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Returns to quantity and quality schooling in SIDS in the context of vulnerability

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Abstract: This study investigates the differential private returns to education quantity (mean years of schooling) and quality (Learning-Adjusted Years of Schooling, LAYS) in Small Island Developing States (SIDS) within a pooled OLS framework, leveraging World Bank data for 2017, 2018, and 2020. Recognizing that SIDS face unique vulnerabilities and resource constraints that impact their educational systems, the analysis incorporates measures of economic and structural vulnerability to isolate the distinct wage effects of schooling quantity versus quality. Results indicate that LAYS exhibits significantly higher returns than mean years of schooling, underscoring the importance of learning outcomes in driving labour market success. The findings align with recent evidence that highlights the limitations of merely increasing school enrolment without addressing the quality of education, and it emphasises the need for policy interventions that bridge the schooling-learning gap. By explicitly accounting for SIDS' vulnerabilities and demonstrating the higher returns to quality-adjusted education, this research provides crucial insights for policymakers seeking to optimise scarce resources and enhance human capital development in these uniquely challenged economies.

Keywords: Learning-Adjusted Years of Schooling (LAYS), Mincerian wage equation model, quality education, quantity education, Small Island Developing States, vulnerability

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Introduction

Most of the work on private returns to education has been exploring the quantity aspect of education, the years being the usual measure of it. Likewise, numerous governments and policy makers have emphasized enhancing access to education as a leading development strategy, prompted, in part, by the pioneering research of economists, such as Gary Becker (1962) who found that there is a positive correlation between years of schooling and economic growth. Even so, there has recently been increasing awareness that not only does the quality of education play a crucial role in the private returns to education, for example in the US, higher educational quality, as measured by a test score, by 11% compared with no additional year of education. Moreover, Hanushek et al. (2015) and Valerio et al. (2016) discovered, in 23 OECD countries, that the basic foundation skills – numeracy and reading ability – of workers have a larger effect on their hourly wages than the years of schooling they have attained. Similarly, Restuccia and Urrutia (2004) also found that when children and young adults have better learned, they are more likely to receive higher incomes in future.

Note that the amount of schooling is not always positively associated with the quality of education. So, the impact of years of schooling on income may not capture the impact of quality of education, which is as or possibly even more important than the quantity of education for determining wages. One composite measure of quantity and quality of education is 'Learning Adjusted Years of Schooling'(LAYS) introduced by the World Bank, which takes into account that the same years of schooling can lead to different levels of learning and comfortably equated with education (Pritchett, 2013; World Bank, 2018). LAYS may be easily interpreted as an index, the product of two quantities, average years of schooling and a measure of learning for which some benchmark is used.

Altinok and Diebolt (2024) suggest that, despite improved access to education in most countries, not much seems to be done to improve the level of learning outcomes; which implies that an increased level of enrolment does not amount to better learning. Their findings highlight the importance of policies that address not only rising school enrolment rates but also the improvement of the quality of schooling. The authors contributed data on learning outcomes, years of schooling and LAYS for more than 120 countries over the period 1970-2020 and they focused on the benefit of the improvement of learning outcomes in the process of building human capital and economic growth.

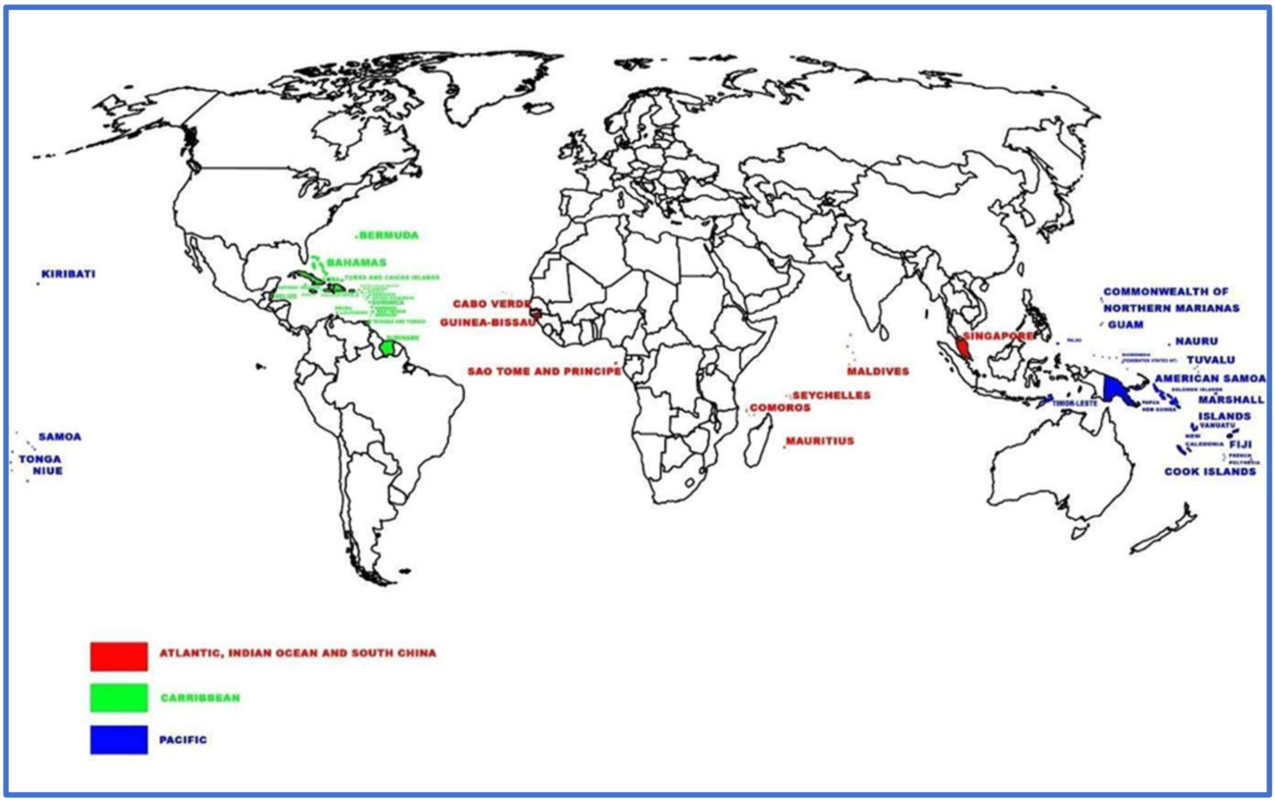
From a contextual standpoint, it is evident that Small Island Developing States (SIDS) frequently encounter unique challenges that lead them to prioritise the quantity of education over its quality. They are constrained by inadequate financial and human resources which hinder a simultaneous increase in quantity and quality of education. They too are amongst the highest rates of Youth NEET. Furthermore, with the large urban-rural coverage gap in access to education, it appears that in many SIDS, the policy emphasis has been more on widening access rather than quality. Moreover, most SIDS, especially those in the Pacific, have a high rate of population growth that serves to emphasize the demand for education expansion rather than the quality of education and student learning. But as noted by the SAMOA Pathway, better quality education and improved learning achievements can be of considerable assistance to SIDS to address their specific dimensions of vulnerability and build overall empowerment and resilience

Since education is considered to be an investment in human capital, a possible approach to drawing its attention to quality education is to demonstrate that investment in the later not only returns, but higher than years of schooling (quantity of education). However, while much is known about the positive private returns to years of schooling, less is known about the private returns to quality schooling, especially for SIDS. As such, this paper fills the literature gap in two fundamental aspects. First, years of schooling in Mincerian equation is replaced with LAYS to take into account the effect of both amount and quality of education on private return (wages) in 27 SIDS. Second, the study is able to consider the specific vulnerabilities that SIDS are exposed to by introducing vulnerability indicators as control variables into the Mincerian model, which in turn, more effectively informs policy-makers in developing more efficient interventions. The remainder of the paper is organised as follows: Section 2 presents a detailed situation analysis of SIDS; section 3 presents the Mincerian equation and its literatures; section 4 depicts the descriptive statistics and the empirical results are discussed in section 5 and section 6 concludes.

Situational analysis

Small Island Developing States (SIDS) are a group of countries distinguished by their small land area, frequently scarce resource bases, and susceptibility to outside shocks, especially natural disasters and climate change. The aggregate population of all the SIDS is 65 million, slightly less than 1% of the world's population, yet this group faces unique social, economic, and environmental challenges. Their challenges are further exacerbated due to their remote location and susceptibility to natural hazards. The United Nations defines Small Island Developing States based on criteria related to their geographical and developmental characteristics. As of 2024, there are 39 SIDS which are UN member states and 18 SIDS which are Associate Members of UN Regional Commissions (www.un.org/ohrlls/content/list-sids). SIDS are further classified into Caribbean SIDS, Pacific SIDS and Atlantic, Indian Ocean, Mediterranean and South China Sea (AIMS) SIDS depending on their location.

