comparing potential fiscal implications, translating demographic opportunities into effective fiscal space requires country-specific policy responses. Political, institutional, and geographic constraints may affect the feasibility and pace of these adjustments, but are not explicitly captured in the quantitative framework.

For South Asia, these lessons point to the importance of a forward-looking approach to education policy. Beyond improving efficiency in the use of resources, a key challenge is to address how education spending is allocated. In many countries in the region, public education budgets are heavily concentrated in infrastructure and teacher salaries, leaving limited room for investments in interventions with higher returns in terms of learning outcomes (Béteille et al., 2020). As a result, even when additional fiscal space becomes available, its impact will depend critically on how resources are reallocated within the system. Evidence from recent research highlights the importance of shifting spending toward cost-effective interventions that directly target learning, such as structured pedagogy programs, teacher training and support, and interventions that align instruction with students' learning levels (Angrist et al., 2025). In this context, if the potential fiscal space identified by the scenarios can be realized, directing these resources toward cost-effective interventions to improve learning could help translate demographic opportunities into better educational outcomes. However, the effectiveness of such investments depends on policy design and implementation, and the resulting improvements in learning are not directly estimated by the quantitative framework presented in this paper.

9. Conclusions

This paper has examined how demographic change may reshape education spending in South Asia and the extent to which it can create fiscal space for improving education outcomes. Using a decomposition framework applied to eight countries in the region, we have shown that declining school-age populations can generate substantial potential resources. Holding enrollment rates and per-student spending constant, demographic change alone would reduce public education spending by close to one percentage point of GDP on average. Even under a scenario of universal enrollment, additional resources of around 0.6 percentage points of GDP could become available. These magnitudes are accounting calculations rather than forecasts of education spending: they measure the resources that demographic change could free up under explicit assumptions about the remaining components. Relaxing those

assumptions moves the estimates in both directions. Allowing enrollment rates and per-student spending to respond to the demographic transition reduces the resources released by demographic change alone by between one third and two thirds. In the scenarios with economic growth, by contrast, allowing higher spending per student to raise human capital adds to the fiscal space that would otherwise be generated. In both exercises, potential fiscal space remains in all eight countries.

At the same time, the analysis has highlighted that this fiscal space is not automatic. As illustrated by international experience, declining student populations do not necessarily translate into lower costs when education systems face rigidities in school networks, staffing, and resource allocation. Without deliberate policy adjustments, efficiency gains may remain limited and potential resources may not be realized.

These findings underscore the central role of policy in shaping the impact of demographic change. Realizing the potential gains from the demographic transition requires aligning education systems with changing population dynamics and ensuring that any resulting fiscal space is effectively reinvested to improve both coverage and learning outcomes. More broadly, the paper has shown that demographic change creates an opportunity to strengthen human capital—but that turning this opportunity into sustained gains depends critically on institutional and policy responses.

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Tables and figures

Table 1: Basic indicators by country – population, poverty, GDP and growth rates.

				Growth rates		
	Population	Poverty	P/c GDP	1980-2019	2002-2019	2022-2028
Afghanistan	38,972,231	N/A	1,804	N/A	3.1%	N/A
Bangladesh	167,420,951	43.4	6,751	3.3%	5.0%	5.8%
Bhutan	772,506	0.5	11,196	5.7%	5.7%	3.2%
India	1,396,387,127	47.5	7,112	4.4%	6.0%	5.4%
Maldives	514,438	0.3	28,510	4.7%	4.9%	4.3%
Nepal	29,348,628	40.8	4,054	3.0%	3.9%	3.0%
Pakistan	227,196,741	41.1	5,670	2.3%	2.2%	1.3%
Sri Lanka	21,715,080	11.8	12,083	4.2%	4.7%	N/A
Mean (unweighted)		26.5	9,648	3.9%	4.4%	3.8%
Total	1,882,327,702	46.4				

Notes: GDP measured in constant values, purchasing power parity, 2017 international dollars.
Sources: population drawn from United Nations Population Division; poverty corresponds to the headcount ratio reported in the Poverty and Inequality Platform of the World Bank using the poverty line of $3.65 a day; GDP per capita drawn from the IMF World Economic Outlook Database, released October 2023; annual growth rates are computed from GDP per capita from the same source.

Table 2: Descriptive statistics of primary and secondary education.

	Net enrollment rate			Share of students in private schools	
	primary	lower secondary	upper secondary	primary	secondary
Afghanistan	47%	33%	20%	7%	4%
Bangladesh	100%	82%	79%	24%	94%
Bhutan	94%	85%	67%	4%	10%
India	99%	87%	56%	44%	52%
Maldives	98%	96%	55%	4%	5%
Nepal	96%	96%	81%	17%	24%
Pakistan	73%	72%	51%	34%	34%
Sri Lanka	97%	97%	86%	3%	7%
Mean (unweighted)	88%	81%	62%	17%	29%

Note: The net enrollment rate is the total number of students of the official age group for a given level of education who are enrolled in any level of education, expressed as a percentage of the corresponding population. The data corresponds to 2023 or the last year available.
Sources: UNESCO Institute of Statistics (UIS). For all countries, except Afghanistan, net enrollment rates come from UIS, based on school register or school census for data on enrollment by age and UNPD population estimates for school-age population. The data corresponds to 2023 or the most recent year available. For Afghanistan, UIS reports net attendance rates based on household survey data for 2022.

Table 3. Scenarios for education expenditure projections 2020-2050.

	Scenario 1: Demographic changes (equation 3)	Scenario 2: Changes in coverage (equation 4)	Scenario 3: Changes in benefits (equation 5)	Scenario 4: Economic growth		
				4,1 (equation 6)	**4,2** (equation 7)	**4,3** (equation 8)
Public expenditure on education/GDP (*g*)	outcome	outcome	outcome	outcome	outcome	outcome
Expenditure per student / GDP per capita (*b* /*y*)	fixed	fixed	Objective: Achieve the levels of upper-middle-income countries	b remains fixed while per capita GDP grows at an annual rate of 2% or 4%	Per capita GDP grows at an annual rate of 2% or 4%, while b grows according to its income elasticity	Baseline GDP per capita grows at an annual rate of 2% or 4%, b evolves according to its income elasticity and feeds back into GDP growth through its effect on human capital
Share of students financed with public funds (*p*)	fixed	fixed	fixed	fixed	fixed	fixed
Gross enrollment rate (*m*)	fixed	Objective for basic education: 100% net enrollment & zero overage. For tertiary education: m of upper-middle-income countries	fixed	fixed	fixed	fixed
Proportion of school-age population (*n*)	projected	projected	projected	projected	projected	projected

Notes: (1) "Fixed" refers to the base year. (2) In Scenario 2, the gross enrollment rate (m) adjusts linearly until it reaches the target value in 2050. (3) In Scenario 3, for countries where benefits per student under the status quo are higher than the corresponding average for upper-middle-income countries, expenditure per student at that educational level is assumed to remain fixed. (4) In Scenario 4.2, GDP per capita is assumed to grow at an annual rate of either 2% or 4%, and b at each educational level responds to this growth according to its income elasticity. The income elasticities are estimated by regressing the logarithm of benefits per student at each educational level on the logarithm of GDP per capita, using a country-year panel from UIS-UNESCO and controlling for country fixed effects (see Table A1). (5) In Scenario 4.3, baseline GDP per capita is assumed to grow at an annual rate of either 2% or 4%, and b at each educational level responds to this growth according to its income elasticity. The accumulated increase in b affects harmonized test scores with a four-year lag, based on the median estimate reported by Handel and Hanushek (2023). The improvement in harmonized test scores then feeds back into GDP per capita growth using the midpoint of the range of estimates reported by Hanushek and Woessmann (2012). The resulting growth increment is added to the

baseline growth rate and used to update GDP per capita recursively. (6) Projections of the school-age population as a percentage of the total population are based on the United Nations Population Division's World Population Prospects, Revision 2022

Table 4. Definitions and data sources of the variables used.

