How do structural vulnerabilities impede progress towards achieving SDG 4 (Quality Education) in SIDS?

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Access to quality education and lifelong learning (Goal 4) is crucial to reach the ambition of the 2030 Agenda for Sustainable Development. Education is an important enabler for many Sustainable Development Goals (SDGs), ranging from no poverty and gender equality to decent work, climate action and peace, among others.

This short policy brief sheds light on the relationship between structural[4] vulnerabilities faced by countries (particularly SIDS) and their ability to achieve SDG 4 (Quality Education). It builds on the pilot Multidimensional Vulnerability Index (MVI) prepared by the Sustainable Development Solutions Network (SDSN) and the UN Resident Coordinators in Small Island Developing States (SIDS), and the SDG Index and dashboards published each year by the SDSN since 2016. Overall, a higher degree of structural vulnerability (e.g. in the case of SIDS, being small, remote, and as islands, being particularly exposed to natural hazards) tends to be associated with poorer performance on education at the country level. Highly vulnerable countries such as SIDS also tend to have lower capacity to invest in education due to fiscal constraints and other reasons. A high degree of structural vulnerability measured by the pilot MVI is found to be associated with high levels of population displacements, food insecurity, and brain drain, which negatively impact the capacity of countries to achieve SDG 4 (Quality Education) and SDG 8 (Decent Work). Digital infrastructure and technologies could, in principle, help strengthen education systems and resilience in SIDS, yet the paper underlines how vulnerable countries tend to face persisting challenges in implementing the digital transformation with consequent negative impacts on educational attainments and quality. The scope of this policy brief is to provide evidence on the existence of a significant relationship (statistical association) between structural vulnerability and education outcomes, in particular in SIDS. It does not aim to study causality between structural vulnerability and education outcomes, but it provides a strong basis for further research to investigate this causal link.

On 19th of September 2022, world leaders will convene at the UN Transforming Education Summit in New York to rethink education systems worldwide and revitalize governments' efforts to achieve SDG 4 and all the SDGs as a result of enhanced human capitals. This policy brief sheds light on some of the main challenges faced by SIDS in strengthening access to and quality of education and suggests some

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[4] In this context, structural refers to the non-self-inflicted vulnerabilities that SIDS are facing stemming from their inherent characteristics of being small, remote and islands. It builds on the narrative, framework and methods described in Sachs, J.D., Massa, I., Marinescu, S. and Lafortune, G. (2021), "The Decade of Action and Small Island Developing States: Measuring and addressing SIDS' vulnerabilities to accelerate SDG progress", SDSN Working Paper, 12 July 2021. Paris, France.

ways forward to support countries in their efforts to plan for more comprehensive and effective education, skills, and labor policies with a particular emphasis on the role of international financing and digital technologies.

Good quality education for all is a necessary condition to achieve sustainable development

Access to quality education and lifelong learning (SDG 4) is essential for achieving the Goals set out in the 2030 Agenda for Sustainable Development. Education is indeed a well-recognized enabler for many Sustainable Development Goals (SDGs).

Access to quality education is first a means for escaping poverty (Goal 1). **Education also contributes to reducing income inequality (Goal 10) and promoting gender equality (Goal 5).** When children and young adults receive a quality education, they have more chances to earn higher incomes later in life and can seize more opportunities to break inter-generational income inequalities and overcome poverty traps (Restuccia and Urrutia, 2004). Good-quality education plays a key role in girls' and women's empowerment. Studies show that education reduces women's early marriages and pregnancies (Lutz and KC, 2011). They have also more chances to get job opportunities and earn higher incomes which may ensure them better futures beyond motherhood and house-based work (Aslam, 2013).

Education improves employment perspectives and helps people find a decent job (Goal 8). A study by ILO (2014) shows that, in middle and low-income economies, youth with post-secondary education have more opportunities of finding a decent job than those with only secondary or primary education.

There is strong evidence that education leads to improved health (Goal 3) and nutrition (Goal 2). Children who can attend school on a regular basis enjoy a better health and a more nutritious diet than others (Cutler and Lleras-Muney, 2006; FAO, 2022). UNESCO (2013) research also shows that educated mothers are better informed about specific diseases and take measures to prevent them. Educated mothers are also more likely to improve their children's nutrition (UNESCO, 2013). This leads to a reduction in infant mortality (Gakidou et al. 2010).

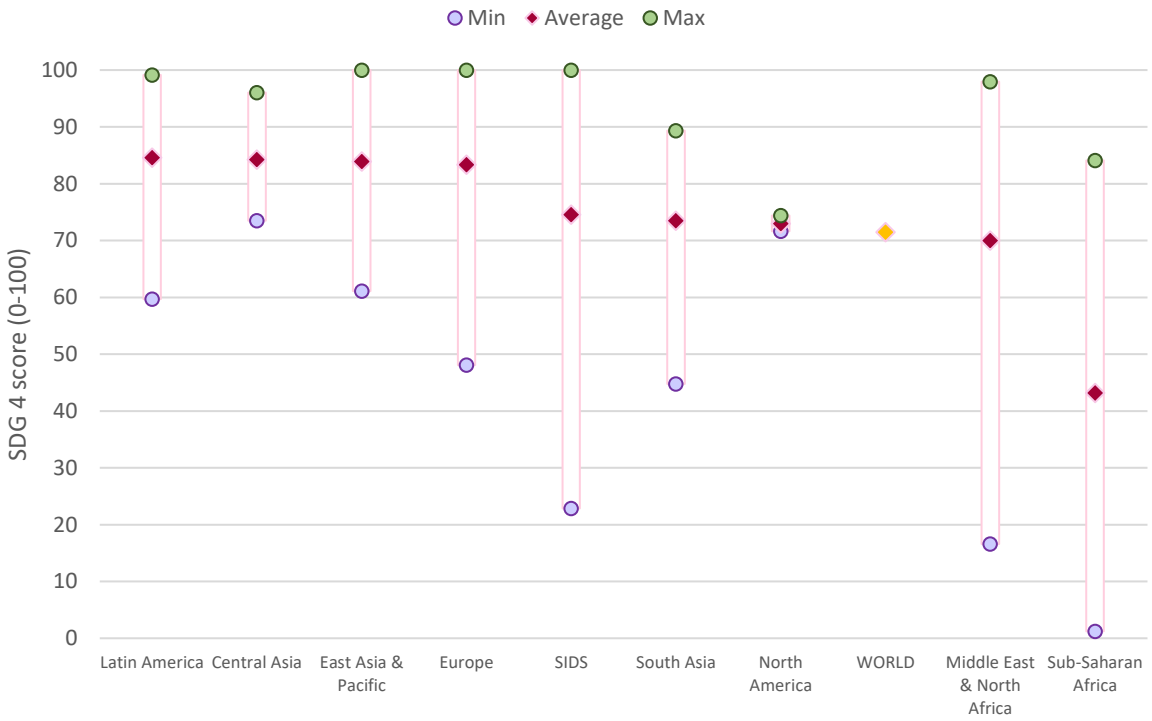
Quality education throughout life helps people to be more concerned about the environment and to learn how to protect it (Goals 13, 14, 15) (UNESCO, 2013). The OECD (2009) highlights that people with more education learn how to lower their negative impact on the planet by managing better their consumption, production, and trade. Education can encourage people to use energy and water more efficiently and recycle household waste (Goals 11, 12). It can also foster the birth of more sustainable and innovative sectors and industries (Goals 7, 9). In poor countries affected by climate change, education helps people adapt to its effects.

Finally, education empowers individuals, encourages tolerance and inclusive societies, which are essential elements to safeguard peace at local, national, and international levels (Goal 16). Chzhen (2013) shows that people with higher levels of education are more tolerant of "out-groups" and more engaged in politics. They are also more likely to participate in public discourse and elections, claim their human rights, promote gender equality, and enjoy economic prosperity. Indeed, an educated society ensures that people are consulted in decision-making processes and that the government takes decisions in the interest of people, thereby promoting transparency, accountability and good governance, which are essential for peace.

SIDS made significant progress in achieving SDG 4, but several challenges remain

Over the last two decades, Small Island Developing States (SIDS) have made significant progress towards achieving SDG 4 (Quality Education). Due to data constraints, in this analysis, performance on SDG 4 (Quality Education) captures access to basic education (from pre-primary to lower secondary) and literacy rate. With an average SDG 4 score of 74.6, SIDS perform above the world average on achieving access to basic education (Figure 1). Overall, SIDS are 25 points away from meeting the goal for education. They perform above the world average and rank fifth across all world regions – just after European countries. Their score reflects important progress in achieving access to basic education in SIDS. The Regional Overview of the EFA GMR 2015 for the SIDS highlights that since 2000 pre-primary, primary and secondary education services expanded considerably in most of the SIDS (UNESCO, 2015). Gender disparities in education have also been reduced, and gender parity particularly in primary education has been achieved in several small islands. Overall, disparities across population groups (economic status, gender, ethnicity, etc.) are not well captured in our aggregate measure for SDG 4 (Quality Education).

Figure 1. Performance on SDG 4 (Quality Education) across and within world regions

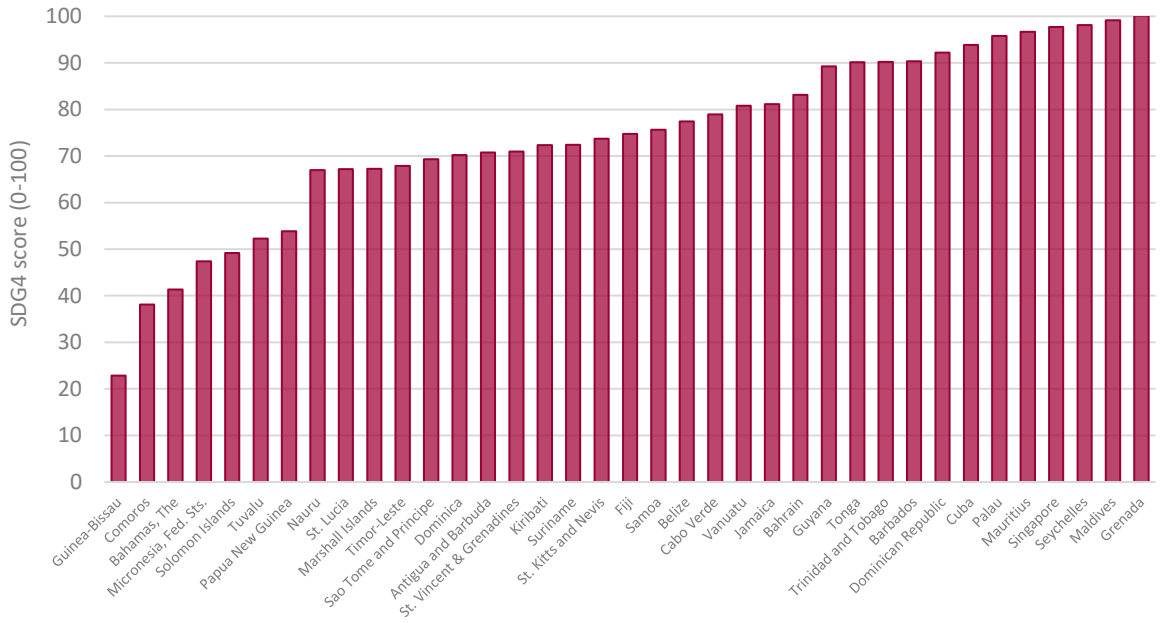


Notes: SDG 4 Score is the equal weighted average of four indicators of the SDSN's SDG Index 2022 related to education: (i) participation rate in pre-primary organized learning (as a percentage of children aged 4 to 6); (ii) net primary enrollment rate (as a percentage of the total population); (iii) lower-secondary completion rate (as a percentage of the total population); (iv) literacy rate (as a percentage of the population aged 15 to 24). SDG 4 score is measured from 0 to 100, where 100 is the best possible outcome. The median value of SDG 4 score across SIDS is 74.7.
Sources: Authors' elaboration based on Sachs et al. (2022).

However, significant disparities in education remain across SIDS, which range into three main clusters (Figure 2). Whilst the SIDS that are furthest behind (i.e. with a score of 50 or below, including Guinea Bissau, Comoros, FSM and Solomon Islands) are performing less well than the world average, countries in the middle of the distribution with a score between 60 and 80 (e.g. Antigua and Barbuda,

Samoa) are closer to the world average regarding access to basic education, and the more advanced countries – with a score of 90 or above (e.g. Grenada, Singapore) – have reached or are very close to reach the Goal on Quality Education. After Sub-Saharan Africa and countries in the Middle East and North Africa region, SIDS are the group of countries displaying the highest heterogeneity in access to basic education (Figure 1).

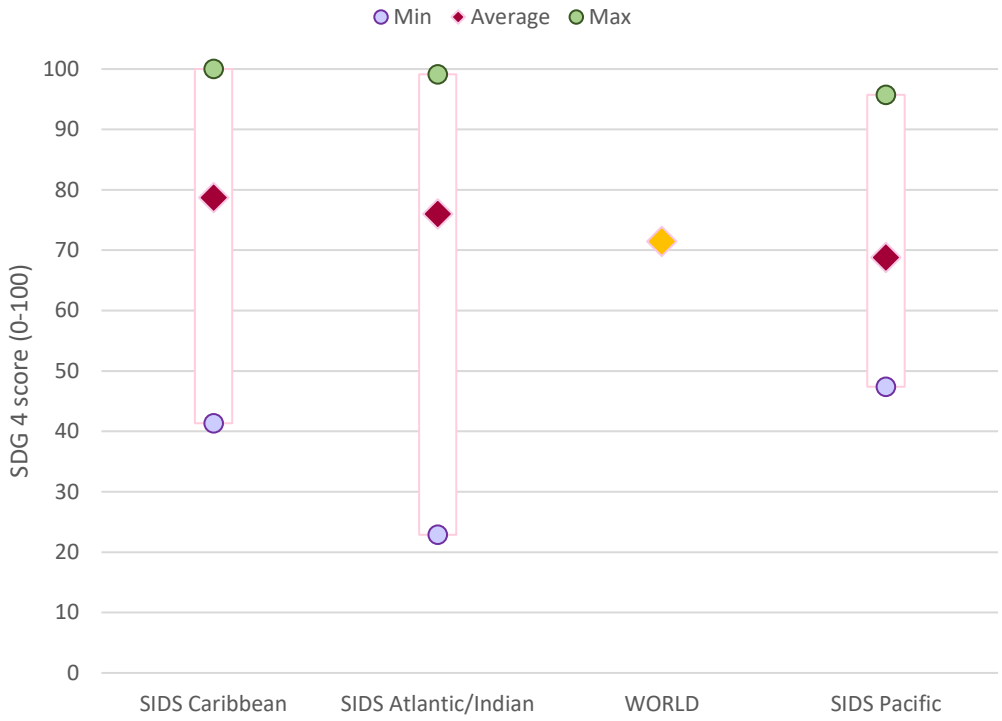
Figure 2. SDG 4 score across SIDS



Notes: SDG 4 Score is the equal weighted average of four indicators of the SDSN's SDG Index 2022 related to education: (i) participation rate in pre-primary organized learning (as a percentage of children aged 4 to 6); (ii) net primary enrollment rate (as a percentage of the total population); (iii) lower-secondary completion rate (as a percentage of the total population); (iv) literacy rate (as a percentage of the population aged 15 to 24). SDG 4 score is measured from 0 to 100, where 100 is the best possible outcome. *Sources*: Authors' elaboration based on Sachs et al. (2022).