Figure 1: Map showing location of SIDS.



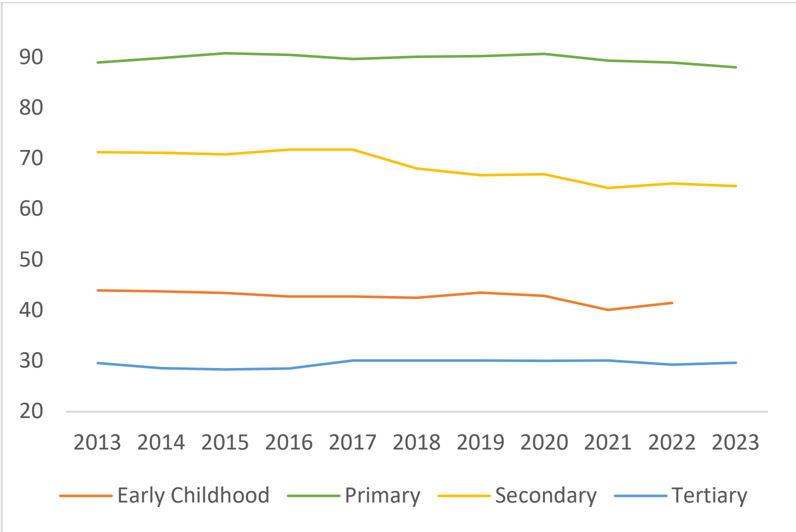
Source: Authors' own compilation

The quantity measures of education

Using the traditional access to education indicators such as gross school enrolment rates, and intake rates, the quantity input measures of education are analysed. From Figure 2, one can note that primary education in SIDS had the highest enrolment ratio, which was consistently above 85% and relatively stable over the years. As for secondary education, a noticeable decrease could be observed in the years 2017 onwards, from 71.8% to 64.5%.

The high enrolment ratios at the primary and secondary levels are indicative of educational policies which reflect government interventions at retaining a maximum number of students in the schooling system. Tertiary education registered the lowest enrolment among all levels, largely as a result of barriers in accessibility, quality and affordability. As per latest available figures, the majority of SIDS reported a high percentage of students enrolled in early childhood programmes, primary and secondary education as a result of the expansion of education and the setting up of the minimum school leaving age, albeit with various variations across countries noted (https://uis.unesco.org/). Small states and territories such as Seychelles, Singapore, Anguilla, Cuba, Montserrat, Saint Kitts and Nevis, Cook Islands and Kiribati registered an enrolment of over 80% in early childhood programmes in contrast to regions such as Comoros, Bahamas, Grenada, Trinidad and Tobago, Marshall Islands, Micronesia, Papua New Guinea and Timor-Leste. Such high enrolment rates indicate a strong foundation for learning and commitment to education which further translate into better economic and social benefits inclusive of reduced dropout rates, increased future productivity, higher returns in terms of future human capital and better social integration. The Net Enrolment Ratio (NER) in Singapore increased from 75.2 in 2018 to 82.6 in 2022. Similarly, the figure in Timor-Leste was 17.3% in 2015 and increased to 26.0 in 2020. However, countries such as Maldives experienced a decrease in NER by more than half, from 98.5% in 2015 to 46.9 in 2023. For Mauritius, the figure was 66.8 in 2015 and has decreased to 62.1% in 2023. Very often, such decreasing trends are attributed to changes in the demographic profile of a country, notably a decline in birth rate and an increase in the ageing population. On average, the AIMS reported the highest enrolment rate in early childhood education, with the figure standing at 60.0%, followed by the Caribbeans with 58.4% and the Pacific with an average enrolment rate of 44.4% during the last decade.

Figure 2: Enrolment ratio in SIDS.



Source: Authors' elaboration based on UIS Statistics

Two indicators – Gross Intake Ratio to the last grade of primary and Gross Intake Ratio to the last grade of lower secondary education – are more promising than those of the NER in early childhood. Accordingly, all countries forming part of AIMS had a Gross Intake Ratio (GIR) of more than 80% in primary education, with the majority of the SIDS maintaining the same standard when it comes to lower secondary education, except for the Comoros and Sao Tome and Principe. Such high figures are usually the result of compulsory education policies which aim at increasing educational attainment and literacy rates. The Pacific also registered GIR in primary education of over 70%; while the figures were much lower for the Caribbean. On average, GIR in primary education across AIMS is 91.3%, followed by the Pacific with 94.9% and the Caribbean by 94.6%.

Furthermore, GIR in lower secondary schooling stood at 88.9% for AIMS, 95.3% for Caribbean and for the Pacific at 82.4%. Countries such as Antigua and Barbuda, Montserrat, Saint Kitts and Nevis, Cook Islands, Fiji, Kiribati, Samo and Vanuatu recorded over 100% of GIR in primary education, and some maintaining the same trend for lower secondary education. On a note of concern, the Gross Enrolment Rate (GER) for tertiary education remained very low across the regions. However, serious improvements were observed: for example, in 2017, the GER in tertiary education stood at 35% in Maldives, which increased to 50% in 2023. The same situation can be applied to Cuba, with an estimate of 36% in 2015, rising to 49% in 2024. The percentage almost doubled for Saint Vincent & the Grenadines: from 24% in 2015 to 41% in 2024.

Figure 3: Completion Rate, Primary.

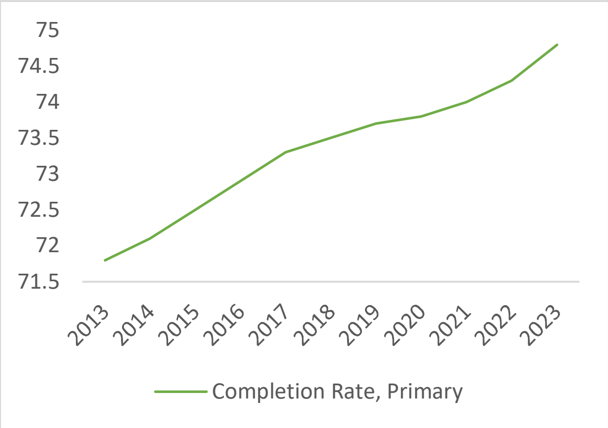
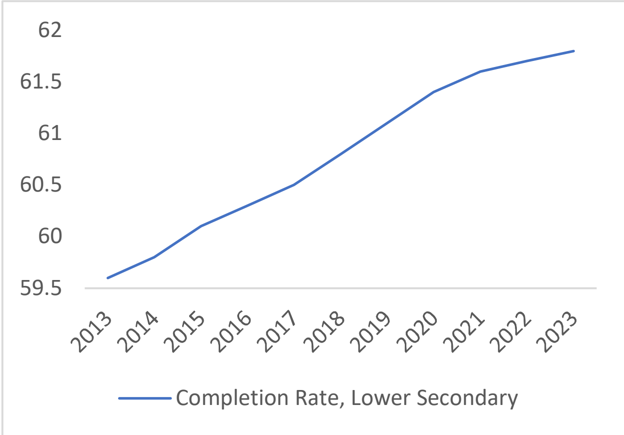


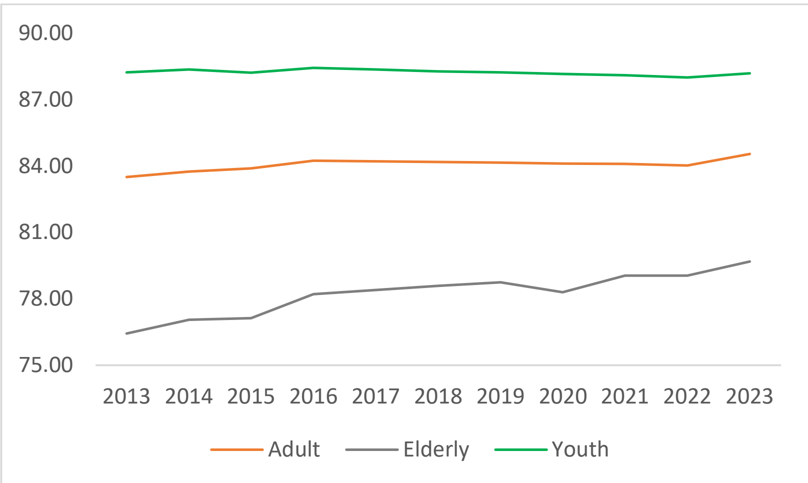
Figure 4: Completion Rate, Lower Secondary



Source: Authors' elaboration based on UIS Statistics

Figures 3 and 4 show the completion rates of primary and lower secondary schooling. While indicators such as GER and NER are useful in assessing educational attainment, they nevertheless need to the interpreted with caution, especially in developing countries. According to UNESCO (2015), students in developing countries often enter the education system at ages that deviate from the official entry age and grade repetition rates have a tendency to be significantly higher, hence inflating GER and NER. Alternatively, completion rates provide a more robust measure of whether students are successfully completing full schooling cycles instead of simply attending. The primary school completion rate for SIDS increased from 71.8% to 74.8% over a period of 10 years indicating a steady and incremental growth. On the other hand, the lower secondary completion rate increased from 59.6% in 2013 to 61.8% in 2023, reflecting a stagnant progress and potential barriers to school continuation beyond primary. The widening gap between primary and secondary completion rates calls for policies that are context specific and may range from strengthening teachers' deployment to target support to students who are at risk.

