

# POTENTIAL ECONOMIC IMPACT OF COVID-19-RELATED SCHOOL CLOSURES

*Spencer Cohen, Sumathi Chakravarthy, Sindhu Bharathi, Badri Narayanan,  
and Cyn-Young Park*

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# CONTENTS

<b>TABLES AND FIGURES</b>	<b>iv</b>
<b>ABSTRACT</b>	<b>v</b>
<b>I. INTRODUCTION</b>	<b>1</b>
<b>II. LITERATURE ON COVID-19 IMPACTS OF EDUCATION AND PRODUCTIVITY</b>	<b>2</b>
A. Online Education and Learning Poverty	2
B. Impact on Labor Productivity	3
C. Disproportionately Large Impact on the Marginalized and Vulnerable	4
<b>III. METHODOLOGY</b>	<b>5</b>
<b>IV. RESULTS</b>	<b>9</b>
A. Change in Gross Domestic Product	9
B. Change in Employment	13
<b>V. CONCLUSIONS</b>	<b>16</b>
<b>REFERENCES</b>	<b>18</b>

## TABLES AND FIGURES

### TABLES

1	Total Enrollment in Primary, Secondary, and Tertiary Levels	6
2	Annual Average Shock to Labor Productivity	7
3	Enrollment Based on Residence and Wealth Quintile	8
4	Impact on Gross Domestic Product of COVID-19 Pandemic	11
5	Change in Employment of Skilled Labor	13
6	Change in Employment of Unskilled Labor	15

### FIGURES

1	School Closures in Asian Economies	1
2	Change in Gross Domestic Product Due to Earning Losses from COVID-19 School Closures	9

## **ABSTRACT**

Severe disruptions in school education during the coronavirus disease (COVID-19) pandemic has impacted children through their formative years which will affect their employment opportunities and earning potential for many years after school ages. This paper examines the medium-to-long-term economic scarring effects, using data available through the Global Trade Analysis Project, a computable general equilibrium model, with empirical study focusing on the impact of school closures on economic growth and employment. The estimated results show significant declines in global gross domestic product (GDP) and employment. Moreover, the losses in global GDP and employment increase over time. Declines in global GDP amount to 0.19% in 2024, 0.64% in 2028, and 1.11% in 2030. In absolute terms, the cost to the global economy in 2030 alone is \$943 billion. The scarring effects are greater in economies with significant student populations from rural areas, those in the poorest and second wealth quintile. Learning and earning losses are also significant in economies where the share of unskilled labor employment in the overall labor force is high.

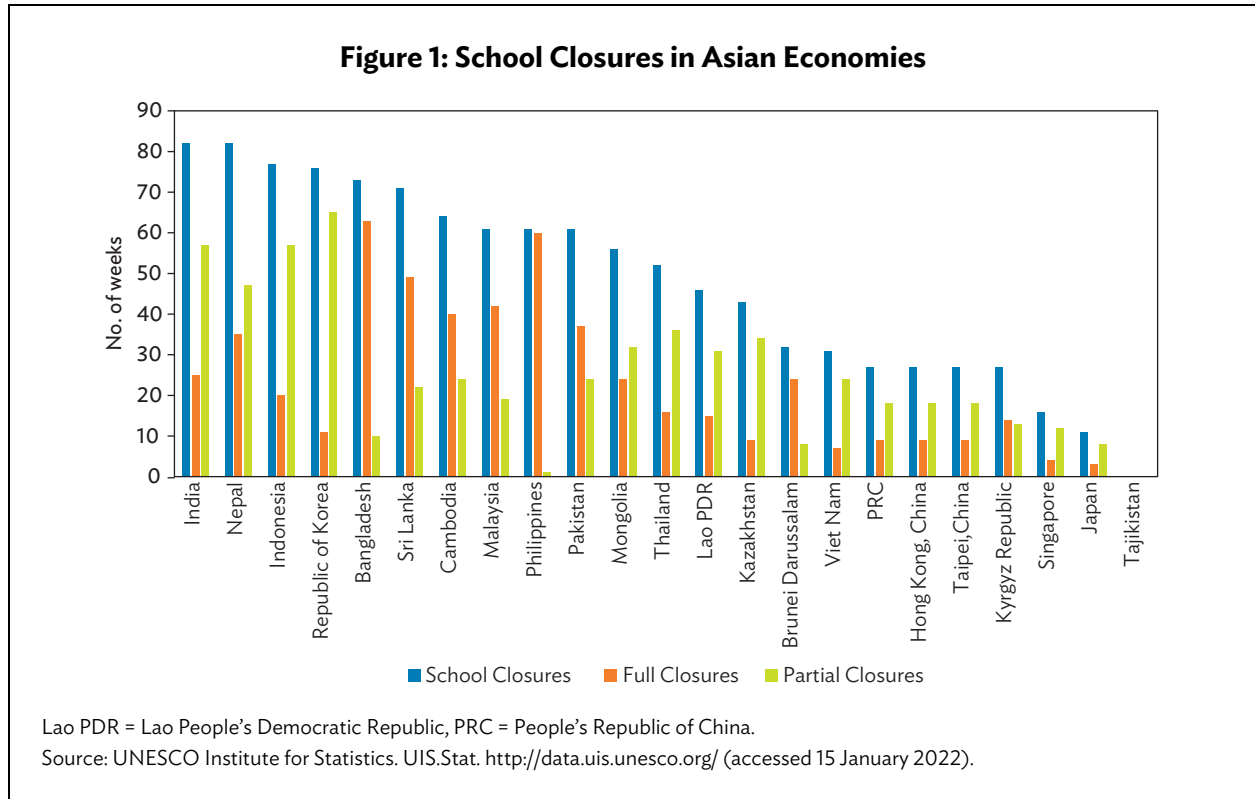
*Keywords:* school closure, labor productivity, economic growth, employment