Noticeable inequalities in education outcomes also exist across and within the three SIDS regions (Figure 3). With an SDG 4 score of 80, SIDS Caribbean record the highest score among SIDS, and perform almost as high as European countries. Nevertheless, they score lower than their regional peers in Latin America (Figure 1). While SIDS in the Atlantic and Indian Ocean score at 76, SIDS in the Pacific Ocean are the only ones with an average score on education below the world average. Important disparities in access to basic education divide countries within each SIDS region. Although access to basic education is lower on average for populations in SIDS in the Pacific Ocean, the largest disparities in access to basic education within a SIDS region are found in SIDS in the Atlantic and Indian Ocean. In this region, the country with the worst access to basic education obtains an SDG4 score of 22.9, while the country with the best access to basic education has a score of 99.2 (Figure 3). While preliminary explanations for the heterogenous outcomes in education across SIDS regions could be the quality of teachers' training, the inclusion in different regional pedagogical reforms, or an unequal access to regional digital infrastructure and international curriculum, further research needs to be done to explore the reasons of these disparities across SIDS geographical groups (Di Biase et al., 2021).

Figure 3. Performance on SDG 4 (Quality Education) across and within SIDS regions



Notes: SDG 4 score is the equal weighted average of four indicators of the SDSN's SDG Index 2022 related to education: (i) participation rate in pre-primary organized learning (as a percentage of children aged 4 to 6); (ii) net primary enrollment rate (as a percentage of the total population); (iii) lower-secondary completion rate (as a percentage of the total population); (iv) literacy rate (as a percentage of the population aged 15 to 24). SDG 4 score is measured from 0 to 100, where 100 is the best possible outcome. The median value of SDG 4 score is 83 across SIDS in the Atlantic/Indian region, 77 across SIDS in the Caribbean region, and 68 across SIDS in the Pacific region.
Sources: Authors' elaboration based on Sachs et al. (2022).

Notwithstanding the progress made, important challenges in the education systems remain in SIDS. Structural vulnerabilities, limited access to financial resources, and low levels of technical capacities are some of the major barriers for achieving the Goal on Quality Education. As explained in the sections below, structural vulnerabilities such as smallness and remoteness prevent SIDS from unlocking their full potential in education. Because SIDS populations are small and dispersed, the per capita costs of investments in education are higher than in more populated countries, and therefore providing good quality and specialized education is more challenging (OECD, 2018). As in all small countries, the high per capita costs of delivering essential public services constrain SIDS' education systems to be unspecialized and of sub-optimal quality. While SIDS have made significant progress on primary and secondary attainment, there is still a limited supply of good quality tertiary and vocational education. Youth are not given the opportunities to learn specific skills, which results in a shortage of skilled labor force on the domestic labor market (Gomes, 2014). Local industries rely mainly on exported international labor, while SIDS's own population migrate abroad to find new job opportunities. The recent COVID-19 pandemic confirms that educational quality and in particular teacher preparation is a main challenge in SIDS (Seetal et al., 2021). The increasingly frequent exposure to extreme weather events and natural hazards also makes particularly challenging for SIDS to maintain and improve the education systems.

SIDS' structural vulnerabilities jeopardize their capacity to perform well in education

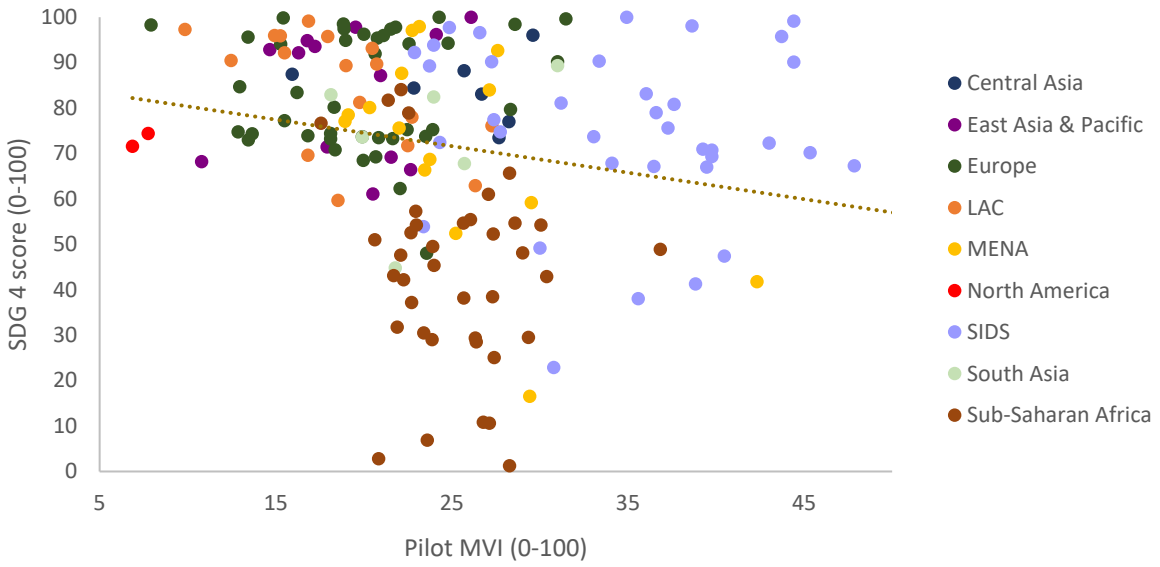
SIDS face a unique set of structural vulnerabilities that impede their sustainable and long-term development. The paper prepared by SDSN and the UN Resident Coordinators in SIDS (Sachs et al., 2021) suggests that three types of inherent vulnerabilities – i.e. Economic, Structural Development, and Environmental – are preventing SIDS from leveraging their full potential to achieve sustainable development. The pilot Multidimensional Vulnerability Index[5] (MVI) shows that SIDS are among the most vulnerable countries in the world, although they are predominantly classified as high-income or upper-middle income countries. Across the three SIDS regions, small islands in the Pacific Ocean have the highest vulnerability score.

SIDS' capacity to achieve SDG 4 (Quality Education) is associated with their level of structural vulnerability. Figure 4 below suggests that across the world, more vulnerable countries tend to record worse outcomes on education. Indeed, looking at the Pearson's correlation coefficient, it appears that the pilot MVI is significantly and negatively correlated with the SDG 4 score[6]. When looking at the individual components of the SDG 4 score, it appears that a higher level of structural vulnerability is associated with lower enrollment rates in pre-primary and primary education (Figures 5 and 6). Pre-primary and primary education are levels of education that are particularly important in determining long-term economic opportunities, health, and well-being (OECD, 2020). If children are not able to attend school, even temporarily or on short but repeated periods of time (e.g. when schools are closed after the strike of natural disasters), they will face greater obstacles than other children to enroll in tertiary education and develop skills to find a job where they live. Countries where the education system is not developed enough may also face high migration of youth to study and work abroad.

[5] The pilot MVI is a composite index made up of 18 indicators across three categories (Figure A1.1 in Annex 1): *economic vulnerability* (7 indicators - dependence on: remittances, Official Development Assistance (ODA), food imports, fuel imports, and tourism receipts; trade openness; degree of export concentration); *structural development limitations* (5 indicators – population; Liner Ship Connectivity Index; ratio of cost insurance freight (CIF)/freight on board factors (FOB); total internal renewable water resources per capita; hectares per capita of arable land); *environmental vulnerability* (6 indicators - share of land area where elevation is below 5 meters; natural disasters costs; number of hydrometeorological disasters; number of seismic disasters; deaths due to hydrometeorological disasters; deaths due to seismic disasters). The pilot MVI ranges from 0 (low vulnerability) to 100 (high vulnerability).

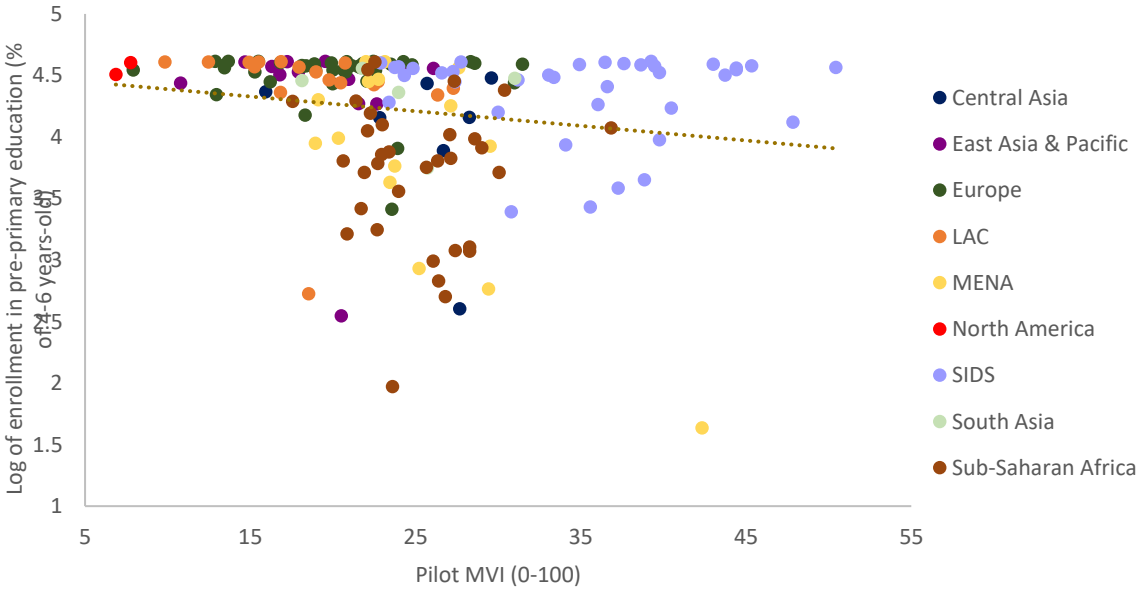
[6] Although the correlation is significant and suggests the existence of a link between vulnerability and education, we are aware that additional factors should be taken into account to better model the relationship between the pilot MVI and SDG 4 score (e.g. quality of institutions, governance).

Figure 4. Structural vulnerability is associated with low education outcomes



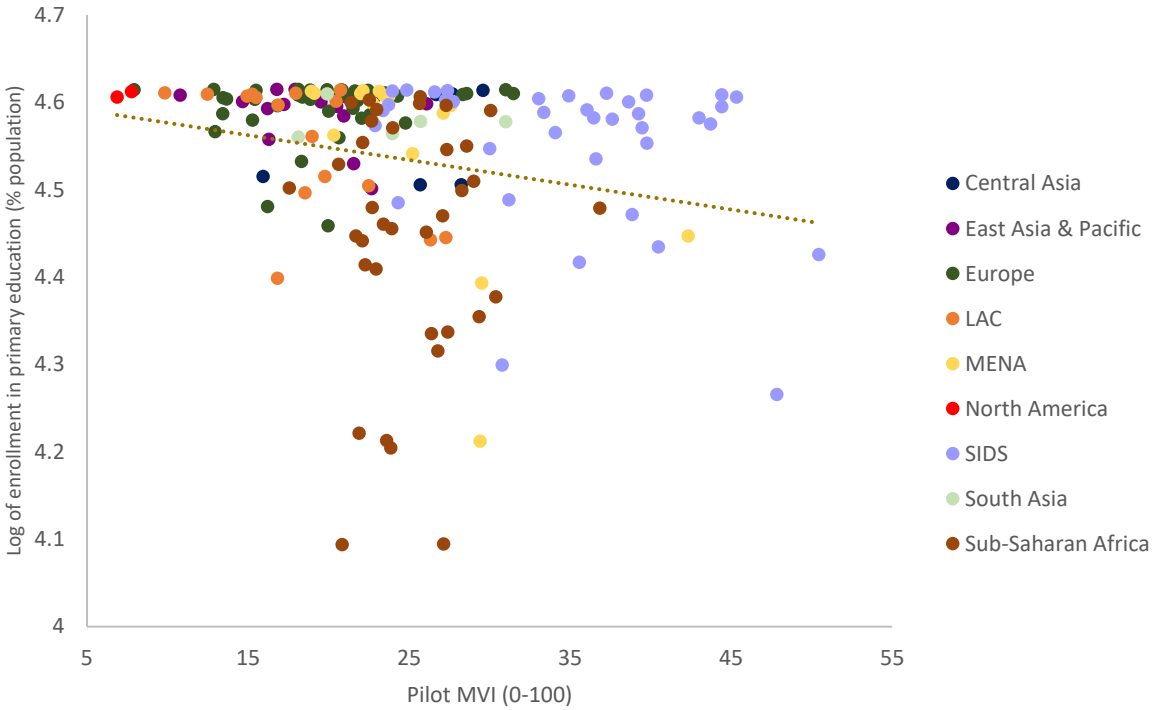
Notes: The correlation coefficient of -0.2045 is statistically significant at the 99% confidence level. Sample: 176 countries, including 37 SIDS of which 15 in the Caribbean region, 13 in the Pacific region, and 9 in the Atlantic/Indian region. SDG 4 score is the equal weighted average of four indicators of the SDSN's SDG Index 2022 related to education: (i) participation rate in pre-primary organized learning (as a percentage of children aged 4 to 6); (ii) net primary enrollment rate (as a percentage of the total population); (iii) lower-secondary completion rate (as a percentage of the total population); (iv) literacy rate (as a percentage of the population aged 15 to 24). SDG 4 score is measured from 0 to 100, where 100 is the best possible outcome. The Pilot MVI ranges from 0 (low vulnerability) to 100 (high vulnerability).
Sources: Authors' elaboration based on Sachs et al. (2022) and Sachs et al. (2021).

Figure 5. More vulnerable countries register lower enrollment rates in pre-primary education



Notes: The correlation coefficient of -0.1868 is statistically significant at the 95% confidence level. Sample: 170 countries, including 37 SIDS of which 15 in the Caribbean region, 13 in the Pacific region, and 9 in the Atlantic/Indian region. The Pilot MVI ranges from 0 (low vulnerability) to 100 (high vulnerability). To reduce the heterogeneity in the distribution of the education variable, this graph plots the log transformation of the enrollment rate in pre-primary education.
Sources: Authors' elaboration based on Sachs et al. (2022) and Sachs et al. (2021).

Figure 6. More vulnerable countries register lower enrollment rates in primary education



Notes: The correlation coefficient of -0.1914 is statistically significant at the 95% confidence level. Sample: 175 countries, including 37 SIDS of which 15 in the Caribbean region, 13 in the Pacific region, and 9 in the Atlantic/Indian region. The Pilot MVI ranges from 0 (low vulnerability) to 100 (high vulnerability). To reduce the heterogeneity in the distribution of the education variable, this graph plots the log transformation of the enrollment rate in primary education.
Sources: Authors' elaboration based on Sachs et al. (2022) and Sachs et al. (2021).