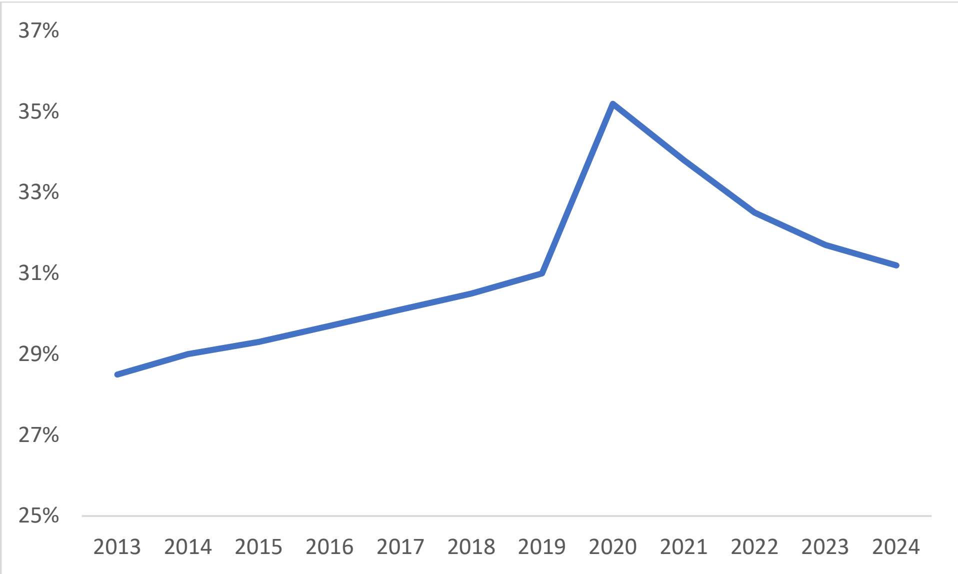
Figure 5: Literacy Rate.



Source: Authors' elaboration based on UIS Statistics

Figure 5 shows literacy rates for adults, youths and the elderly over the period 2013 to 2023. The graph shows that youth literacy has remained the highest during the past 10 years followed by that for adults and the elderly. While the literacy rate of elders showed a gradual increase, it nevertheless remains the most vulnerable group in terms of literacy levels. The educational outcomes are stronger for youths in SIDS; however, the figures remained below 90%, following the same trend during the past decade. An assessment of generational differences in literacy rates would point to a significant disparity in intergenerational learning and support, impact of educational reforms, technological advancements, economic and social factors among others. The estimated adult literacy rate, adjusted gender parity index across AIMS was found to be 0.9 and 1.0 for both the Pacific and Caribbean. Many of the SIDS reported having an index of 1.0 indicating successful efforts in promoting gender equality in education and literacy programs. Countries with latest lower indices include Cabo Verde, Guinea-Bissau, Sao Tome and Principe, Haiti, Papua New Guinea and Timor-Leste. Between 2001 and 2010, in Timor-Leste, the adult literacy rate went from about 38% to 58% and in Guinea-Bissau, from 41% to 57% between 2000 and 2012. Furthermore, most of the SIDS registered a literacy rate of above 90%, with the highest numbers documented in Tonga, Trinidad and Tobago at 99%. Haiti, Papua New Guinea and Timor-Leste tabulated the lowest literacy rates, which were found to be below 70%, which explains their status as least developed economies. As a matter of fact, these countries are still far from meeting the goal 4 target of reducing illiteracy by less than 30%.

Figure 6: Expenditure on education as a percentage of GDP.



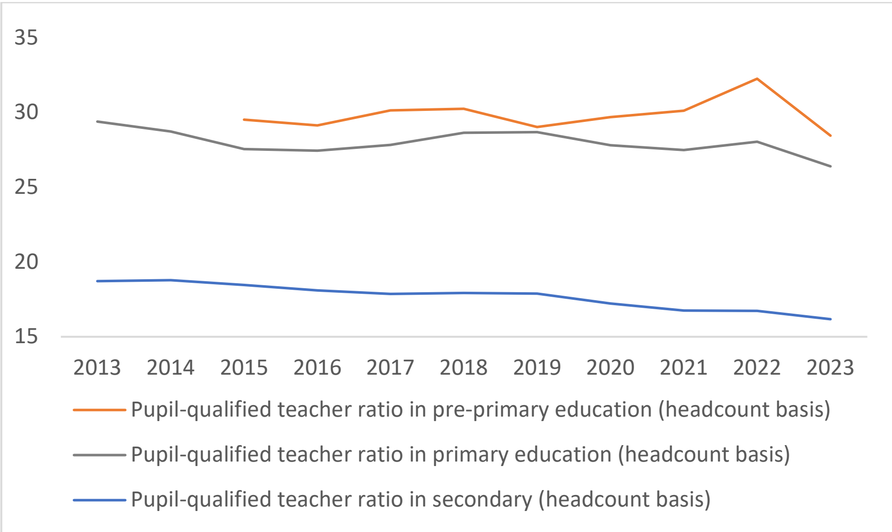
Source: *Authors' elaboration based on UIS Statistics*

The trend in public expenditure on education as a percentage of GDP for SIDS, as shown in Figure 6, mirrors the complex interaction of structural vulnerabilities, external shocks, and policy responses. The step-up before 2020 reflects the continuation of efforts to accumulation human capital and educational outcomes in the face of challenges including small populations, high per capita service delivery costs, and limited fiscal space. The huge increase in 2020 is largely, in turn, the product of the COVID-19 pandemic, which led to dramatic economic contraction – most notably in the collapse in travel and disruption of supply chains – shrinking GDP, and thus inflating the ratio of education expenditure to total output even if nominal expenditure were held stable or rose modestly. In this context, governments were also under pressure to minimize the impact of the lockdown on education provision (including remotely) and health measures while resources were limited. After the pandemic, the ratio's descent reflects some normalisation of the budget and also the increased share going to education, but that it is still higher post-pandemic compared to pre-pandemic years also signals continued issues: SIDS still struggle with high debt burdens, access to concessionary finance, and vulnerability to external shocks– with these conditions disproportionally affecting their ability to invest sustainably in education.

The quality measures of education

Coming to the quality of education in SIDS, given the scant of available indicators, we make use of Pupil Qualified Teacher Ratio (PQTR) and LAYS ratio to highlight the trends (see Figure 7).

Figure 7: Pupil-qualified teacher ratio.