Variable	Source	Definition
Public expenditure on education/GDP (*g*)	UNESCO Institute for Statistics	Total expenditure (current, capital, and transfers) of the general government (local, regional, and central) on education, expressed as a percentage of GDP.
Expenditure per student / GDP per capita (*b*/*y*)	UNESCO Institute for Statistics	Total expenditure (current and capital) of the general government (local, regional, and central) on a given educational level excluding international transfers to the government for education, divided by the number of enrolled students in that educational level, and then expressed as a percentage of GDP per capita.
Share of students financed with public funds (p)	UNESCO Institute for Statistics and assumptions (see text)	Proportion of students financed with public expenditure based on the participation of the private sector in enrollment by educational level, and assumptions (see text)
Gross enrollment rate (*m*)	UNESCO Institute for Statistics	Number of enrolled students in a given level of education, regardless of age, expressed as a percentage of the official population of corresponding school age for the same level of education.
Proportion of school-age population (*n*)	World Population Prospects: The 2022 revision, United Nations Population Division	The participation of the theoretical school-age population for each educational level (Pe) in the total population of the country (P), both estimated for the year 2020. The estimates of Pe are derived from the population estimates by single ages from WPP, considering the theoretical age ranges applicable in each country. For tertiary education, the age group of 4 years starting from the theoretical age of completing secondary education is considered.

Table 5. Official age of entrance and completion of each educational level in SAR countries.

Country	Pre-primary		Primary		Secondary		Tertiary	
	entrance	completion	entrance	completion	entrance	completion	entrance	completion*
Afghanistan	6	6	7	12	13	18	19	22
Bangladesh	3	5	6	10	11	17	18	21
Bhutan	4	5	6	12	13	18	19	22
India	3	5	6	10	11	17	18	21
Maldives	3	5	6	12	13	17	18	21
Nepal	3	4	5	9	10	16	17	20
Pakistan	3	4	5	9	10	16	17	20
Sri Lanka	3	4	5	9	10	17	18	21

Source: UNESCO Institute for Statistics (UIS), based on official entrance age and theoretical duration of each level in 2022.
Note: * An ad hoc age range of 4 years is set starting from the theoretical age of completion of the secondary level, assuming that degree programs have a duration of 4 years.

Table 6. Characterization of the base year or status quo (circa 2020). Primary and secondary education levels.

Country	Educational level	Public expenditure on education/GDP (*g*)	Expenditure per student / GDP per capita (*b*/*y*)		Share of students in public schools (pu)	Gross enrollment rate (*m*)	Proportion of school-age population (*n*)
			Case 1: p=1	Case 2: p=pu			
Afghanistan	Total	2.89%	11.3%	12.0%	94.0%	82.4%	30.9%
	Primary	1.92%	11.1%	11.9%	92.7%	106.7%	16.2%
	Secondary	0.97%	11.9%	12.4%	95.5%	55.4%	14.7%
Bangladesh	Total	1.68%	8.3%	24.8%	33.5%	89.8%	22.5%
	Primary	0.97%	9.4%	12.4%	76.1%	116.5%	8.8%
	Secondary	0.71%	7.2%	117.5%	6.1%	72.6%	13.7%
Bhutan	Total	5.07%	23.5%	25.3%	92.8%	95.0%	22.7%
	Primary	2.81%	24.2%	25.3%	95.8%	99.5%	11.7%
	Secondary	2.26%	22.7%	25.3%	89.7%	90.1%	11.0%
India	Total	2.47%	13.8%	26.7%	51.4%	83.2%	21.6%
	Primary	0.94%	11.0%	19.6%	56.2%	96.8%	8.8%
	Secondary	1.53%	16.2%	33.8%	48.1%	73.8%	12.7%
Maldives	Total	2.84%	18.9%	19.8%	95.9%	91.9%	16.3%
	Primary	2.02%	20.1%	20.8%	96.5%	98.0%	10.3%
	Secondary	0.82%	16.6%	17.5%	94.8%	81.3%	6.0%
Nepal	Total	3.08%	11.9%	15.1%	79.1%	105.3%	24.5%
	Primary	1.59%	11.3%	13.5%	83.4%	142.1%	9.9%
	Secondary	1.49%	12.7%	16.7%	76.2%	80.2%	14.5%
Pakistan	Total	1.99%	10.3%	15.6%	66.1%	67.1%	28.7%
	Primary	1.26%	10.4%	15.8%	65.7%	95.5%	12.6%
	Secondary	0.73%	10.1%	15.2%	66.4%	44.9%	16.1%
Sri Lanka	Total	1.50%	7.1%	7.5%	94.3%	100.3%	21.1%
	Primary	0.59%	7.4%	7.7%	96.8%	100.2%	8.0%
	Secondary	0.91%	6.9%	7.4%	92.7%	100.3%	13.2%
South Asia	Total	2.69%	13.1%	18.4%	75.9%	89.4%	23.5%
(unweighted means)	Primary	1.51%	13.1%	15.9%	82.9%	106.9%	10.8%
	Secondary	1.18%	13.1%	30.7%	71.2%	74.8%	12.7%

Source: UNESCO Institute for Statistics (UIS), except for the proportion of school-age population, which are the 2020 estimates obtained from the World Population Prospects-2022 revision using the school ages in Table 3, and the Gross Enrollment Rate in pre-primary and tertiary, which are extracted from WDI (ultimate source: UNESCO).

Notes: (1) The expenditure per student / GDP per capita is obtained as $g/p.m.n$ to ensure an exact decomposition, but its values are very similar to those published by UIS in most of the cases. (2) The gross enrollment rate for total basic education is obtained as the sum across primary and secondary of the product of the gross enrollment rates and the corresponding total school age population, divided by the sum of the school-age population across these 3 levels, according to the data published by WPP. (3) The public expenditure on education/GDP for total basic education is obtained as the sum of the respective expenditures in the primary and secondary levels. (4) Gross enrollment rates and public expenditure on education/GDP correspond to the last available data.

Table 7: Decomposition of *g*. Normalized values of components in decomposition of equation (2). Primary and secondary education levels.

		b/y		p			
	g	p=1	p=pu	p=1	p=pu	m	n
Afghanistan	1.04	0.86	0.66	1.00	1.24	0.92	1.31
Bangladesh	0.61	0.63	1.35	1.00	0.44	1.00	0.96
Bhutan	1.83	1.79	1.38	1.00	1.22	1.06	0.96
India	0.89	1.05	1.46	1.00	0.68	0.93	0.92
Maldives	1.03	1.44	1.08	1.00	1.26	1.03	0.69
Nepal	1.11	0.91	0.82	1.00	1.04	1.18	1.04
Pakistan	0.72	0.78	0.85	1.00	0.87	0.75	1.22
Sri Lanka	0.54	0.54	0.41	1.00	1.24	1.12	0.90

Source: own calculations based on Table 6. Note: each column other than the first shows one component of the right-hand side of equation (2) (b/y, p, m, and n) for each country, divided by the unweighted mean of that component across the countries in the region. The first column reports the product of those four ratios under the assumption p=1.

Table 8: Expected change in public expenditure on basic education/GDP (*g*) between 2020 and 2050 under different scenarios.

Country	Public expenditure in education/GDP	Projected changes in g between 2020 and 2050									
		Only demographic changes	Changes in enrollment	Changes in benefits		Economic growth					
				Case 1: p=1	Case 2: p=pu	rate 2% b fixed	rate 4% b fixed	rate 2% b variable	rate 4% b variable	rate 2% b variable + feedback	rate 4% b variable + feedback
	Baseline value	(1)	(2)	(3a)	(3b)	(4.1a)	(4.1b)	(4.2a)	(4.2b)	(4.3a)	(4.3b)
Afghanistan	2.9	-0.6	-0.1	0.4	0.7	-1.6	-2.2	-0.3	0.0	-0.5	-0.4
Bangladesh	1.7	-0.6	-0.5	0.6	-0.3	-1.1	-1.3	-0.4	-0.3	-0.5	-0.5
Bhutan	5.1	-2.1	-2.0	-2.1	-2.1	-3.4	-4.2	-1.7	-1.3	-2.0	-1.8
India	2.5	-0.8	-0.4	-0.3	-0.8	-1.5	-1.9	-0.6	-0.4	-0.7	-0.7
Maldives	2.8	-1.0	-0.9	-1.0	-0.9	-1.8	-2.3	-0.8	-0.5	-0.9	-0.8
Nepal	3.1	-1.0	-1.1	-0.2	-0.4	-2.0	-2.5	-0.8	-0.5	-1.0	-0.9
Pakistan	2.0	-0.5	0.3	0.5	-0.1	-1.2	-1.5	-0.3	-0.1	-0.4	-0.3
Sri Lanka	1.5	-0.4	-0.4	1.3	1.6	-0.9	-1.2	-0.3	-0.1	-0.3	-0.3
SAR mean	2.7	-0.9	-0.6	-0.1	-0.3	-1.7	-2.1	-0.7	-0.4	-0.8	-0.7

Note: The table shows the difference between the projected public expenditure on education/GDP in primary and secondary education in 2050 and the value in the status quo (circa 2020) under scenarios 1 to 4 described in the document.