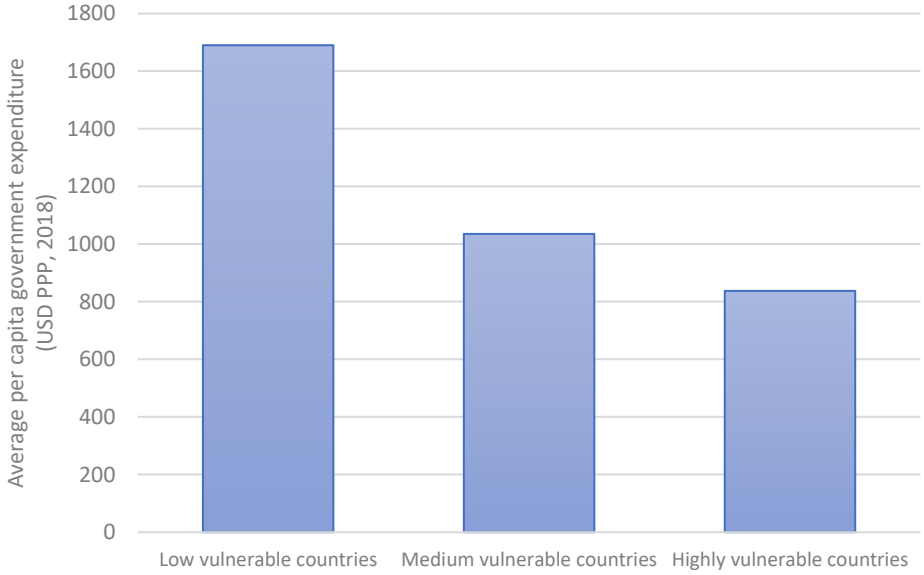
Across the different types of structural vulnerability captured by the pilot MVI, economic vulnerabilities and (to a lesser extent) structural development limitations appear to have a significant negative relationship with the achievement of SDG 4 (Quality Education). This indicates that higher exposure to unforeseen external shocks and more stringent geophysical constraints in SIDS are associated with lower education outcomes (see Annex 2). Export concentration, dependence on Official Development Assistance (ODA), reliance on food imports, and ship connectivity seem to drive these relationships (see Annex 3).

Nonetheless, this should not mean that environmental vulnerability is not important in shaping education in SIDS, as more environmentally vulnerable countries suffer more displacements of population after a natural disaster, which in turn lead to lower education performance. The relationship between structural vulnerability and displacement after natural disasters is discussed in the next section.

SIDS' structural vulnerabilities also constrain their capacity to mobilize the financing needed to make progress on SDG 4. While SIDS require significantly more financing than other countries to recover from natural disasters and build resilience, they have limited domestic resources. Their fiscal space is narrow because of their small tax base; they generally suffer from heavy debt burdens because of their high exposure to risk; and they are left with sizeable SDG financing gaps, as they do not meet the current criteria to access concessional finance (Massa and Bermont Díaz 2022). Figure 7 suggests that the overall public expenditure on education (in per capita terms) of countries with high levels of structural vulnerability is significantly lower than that of less vulnerable countries. In the education

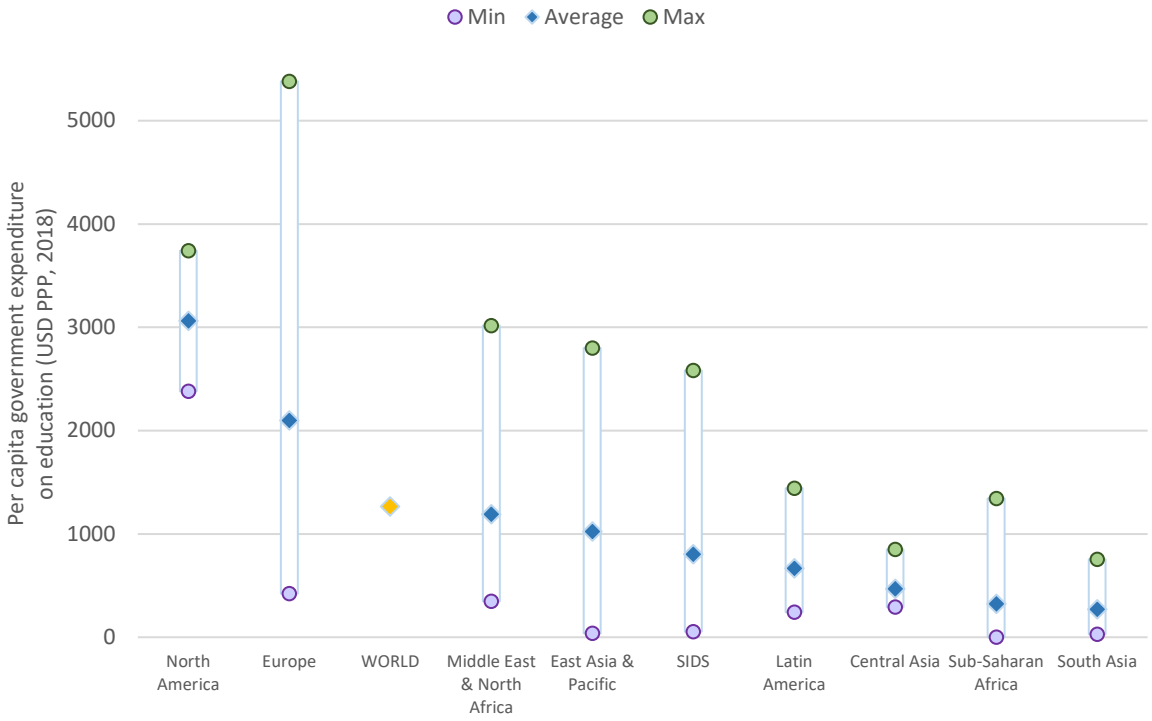
sector, SIDS are spending relatively less than other world's regions. As shown by Figure 8, on average, SIDS' expenditure on the education sector (i.e. for pre-primary, primary, secondary, and tertiary education, and research and development) reach no more than USD PPP 800 per capita, a level of expenditure far below the world average of USD PPP 1270 per capita. Only SIDS in the Atlantic and Indian Ocean register a similar average level of public expenditure in education compared to other regions in the world (Figures 8-9). Yet, SIDS in the Atlantic and Indian Ocean are the ones where inequalities in public spending for education are the highest across countries of the same region (Figure 9). In this group of SIDS, the gap between the country spending the less and the one spending the most on education accounts for more than USD PPP 2200 per capita, as Singapore spends around USD PPP 2582 per capita, while Cabo Verde spends only USD PPP 377 (Figure 9).

Figure 7. Average per capita public expenditure in education, by levels of vulnerability



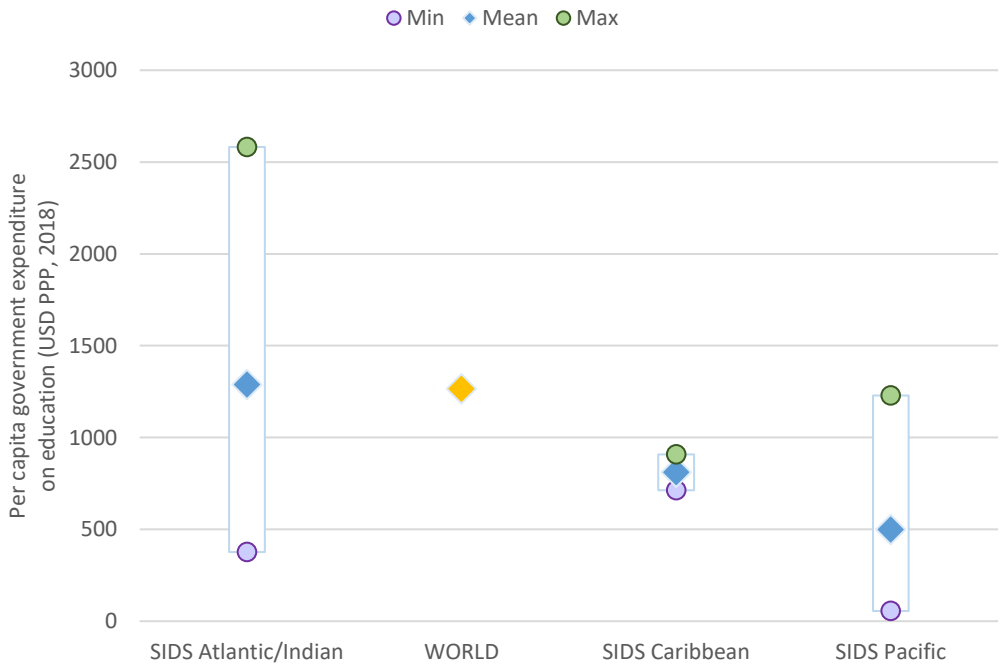
Notes: In this graph, the vulnerability groups are defined based on the distribution of the Pilot MVI across countries: i) low vulnerable countries have a Pilot MVI inferior to 20; ii) medium vulnerable countries have a Pilot MVI between 20 and 30; and iii) highly vulnerable countries have a Pilot MVI superior to 30. The sample is composed of 99 countries, including 15 SIDS, among which 5 are in the Atlantic Indian region, 2 are in the Caribbean region, and 8 are in the Pacific region. Among countries with available data on public expenditure, 10 out of the 12 countries that pertain to the highly vulnerable group are SIDS. *Sources*: Authors' elaboration based on Sachs et al. (2021) and IMF (2022a).

Figure 8. Public expenditure per capita on education, across and within world region



Notes: The sample is composed of 99 countries, including 15 SIDS, among which 5 are in the Atlantic Indian region, 2 are in the Caribbean region, and 8 are in the Pacific region. The median value of per capita public expenditure on education across SIDS is USD PPP 712. *Sources*: Authors' elaboration based on IMF (2022a).

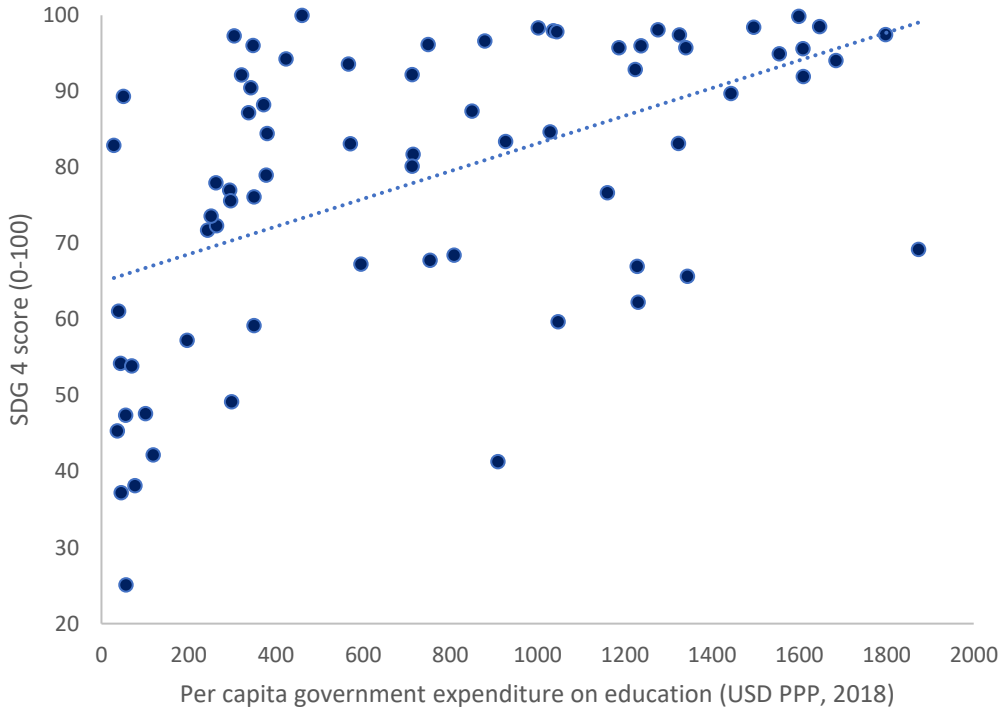
Figure 9. Public expenditure per capita on education, across and within SIDS region



Notes: The sample is composed of 99 countries, including 15 SIDS, among which 5 are in the Atlantic Indian region, 2 are in the Caribbean region, and 8 are in the Pacific region. The median value of per capita public expenditure is USD PPP 1 276 across SIDS in the Atlantic/Indian region, USD PPP 811 across SIDS in the Caribbean region, and USD PPP 297 across SIDS in the Pacific region. *Sources*: Authors' elaboration based on IMF (2022a).

Low levels of public spending per capita are among the main reasons why the SDGs, including SDG 4, are not being achieved (Sachs et al., 2022). Weak institutions, poor governance and corruption, as well as lack of technical expertise reduce the effectiveness of public expenditure to ensure the availability of quality education that is accessible to all. Provided that such obstacles are effectively addressed, increasing public investments in the education sector leads to significantly higher progress on education outcomes, especially for countries starting with relatively low levels of per capita public expenditure (Figure 10).

Figure 10. Higher public expenditure per capita on education is associated with greater performance on SDG 4

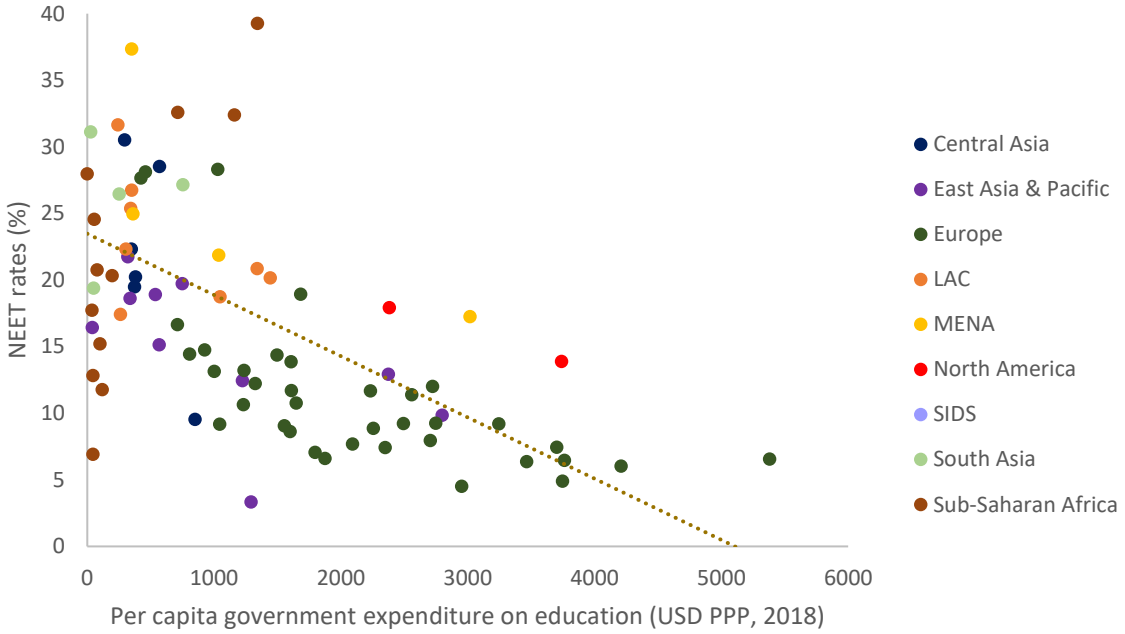


Notes: The correlation coefficient of 0.5196 is statistically significant at the 99% confidence level. Sample: 71 countries, including 14 SIDS, of which 4 in the Atlantic/Indian region, 2 in the Caribbean region, and 8 in the Pacific region. SDG 4 score is the equal weighted average of four indicators of the SDSN's SDG Index 2022 related to education: (i) participation rate in pre-primary organized learning (as a percentage of children aged 4 to 6); (ii) net primary enrollment rate (as a percentage of the total population); (iii) lower-secondary completion rate (as a percentage of the total population); (iv) literacy rate (as a percentage of the population aged 15 to 24). SDG 4 score is measured from 0 to 100, where 100 is the best possible outcome. *Sources*: Authors' elaboration based on IMF (2022a) and Sachs et al. (2022).