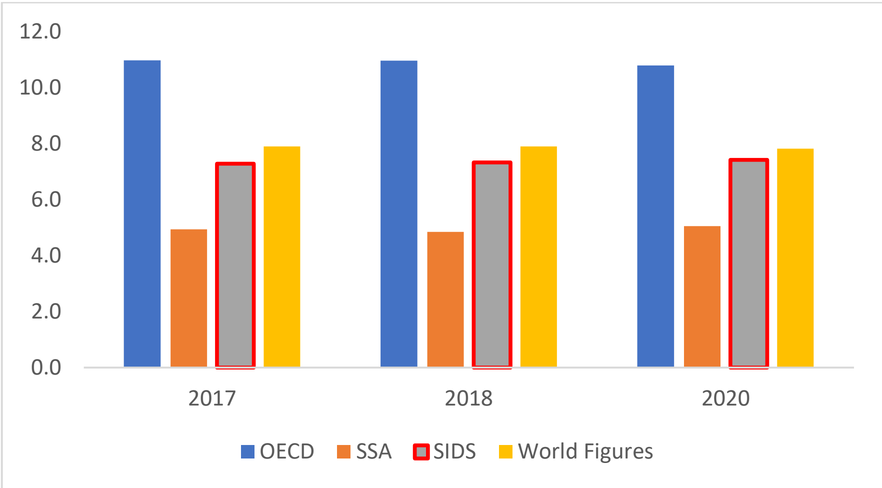
Source: *Authors' elaboration based on UIS Statistics*

Indicators on the pupil-qualified teacher ratio shows a higher ratio for pre-primary, followed by primary and secondary levels. The metric used determines the number of students that are assigned to each qualified teacher within the educational system which translates into higher individual attention and therefore a higher quality of schooling provided. Due to limited resources in SIDS, especially in low-income countries, teachers may not meet the relevant requirement to teach at the lower levels resulting in a higher ratio. Many regions in SIDS do not recognise the importance of early childhood and therefore do not make provisions in their budget. On the other hand, secondary education requires specialised subject teachers resulting in smaller classroom sizes. The knowledge, skills and effectiveness of teachers influence the quality of classroom interaction way more than the physical setting and resources do. Students enrolled in classrooms with lower Pupil Qualified Teacher Ratios (PQTRs) have better educational attainment with higher literacy and numeracy levels as a result of an increase in time that teachers can dedicate to each student. Moreover, better pedagogical methods are applied when teachers are better qualified. A high PQTR reduces the quality of education. The average PQTR in pre-primary education in AIMS was around 30.3, for Caribbean the average was 31.6 while for the Pacific, the number was 33.8. Lower averages of 18.7, 28.1 and 25.2 were recorded in primary education for the previously listed regions. As for tertiary education, the Caribbean registered the lowest average PQTR (19.5), with a gap of 9.3 from the Pacific. The PQTR for pre-primary education was 56.7 in Cabo Verde in 2020, and alarmingly 67.4 in Belize in 2023, 58.4 in 2023 in Guyana and 183.1 in Suriname in the same year. Among the 40 SIDS with data for primary education on PQTR, countries such as Mauritius (from

18.8 in 2015 to 15.8 in 2023), Micronesia (from 24.85 in 2016 to 17.51 in 2022), Niue (from 17.25 in 2015 to 10.17 in 2023), Vanuatu (from 36.98 in 2015 to 25.27 in 2023) have shown considerable progress. On the other hand, PQTR increased drastically in a number of countries, with 20.4 in 2015 to 42.1 in 2023 in Tuvalu, with the figure almost doubling. The same situation can be applied to Belize which registered a PQTR of 71.0 in 2015 to reaching 155.3 in 2023. Meanwhile, for secondary education, countries such as Belize, Nauru and Vanuatu still registered a high PQTR, while the majority of SIDS registered a general decline.

Another essential indicator relating to the quality of education is teacher attrition rate from primary schooling. A high teacher attrition rate is usually attributed to poor working conditions, lack of professional development opportunities or burnout due to high PQTR, therefore possessing a certain level of correlation with PQTR. Teacher attrition rate from primary education was found to be lower than 10 in most of the SIDS for the period 2015 to 2023.

Figure 8: LAYS across regions.



Source: Authors' elaboration based on World Bank Open Data and UIS Statistics

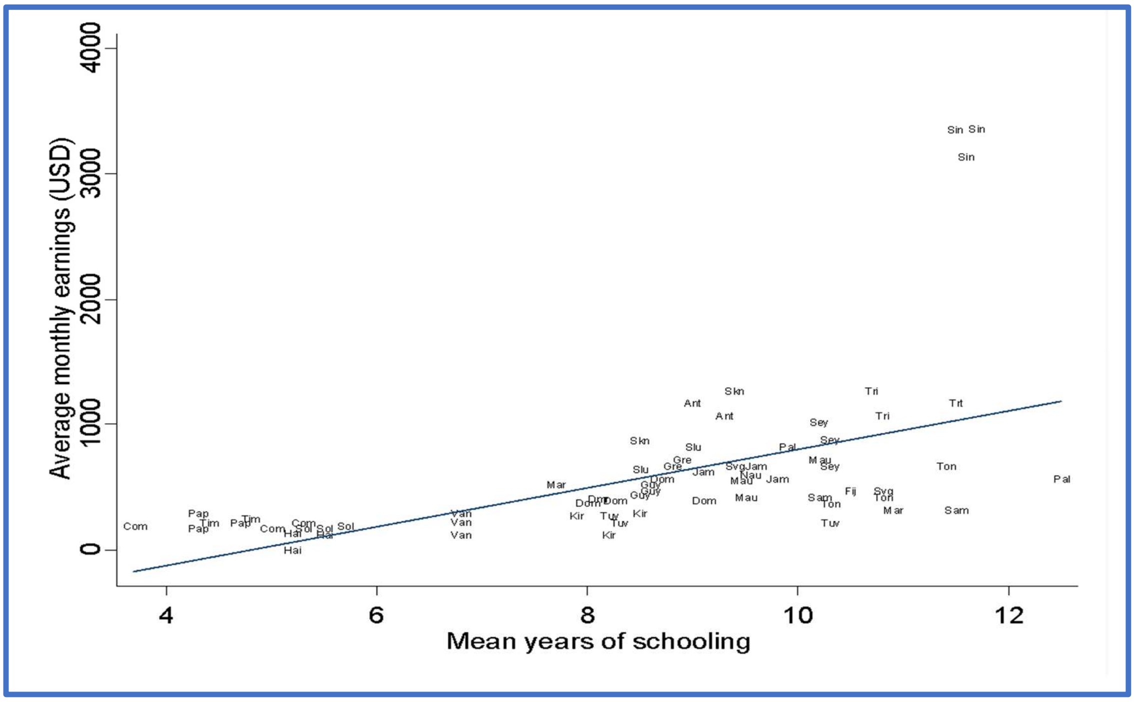
Note: No data is available for LAYS in 2019.

When compared against countries from the OECD and World figures (aggregate of all countries and regions included in the World Bank database), SIDS were found to have a lower average LAYS. The figure is indicative of the lower quality of education and limited resources in SIDS as a result of their geographical location and economic vulnerability. While the gap between SIDS and OECD is more consequent, the opposite applies to the gap between SIDS and World Figures. Nevertheless, SIDS perform better than the Sub-Saharan Africa in terms of providing quality education and both mentioned regions have shown a slight increase in their LAYS as compared to the other two regions despite the pandemic.

Integrating both the quantity and quality measures of education

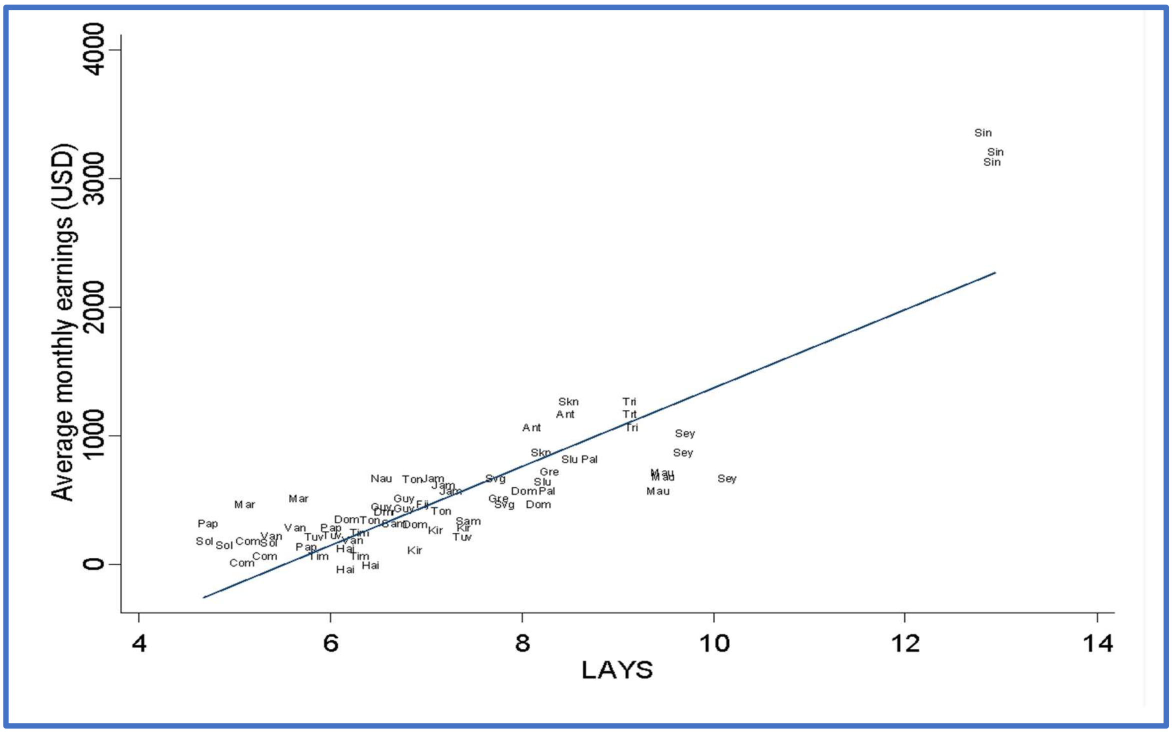
According to UIS, 27 SIDS reported data on LAYS, which is a crucial indicator in defining quality of education and which takes into account standardised test scores and proficiency levels in core subjects like math and reading. A year spent in a country that does well in terms of learning outcomes, for example, might be more valuable in terms of real learning than a year spent in a country with lower educational standards. The average LAYS for AIMS was found to be 9.3, for the Caribbean the figure was 7.7 and the Pacific registered the lowest LAYS with an average of only 6.5. Singapore topped the list with the highest LAYS (12.8) while the indicator fell below 10 for the other SIDS. In 2017, only 16 SIDS reported data on LAYS. The figure increased to 25 in 2018 and 27 in 2020.