Table 9: Expected change in public expenditure on primary education/GDP (*g*) between 2020 and 2050 under different scenarios.

Country	Public expenditure in education/GDP	Projected changes in g between 2020 and 2050									
		Only demographic changes	Changes in enrollment	Changes in benefits		Economic growth					
				Case 1: p=1	Case 2: p=pu	rate 2% b fixed	rate 4% b fixed	rate 2% b variable	rate 4% b variable	rate 2% b variable + feedback	rate 4% b variable + feedback
	Baseline value	(1)	(2)	(3a)	(3b)	(4.1a)	(4.1b)	(4.2a)	(4.2b)	(4.3a)	(4.3b)
Afghanistan	1.9	-0.5	-0.6	0.2	0.3	-1.1	-1.5	-0.2	0.1	-0.3	-0.2
Bangladesh	1.0	-0.3	-0.4	0.1	0.0	-0.6	-0.8	-0.2	-0.1	-0.3	-0.2
Bhutan	2.8	-1.1	-1.1	-1.1	-1.1	-1.9	-2.3	-0.9	-0.6	-1.0	-0.9
India	0.9	-0.3	-0.3	0.0	-0.3	-0.6	-0.7	-0.2	-0.1	-0.2	-0.2
Maldives	2.0	-0.8	-0.8	-0.8	-0.8	-1.3	-1.6	-0.6	-0.3	-0.7	-0.6
Nepal	1.6	-0.5	-0.8	-0.1	-0.2	-1.0	-1.3	-0.4	-0.2	-0.4	-0.3
Pakistan	1.3	-0.3	-0.3	0.1	-0.2	-0.8	-1.0	-0.2	0.0	-0.3	-0.2
Sri Lanka	0.6	-0.2	-0.2	0.3	0.4	-0.4	-0.5	-0.1	0.0	-0.1	-0.1
SAR mean	1.5	-0.5	-0.6	-0.2	-0.2	-1.0	-1.2	-0.3	-0.1	-0.4	-0.3

Note: The table shows the difference between the projected public expenditure on education/GDP in primary education in 2050 and the value in the status quo (circa 2020) under scenarios 1 to 4 described in the document.

Table 10: Expected change in public expenditure on secondary education/GDP (*g*) between 2020 and 2050 under different scenarios.

Country	Public expenditure in education/GDP	Projected changes in g between 2020 and 2050									
		Only demographic changes	Changes in enrollment	Changes in benefits		Economic growth					
				Case 1: p=1	Case 2: p=pu	rate 2% b fixed	rate 4% b fixed	rate 2% b variable	rate 4% b variable	rate 2% b variable + feedback	rate 4% b variable + feedback
	Baseline value	(1)	(2)	(3a)	(3b)	(4.1a)	(4.1b)	(4.2a)	(4.2b)	(4.3a)	(4.3b)
Afghanistan	1.0	-0.2	0.4	0.3	0.4	-0.5	-0.7	-0.1	-0.1	-0.2	-0.2
Bangladesh	0.7	-0.3	-0.1	0.5	-0.3	-0.5	-0.6	-0.2	-0.2	-0.3	-0.3
Bhutan	2.3	-1.0	-0.8	-1.0	-1.0	-1.5	-1.9	-0.9	-0.8	-1.0	-1.0
India	1.5	-0.5	-0.1	-0.3	-0.5	-0.9	-1.2	-0.4	-0.3	-0.5	-0.5
Maldives	0.8	-0.3	-0.1	-0.2	-0.1	-0.5	-0.6	-0.2	-0.2	-0.3	-0.3
Nepal	1.5	-0.5	-0.3	-0.1	-0.2	-0.9	-1.2	-0.4	-0.4	-0.5	-0.5
Pakistan	0.7	-0.2	0.6	0.3	0.1	-0.4	-0.6	-0.1	-0.1	-0.2	-0.2
Sri Lanka	0.9	-0.2	-0.2	1.0	1.2	-0.5	-0.7	-0.2	-0.1	-0.2	-0.2
SAR mean	1.2	-0.4	-0.1	0.1	-0.0	-0.7	-0.9	-0.3	-0.3	-0.4	-0.4

Note: The table shows the difference between the projected public expenditure on education/GDP in secondary education in 2050 and the value in the status quo (circa 2020) under scenarios 1 to 4 described in the document.

Table 11. Characterization of the base year or status quo (circa 2020). Pre-primary level.

Country	Public expenditure on education/GDP (*g*)	Expenditure per student / GDP per capita (*b*/*y*)		Share of students in public schools (pu)	Gross enrollment rate (*m*)	Proportion of school-age population (*n*)
		Case 1: p=1	Case 2: p=pu			
Bhutan	0,25%	15,8%	19,6%	80,7%	35,7%	4,4%
India	0,09%	2,9%	3,7%	78,3%	62,8%	5,1%
Maldives	0,80%	20,4%	31,8%	64,2%	86,0%	4,6%
Nepal	0,41%	7,9%	12,1%	65,6%	86,0%	6,0%
Pakistan	0,57%	9,1%	14,8%	61,4%	82,6%	7,7%
South Asia	0,43%	11,2%	16,4%	70,0%	70,6%	5,6%

Source: UNESCO Institute for Statistics (UIS), except for the proportion of school-age population, which is based on the 2020 estimates obtained from the World Population Prospects-2022 revision using the 3-to-5 age range for Bhutan, India, and Maldives, and the 2-to-4 age range for Nepal and Pakistan, and the Gross Enrollment Rate, which are extracted from WDI (ultimate source: UNESCO).
Notes: (1) The expenditure per student / GDP per capita is obtained as $g/p.m.n$ to ensure an exact decomposition, but its values are very similar to those published by UIS in most of the cases. (2) Gross enrollment rates and public expenditure on education/GDP correspond to the last available data.

Table 12: Decomposition of *g*. Normalized values of components in decomposition of equation (2). Pre-primary level.

	g	b/y		p		m	n
		p=1	p=pu	p=1	p=pu		
Bhutan	0,57	1,41	1,20	1,00	1,15	0,51	0,80
India	0,21	0,26	0,22	1,00	1,12	0,89	0,92
Maldives	1,82	1,82	1,94	1,00	0,92	1,22	0,82
Nepal	0,93	0,71	0,74	1,00	0,94	1,22	1,08
Pakistan	1,31	0,81	0,90	1,00	0,88	1,17	1,38

Source: own calculations based on Table 11. Note: each column other than the first shows one component of the right-hand side of equation (2) (b/y, p, m, and n) for each country, divided by the unweighted mean of that component across the countries in the region. The first column reports the product of those four ratios under the assumption p=1.

Table 13: Expected change in public expenditure on pre-primary education/GDP (*g*) between 2020 and 2050 under different scenarios.

Country	Public expenditure in education/GDP	Projected changes in g between 2020 and 2050									
		Only demographic changes	Changes in enrollment	Changes in benefits		Economic growth					
				Case 1: p=1	Case 2: p=pu	rate 2% b fixed	rate 4% b fixed	rate 2% b variable	rate 4% b variable	rate 2% b variable + feedback	rate 4% b variable + feedback
	Baseline value	(1)	(2)	(3a)	(3b)	(4.1a)	(4.1b)	(4.2a)	(4.2b)	(4.3a)	(4.3b)
Bhutan	0.25	-0.10	0.18	-0.10	-0.06	-0.17	-0.20	-0.08	-0.06	-0.09	-0.09
India	0.09	-0.03	0.01	0.20	0.32	-0.06	-0.07	-0.02	-0.02	-0.03	-0.03
Maldives	0.80	-0.28	-0.20	-0.28	-0.28	-0.52	-0.64	-0.23	-0.18	-0.27	-0.26
Nepal	0.41	-0.14	-0.10	0.04	0.12	-0.26	-0.33	-0.12	-0.09	-0.14	-0.13
Pakistan	0.57	-0.16	-0.07	0.03	0.09	-0.35	-0.45	-0.12	-0.08	-0.15	-0.14
SAR mean	0.43	-0.14	-0.04	-0.02	0.04	-0.27	-0.34	-0.11	-0.08	-0.14	-0.13

Note: The table shows the difference between the projected public expenditure on education/GDP in pre-primary education in 2050 and the value in the status quo (circa 2020) under scenarios 1 to 4 described in the document.