Low levels of public spending per capita are also associated with higher rates of youth not in education, employment, or training (NEET) (Figure 11). NEET is an important metric to determine the capacity of the education system to provide youth with adequate skills to enter the local labor market. In recent years, the NEET across the SIDS has significantly increased due, in part, to school dropout driven by poverty, domestic violence, and poor nutrition causing low learning performance, low wages, teenage pregnancy, disconnect and mismatch between the education and labor markets, and to various forms of social exclusion. As shown by ILO (2020) and SDG Tracker data, NEET is an acute problem in the Caribbean, with statistics varying from 27.3% in Belize, 35.69% in Guyana, 29.57% in Jamaica, 30% in Saint Lucia, 37.71% in the Dominican Republic to 52% in Trinidad and Tobago. Among the Pacific SIDS, Nauru's NEET is the highest at 51.3% followed by Kiribati's 47.6%, Vanuatu's 43.19%, Samoa's 37.9%, Tuvalu's 37.4%, and Tonga's 30.29%. In the Atlantic, Indian Ocean and South China Sea (AIS) SIDS, Mauritius has the highest NEET rate of 41.7% followed by Cabo Verde's 28%, Comoros'

27.9%, Maldives' 27.6%, and Guinea Bissau 24.3%. These young cohorts represent the main source of migration across SIDS.

Figure 11. Higher public expenditure per capita on education is associated with lower rates of youth not in education, employment, or training (NEET)



Notes: The correlation coefficient of -0.6 is statistically significant at the 99% confidence level. Sample: 92 countries, including 9 SIDS, of which 4 in the Atlantic/Indian region, 2 in the Caribbean region, and 3 in the Pacific region.
Sources: Authors' elaboration based on IMF (2022a) and ILO (2020).

Vulnerability to climate change, food insecurity, exposure to brain drain, and low digitalization capacities are holding up progress on SDG 4 and SDG 8 in SIDS

In SIDS, early and primary education are under threat because of their growing exposure to natural hazards which lead to significant population displacements. Moreover, their small populations, limited land area, and colonial history, force SIDS to rely on an undiversified economic base, thus making them more vulnerable to exogenous shocks and incentivizing young adults to leave their country to study or work abroad. SIDS' structural vulnerability also curb their progress on digital transformation. The following section investigates the link between some major consequences of SIDS' structural vulnerability (i.e. population displacement, food insecurity, brain drain, underdeveloped digitalization) and education and labor market outcomes.

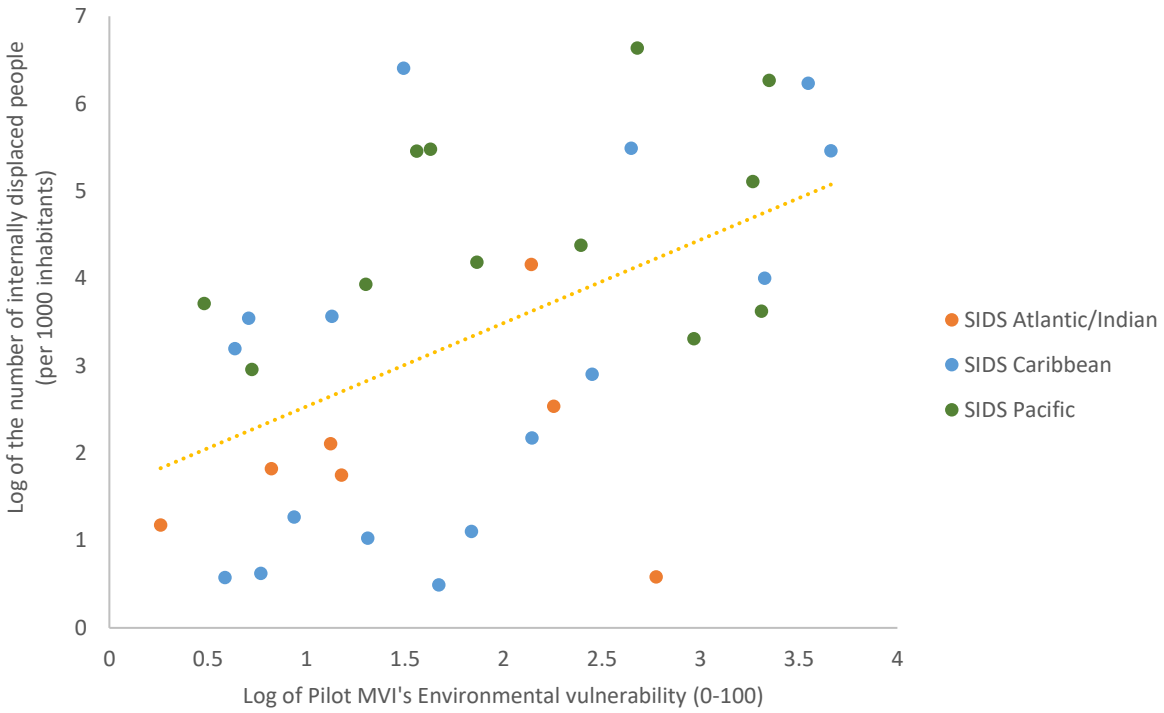
Structural vulnerability, population displacement, and education

In 2021, more than 23 million people were displaced because of natural disasters (IDCM, 2022a). Population displacements are a major source of education disruption, as families are temporarily relocated far from their home, where access to new schools is more difficult. Displaced families generally suffer from a significant drop in their income, which can be an obstacle to pay for the

education fees. An interruption of education – even temporal – has consequent negative effects on children's future income and mental health when they reach adulthood, as well as on the development of their cognitive skills, capacity to learn, and opportunities on the labor market (IDCM, 2022a; Porter, 2021).

SIDS are the countries most exposed to climate change and extreme weather events, and therefore most at risk of facing population displacements. Figure 12 shows that there exists a significant positive relationship between the degree of environmental vulnerability of a country, as measured by the pilot MVI's environmental pillar, and the number of displaced people per capita. This implies that SIDS, which are more vulnerable to environmental conditions (including several Pacific and Caribbean SIDS – see Sachs et al., 2021), are more likely to face large displacements of their populations in per capita terms.

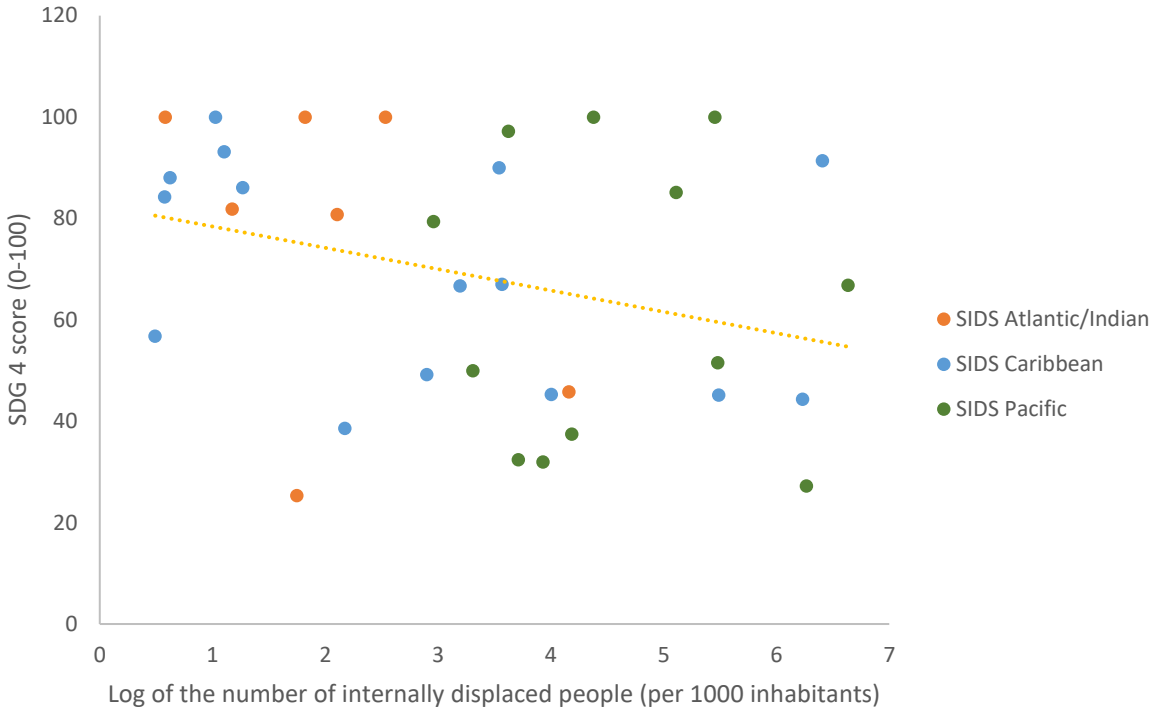
Figure 12. Countries more vulnerable to environmental conditions face larger displacements of population following natural disasters



Notes: The correlation coefficient of 0.3997 is statistically significant at the 99% confidence level. Sample: 35 SIDS, including 7 SIDS in the Atlantic/Indian region, 16 SIDS in the Caribbean region, and 12 SIDS in the Pacific region. Environmental vulnerability is measured by the Environment Pillar of the Pilot MVI, which includes a) the land surface area below 5 meters (as a percentage of total land area), b) the costs of natural disasters (as a percentage of GDP), c) the number of hydrometeorological disasters (by square kilometer), d) the number of seismic disasters (by square kilometer), e) the number of fatalities caused by hydrometeorological disasters (as a percent of the population), and f) the number of fatalities caused by seismic disasters (as a percent of the population). To reduce heterogeneity, the graph plots the log-transformed variables of the Environmental Pillar of the MVI and the number of displaced people, as the distributions for these variables are very dispersed.
Sources: Authors' elaboration based on IDMC (2022b) and Sachs et al. (2022).

Population displacements generally lead to disruption of education and negatively impact the capacity of countries to reach SDG 4 in the long-term. As shown by Figure 13, across the world, larger displacements of population per capita are significantly correlated with lower SDG 4 scores.

Figure 13. Countries with large displacements of populations after natural disasters tend to have lower performance on SDG 4



Notes: The correlation coefficient of -0.2299 is statistically significant at the 99% confidence level. Sample is composed of 34 SIDS, including 7 SIDS in the Atlantic/Indian region, 15 SIDS in the Caribbean region, and 12 SIDS in the Pacific region. For this graph, SDG 4 score is the equal weighted average of two indicators of the SDSN's SDG Index 2022 related to education: (i) lower-secondary completion rate (as a percentage of the total population); (ii) literacy rate (as a percentage of the population aged 15 to 24). SDG 4 score is measured from 0 to 100, where 100 is the best possible outcome. To reduce heterogeneity, the graph plots the log-transformed variable of the number of internally displaced people, as the distribution for this variable is dispersed.
Sources: Authors' elaboration based on IDMC (2022b) and Sachs et al. (2022).

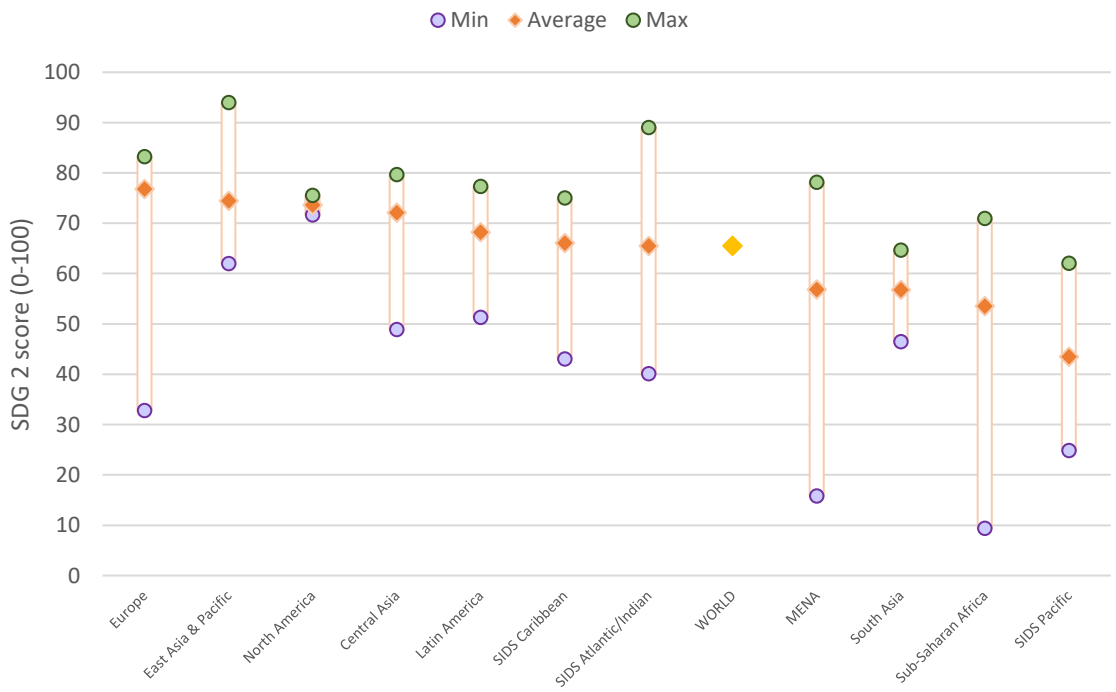
Since the number and severity of natural disasters is expected to grow with the intensification of climate change (IPCC, 2022), SIDS' education systems will be increasingly affected by population displacements. In recent years, several SIDS already experienced natural disasters of record intensity, with increased human and economic losses. In August 2021, Haiti was hit by the most devastating earthquake since 2010. The earthquake and the following floods forced more than 220 thousand people to leave their home and move to another part of the country or abroad (IDCM, 2022). Many families affected by the earthquake had already been displaced due to previous disasters or conflict. As no solution is being found for those families, the number of displaced people in Haiti might grow rapidly. The Bahamas also experienced in 2021 the strongest tropical storm ever recorded in the country, that forced 2% of the population out of their home and generated more than USD 3 billion in economic losses (IDCM, 2022). With the intensification of climate change, the consequences of natural disasters in terms of human and economic losses will continue to grow, especially if the international community does not improve the capacity for SIDS to access funds and increase their preparedness to disasters.

Structural vulnerability, food insecurity, and progress on SDG 4

Food insecurity – a main component of SDG 2 (Zero Hunger) – represents one of the greatest challenges of our times, as more than three billion people across the planet still suffer from malnutrition (WHO, 2020). While the current COVID-19 crisis has led millions to tumble into poverty, inflation and the disruptions in food supply chains caused by the invasion of Ukraine by the Russian Federation pose an enormous threat to food security worldwide. Food insecurity is a complex and multidimensional issue, with different forms, including insufficient calorie intakes, insufficient nutrients intakes, or excessive and unbalanced food consumption that can lead to obesity and related Noncommunicable Diseases (NCDs).