Figure 9: Plot showing mean years of schooling and average monthly earnings.



Source: Authors' elaboration based on World Bank Open Data

Figure 10: Plot showing LAYS and average monthly earnings.



Source: Authors' elaboration based on World Bank Open Data

The relationship between average monthly earnings and mean years of schooling for small island states is depicted in figure 9. The positive coefficient of years of average schooling indicates a positive relationship, that is, monthly earnings rise with the average years of schooling. But data points are scattered around the line (it is a "scattered plot") because numbers of years in school are not the sole determinant of earnings. It is worth noting that, although the majority of the countries form a bundle between 6-10 years of schooling wage pairings, there are a number of extreme outlier countries; most notably Singapore (Sin), which shows the maximum mean number of years of schooling as well as the maximum mean monthly wage by some distance. This seems to indicate that, even though access to education has expanded, it is not the only determinant of income outcomes: quality of education, the labour market and the broader economic context also matter.

Figure 10 shows LAYS instead of mean years of schooling, which corrects for the quantity of education as well as the quality of education, adjusting for learning. In this case, the positive linearity between schooling and earnings is even stronger, because the data points concentrate more around the regression line, especially for larger value of LAYS. This means that when educational quality is taken into account, the explained share of earnings by educational attainment rises. Once again Singapore is a striking exception; with relatively high LAYS and average earnings, this provides further evidence of the benefits of investing in educational quality. The innovation is in the graph, where reduced dispersion compared to the first serves as a reminder that the goal is not only about more years of schooling, but how do we make them result in learning.

Measuring the private returns to education

The degree to which a person's productivity is dependent on the skills they have acquired via investments in human capital is the fundamental basis of the Human Capital Theory. Human Capital scholars share the common view that the sets of marketable skills of individuals are a sort of human capital in which they invest to reap rewards in terms of earnings later in the labour market. The human capital theory has been the subject of extensive research. Proponents define human capital as "the present value of past investments in the skills of people" (Blaug, 1970) and as "the productive capacities of human beings as income-producing agents in an economy" (Hornbeck & Salamon, 1991, p. 3). The Human Capital Theory has progressively been regarded as the reasoning of how education is an investment of present resources comprising of time as well as direct costs in exchange for future rewards. Investments in human capital, which often include migration, on-the-job training, and formal education, have a favourable impact on earnings by raising observed earnings later in life. Since observed earnings are "gross of the return on human capital" (Becker, 1994), investing more in education simply has the effect of raising the returns to education in terms of wages. Indeed, the notion of human capital as "the sum of the individual congenital and acquired skills, knowledge, and experiences of individuals" (Kucharčíková, 2011, p. 240) is emphasized in contemporary theories of economic growth. OECD (2001) defined human capital as "productive wealth embodied in labour, skills, and knowledge."

According to Becker (1964), employees with greater levels of education and work experience have higher earnings. Longer stays in the educational system are associated with higher education levels, and longer stays in the labour market are associated with higher employment experience. Becker (1994) further sees the role of human capital in the production process as being highly complicated, representable by a unidimensional object such as the stock of knowledge or skills as part of the production process. Decisions about education result in the maximization of the present value of the lifetime earnings of individuals, therefore, acting as lenses through which Human Capital Theorists see investment in education.

According to Wilson (2001), the likelihood of a person graduating from high school increases with better returns on education. People are rational decision makers since they base their decision to invest in higher education mostly on the revenue that will be generated from this investment in the future. In a logical sense, a degree is worth more than a diploma, explaining a higher associated earning. However, since over- and underemployment are becoming more common, this may not always be the case. Because most developing nations lack natural resources and only have access to human resources—a skilled workforce serves as a catalyst for economic growth—they are therefore more inclined to make significant investments in their educational systems. Higher degrees of education are linked to improved success in the labour market, and Cahuc and Zylberberg (2004) claim that having a particular level of education is necessary to significantly enhance one's wages. The training costs listed by Becker primarily cover costs like study-related expenses, income loss, and psychological costs like stress and anxiety in addition to the sheer difficulty of studying. These costs take up time that could be spent in the labour market engaging in paid activity.

Returns to quantity education: The Classical Mincerian equation

The Mincerian wage equation model is a pillar of empirical economics; it has been extensively employed to examine the estimated returns to quantity education and the effects of work experience on gender differences. These studies capture a pricing equation that reflects how productivity is rewarded in conjunction with the rate of return to education. Basic concepts were presented by Mincer, including the idea that a person's decisions about their labour have an impact on a pay flow that can be roughly calculated using capital theory.

The Mincerian earnings equation is typically specified as:

$$\ln(w_i) = \alpha + \beta S_i + \gamma X_i + \delta X_i^2 + \epsilon_i \qquad (1)$$

where ln(wi) is the natural logarithm of individual i's earnings, Si represents years of schooling (the quantity of education), Xi is years of labour market experience, and Xi^2 captures the non-linear effect of experience on earnings. This specification, widely used in the literature, measures the percentage increase in earnings associated with an additional year of schooling, holding experience constant. In general, experience and schooling (Xi and Si) are negatively correlated, i.e., whilst investigating people of the same age, those with higher years of schooling have less work experience. Psacharopoulos and Patrinos (2004) reported how the Mincerian Wage Regression analysis model has been extensively applied across many countries and time periods with tabulations of Mincer's rates of return generated. Both explanatory variables are expected to be positively influencing earnings.

The Mincerian Equation revisited: From quantity to quality-adjusted education

While the traditional Mincerian equation focuses on the quantity of education (years of schooling), a growing body of research highlights that this measure alone does not sufficiently capture the economic value of education, especially in contexts where the quality of learning is highly variable. The use of average years of schooling tends to neglect the differences in the achieved learning outcome, which according to Hanushek and Woessmann (2008), "the core of what education is all about". One year of schooling in a country may not result in the same skill increase as one year of schooling in another country. Policymakers have called for the incorporation of both quality and quantity dimensions when it comes to working on educational policy (Crawfurd and Rolleston, 2020; McKeever, 2020). According to Hanushek and Woessmann (2012), economic growth is associated with learning and therefore it becomes important to cater for learning adjusted years of schooling in Small Island Developing States. Also, the lack of a reliable metric to measure the outcomes of education in SIDS may further undermine and jeopardise the quality of schooling that is being dispensed.

The Learning-Adjusted Years of Schooling (LAYS) measure was created by the World Bank to combine the number of years of schooling (or years of education) with the quality of learning attained during those years in order to provide a more nuanced picture of educational outcomes. This indicator recognises that pupils may not be learning the skills and knowledge necessary for success in the future only by attending school. Through the addition of data on student achievement on standardised tests, LAYS modifies the number of years of schooling to reflect the actual learning occurring. By looking at more than just the average number of years of education, important differences in the quality of education between nations can be uncovered (World Bank Gender Data Portal, Our World in Data, Open Knowledge Repository).

The measure of learning productivity used to adjust the standard years of schooling is concerned with how much students learn for each year spent in school. The LAYS approach reflects both the desirable quantity and quality of schooling. The LAYS measure is derived as follow:

$$\boldsymbol{LAYS_c = S_c \times R_c^n} \quad \textbf{(2)}$$

Where $\boldsymbol{S_c}$ represents the average years of schooling for the relevant population cohort in country $\boldsymbol{c}$. In other words, how many years, on average, people in that country have spent in school. $\boldsymbol{R_c^n}$ denotes the measure of learning for country $\boldsymbol{c}$**,** relative to a "numeraire" country $\boldsymbol{n}$. This represents the quality or effectiveness of schooling in country $\boldsymbol{c}$ compared to a benchmark country $\boldsymbol{n}$. Therefore, LAYS as an index arising from the product of two elements, i.e., average years of schooling and a particular measure of learning relative to a numeraire, is thus a better indicator of human capital.