Table 14. Characterization of the base year or status quo (circa 2020). Tertiary level.

Country	Public expenditure on education/GDP (*g*)	Expenditure per student / GDP per capita (*b*/*y*)		Share of students in public schools (pu)	Gross enrollment rate (*m*)	Proportion of school-age population (*n*)
		Case 1: p=1	Case 2: p=pu			
Afghanistan	0.50%	61.5%	122.5%	50.2%	9.7%	8.5%
Bangladesh	0.39%	20.4%	31.8%	64.2%	24.0%	7.9%
Bhutan	0.36%	30.5%	40.3%	75.7%	15.6%	7.5%
India	1.33%	63.5%	150.5%	42.2%	28.6%	7.3%
Maldives	0.57%	30.8%	60.8%	50.7%	34.1%	5.4%
Nepal	0.32%	27.2%	42.9%	63.5%	13.3%	8.8%
Pakistan	0.14%	13.4%	17.0%	79.3%	12.2%	8.4%
Sri Lanka	0.41%	32.1%	36.4%	88.1%	21.1%	6.1%
South Asia	0.50%	34.9%	62.8%	64.2%	19.8%	7.5%

Source: UNESCO Institute for Statistics (UIS), except for the proportion of school-age population, which is based on the 2020 estimates obtained from the World Population Prospects-2022 revision using the school ages in Table 5, and the Gross Enrollment Rate, which are extracted from WDI (ultimate source: UNESCO). Notes: (1) The expenditure per student / GDP per capita is obtained as $g/p.m.n$ to ensure an exact decomposition, but its values are very similar to those published by UIS in most of the cases. (2) Gross enrollment rates and public expenditure on education/GDP correspond to the last available data.

Table 15: Decomposition of *g*. Normalized values of components in decomposition of equation (2). Tertiary level.

		b/y		p			
	g	p=1	p=pu	p=1	p=pu	m	n
Afghanistan	0.97	1.76	1.95	1.00	0.78	0.49	1.13
Bangladesh	0.75	0.58	0.51	1.00	1.00	1.21	1.06
Bhutan	0.69	0.87	0.64	1.00	1.18	0.79	1.00
India	2.57	1.82	2.40	1.00	0.66	1.44	0.98
Maldives	1.10	0.88	0.97	1.00	0.79	1.72	0.73
Nepal	0.61	0.78	0.68	1.00	0.99	0.67	1.17
Pakistan	0.27	0.38	0.27	1.00	1.23	0.62	1.12
Sri Lanka	0.79	0.92	0.58	1.00	1.37	1.07	0.81

Source: own calculations based on Table 14. Note: each column other than the first shows one component of the right-hand side of equation (2) (b/y, p, m, and n) for each country, divided by the unweighted mean of that component across the countries in the region. The first column reports the product of those four ratios under the assumption p=1.

Table 16: Expected change in public expenditure on tertiary education/GDP (*g*) between 2020 and 2050 under different scenarios.

Country	Public expenditure in education/GDP	Projected changes in g between 2020 and 2050									
		Only demographic changes	Changes in enrollment	Changes in benefits		Economic growth					
				Case 1: p=1	Case 2: p=pu	rate 2% b fixed	rate 4% b fixed	rate 2% b variable	rate 4% b variable	rate 2% b variable + feedback	rate 4% b variable + feedback
	Baseline value	(1)	(2)	(3a)	(3b)	(4.1a)	(4.1b)	(4.2a)	(4.2b)	(4.3a)	(4.3b)
Afghanistan	0.50	-0.05	1.60	-0.05	-0.05	-0.25	-0.36	-0.23	-0.34	-0.25	-0.36
Bangladesh	0.39	-0.13	0.10	0.06	0.01	-0.25	-0.31	-0.23	-0.29	-0.24	-0.31
Bhutan	0.36	-0.15	0.24	-0.12	-0.10	-0.24	-0.29	-0.23	-0.28	-0.24	-0.29
India	1.33	-0.39	0.15	-0.39	-0.39	-0.81	-1.04	-0.76	-0.99	-0.80	-1.03
Maldives	0.57	-0.20	-0.08	-0.15	-0.20	-0.37	-0.46	-0.35	-0.44	-0.36	-0.45
Nepal	0.32	-0.11	0.38	-0.05	-0.08	-0.20	-0.26	-0.19	-0.24	-0.20	-0.25
Pakistan	0.14	-0.02	0.29	0.16	0.20	-0.07	-0.10	-0.07	-0.10	-0.07	-0.10
Sri Lanka	0.41	-0.08	0.30	-0.05	0.04	-0.23	-0.31	-0.21	-0.29	-0.23	-0.31
SAR mean	0.50	-0.14	0.37	-0.07	-0.07	-0.30	-0.39	-0.29	-0.37	-0.30	-0.39

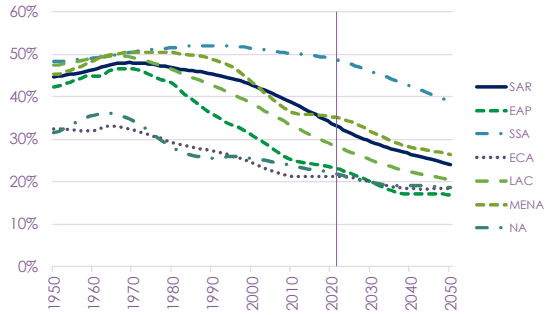
Note: The table shows the difference between the projected public expenditure on education/GDP in tertiary education in 2050 and the value in the status quo (circa 2020) under scenarios 1 to 4 described in the document.

Figure 1. Share of children and youth (0-17 years) in the population, 1950-2050.

a. South Asian countries



b. World regions

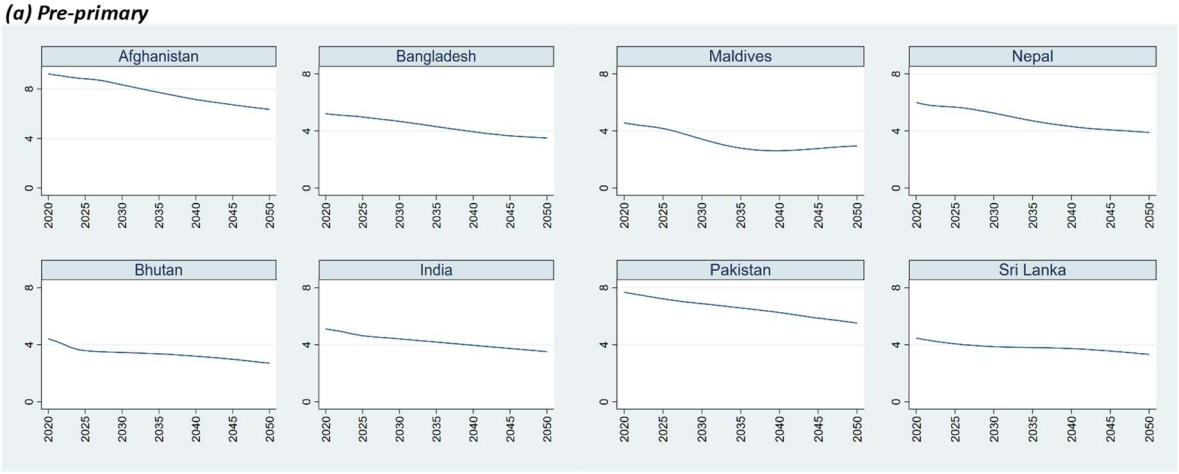


Source: Own elaboration based on United Nations, Department of Economic and Social Affairs, Population Division (2022). World Population Prospects: The 2022 Revision.