On average, SIDS perform below the world average on the SDG 2 score that reflects the four key dimensions of food insecurity (i.e. prevalence of undernourishment, prevalence of stunting in children under 5 years of age, prevalence of wasting in children under 5 years of age, and prevalence of obesity). This overall low performance of SIDS is mainly driven by the significant challenges remaining among SIDS Pacific, as their average score on SDG 2 (43.5 points) is the weaker in the world and is significantly lower than that of SIDS in the Atlantic Indian Ocean and SIDS in the Caribbean region that score 65.5 and 66 respectively (Figure 14). Although undernourishment and poor nutrient intakes leading to stunting and wasting remain a concern in many SIDS, the most significant challenge facing SIDS appears to be the growing prevalence of obesity among the population, particularly in Pacific small islands. In SIDS in the Pacific Ocean, 39% of the population is obese, on average (Sachs et al., 2022) – making the small states among the most obese nations in the world (WHO, 2021).

Figure 14. Disparities in food security outcomes across the world

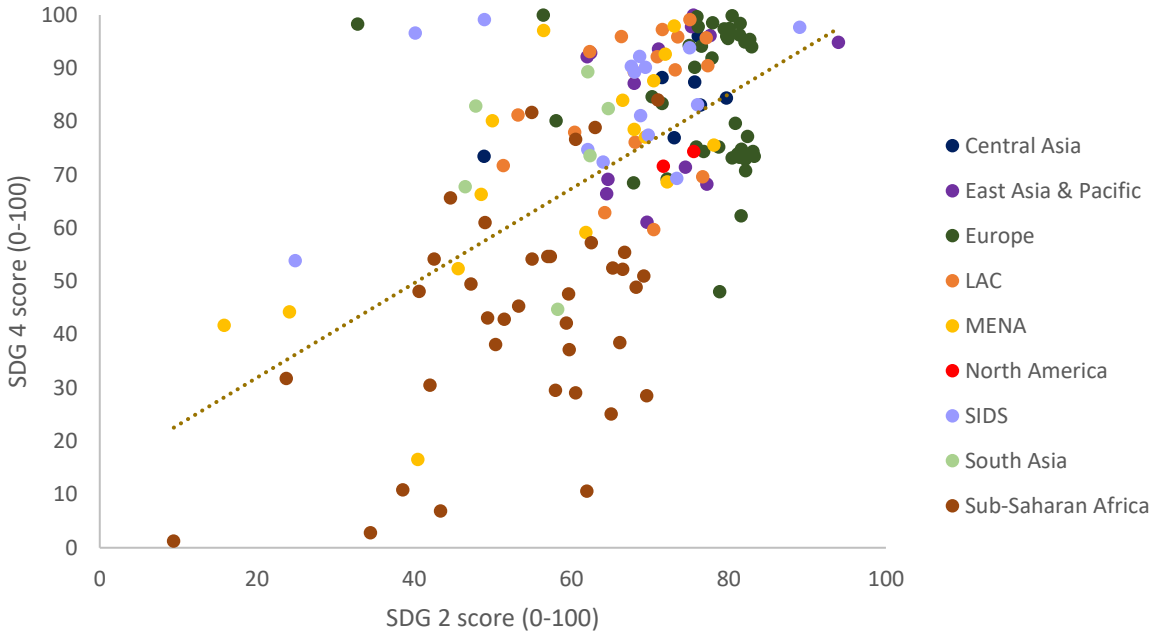


Notes: The sample is composed of 163 countries, of which 38 SIDS, including 5 SIDS in the Atlantic/Indian region, 9 SIDS in the Caribbean region, and 2 SIDS in the Pacific region. The median value of the SDG 2 score in SIDS Atlantic/Indian is 73.4, 68.7 in SIDS Caribbean, and 43.5 in SIDS Pacific. SDG 2 score is the equal weighted average of four of the SDSN's SDG 2 Index 2022: (i) prevalence of undernourishment (%); (ii) prevalence of stunting in children under 5 years of age (%); (iii) prevalence of wasting in children under 5 years of age (%); and (iv) prevalence of obesity, BMI ≥ 30 (% of adult population). SDG 2 and 4 scores are measured from 0 to 100, where 100 is the best possible outcome.
Sources: Authors' elaboration based on Sachs et al. (2022).

Food insecurity in SIDS is directly linked with their unique set of structural vulnerabilities. Previous work studying the relationship between the SDSN's pilot MVI and SDG 2 score shows a negative and significant correlation between the degree of structural vulnerability of countries across the world and their progress towards achieving SDG 2 (Massa, 2021). In SIDS, specific vulnerabilities such as the small size of the countries, the lack of arable land, the limited freshwater resources, and the extreme exposure to natural hazards are creating the conditions for a decline in domestic food production and an increase in the reliance on food imports. Because of their high dependence on food imports, SIDS tend to face higher food prices than other countries in the world, especially for fresh products due to their scarcity and higher costs of transportation. Such high prices contribute to curb financial access to healthy food, thus affecting diet diversity and reducing intakes of healthy nutrients – which contributes to explain the high prevalence of obesity and related NCDs in SIDS. Besides, colonialism had a significant impact on SIDS' economic specialization in few agricultural items, thus increasing dependence on food products from former colonial countries (McLennan and Ulijaszek, 2014).

Food insecurity – including obesity and undernourishment – has numerous consequences on people's health and well-being, but also on their educational enrollment and performance, and therefore on their life-long earnings. There is a significant and positive relationship between SDG 2 and SDG 4 outcomes (Figure 15), which suggests that more vulnerable countries with lower levels of food security are lagging behind on SDG 4. Good nutrition is a key element to strengthen people's capacities to learn. Malnutrition alters the human body's both physical and cognitive development process, and directly reduces children's capacity to focus, assimilate new concepts, and learn – and this impaired development provokes long-term consequences throughout adult life. Studies on the impact of food insecurity on education show that people who experienced undernourishment early in life reach lower education attainments levels than others, and this in turn significantly lowers their life-long earnings (McGovern et al., 2017, Dewey and Begum, 2011; Prendergast and Humphrey, 2014; Maccini and Yang, 2009; Jürges, 2013; Chen, 2022). In the case of obesity, social factors – e.g. exclusion and prejudices – are additional obstacles to education and future inclusion on the labor market (OECD, 2019).

Figure 15. Countries with higher levels of food security also reach better performance on SDG 4



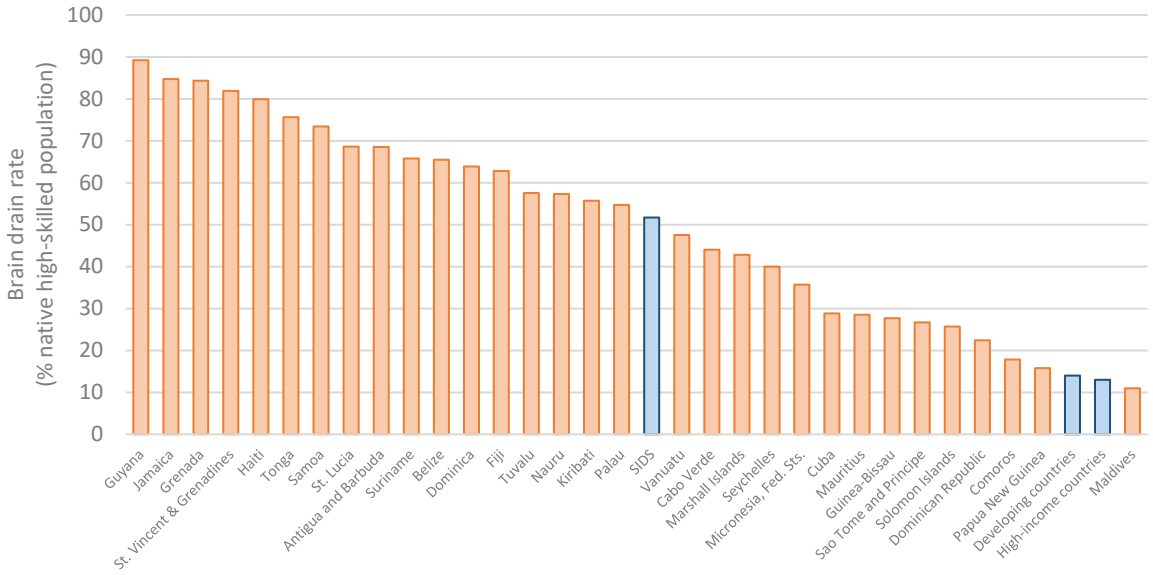
Notes: The correlation coefficient of 0.57 is statistically significant at the 99% confidence level. Sample is composed of 154 countries, of which 15 SIDS, including 5 SIDS in the Atlantic/Indian region, 8 SIDS in the Caribbean region, and 2 SIDS in the Pacific region. SDG 4 score is the equal weighted average of four indicators of the SDSN's SDG Index 2022 related to education: (i) participation rate in pre-primary organized learning (as a percentage of children aged 4 to 6); (ii) net primary enrollment rate (as a percentage of the total population); (iii) lower-secondary completion rate (as a percentage of the total population); (iv) literacy rate (as a percentage of the population aged 15 to 24). SDG 2 score is the equal weighted average of four of the SDSN's SDG 2 Index 2022: (i) prevalence of undernourishment (%); (ii) prevalence of stunting in children under 5 years of age (%); (iii) prevalence of wasting in children under 5 years of age (%); and (iv) prevalence of obesity, BMI ≥ 30 (% of adult population). SDG 2 and 4 scores are measured from 0 to 100, where 100 is the best possible outcome.
Sources: Authors' elaboration based on Sachs et al. (2022).

Structural vulnerability, brain drain, and progress on SDG 8

Emigration rates of high-skilled workers from SIDS are among the highest in the world. Brain drain is a particularly major issue for SIDS, which have been facing the highest rates of skilled emigration for the past thirty years. Because human capital is key to economic growth, the significant brain drain experienced by SIDS represent a substantial threat to their economic, social, and sustainable development (de la Croix et al., 2014; Wenner, 2016; Beine et al., 2008; Docquier and Schiff, 2008).

While brain drain rates almost reach 52% of college graduates natives from SIDS – meaning that 1 out of 2 high-skilled worker is leaving their country to work abroad – skilled emigration rates do not exceed 14% in large developing countries, and 13% in high-income countries (Figure 16). SIDS in the Caribbean region are the most exposed to brain drain, since almost 67% of their high-skilled population migrates abroad, closely followed by SIDS in the Pacific region that face rates of emigration of 50%, whereas SIDS in the Atlantic / Indian region are relatively less vulnerable, with brain drain rates around 28% (Figure 17). Besides being the region most affected by the brain drain phenomenon, SIDS in the Caribbean Sea are also displaying the highest heterogeneity in brain drain rates across countries of a same region (Figure 17). While 22% of the high-skilled population of the Dominican Republic migrate to look for better job opportunities – a level of emigration still higher than the average of other developing and high-income countries –, almost 90% of the population with a higher education degree moves out of Guyana (Figure 16).

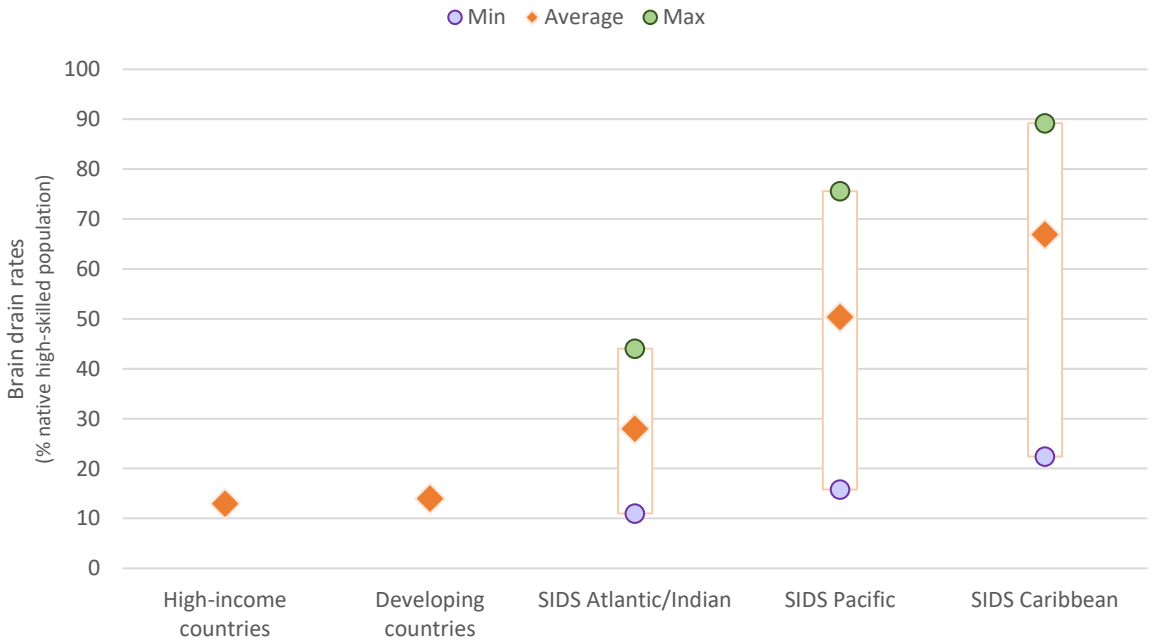
Figure 16. Emigration rates of high-skilled individuals in SIDS are among the highest in the world



Note: Brain drain rates are from circa 2000. Emigration data by level of education are scarce – latest available data were produced during the 2000 round of censuses. *Sources*: Authors' elaboration based on data from de la Croix et al. (2014).

Geographical proximity, past colonialization, and family networks generally determine where high-skilled migrants chose to relocate. While most of the high-skilled migrants from SIDS in the Pacific region travel to the largest neighbors including Australia or New-Zealand, migrants from SIDS in the Caribbean region mainly chose to relocate to the United States or Canada, and migrants from SIDS in the Atlantic and Indian region generally move to Great-Britain, Portugal, or France (OECD, 2008).

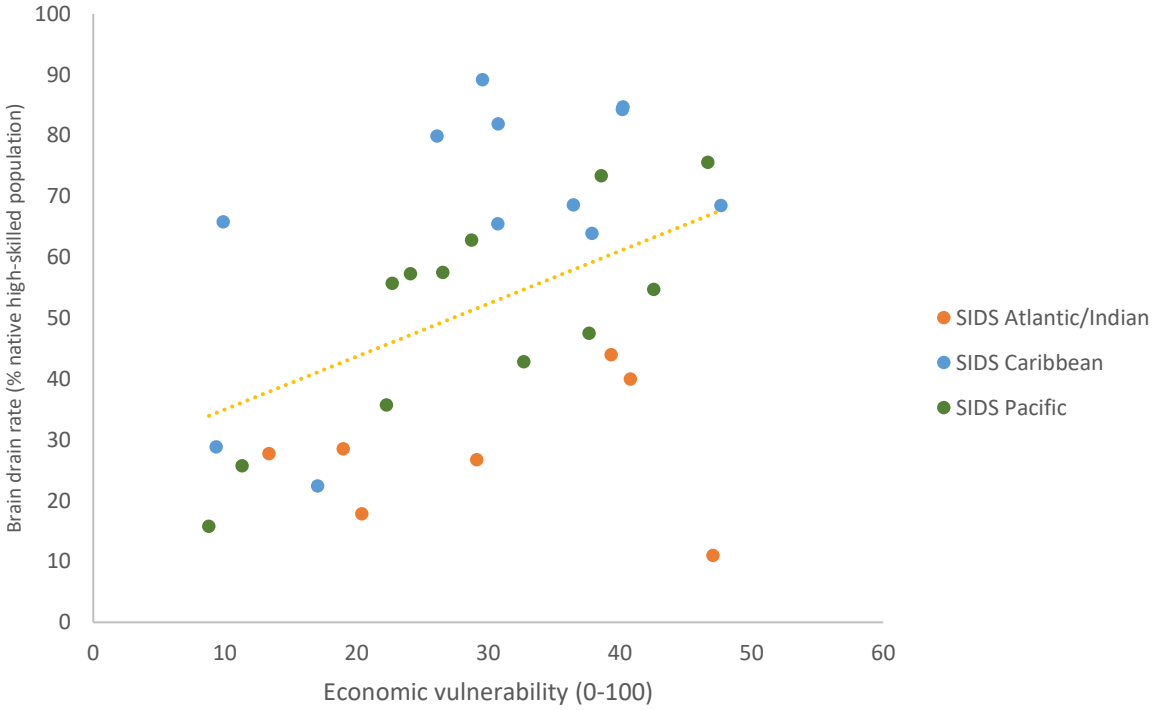
Figure 17. SIDS in the Caribbean and Pacific regions are particularly exposed to brain drain



Note: Brain drain rates are from circa 2000. Emigration data by level of education are scarce – latest available data were produced during the 2000 round of censuses. The median value of brain drain rates is 55.7% across all SIDS, 27.7% across SIDS in the Atlantic/Indian region, 68.5% across SIDS in the Caribbean region, and 55.2% across SIDS in the Pacific region. *Sources*: Authors' elaboration based on data from de la Croix et al. (2014).