A very limited number of studies have been carried out on the returns to schooling in Small Island Developing States. The lack of relevant information and the scarce resources in SIDS imply that these states will largely remain under-researched. Moreover, the number of SIDS participating in international educational assessments such as TIMSS (Trends in international Mathematics and Science Study) and PIRLS remains negligible. Otherwise, it would have been interesting to evaluate the educational attainment of SIDS across countries, as such comparisons help to have a better perception of the educational system, while understanding students' learning outcomes and informing policy decisions. However, participation remains challenging given the resource constraint, the need for capacity building and the relevancy of the context. To account for this gap in the literature we upgrade equation 1 by replacing years of schooling (Si) with Learning-Adjusted Years of Schooling (LAYS). This modification allows us to estimate the returns to education in a way that reflects not only how long individuals attend school, but also how much they learn during those years.

$$\boldsymbol{\ln(w_i) = \alpha + \beta LAYS_i + \gamma X_i + \delta X_i^2 + \epsilon_i} \quad \textbf{(3)}$$

Further extensions: Accounting for vulnerability, technology and labour market dynamics

Recognising the distinctive challenges that Small Island Developing States (SIDS) face—such as heightened exposure to external shocks, limited economic diversification, and persistent fiscal constraints—we expand the traditional Mincerian earnings framework to better reflect these realities. The upgraded equation is specified as:

$$\boldsymbol{\ln(w_i) = \alpha + \beta LAYS_i + \gamma X_i + \delta X_i^2 + \theta_1 SVI_i + \theta_2 EVI_i + \theta_3 Unemp_i + \theta_4 Tech_i + \lambda_{2018} D2018 + \lambda_{2020} D2020 + \mu_{Caribbean} DCARIBBEAN + \mu_{AIMS} DAIMS + \epsilon_i} \quad \textbf{(4)}$$

where wi is the monthly earnings of individual i, LAYS represents Learning-Adjusted Years of Schooling, X is labour market experience, SVI denotes the Structural Vulnerability Index, EVI embodies the Economic Vulnerability Index, Unemp is the unemployment rate, and Tech refers to technological advancement proxied by internet usage. D2018 and D2020, represent the dummy variables for the year 2018 and 2020 respectively (2017 being the reference year) and DCaribbean and DAIMS denote the dummy variables for the region Caribbean and AIMS respectively (Pacific region being the reference region).

Including both the Economic Vulnerability Index (EVI) and Structural Vulnerability measures when testing a Mincerian wage equation for Small Island Developing States (SIDS) is essential because they capture complementary dimensions of vulnerability that jointly shape economic outcomes in these countries. The EVI focuses specifically on economic exposure and shocks—such as susceptibility to natural disasters, export concentration, and market volatility—that directly affect wage levels and returns to education by influencing macroeconomic stability and labour market conditions. Structural vulnerability, on the other hand, encompasses broader, persistent characteristics like geographic isolation, limited economies of scale, and infrastructural constraints that underpin the long-term fragility of SIDS economies and their development potential. By including both indices, the model accounts for immediate economic shocks and deeper, enduring structural challenges, ensuring that estimates of wage determinants reflect the full spectrum of vulnerabilities unique to SIDS. This dual consideration improves the accuracy and policy relevance of the analysis, recognising that SIDS' wage dynamics are shaped not only by transient economic fluctuations but also by entrenched structural constraints that affect productivity, labour market efficiency, and resilience over time.

The unemployment rate is incorporated as a proxy for labour market inefficiency and demand-side constraints. High unemployment typically depresses wages and diminishes the bargaining power of workers, potentially reducing the observed returns to both education and experience. Including this variable allows us to control for cyclical and structural labour market conditions, thereby producing more accurate and context-sensitive estimates of the wage-education relationship. This is especially important in SIDS, where labour markets are often small, segmented, and subject to significant shocks.

Technological advancement is captured through the percentage of the population using the internet, serving as a practical proxy for digital integration and technological progress. The rationale for this inclusion is grounded in a robust literature demonstrating that technology amplifies the productivity of skilled labour, thereby increasing the returns to education (Autor, 2014; Goldin & Katz, 2008; Acemoglu & Restrepo, 2020). In economies undergoing rapid digital transformation—such as many SIDS—technological adoption not only raises wage premiums for educated workers but also shapes the structure and dynamics of labour markets. Given data limitations in SIDS, internet usage is a widely available and meaningful indicator that reflects both access to digital infrastructure and broader socioeconomic modernisation.

Year dummies for 2018 and 2020 (with 2017 as the base) are included to capture time-specific effects that influence wages across all countries and regions in those years. These dummies control for macroeconomic fluctuations, policy changes, or external shocks—such as natural disasters or global economic crises—that affect the Small Island Developing States (SIDS) collectively but vary over time. By accounting for these common temporal factors, the model isolates the true impact of individual-level variables like education and experience on wages, ensuring that observed changes in earnings are not confounded by unobserved year-to-year variations in the economic environment. Regional dummies for the Caribbean and AIMS regions (with the Pacific as the reference) are incorporated to control for persistent differences in economic structures, labour market dynamics, institutional frameworks, and vulnerability profiles across SIDS regions. These qualitative geographic distinctions capture unobserved heterogeneity that affects wage levels and returns to education but remains constant over time within each region. Including regional dummies allows the model to differentiate the baseline wage effects attributable to regional characteristics, improving the accuracy of estimated coefficients for education, experience, and other explanatory variables by controlling for spatial heterogeneity inherent in the diverse SIDS economies.

Table 1 summarises all the variables, their definitions, indicators, data sources and the expected signs of their associated coefficients.

Table 1: Summary of variables used to augment the Mincer equation.

Variable	Measure	Data Source	Expected sign
Ln (w_i)	Log of average monthly earnings of country i (in USD).	*World Bank/National Statistical Offices*	
S_i	Average years of schooling of country i	*UIS*	+
LAYS	Learning Adjusted Years of Schooling of a country i	*World Bank*	+
X_i	Years of total experience in labour force	*World Bank / National Statistical Offices*	+
SVI	Structural Vulnerability index	Composite index from UN data. *United Nations CDP (Committee for Development Policy)*	−
EVI	Economic Vulnerability Index	Composite index from UN data. *United Nations CDP (Committee for Development Policy)*	−
Tech	% Population using internet	*World Bank*	+
Unemp	Percentage of the labour force that is unemployed	*World Bank*	−
D2018	D2018=1 if year =2018, 0 otherwise	-	+/-
D2020	D2020=1 if year =2020, 0 otherwise	-	+/-
DCaribbean	DCaribbean=1 if Region=Caribbean, 0 otherwise	-	+/-
DAIMS	DAIMS=1 if Region=AIMS, 0 otherwise	-	+/-

By systematically integrating these variables, the extended Mincerian equation provides a more nuanced and policy-relevant analysis of the determinants of earnings in SIDS. This approach not only mitigates omitted variable bias and endogeneity concerns but also aligns the empirical strategy with the complex realities of small island economies, ensuring that the estimated returns to education are robust, context-aware, and actionable for policymakers.

Because of the nature of our panel data, with 16 countries in 2017, 25 in 2018 and 27 in 2020 and a maximum of three time points per country, we use a pooled OLS estimator as our main statistical method. This choice can be motivated by the kind of data we use and its limitations: the panel is short (we only have three years) and unbalanced with few cross-sectional units and uneven group sizes. Although conceptually attractive to account for unobserved heterogeneity, fixed effects estimates are more credible with larger number of countries (30–50) and for longer time series. In our data set, fixed effects may overfit severely and lose many of the 68(−1) total degrees of freedom if only one of the groups is observed in some of the periods. This data sparsity implies that fixed-effects estimates are not robust and are difficult to interpret.