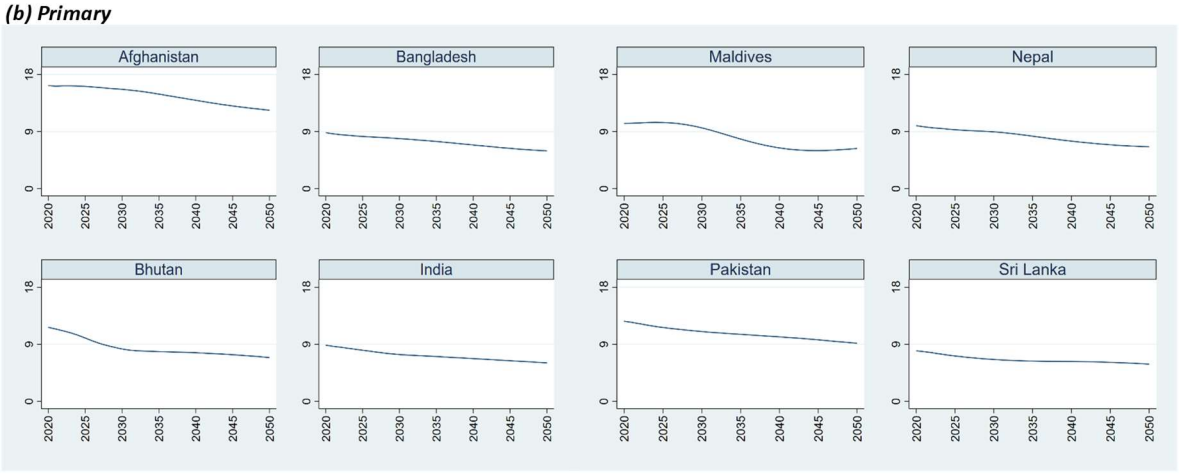
Note: 2020-2050 projected values correspond to the Medium variant.

Figure 2. Projected evolution in the percentage of the population in age of attending the different education levels according to the medium variant.

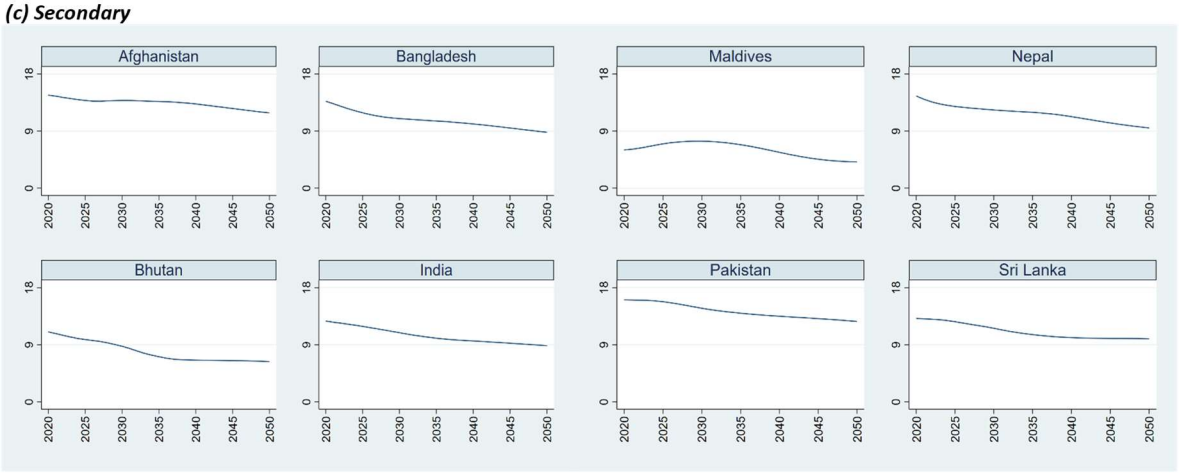
(a) Pre-primary



(b) Primary



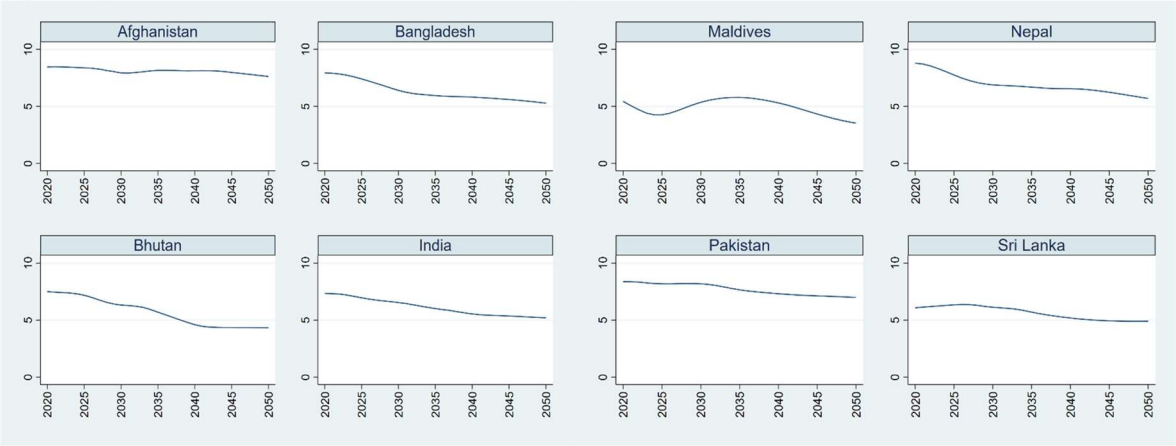
(c) Secondary



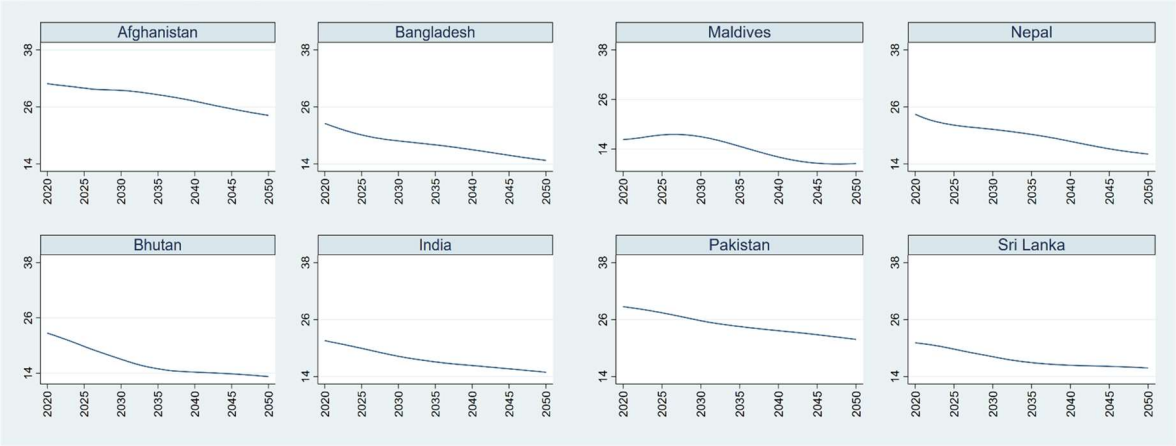
Source: own elaboration based on WPP- 2022 revision- and official school-ages in Table 3.
Note: projections from 2022 according to the medium variant.

Figure 2. Projected evolution in the percentage of the population in age of attending the different education levels according to the medium variant (cont.).

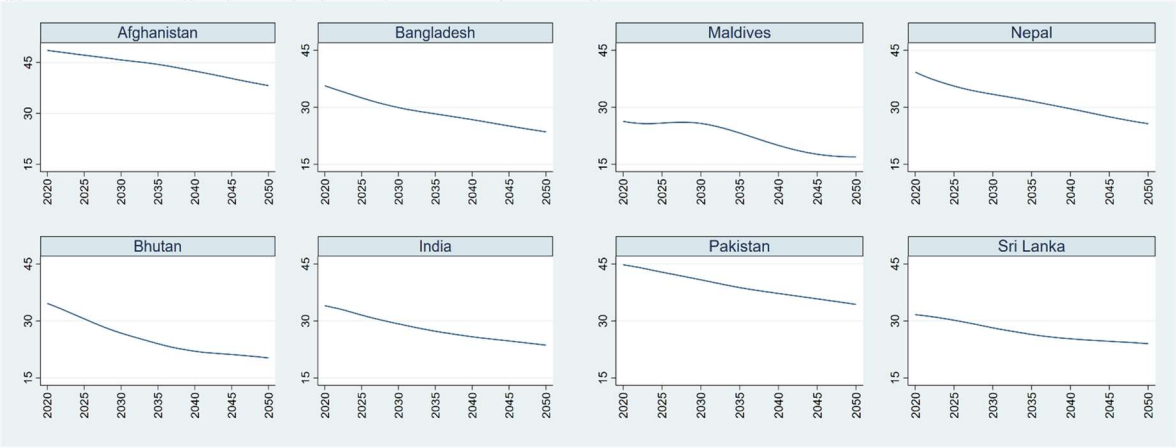
(d) Tertiary



(e) Basic education (primary + secondary)