SIDS' structural vulnerabilities are the root cause for the massive brain drain in SIDS. SIDS' economic vulnerabilities – including their small population size, their reliance on trade, their high degree of sectoral specialization, and their exposure to external shocks – are generating incentives for high-skilled workers to leave their native countries and find better job opportunities abroad. There is, indeed, a positive and significant relationship between SIDS' economic vulnerability and the brain drain rates they experience (Figure 18).

Figure 18. Brain drain is larger in countries with high levels of economic vulnerability



Notes: The correlation coefficient of 0.4410 is statistically significant at the 95% confidence level. Sample: 31 SIDS countries, including 7 SIDS in the Atlantic/Indian region, 12 SIDS in the Caribbean region, and 12 SIDS in the Pacific region. In this graph, economic vulnerability is measured as the equal weighted average of three indicators of the pilot MVI's Economic pillar, i.e. the dependency on tourism, the dependency on remittances and the degree of trade openness. Economic vulnerability ranges from 0 (low vulnerability) to 100 (high vulnerability). Due to low data availability, brain drain rates data are from circa 2000. Latest available emigration data by level of education were produced during the 2000 round of censuses.
Sources: Authors' elaboration based on de la Croix et al. (2014) and Sachs et al. (2021).

Two main economic vulnerabilities explain SIDS' high rates of brain drain. First, these countries are small and undiversified economies, where the opportunities for high-skilled labor are few (Wenner, 2016; Docquier and Schiff, 2008). Because they are small – in terms of population, land, and resources – SIDS must specialize in a few economic sectors and rely on imports for the provision of most of the intermediate and final goods they consume. Their undiversified economic base generally relies on sectors that are less skills-intensive, such as tourism or agriculture. In addition, customary land tenure makes private investment difficult, and hence limits job opportunities in the private sector. In SIDS, the opportunities for skilled labor are therefore few, and this forces the population with high levels of education to emigrate in the search of better employment opportunities.

Second, SIDS have a high degree of openness to international trade, which makes them particularly vulnerable to price volatility, and sectoral shocks. Coupled with the inadequacy of the available welfare public programs, this economic instability creates strong incentives for high-skilled individuals

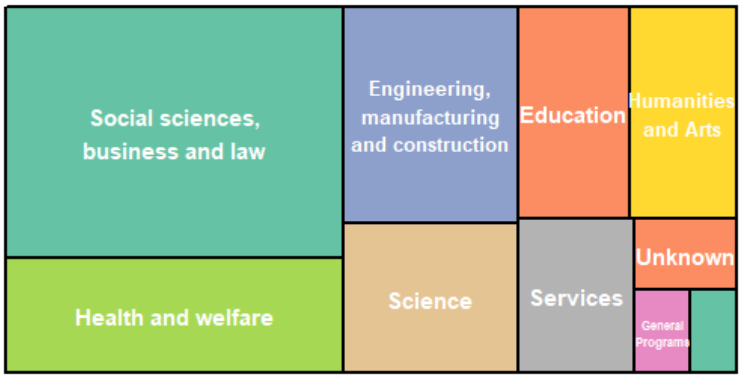
to migrate, even if they would be able to find a job in their home country (Wenner, 2016; Docquier and Schiff, 2008).

Moreover, the relative low wages and incomes in SIDS compared to the host countries constitute a significant push factor for high-skilled labor to work outside of SIDS (de la Croix et al., 2014).

In SIDS, the negative consequences of brain drain largely outweigh the potential benefits. Unlike larger countries that experience brain drain, the size of the SIDS diaspora is too small in absolute terms to generate enough positive feedback effects to compensate for the negative consequences of brain drain. While the remittances sent by skilled emigrants might help alleviate poverty and maintain macroeconomic stability, small island economies are heavily impacted by the negative consequences of brain drain, including the increased skilled wage gap between SIDS and host countries - which in turn reinforces skilled emigration, and the significant loss in human capital (Beine et al., 2008; Wenner, 2016).

In SIDS, the high rates of skilled emigration lead to a substantial reduction in human capital. Because of their economic vulnerabilities, SIDS are not able to retain their skilled population, nor to attract skilled workers from abroad. This net loss in human capital is a serious jeopardy for SIDS' economic development, as human capital is a key factor of growth. Across all three regions of SIDS, brain drain affects key sectors of the economy, as the majority of skilled migrants leaving their home island have high education degrees in either social science, engineering and construction, or health (Figure 19).

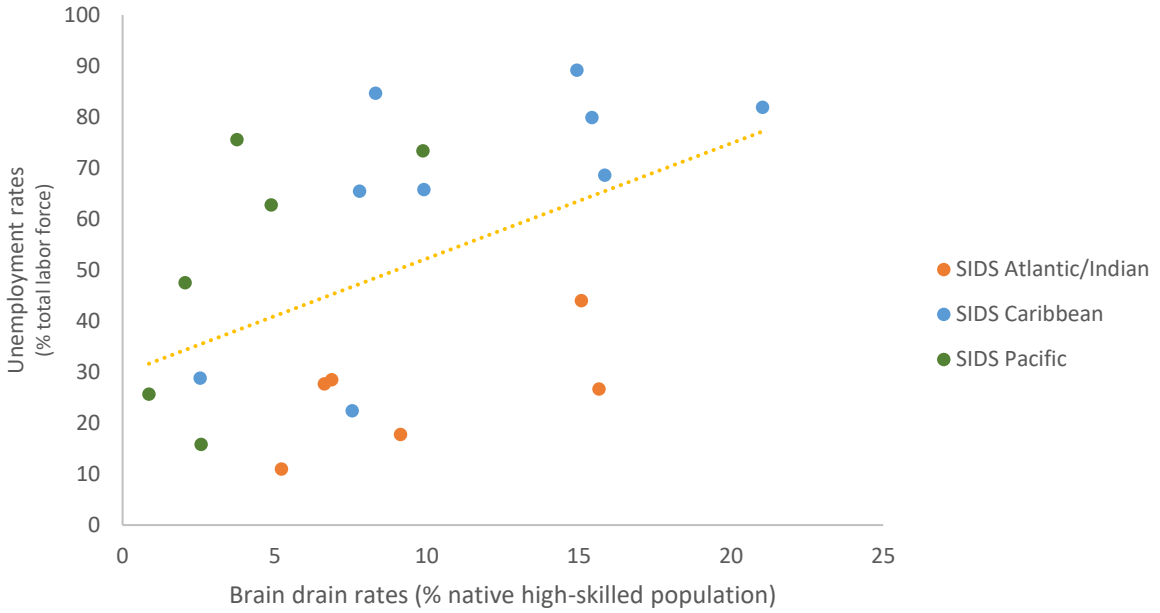
Figure 19. Emigration of high-skilled individuals affect key sectors of the SIDS' economy



Notes: The figure shows the share of each field of study among total emigration from SIDS. Brain drain rates are from circa 2000. Emigration data by level of education are scarce – latest available data were produced during the 2000 round of censuses.
Sources: Authors' elaboration based on OECD (2008).

As emigration of skilled individuals occur in pivotal sectors that help foster economic development, SIDS with high brain drain rates tend to struggle relatively more than other countries to make progress on SDG 8 (Decent work and economic growth). In SIDS, labor market conditions are especially challenging for those with high levels of education. The relatively small presence of skill-intensive sectors among the economy (e.g. ICT sector) leads to a low demand of skilled labor in the islands, leaving many high-skilled people unemployed and forcing them to migrate abroad to find a job. SIDS with more intense brain drain are therefore characterized by higher levels of unemployment (Figure 20) – a major factor for slow economic growth (Okun, 1963; Hjazeen et al., 2021) that can therefore induce poor progress on SDG 8 in SIDS.

Figure 20. Brain drain and unemployment rates are closely related in SIDS

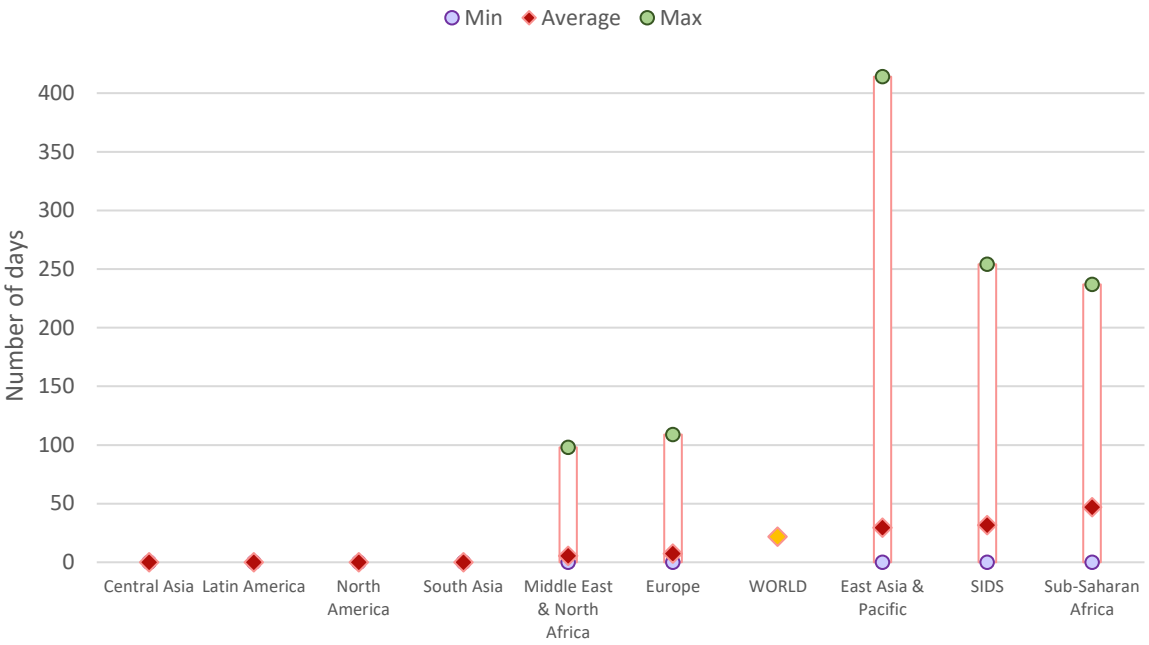


Notes: The correlation coefficient of 0.4766 is statistically significant at the 95% confidence level. Given data availability, unemployment rate is used as a proxy for SDG 8 performance (higher unemployment mirrors lower performance on SDG 8). Sample: 21 SIDS countries, including 6 SIDS in the Atlantic/Indian region, 9 SIDS in the Caribbean region, and 6 SIDS in the Pacific region. Brain drain rates are from circa 2000. Latest available emigration data by level of education were produced during the 2000 round of censuses.
Sources: Authors' elaboration based on de la Croix et al. (2014) and Sachs et al. (2022).

Structural vulnerability, digitalization, and the improvement of educational systems

Information and Communication Technologies (ICTs) and the digitalization of the economy represent a vital opportunity for SIDS to mitigate their structural vulnerabilities and make progress on the SDGs. As highlighted in the SAMOA Pathway – the outcome report of the 3rd International Conference on SIDS that took place in 2014 – the *"access by SIDS to appropriate, reliable, affordable, modern, and environmentally sound technologies is critical to achieving their sustainable development objectives [… as] science, technology, and innovation are essential enablers and drivers for sustainable development"* (ITU, 2019). SDSN's Six Transformations Framework for the SDGs emphasizes the importance of harnessing the digital revolution for achieving the SDGs (Sachs et al., 2019). An increased adoption of ICTs could help SIDS make progress on several SDGs, including SDG 4 by improving the quality of the education programs and ensuring online access to education in case of crisis such as the recent COVID-19 pandemic (Fellows and Leonardo, 2020). The COVID-19 crisis has considerably affected progress on access to education around the world, especially in countries with limited penetration of digital infrastructure. While schools were closed everywhere, countries with low access to internet faced more difficulties to transfer classes online, thus generating more abrupt and prolonged interruptions in learning (Sachs, Schmidt-Traub et al., 2021). SIDS belong to the countries with the highest number of days where no online teaching was possible while schools were fully closed because of COVID-19 (Figure 21). As experienced during the COVID-19 pandemic, digital services and infrastructure are key for resilience to shocks. Besides health crises, digital technologies can help maintain access and quality of services in the context of natural and climate-related events and enhance environmental sustainability (ADB, 2021).

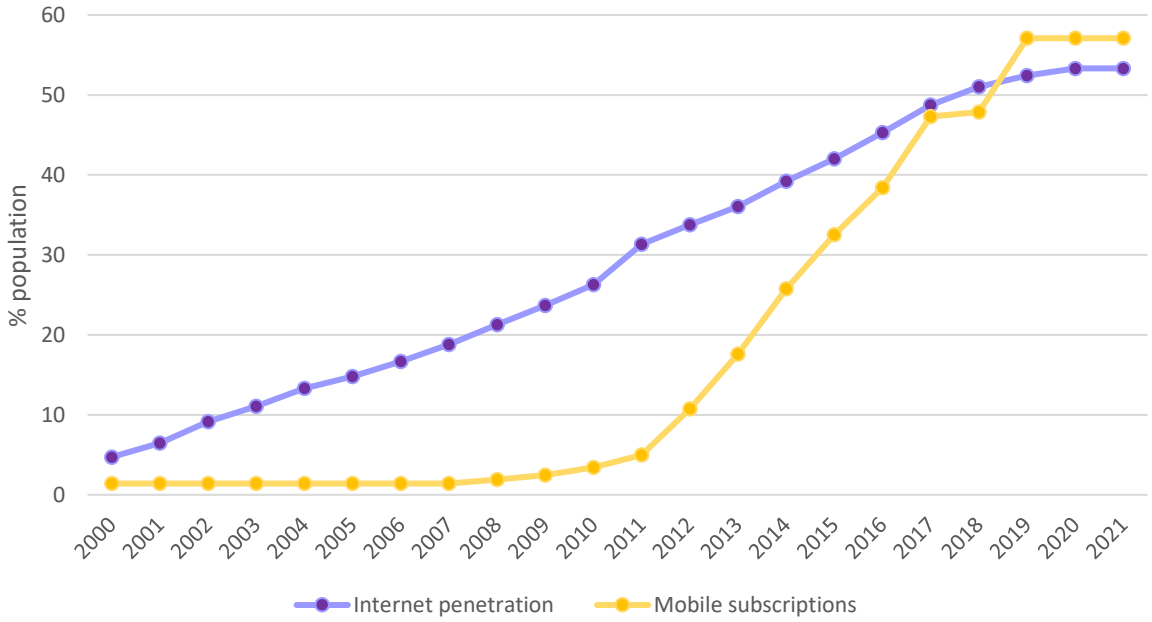
Figure 21. Number of days where no online teaching was possible due to school closures during the COVID-19 pandemic (February 2020-March 2022)



Notes: Sample: 198 countries, of which 40 SIDS, including 9 in the Atlantic/Indian region, 19 in the Caribbean region, and 12 in the Pacific region. *Sources*: Authors' elaboration based on UNESCO (2022).