In addition, the Hausman test was used to formally test for correlation of unobserved country effects with the regressors. In all model specifications the Hausman test produced p-values of 0.6023, 0.7092, and 0.3903, all well above traditional levels of significance. This implies that the pool OLS- effect size difference is not systematic and pool OLS is not biased due to omitted country-specific effects. All the above discussed aspects in combination rationalise our proclivity to use pooled OLS estimator, which is simpler and more relevant considering the limitations on the data. Robustness checks were conducted to ensure the validity of our inference. Specifically, we tested for heteroskedasticity using the Breusch-Pagan test and for autocorrelation using the Durbin-Watson or Wooldridge tests. Where evidence of heteroskedasticity was detected (model 2: $chi^2(1) = 5.10$, $p = 0.0239$), we implemented cluster-robust standard errors at the country level. This adjustment corrects for both non-constant error variance and within-country serial correlation, thereby enhancing the reliability of our standard errors and statistical inference. In model 1, the Breusch-Pagan test did not reject the null hypothesis of homoskedasticity ($chi^2(1) = 1.35$, $p = 0.2461$), indicating that variance may be constant in that specification. Overall, our methodological choices are guided by the structure and limitations of the available data, with a view to producing robust and interpretable estimates of the returns to education in SIDS.

Given the evidence of heteroskedasticity in most models, we used cluster-robust standard errors at the country level. This adjustment corrects for heteroskedasticity and any potential serial correlation within clusters (countries), enhancing the reliability of the pooled OLS estimates, which otherwise assume constant error variance. Pooled OLS treats all observations as independent, but in panel data, observations within the same cluster (country or individual) are likely correlated, violating the assumption of independent errors. Clustering corrects the standard errors for this intra-cluster correlation, producing robust inference and avoiding underestimated standard errors that could lead to overstated statistical significance. This adjustment is especially relevant in SIDS data where repeated observations per country and over years may share unobserved shocks or persistent factors. Thus, clustered pooled OLS combines the simplicity of pooled OLS estimation with robust standard errors that reflect the data's grouped structure, improving the reliability of hypothesis tests and confidence intervals without requiring more complex panel estimators.

Findings and analysis

Since the objective of this study is to compare the returns to the Learning Adjusted Years of schooling (LAYS) to those of mean years of schooling in Small Island Developing States, the modified Mincerian equation is regressed using both quantity metric in the form of 'mean years of schooling' and quality metric in form of LAYS. The variables have been retrieved from the World Bank Database for the years 2017, 2018 and 2020 (the only time periods for which data on LAYS is available).

Descriptive analysis

Table 2 presents the mean values for all variables included in the regression model across the sample of Small Island Developing States (SIDS). The indicators—years of schooling, Learning-Adjusted Years of Schooling (LAYS), structural and economic vulnerability indices, serving length, monthly earnings, internet usage, and unemployment rate—collectively offer a comprehensive snapshot of the heterogeneity characterising SIDS in terms of educational attainment, economic structure, technological integration, and labour market conditions.

Table 2: Descriptive statistics- Mean Values

Country	Monthly earnings (USD)	Years of schooling	LAYS	Structural Vulnerability Index	Economic Vulnerability Index	Serving Length (In years)	Internet Usage	Unemployment rate
Antigua & Barbuda	1050.0	9.2	8.3	63.4	70.1	40	83.3	11.0
Comoros	123.3	4.7	5.2	53.9	51.8	35	10.3	10.7
Dominica	450.0	8.4	8.1	62.4	66.9	40	68.7	18.8
Dominican Republic	322.8	8.4	6.5	43.1	28.7	38	71.9	5.7
Fiji	400.0	10.5	7.0	50.2	49.4	40	68.5	5.5
Grenada	625.0	8.9	8.0	65.3	87.4	40	69.8	16.0
Guyana	406.5	8.6	6.7	55.1	62.9	38	42	13.5
Haiti	61.7	5.3	6.2	68.0	72.7	35	14.8	14.7
Jamaica	550.0	9.5	7.2	48.1	51.6	40	60.7	13.2
Kiribati	206.7	8.2	7.1	48.8	66.7	38	17.7	8.7
Marshall Islands	425.0	9.3	5.4	45.1	58.6	35	36.5	11.0
Mauritius	588.2	9.8	9.4	38.6	44.6	40	57.7	7.8
Nauru	600.0	9.4	6.5	58.2	76.6	35	54	10.0
Palau	625.0	11.2	8.5	53.7	75.0	38	42.5	9.0
Papua New Guinea	206.7	4.4	5.5	26.6	33.7	35	12.7	6.7
Samoa	300.0	10.9	6.9	57.2	53.7	35	34.5	8.0
Seychelles	835.3	10.3	9.8	47.2	69.0	37	61.7	5.3
Singapore	3213.4	11.6	12.9	39.8	61.5	40	87.8	2.1
Solomon Islands	106.7	5.5	5.0	50.2	56.7	35	13.3	6.7
St. Kitts and Nevis	1000.0	9.0	8.3	52.4	58.1	40	78	9.8
St. Lucia	662.5	8.8	8.3	73.2	86.5	40	71.5	13.8
St. Vincent and the Grenadines	500.0	10.1	7.8	65.1	62.0	40	67.5	14.8
Timor-Leste	160.0	4.5	6.1	43.3	67.5	35	29.7	7.7
Tonga	415.5	10.8	6.8	49.6	59.7	38	45.7	6.7
Trinidad & Tobago	1100.0	11.0	9.1	47.7	53.2	40	73	5.3
Tuvalu	166.7	8.9	6.4	48.3	66.0	35	50	10.7
Vanuatu	191.0	6.8	5.7	51.2	62.1	35	22.3	5.7

Source: Authors' elaboration based on World Bank Open Data, UNCTAD and UIS Statistics

These summary statistics reveal considerable variation across countries. Years of schooling range from 4.4 in Papua New Guinea to 11.6 in Singapore; while LAYS span from 5.0 in Solomon Islands to 12.9 in Singapore, reflecting serious disparities in both access to and quality of education. Monthly earnings range from Haiti (US$ 62) to Singapore (US$ 3,213), the latter being an order of magnitude higher than the next highest value (Antigua and Barbuda, US$ 1,050). Similarly, internet usage varies widely: from 10.3% in Comoros to 88% in Singapore, indicating contrasts in technological infrastructure. Unemployment rates also show a marked spread: from Dominica (19%) and St. Vincent and the Grenadines (15%) to Singapore (2%) and Trinidad and Tobago (5%).

Singapore emerges as the clear outlier across multiple dimensions, with the highest years of schooling, LAYS, monthly earnings and internet usage, plus the lowest unemployment rate. Its economic, technological and labour market signatures are markedly distinct from the rest of the SIDS sample, with their lower income levels, greater vulnerability, and less advanced digital ecosystems. Thus, Singapore's inclusion distorts the estimated coefficients; from a methodological standpoint, robustness checks with and without Singapore are warranted to assess the sensitivity of the results. This approach ensures that the findings are more representative of the broader SIDS context and not disproportionately driven by a single, atypical observation.

Regression results

The results of the clustered pooled OLS estimations are provided as Table 3 and Table 4.

Table 3: Estimation Results for mean years of schooling.

Model 1: Parameter Estimates for Mean years of schooling								
N	**R-squared**	**Root MSE**	**F-value**	**P-value**	**R-squared**	**Root MSE**	**F-value**	**P-value**
68	0.873	0.348	33.42	0.000	0.835	0.347	29.33	0.000
Variable	**Including Singapore**				**Excluding Singapore**			
	Parameter Estimate	**Robust Standard Error**	**t-value**	**P-value**	**Parameter Estimate**	**Robust Standard Error**	**t-value**	**P-value**
Mean years of schooling	0.110	0.037	3	0.006	0.112	0.036	3.15	0.004
Average working years	0.098	0.071	1.38	0.179	0.097	0.069	1.4	0.173
Structural vulnerability index	-0.032	0.013	-2.49	0.02	-0.029	0.012	-2.44	0.022
Economic vulnerability index	0.021	0.007	2.81	0.009	0.018	0.007	2.81	0.01
Internet Usage	0.013	0.007	1.77	0.089	0.012	0.008	1.52	0.141
Unemployment Rate	-0.035	0.03	-1.2	0.24	-0.028	0.028	-1	0.329
Year 2018	-0.020	0.064	-0.31	0.759	-0.015	0.068	-0.22	0.825
Year 2020	0.171	0.152	1.12	0.272	0.18	0.159	1.13	0.268
Atlantic, Indian Ocean & South China	0.343	0.203	1.69	0.103	0.263	0.181	1.45	0.159
Caribbean	0.312	0.312	1	0.326	0.299	0.321	0.93	0.36
_cons	1.147	2.404	0.48	0.637	1.162	2.351	0.49	0.625

The inclusion of Singapore in the pooled OLS analysis of Small Island Developing States (SIDS) wage determinants, despite Singapore's outlier status in terms of economic development, technological advancement, and wage levels, does not significantly alter the overall results. This robustness is evident in the consistently high R-squared values (approximately 0.80–0.87 with Singapore and slightly lower but still strong around 0.84–0.86 without) and highly significant F-values across both samples. These statistics indicate that the models explain a substantial share of wage variation regardless of Singapore's presence. The stability of coefficients and significance levels suggests that the models' control for regional, temporal, and vulnerability factors effectively capture heterogeneity across countries, preventing Singapore's exceptional characteristics from disproportionately influencing the results. This finding aligns with empirical evidence in cross-country studies, where robust model specifications mitigate the influence of outliers, ensuring generalisability of conclusions across diverse economic contexts.