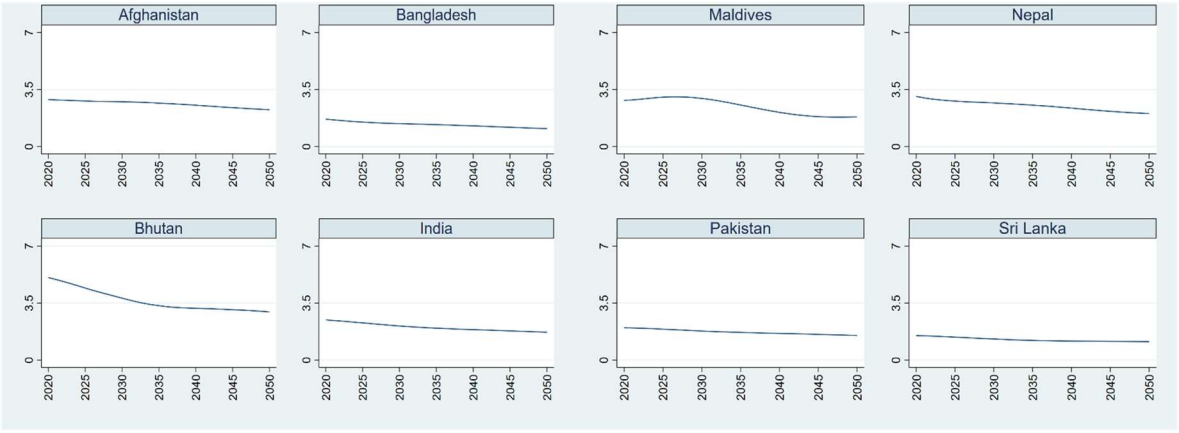


(f) Total education (pre-primary + primary + secondary + tertiary)



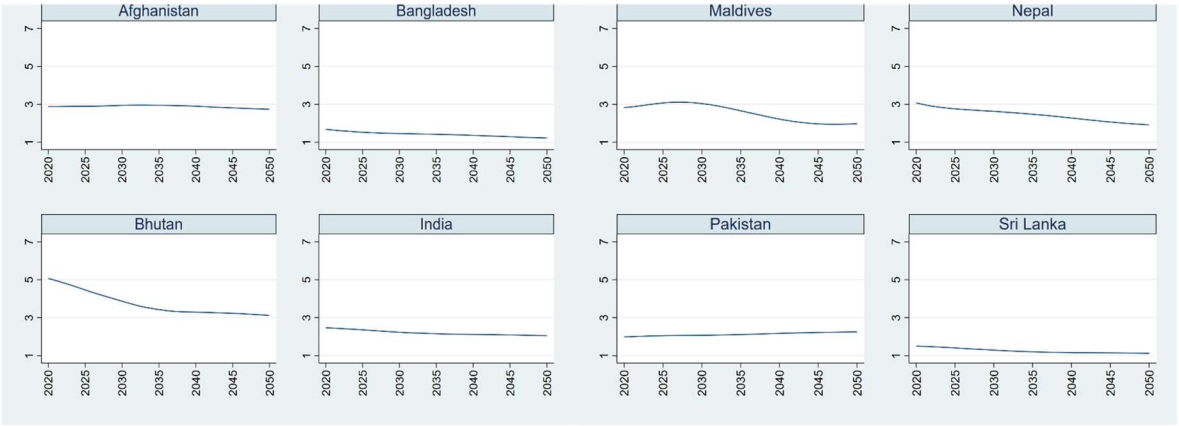
Source: own elaboration based on WPP- 2022 revision- and official school-ages in Table 3.
Note: projections from 2022 according to the medium variant.

Figure 3. Projected evolution in public expenditure on education/GDP for basic education in scenario 1



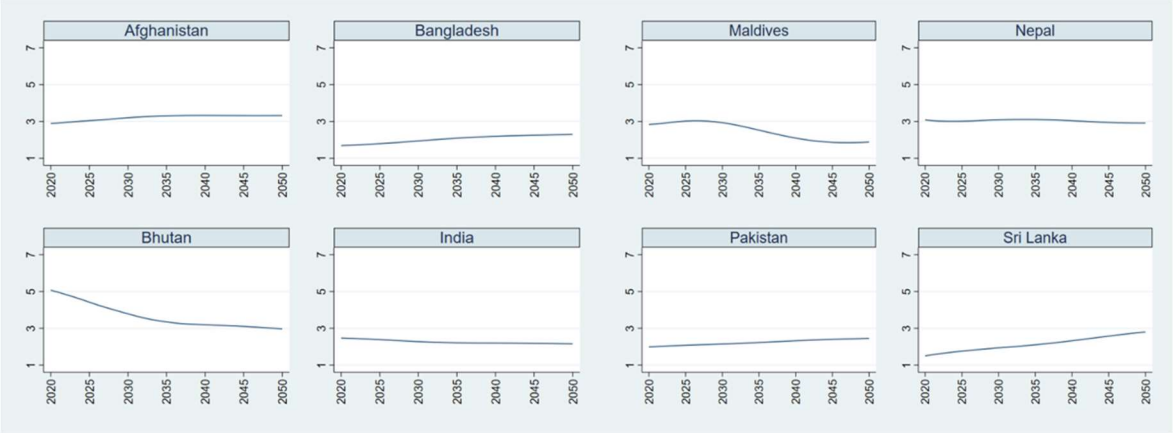
Source: own elaboration based on equation 1 and the status quo values from Table 6.
Note: The Figure shows the dynamics of projected public expenditure on education/GDP in primary and secondary education from 2020 through 2050 under scenario 1.

Figure 4. Projected evolution in public expenditure on education/GDP for basic education in scenario 2



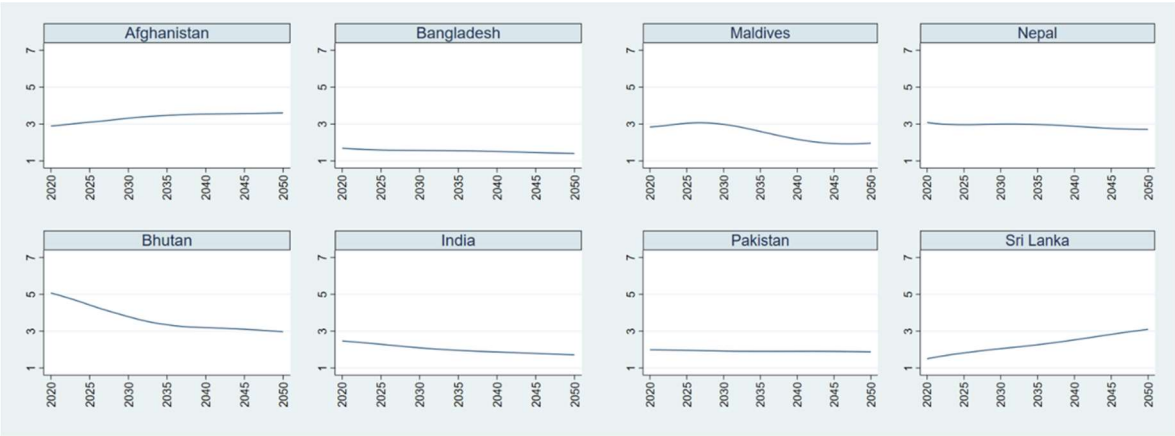
Source: own elaboration based on equation 4 and the status quo values from Table 6.
Note: The Figure shows the dynamics of projected public expenditure on education/GDP in primary and secondary education from 2020 through 2050 under scenario 2.