Since the adoption of the 2030 Agenda, SIDS have made significant progress in the use of ICTs. While mobile broadband coverage began to increase from 3% in 2010 to reach 57% in 2021 on average, more and more SIDS inhabitants have access to the Internet. Today, internet penetration rates reach 53% of the SIDS population, and rose by 11 percentage points compared to 2015 (Figure 22). This progress is due to gradual improvement and expansion of ICTs infrastructure, including the connection of a growing number of SIDS to submarine optic fiber cables (ITU, 2019), which allow for a better-quality connectivity at more affordable prices. Deregulations of the ICTs sector, especially in SIDS in the Pacific region, have also helped attract private investments that reduced the price to access internet and increased the quality of telecommunication services, including better internet coverage across the islands (ADB, 2018).

Figure 22. Internet access and mobile use in SIDS has increased significantly over the past decade

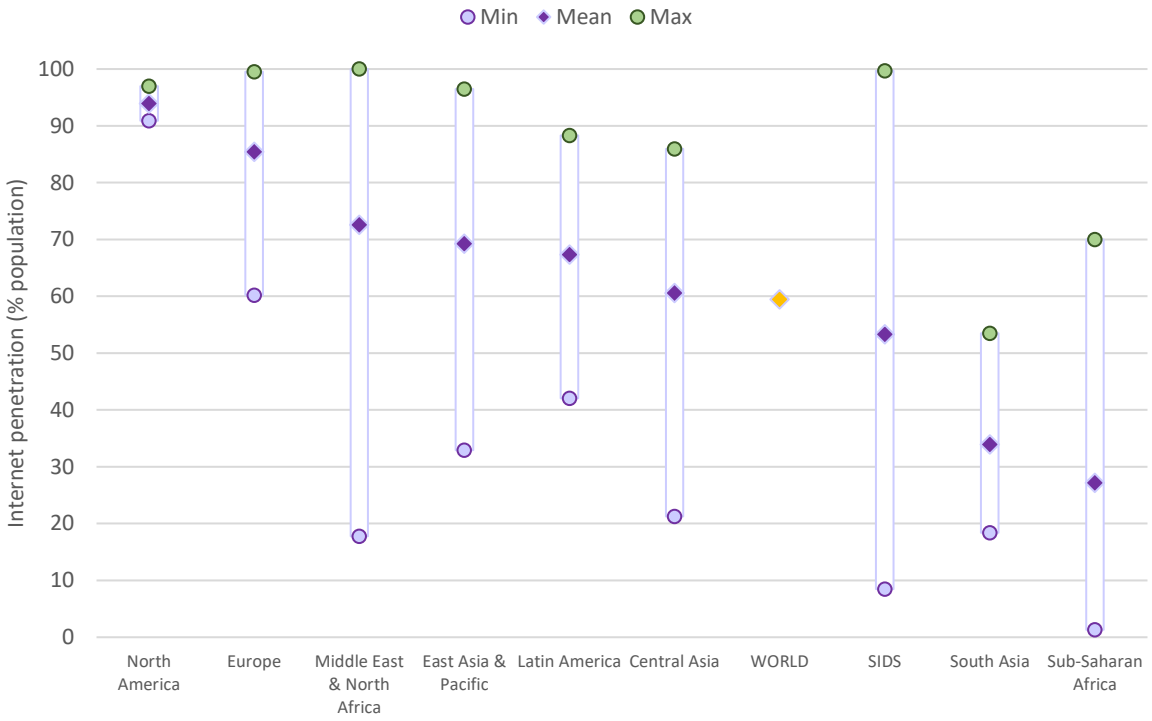


Notes: The sample is composed of 38 SIDS, including 9 SIDS in the Atlantic/Indian region, 16 SIDS in the Caribbean region, and 13 SIDS in the Pacific region. *Sources*: Authors' elaboration based on Sachs et al. (2022).

Although SIDS have experienced significant progress, they are still lagging behind most of the other regions of the world regarding internet access (Figure 23). Together with countries in the Middle East and North Africa, SIDS represent the group of countries with the highest degree of heterogeneity in internet penetration across countries. While SIDS in the Caribbean region perform above the world average on the rate of internet penetration – with internet access rates above 65% – small islands in the Pacific region display lower progress in their digitalization, since only 35% of their population use the internet, on average (Figure 24). Across the different SIDS regions, SIDS in the Atlantic and Indian Ocean have the greatest inequalities on internet access across countries in the same region (Figure 24). Internet access is the lowest in Comoros – where only 8.5% of the population uses Internet – and the highest in Bahrein (99.7%) where ICT infrastructure is more developed.

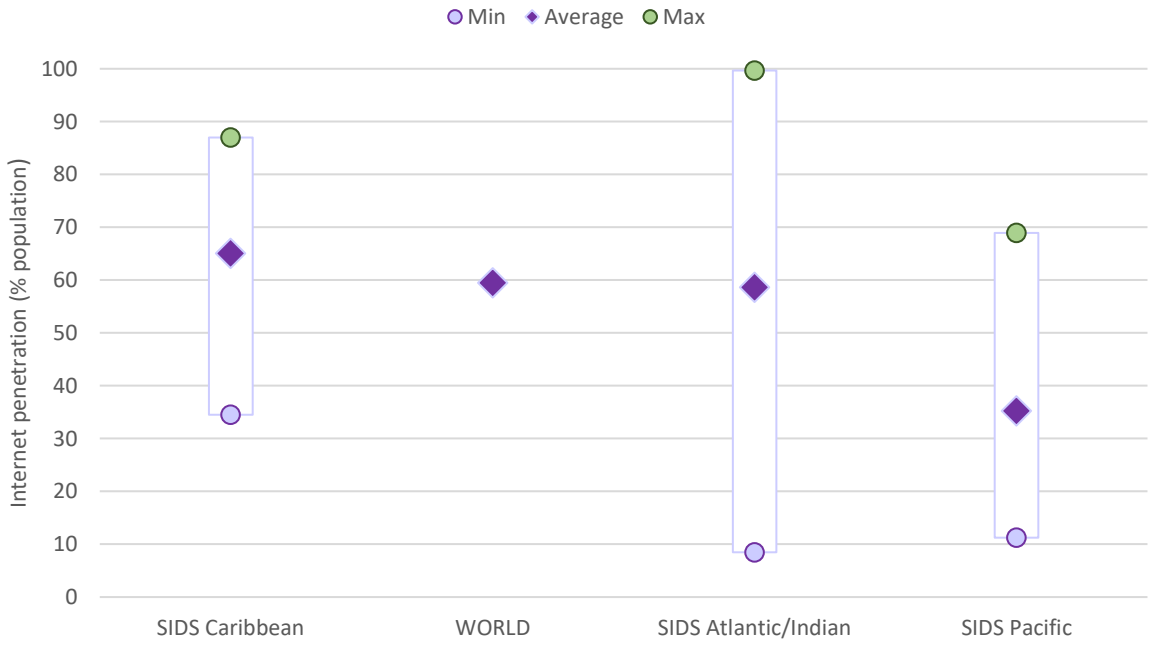
SIDS' telecommunication networks still suffer from a low degree of interconnectivity (among SIDS and across the world) and offer technologies that remain relatively slow compared to other countries as they are often limited to 2G connections (UNIDO, 2021).

Figure 23. Internet penetration in SIDS is still low compared to the rest of the world



Notes: The sample is composed of 192 countries, of which 38 SIDS, including 9 SIDS in the Atlantic/Indian region, 16 SIDS in the Caribbean region, and 13 SIDS in the Pacific region. The median value of internet penetration across SIDS is 56.45%.
Sources: Authors' elaboration based on Sachs et al. (2022).

Figure 24. Internet penetration is lower in SIDS in the Pacific Ocean

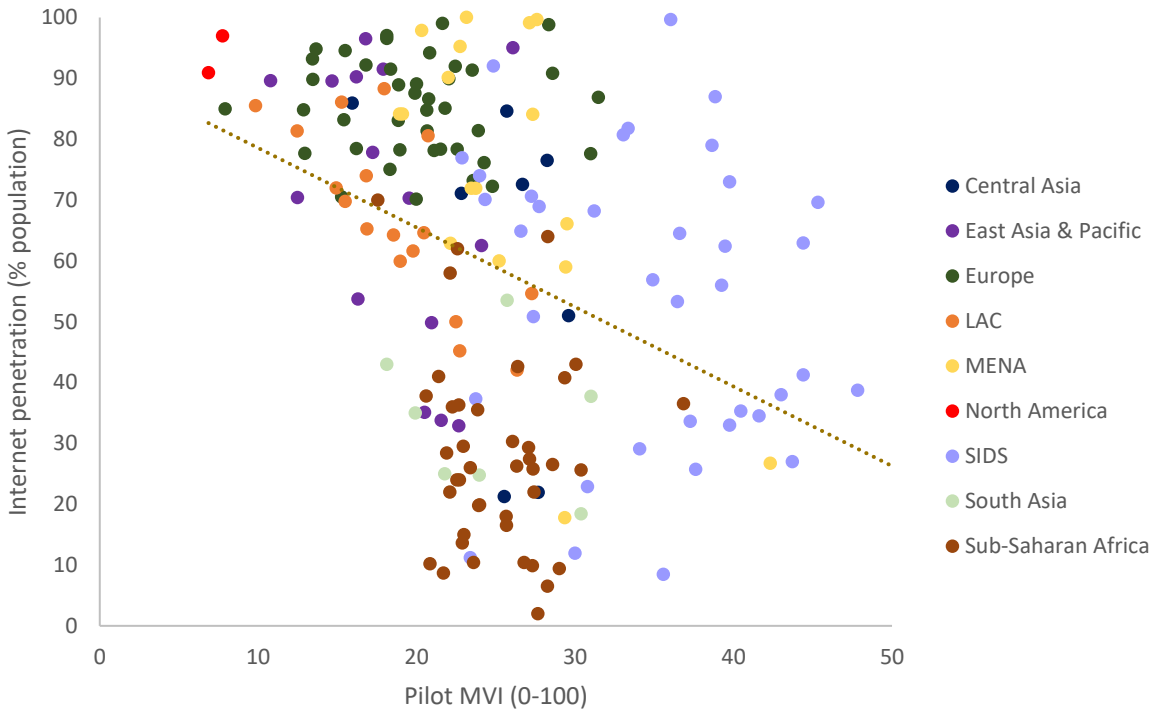


Notes: The sample is composed of 192 countries, of which 38 SIDS, including 9 SIDS in the Atlantic/Indian region, 16 SIDS in the Caribbean region, and 13 SIDS in the Pacific region. The median value of internet penetration is 64.5% in SIDS in the Atlantic/Indian region, 69.84% in SIDS in the Caribbean region, and 35.2% in SIDS in the Pacific region.
Sources: Authors' elaboration based on Sachs et al. (2022).

The lack of ICT skills and digital literacy among SIDS' populations constitute a major barrier to a larger digitalization of small islands (ITU, 2019; UNESCO, 2021, ADB, 2018; Fellows and Leonardo, 2020; IIEP, 2010). Besides investments in physical telecommunication infrastructure, the key to SIDS digitalization is to increase the strength of the digitally skilled human capital, to promote the efficient installation and maintenance of telecommunication infrastructure, as well as to advocate on the large array of ICTs use across the economy, particularly in the education sector. Seetal et al. (2021) showed that in the wake of COVID-19 when many classes were moved online, the major obstacle to ensure education was not the lack of internet access among students, but the lack of digital knowledge across teachers.

SIDS' high level of structural vulnerability jeopardizes their capacity to progress on their digital transformation. There is indeed a significant and negative relationship between the pilot MVI which measures countries' degree of structural vulnerability, and their level of digitalization, as measured by internet penetration (Figure 25). While digitalization is partly determined by a country's level of income and economic development, SIDS' structural vulnerabilities such as small population size, remoteness, and exposure to climate risk, prevent them from investing adequately in ICTs infrastructure and digital skills. The small size of the population and land, for example, implies that bringing internet or mobile technology services to the entire population is particularly challenging and costly for most of the SIDS (IIEP, 2010; ITU, 2019). Moreover, the relatively low skills in digital technologies among government officials at the national or local level, coupled with a steady emigration of high-skilled individuals (see above), constitute a limit to the deployment of ICTs across SIDS' economies. SIDS' vulnerability to climate change also significantly complicates the way ICTs networks are managed, as SIDS must use a specific type of ICTs infrastructure, resistant to extreme weather, which is typically of lower quality and speed than the infrastructure adopted elsewhere in the world (UNESCO, 2020).

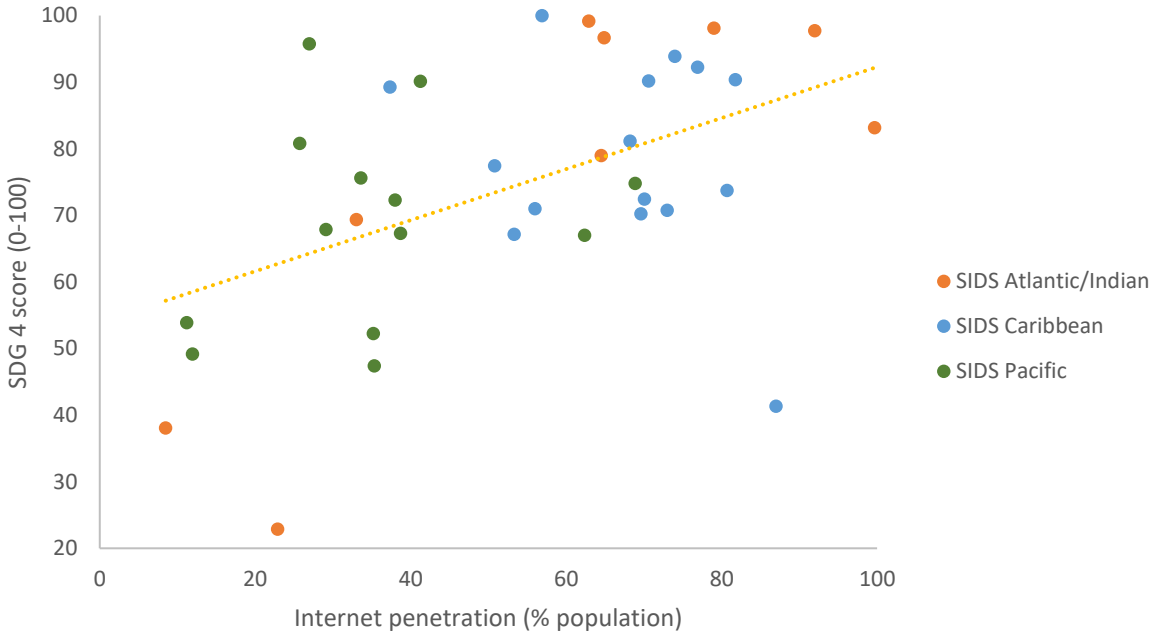
Figure 25. More vulnerable countries have more difficulties to digitalize



Notes: The correlation coefficient of -0.3750 is statistically significant at the 99% confidence level. Sample: 186 countries, of which 38 SIDS, including 9 SIDS in the Atlantic/Indian region, 16 SIDS in the Caribbean region, and 13 SIDS in the Pacific region.
Sources: Authors' elaboration based on Sachs et al. (2022) and Sachs et al. (2021).