Table 4: Estimation Results for LAYS.

Model 2: Parameter Estimates for LAYS								
N	**R-squared**	**Root MSE**	**F-value**	**P-value**	**R-squared**	**Root MSE**	**F-value**	**P-value**
65	0.805	0.377	19.16	0.000	0.856	0.369	33.94	0.000
Variable	**Including Singapore**				**Excluding Singapore**			
	Parameter Estimate	**Robust Standard Error**	**t-value**	**P-value**	**Parameter Estimate**	**Robust Standard Error**	**t-value**	**P-value**
LAYS	0.137	0.1	0.97	0.024	0.123	0.065	1.89	0.047
Average working years	0.111	0.072	1.54	0.136	0.104	0.041	2.52	0.015
Structural vulnerability index	-0.017	0.015	-1.1	0.281	-0.017	0.01	-1.79	0.079
Economic vulnerability index	0.011	0.01	1.01	0.32	0.01	0.007	1.45	0.151
Internet Usage	0.018	0.008	2.12	0.044	0.018	0.004	4.44	0
Unemployment Rate	-0.023	0.031	-0.74	0.465	-0.024	0.021	-1.13	0.265
Year 2018	0.014	0.092	0.15	0.881	0.015	0.123	0.12	0.903
Year 2020	0.085	0.167	0.51	0.616	0.079	0.14	0.56	0.575
Atlantic, Indian Ocean & South China	-0.001	0.223	-0.01	0.995	-0.004	0.184	-0.02	0.984
Caribbean	-0.081	0.346	-0.23	0.817	-0.086	0.196	-0.44	0.664
_cons	0.599	2.383	0.25	0.804	0.736	1.344	0.55	0.586

Comparing Model 1 (using mean years of schooling) and Model 2 (using Learning-Adjusted Years of Schooling, LAYS) highlights the critical role of accounting for both education quantity and quality in wage determination. Model 2 consistently shows a higher coefficient on LAYS than Model 1's coefficient on years of schooling, indicating that when learning quality is incorporated, the estimated returns to education on wages are stronger. This result resonates with Angrist et al. (2020), who emphasise that while many educational interventions globally are not cost-effective, regions such as AIMS demonstrate that targeted investments delivering three years of high-quality education can yield substantial returns. Their findings highlight that quality-adjusted schooling measures like LAYS better capture the true human capital accumulation that drives wage growth, especially in contexts where raw years of schooling may mask disparities in learning outcomes. This reinforces the notion that policy focus should shift from mere schooling duration to improving education effectiveness to maximise economic returns.

The importance of considering education quality alongside quantity is further supported by Johnson and Jackson (2019), who argue that the choice of metrics such as LAYS, Quality-Adjusted Life Years (QALYs), or Disability-Adjusted Life Years (DALYs) must be context-sensitive. For SIDS, where early childhood development and primary education quality are often constrained by limited resources, infrastructure, and teacher performance, quality-adjusted measures provide a more accurate reflection of educational impacts on labour market outcomes. Their work highlights those investments in early childhood development only translate into higher returns when supported by a robust primary education system, a dynamic that compulsory education policies can strengthen. This contextual nuance explains why LAYS, which integrates learning achievement, better explains wage variation than years of schooling alone in the pooled SIDS sample.

Beyond education, the results reveal that structural and economic vulnerabilities significantly influence wage outcomes, but their effects differ depending on the education measure used. The Structural Vulnerability Index (SVI) shows a statistically significant negative association with wages in Model 1 but loses significance in Model 2. This suggests that when only education quantity is considered, structural vulnerabilities—such as geographic isolation, institutional weaknesses, and limited market access—exert a stronger explanatory role, potentially capturing unmeasured variations in human capital quality. Deme and Mahmoud (2020) similarly find that structural limitations in African countries negatively affect economic growth and educational quality, reinforcing the idea that structural fragility constrains the benefits derived from schooling. Appiah (2017) further supports this by linking increased educational expenditure to human capital accumulation and productivity, which structural vulnerabilities may impede. Hence, incorporating LAYS absorbs some of the variation previously attributed to structural vulnerabilities, refining the model's precision in isolating education's direct wage effects.

Economic vulnerability also plays a nuanced role. While the Economic Vulnerability Index (EVI) is positively and significantly associated with wages in Model 1, its effect diminishes and becomes statistically insignificant in Model 2. This pattern aligns with Guillaumont (2010), who documents how economic shocks limit government capacity to finance education, particularly in vulnerable developing countries like many SIDS. Economic crises often lead to cuts in public education spending, reducing quality and accessibility, which in turn depresses wage returns. The reduced significance of EVI in Model 2 suggests that LAYS captures some of the quality-related impacts of economic vulnerability, highlighting how vulnerability indirectly affects wages through education quality rather than quantity alone. This finding emphasizes the importance of strengthening educational systems' resilience to economic shocks to sustain human capital development and wage growth.

Technological advancement, proxied by internet usage, emerges as a consistently positive and increasingly significant predictor of wages, particularly in Model 2. This supports the literature (Autor, 2014; Goldin & Katz, 2008; Acemoglu & Restrepo, 2020) demonstrating that technology amplifies the productivity of skilled labour, raising returns to education. The stronger significance of internet usage when LAYS is used suggests that quality education better equips workers to leverage technological opportunities, boosting wage premiums. In the SIDS context, where digital integration is uneven but growing, this interaction between technology and education quality is critical for labour market modernisation and economic development.

The above findings thus emphasise that while Singapore's inclusion as an outlier does not distort the overall wage-education relationships in SIDS, the choice of education measure strongly affects the interpretation of returns to schooling and the role of vulnerabilities and technology. Quality-adjusted education metrics like LAYS provide a more nuanced and policy-relevant understanding of human capital impacts, consistent with global evidence emphasising the need for effective, high-quality education investments. Moreover, the differential effects of structural and economic vulnerabilities across models highlight the complex pathways through which fragility influences labour market outcomes, reinforcing calls for integrated policies that address both educational quality and broader economic resilience in SIDS.

Conclusion

The evidence presented in this paper is consistent with the limited number of studies that have been carried out on Learning Adjusted Years of Schooling. The returns to LAYS were found to be much higher than the mean years of schooling in SIDS. The implication of this study is that a higher number of years of schooling translates into better quality of learning. With the increasing changing demands of the labour market, it becomes important to assess and review existing policies of whether they are delivering the anticipated results in SIDS while also considering the fragility of the nations that form part of SIDS.

This study highlights the importance of investment in education, the promotion of lifelong learning and addressing the structural vulnerabilities that SIDS face. In order to calculate LAYS, a large amount of information based on a meaningful scale is needed. Such data (PISA and TIMSS) is available for high income countries only, which discourages comparability. The lack of a comparable and comprehensive measure of schooling in middle- and low-income countries such as SIDS poses as a serious challenge when it comes to employing a macro-LAYS approach.

The results of this study must be appreciated in light of the limitations of any country-level assessment of educational reforms. LAYS is a relatively new concept; and so there were not many studies available to lend support to the results obtained. Moreover, owing to sparse resources of SIDS, many studies have not been carried out on them and therefore research becomes a challenge, largely contributing to their underrepresentation in academic research. The limited data available makes it even more challenging to build up a literature on SIDS. The unavailability or irregularity of standardised international learning assessments in many SIDS implies that there is a reliance on imputation methods or regional proxies which distort local educational realities. The issue of data scarcity compounds the risk of endogeneity in empirical models. While the Human Capital Theory stipulates that a higher level of schooling leads to higher earnings, the inverse is also true: higher income also leads to better educational outcomes. However, with weak instruments and limited panel data, it becomes arduous to control for unobserved heterogeneity, to establish causal inference and to perform robust cross-country comparisons. Despite the limitations, the results of this study, being region-specific, align with those of Altinok and Diebolt (2024) who adopt an international approach with a larger sample size. The policy relevance and practical implications of the Learning-Adjusted Years of Schooling (LAYS) metric remain to be thoroughly assessed by policymakers and warrant further exploration in future evaluations and reforms.

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Data Availability Statement

The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

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