Figure 5. Projected evolution in public expenditure on education/GDP for basic education in scenario 3a



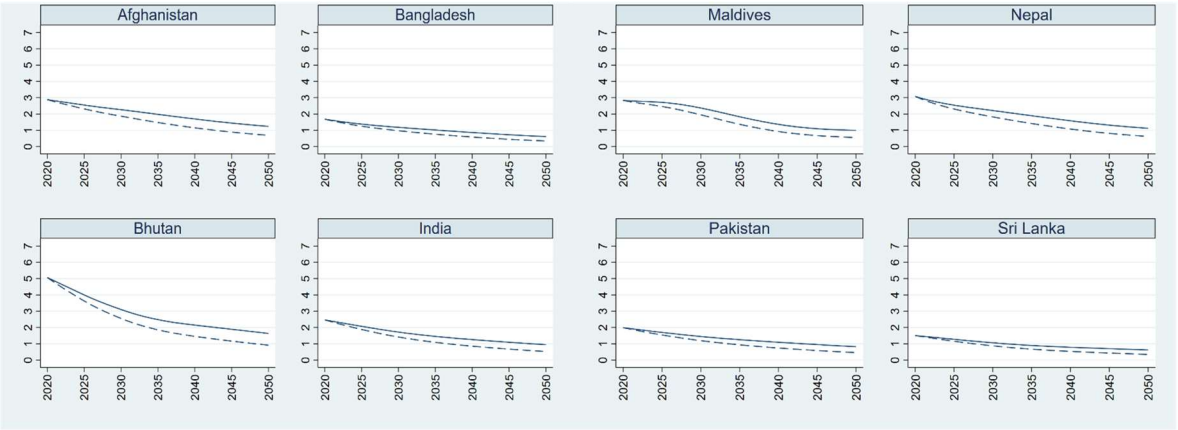
Source: own elaboration based on equation 5 and the status quo values from Table 6.
Note: The Figure shows the dynamics of projected public expenditure on education/GDP in primary and secondary education from 2020 through 2050 under scenario 3a.

Figure 6. Projected evolution in public expenditure on education/GDP for basic education in scenario 3b



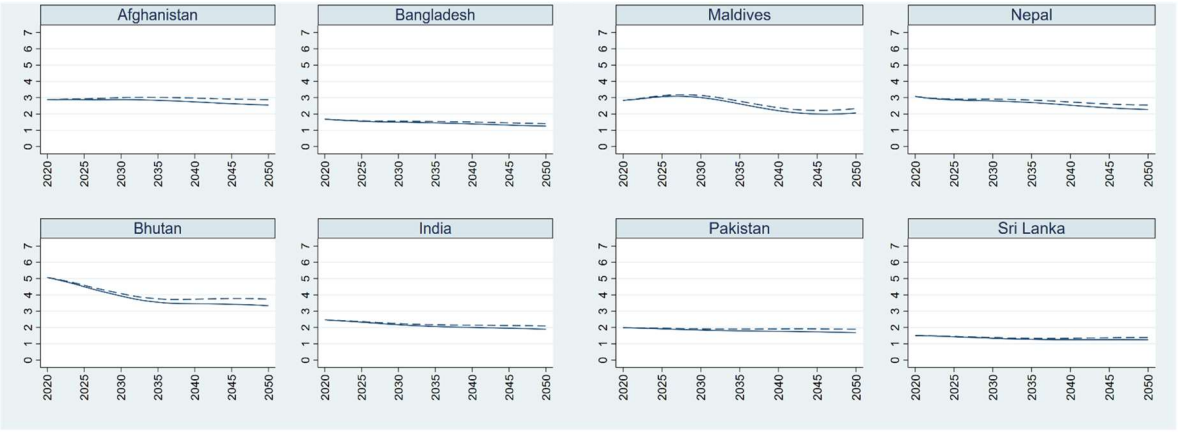
Source: own elaboration based on equation 5 and the status quo values from Table 6.
Note: The Figure shows the dynamics of projected public expenditure on education/GDP in primary and secondary education from 2020 through 2050 under scenario 3b.

Figure 7. Projected evolution in public expenditure on education/GDP for basic education in scenario 4.1



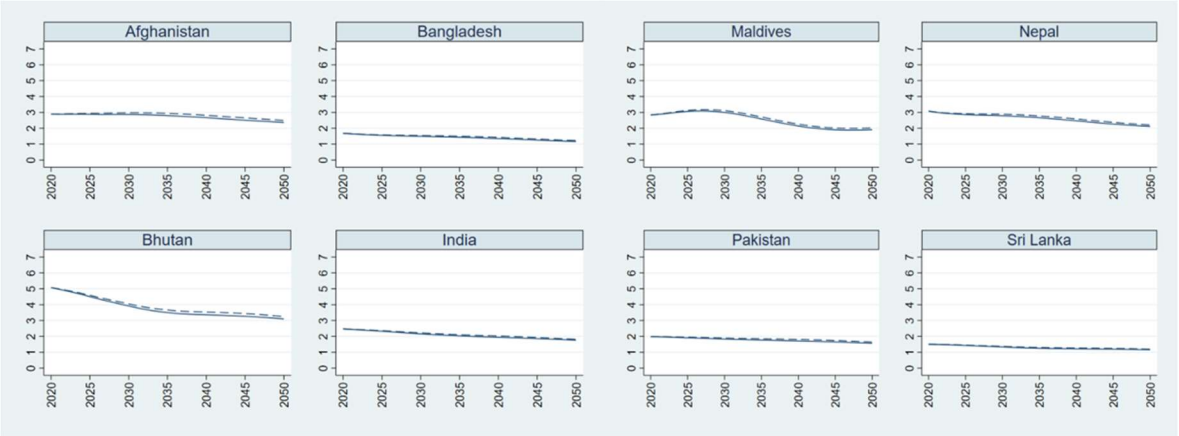
Source: own elaboration based on equation 6 and the status quo values from Table 6.
Note: The Figure shows the dynamics of projected public expenditure on education/GDP in primary and secondary education from 2020 through 2050 under scenario 4.1.

Figure 8. Projected evolution in public expenditure on education/GDP for basic education in scenario 4.2



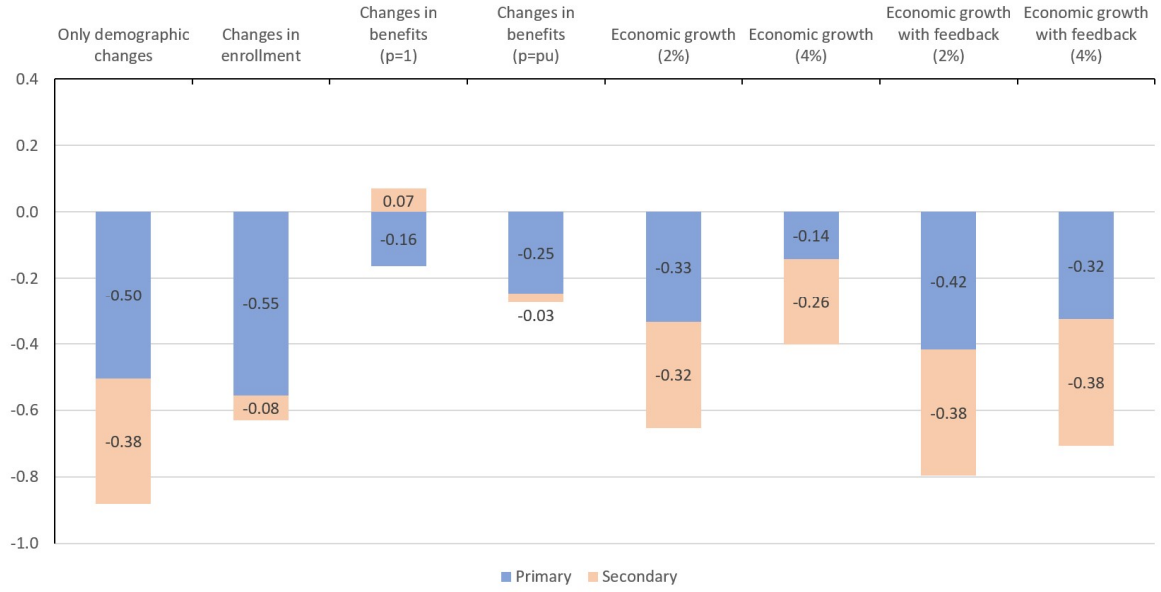
Source: own elaboration based on equation 7 and the status quo values from Table 6.
Note: The Figure shows the dynamics of projected public expenditure on education/GDP in primary and secondary education from 2020 through 2050 under scenario 4.2.