Yet, digital technologies are essential to achieve the SDGs, and are a particularly useful tool to make progress on SDG 4. Digitalization can improve educational attainment in SIDS and resilience, and it can also lead to higher quality education, as it allows greater international integration and knowledge sharing (UNESCO, 2020). Data show that SIDS with higher levels of digitalization tend to perform better on SDG 4 (Figure 26). Because SIDS are small and remote, they tend to have limited supply of teachers, school material, and school facilities (ADB, 2018). An increased use of ICTs in SIDS could contribute to remove important barriers to education – especially to tertiary education – by allowing students residing in SIDS with a low educational offer to attend online classes of other countries' universities. In this way, the digitalization of education in SIDS could also be a precious tool to reduce the steady brain drain phenomenon as well as to ensure schools' continuity when small islands are hit by natural disasters. An extensive use of ICTs in education would also contribute to lower the financial and opportunity costs of education, therefore reducing inequalities in access to education across women and men and across income-groups within the population (IIEP, 2010).

Figure 26. SIDS with higher levels of digitalization perform better on SDG 4



Notes: The correlation coefficient of 0.4899 is statistically significant at the 99% confidence level. Sample: 37 SIDS, including 9 SIDS in the Atlantic/Indian region, 15 SIDS in the Caribbean region, and 13 SIDS in the Pacific region. SDG 4 score is the equal weighted average of four indicators of the SDSN's SDG Index 2022 related to education: (i) participation rate in pre-primary organized learning (as a percentage of children aged 4 to 6); (ii) net primary enrollment rate (as a percentage of the total population); (iii) lower-secondary completion rate (as a percentage of the total population); (iv) literacy rate (as a percentage of the population aged 15 to 24). SDG 4 score is measured from 0 to 100, where 100 is the best possible outcome.
Sources: Authors' elaboration based on Sachs et al. (2022) and Sachs et al. (2021).

Thanks to the development of fiber-optic technology, SIDS in the Pacific and Caribbean regions have led the way towards digitalization of the educational system, by establishing the first university's satellite communication network. In the University of the South Pacific, the USPNet systems connects more than 12 campuses located in other Pacific SIDS and provides direct access for the students to the resources of the Australia's Academic and Research Network (ADB, 2018). In a similar way, the University of the West Indies Open Campus offers online classes to its 23 thousand students located across different SIDS in the Caribbean region (ITU, 2019).

Outlook

Although SIDS have made significant improvements on key education outcomes such as the share of the population enrolled in pre-primary and primary education since the adoption of the 2030 Agenda, many challenges still prevent them from offering high-quality education systems to their populations.

Structural vulnerabilities and limited access to financial resources impede SIDS' achievement of SDG 4 (Quality Education). Despite the well-known limitations of cross-country regressions with a limited number of observations, this paper explores and discusses the linkages between structural vulnerabilities and lower performance on SDG 4 (Quality Education). Exposure to climate change and natural disasters lead to significant population displacements which in turn cause severe disruptions in the education systems. The lack of opportunities in local labor markets incentivizes the migration of students and skilled workers abroad thus hampering economic growth. The small size, remoteness, and lack of ICT skills constrain progress in digitalization with consequent adverse impacts on educational attainment and quality. Redesigning education systems is critical across SIDS to generate skills and expertise required to advance blue and green economies, nature conservation, and net-zero aligned growth. With adequate education and technological means, SIDS could become research hubs and be at the forefront of the development of ocean science for environmental sustainability, food security, and decarbonization. Policy interventions to ensure best performing students pursue a teaching career rather than those with lower grades as is currently the case in many SIDS would lead to enhanced quality of education systems and higher esteem associated with the teaching profession.

SIDS could undertake a series of actions and investments to help improve education and ensure better opportunities to their populations. To reduce the impacts on education of climate induced population displacements and migration, governments could adopt policies, developed through consultations with affected communities, that mitigate climate change and its effects, support communities to enhance disaster preparedness, and establish disaster-risk reduction strategies that limit forced displacement and shorten rehabilitation time while strengthening human security. Access to education (and other essential services) could be guaranteed to displaced people also by harnessing the potential of digital technologies. International cooperation and humanitarian assistance that is informed by the needs of the population and affected communities could play a key role in supporting displaced populations. Expanding lifelong learning opportunities including through virtual platforms is in dire need in many SIDS, in which options for continued education are typically limited.

In order to reduce the brain drain phenomenon and its adverse impacts on the economy, SIDS' governments could take several steps to slow the flow of migrants abroad and create better opportunities at home. For example, they could stimulate the return of highly skilled workers who left by creating cooperative arrangements with host countries according to which local students receive fellowships to study abroad on the condition that they return home after graduation for a specified period of time, prior to being allowed to emigrate again. Governments could also generate greater incentives for highly skilled workers to remain at home by creating new job opportunities in human capital-intensive sectors, or in industries where SIDS have a comparative advantage. Better education facilities, wages, promotion and protection of human rights, including labor rights, and business environment could also be effective strategies to convince and enable people to remain in their country of birth. While labor migration and remittances represent structural necessities in SIDS regions, through better alignment of education systems with the labor market including through modernized and adequately budgeted Technical and Vocational Education Trainings (TVET) programs,

enhanced digitalization and adoption of technology, SIDS economies could further diversify and reliance on remittances as a means of improved living could gradually decline.

Implementing more solid social welfare programs and closing the gender gap in education attainment at all levels of education are also key elements to reduce brain drain. In many cases, school dropouts are driven by poverty, domestic violence, and poor nutrition leading to suboptimal learning outcomes. The introduction of social protection floors and income generating opportunities at the community level – outside the government payroll – would reduce reliance on remittances for families in SIDS and, implicitly, reduce the economically-driven early dropouts and labor migration of young workers. Social protection benefits and programmes including school feeding will reduce food insecurity and improve nutrition and school performance. Equally important is to reduce the gap between girls' and boys' education outcomes. Recent DHS MICS data (Samoa Bureau of Statistics, 2021; Secretariat of the Pacific Community, 2022) show that boys gravely underperform in the Pacific SIDS. As a result, boys drop out earlier than girls and enroll in labor migration schemes (that also provide basic training) as one of the very few options for them to make a living and support their family. The highest education performance of girls is behind the female-dominated government labor force, while men take the road of migration and provision of remote support to their families through remittances. Better alignment of education programs with the labor demand profile in SIDS is needed to reduce structural unemployment particularly among youth and to foster growth.

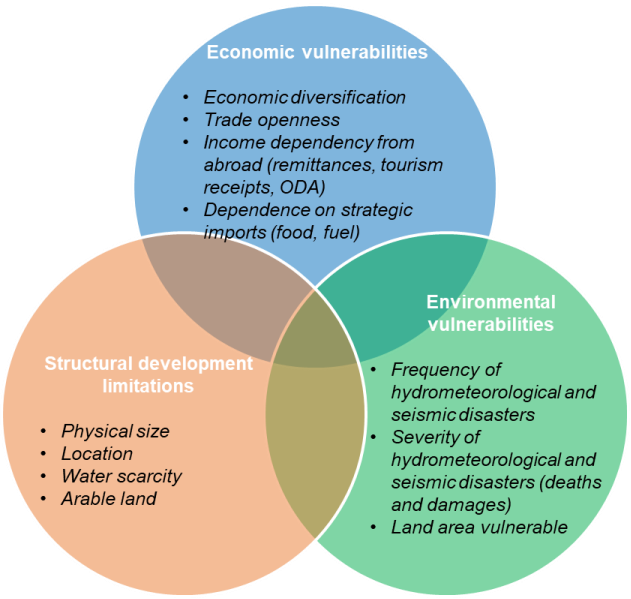
To allow and accelerate progress on digital transformation, governments of small islands could establish and implement national ICT plans. Integrating ICT into the national curriculum as well as in teacher training could also be an effective strategy. New investments and partnerships could be made to allocate adequate resources to key national infrastructure such as fiber-optic cables. Learning from experience on innovation and digitalization of other regions around the world could also be a useful way for SIDS' governments to acquire the necessary knowledge to develop scalable, adaptable, affordable, and equitable digital solutions. With adequate digital infrastructure and policies in place, SIDS will be able to become knowledge societies and ensure all people have access to information and learning opportunities to secure jobs without migrating.

Finally, International Financial Institutions (IFIs) and Multilateral Development Banks (MDBs) have a key role to play in unlocking progress on education in SIDS. Because of their narrow fiscal space and the repeated climate change-induced natural disasters, SIDS do not have the capacity to fund the SDGs with their own domestic resources only. By developing new, targeted, and innovative financing schemes, IFIs and MDBs can allow SIDS to receive the amount of external funding they need to make progress on the SDGs, reinforce their resilience and ensure a brighter future to their populations. On one hand, IFIs need to revise the current eligibility criteria for allocating concessional funding, which preclude SIDS – that are considered too rich – to benefit from development finance. On the other hand, IFIs also need to consider SIDS' structural vulnerabilities and exposure to rich countries' spillovers and to raise SIDS' creditworthiness. By doing so, SIDS could be able to adopt new and innovative financial solutions – including issuing SDG bonds or debt swaps – to liberate liquidity and finance investment in basic, tertiary, and vocational education (Massa et al., 2022).

Annexes

Annex 1

Table A1.1. Framework for the Pilot Multidimentional Vulnerability Index (MVI)



Source: Sachs et al. (2021)

Annex 2

Table A2.1. Economic and development vulnerabilities are related with lower performance on SDG 4

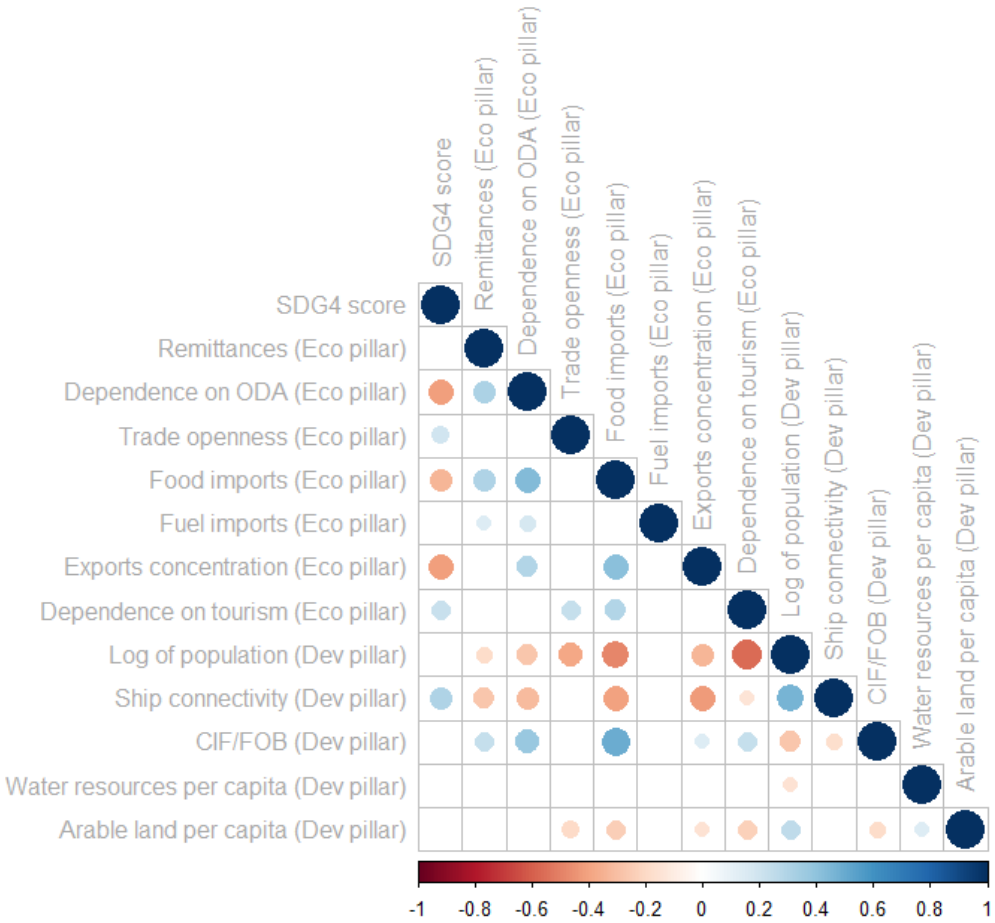
Pilot MVI's pillars	SDG 4 score
Pilot MVI's Economic Pillar	-0.2963*
Pilot MVI's Development Pillar	-0.1501*
Pilot MVI's Environment Pillar	0.0124

Notes: The table shows the pairwise correlation coefficients between each of the SDSN's Pilot MVI pillars and SDG 4 score. * denotes a significance at the 95% confidence level. Sample: 176 countries, of which 37 SIDS, including 9 are in the Atlantic/Indian region, 15 in the Caribbean region, and 13 in the Pacific region. SDG 4 score is the equal weighted average of four indicators of the SDSN's SDG Index 2022 related to education: (i) participation rate in pre-primary organized learning (as a percentage of children aged 4 to 6); (ii) net primary enrollment rate (as a percentage of the total population); (iii) lower-secondary completion rate (as a percentage of the total population); (iv) literacy rate (as a percentage of the population aged 15 to 24). SDG 4 score is measured from 0 to 100, where 100 is the best possible outcome.
Sources: Authors' elaboration based on Sachs et al. (2022) and Sachs et al. (2021).

Annex 3

Countries with higher levels of economic and development structural vulnerability generally experience higher dependence on food imports and ODA, are characterized by a concentration of their productive sectors and exports and are less connected to the rest of the world. All these aspects of economic and development structural vulnerabilities appear to be significantly related to lower score on SDG 4 (Figure A2.1).

Figure A3.1. Variables of the Economic and Development Pillars of the Pilot MVI and their correlation with SDG 4 score



Notes: This correlogram reports the significant correlations between SDG 4 score and the various indicators included in the Economic and Development Pillars of the Pilot MVI. Positive correlations are shown in blue, while negative correlations are shown in red. The size of the circles is proportional to the intensity of the correlation between the variables. SDG 4 score is the equal weighted average of four indicators of the SDSN's SDG Index 2022 related to education: (i) participation rate in pre-primary organized learning (as a percentage of children aged 4 to 6); (ii) net primary enrollment rate (as a percentage of the total population); (iii) lower-secondary completion rate (as a percentage of the total population); (iv) literacy rate (as a percentage of the population aged 15 to 24). SDG 4 score is measured from 0 to 100, where 100 is the best possible outcome. *Sources*: Authors' elaboration based on Sachs et al. (2022) and Sachs et al. (2021).

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