Figure 9. Projected evolution in public expenditure on education/GDP for basic education in scenario 4.3



Source: own elaboration based on equation 8 and the status quo values from Table 6.
Note: The Figure shows the dynamics of projected public expenditure on education/GDP in primary and secondary education from 2020 through 2050 under scenario 4.3.

Figure 10. Expected change in public expenditure on primary and secondary education/GDP (*g*) between 2020 and 2050 under different scenarios. Mean values for South Asia



Source: own elaboration.
Note: The Figure summarizes the results of scenarios 1 to 4 for primary and secondary education, separately. The bars show, for each scenario, the difference between the projected public expenditure on education/GDP in primary (blue) and secondary (pink) education, separately, in 2050 and the value in the status quo (circa 2020).

Appendix A

Table A1. Estimates of the income elasticities of benefit per student (*b*).

	Pre-primary	Primary	Secondary	Tertiary
	log (b)	log (b)	log (b)	log (b)
log (y)	1.165**	1.267**	1.117**	0.145**
	(0.105)	(0.0424)	(0.0431)	(0.0544)
Observations	1,249	1,499	1,352	1,394
R squared	0.099	0.399	0.358	0.006
Number of countries	141	157	152	154
Fixed effects by country	YES	YES	YES	YES

Source: Own elaboration based on UNESCO Institute for Statistics
Notes: (1) Standard errors in parenthesis. (2) ** p<0.01, * p<0.05. (3) log(*y*): Logarithm of GDP per capita (constant PPP); log(*b*): Logarithm of benefit per student in the corresponding level (constant PPP).

Table A2. Years for the characterization of the status quo

Country	Educational level	Public expenditure on education/GDP (*g*)	Gross enrollment rate (*m*)	Proportion of school-age population (*n*)
Afghanistan	Pre-primary	1982	2011	2020
	Primary	2017	2019	2020
	Secondary	2017	2018	2020
	Tertiary	2019	2018	2020
Bangladesh	Pre-primary	2012	2018	2020
	Primary	2012	2018	2020
	Secondary	2019	2019	2020
	Tertiary	2019	2019	2020
Bhutan	Pre-primary	2019	2019	2020
	Primary	2019	2019	2020
	Secondary	2019	2018	2020
	Tertiary	2019	2019	2020
India	Pre-primary	2019	2019	2020
	Primary	2019	2019	2020
	Secondary	2019	2019	2020
	Tertiary	2019	2019	2020
Maldives	Pre-primary	2019	2019	2020
	Primary	2019	2019	2020
	Secondary	2019	2019	2020
	Tertiary	2019	2019	2020
Nepal	Pre-primary	2019	2017	2020
	Primary	2019	2019	2020
	Secondary	2019	2019	2020
	Tertiary	2018	2019	2020
Pakistan	Pre-primary	2018	2019	2020
	Primary	2019	2019	2020
	Secondary	2019	2019	2020
	Tertiary	2019	2019	2020
Sri Lanka	Pre-primary	2018	2019	2020
	Primary	2018	2019	2020
	Secondary	2018	2018	2020
	Tertiary	2018	2019	2020

Source: UNESCO Institute for Statistics (UIS), except for the Proportion of school-age population, which are the 2020 estimates obtained from the World Population Prospects-2022 revision using the school ages in Table 3, and the Gross Enrollment Rate in pre-primary and tertiary, which are extracted from WDI (ultimate source: UNESCO).

Table A3. Population projection scenarios in terms of assumptions for fertility, mortality and international migration from World Population Prospects (WPP)

Projection scenarios	Assumptions		
	Fertility	Mortality	International migration
Medium (fertility)	Medium *	Medium *	Medium
Low fertility	Low	Medium	Medium
High fertility	High	Medium	Medium
Constant-fertility	Constant as of 2022	Medium	Medium
Instant-replacement-fertility	Instant-replacement as of 2022	Medium	Medium
Constant-mortality	Medium	Constant as of 2022	Medium
No change	Constant as of 2022	Constant as of 2022	Medium
Zero-migration	Medium	Medium	Zero from 2022
Instant-replacement zero-migration	Instant-replacement as of 2022	Medium	Zero from 2022
Momentum	Instant-replacement as of 2022	Constant as of 2022	Zero from 2022

Source: Table II.4 in United Nations, Department of Economic and Social Affairs, Population Division (2022). World Population Prospects 2022: Methodology of the United Nations population estimates and projections. UN DESA/POP/2022/TR/NO. 4.
Note: * Based on the median probabilistic projection.

Appendix B

The purpose of this exercise is to assess how sensitive the estimated fiscal space is to potential adjustments in education policies and practices as demographic change unfolds. While the baseline scenario (Scenario 1) considers only demographic shifts, here we allow enrollment rates (m) and benefits per student (b/y) to respond to changes in the school-age population share (n).

While the baseline specification (equation 3) isolates the mechanical effect of the demographic transition on education spending, equation b1 simulates a new scenario (Scenario b1), where coverage (m) is allowed to vary with demographic changes (n), according to the estimated elasticity of m with respect to n, while benefits per student (b/y) remain fixed.

(b1) $g_t^e = (b/y)_0 . p_0 . m_t^a \, . n_t^a$, with $m_t^a = m_{t-1}^a (1 + \delta_t^n . \varepsilon_m)$

where δ_t^n is the log change in n_t^a between t and t-1 and ε_m is the elasticity of coverage (m) with respect to demographic changes (n).

Equation b2 simulates another scenario (Scenario b2) in which benefits per student (b/y) are allowed to adjust with demographic changes (n), according to the estimated elasticity of b/y with respect to n, while enrollment rates (m) remain constant.

(b2) $g_t^e = (b/y)_t^a . p_0 . m_0 \, . n_t^a$, with $(b/y)_t^a = (b/y)_{t-1}^a \left(1 + \delta_t^n . \varepsilon_{b/y}\right)$

where δ_t^n is the log change in n_t^a between t and t-1 and $\varepsilon_{b/y}$ is the elasticity of benefits (b/y) with respect to demographic changes (n).

The elasticities used in these new scenarios are obtained from regressions with country fixed effects, using annual data since the 1970s from the World Population Prospects and the UNESCO Institute for Statistics (UIS). The estimated values are reported in Table B1.

Table B1. Estimated elasticities of coverage (*m*) and benefits (*b/y*) with respect to demographic changes (*n*) in basic education.

	Primary education		Secondary education	
	log (m)	log (b/y)	log (m)	log (b/y)
log (n)	-0.0385***	-0.781***	-0.864***	-0.479***
	(0.0143)	(0.0645)	(0.0369)	(0.0626)
Observations	7,517	1,552	6,368	1,400
R squared	0.001	0.096	0.082	0.045
Number of countries	205	170	205	164
Fixed effects by country	YES	YES	YES	YES

Source: Own elaboration based on UNESCO Institute for Statistics and World Population Prospects.
Notes: (1) Standard errors in parenthesis. (2) ** p<0.01, * p<0.05. (3) log(n): Logarithm of the proportion of the school-age population at the corresponding level; log(m): Logarithm of the gross enrollment rate at the corresponding level; log(b/y): Logarithm of the benefit per student as a proportion of per capita GDP at the corresponding level.

The results of these new scenarios indicate that the potential fiscal space of 0.9 percentage points of GDP by 2050 under Scenario 1, reported in Section 5.2, is reduced to 0.6 points when enrollment rates adjust (Scenario b1), and to 0.3 points when benefits per student adjust (Scenario b2). These results are summarized in Table B2. These findings underline that while demographic change generates fiscal space for education, the size of this opportunity depends on how education systems respond through expanded coverage or increased generosity.

Table B2. Expected change in public expenditure on basic education as a share of GDP in 2050 under different scenarios of coverage and benefit responses to demographic changes

Country	Scenario		
	Demographic changes only (1a)	With coverage response to demographic changes	With benefits response to demographic changes
Afghanistan	-0,6	-0,5	-0,2
Bangladesh	-0,6	-0,3	-0,2
Bhutan	-2,1	-1,3	-0,9
India	-0,8	-0,4	-0,3
Maldives	-1,0	-0,8	-0,4
Nepal	-1,0	-0,6	-0,4
Pakistan	-0,5	-0,4	-0,2
Sri Lanka	-0,4	-0,2	-0,2
SAR average	-0,9	-0,6	-0,3

Note: The table shows the difference between the projected public expenditure on education/GDP in primary and secondary education in 2050 and the value in the statu quo (2020) under the different scenarios