*JEL codes:* I25, J24, P46

# I. INTRODUCTION

Schools serve children as their first and foremost source of knowledge and exposure to learning. Yet education has suffered through the coronavirus disease (COVID-19) pandemic and amid measures to contain the spread of the virus that closed schools, bringing substantial disruption to children’s lives. Prolonged school closures will impact the skills children can acquire through their formative years and affect their employment opportunities and earning potential for many years after school ages.

More than 1.5 billion students and youth around the world have been impacted by school closures during the pandemic, with significant learning and earning losses common across all economies (United Nations Educational, Scientific and Cultural Organization [UNESCO] 2021a). This paper examines the medium-to-long-term economic scarring effects, using data available through the Global Trade Analysis Project (GTAP), a computable general equilibrium model, with empirical study focusing on the impact of school closures (Figure 1) on economic growth and employment. It also evaluates the labor productivity effect per year of schooling at different levels of schooling—primary, secondary, and tertiary—measuring the impact of time and magnitude, guided by assumptions derived from the literature.



Earning losses due to the emergence of COVID-19 are measured in percentage terms for every level of education and the study feeds this data to the model as shocks. We follow the standard labor economics-based assumption that a percentage change in earning losses generates the same change in marginal labor productivity. The earning loss in secondary education is taken as a shock to the model between 2023 and 2030, while that of primary and tertiary education is applied as a shock to the model between 2026 and 2030.

A thorough literature review helps understand the labor productivity effect per year of schooling at different levels and across economies. From this, we estimate the timing of the impact, magnitude, and the type of labor affected by closures across each level of schooling.

The paper is structured as follows. The next section offers literature review of COVID-19 impacts on education and productivity. Section III explains the methodology we adopted by using a computable general equilibrium model to estimate the economic costs of school closures. Section IV presents the estimation results on the effects of school closures on gross domestic product (GDP) and employment losses. Section V concludes with policy implications driven by the estimation results.

## **II. LITERATURE ON COVID-19 IMPACTS OF EDUCATION AND PRODUCTIVITY**

The COVID-19 pandemic has severely disrupted school education globally. According to UNESCO (2021b), full or partial school closures have affected 210 economies, with 84 having experienced more than 40 weeks shuttered (a full school year). As of 25 February 2022, closures continue to affect over 43.5 million learners, although that is down from the April 2020 peak of 1.4 billion.

Economic costs are expected to be huge, both in terms of earnings losses for individuals and the reduction in long-term productivity and growth for economies. Without appropriate policy support, disruptions in school education will translate into fewer students transitioning to higher education, higher unemployment, and reduced earnings potential. Disrupted education will have a long-term compounding impact, not only on many children's future well-being, but also on socioeconomic outcomes such as economic growth, poverty, and inequality.

Prolonged school closures have propelled educational institutions around the world into introducing innovative methods and strategies to make up for lost school days. Outlets as varied as social media, YouTube videos, and video conferencing on platforms like Zoom and Google Meet have been used on an extensive scale to meet educational needs. Though schools have attuned to online teaching and students are taking the nuances of online learning in their stride, this is widely seen as an auxiliary rather than a complete alternative to the immersive experience of a school education (Asian Development Bank [ADB] 2021).

### **A. Online Education and Learning Poverty**

Particularly in developing economies, where students often do not have proper access to high-speed internet connectivity, online education may not be as effective as in-person schooling and learning. Distance education can abate a lost year in schooling, but its success depends on having access to



learning materials and the effectiveness of these resources for learning. More than 200 million students in low-income and middle-income economies have not had access to online and remote learning opportunities during the pandemic (United Nations Children's Fund 2021). While use of distance learning modules requires proper planning, the suddenness of pandemic-induced closures left scarce time for teachers, students, and parents to prepare for home schooling. Champeaux et al. (2020) reveals how children in France and Italy made slower progress in distance learning during lockdowns than when they attended class in-person. Even in developed economies, children learning through online modules scored lower than their counterparts who adopted for a hybrid mode or physical learning mode. The attrition rates in online learning environment are also higher (Kizilcec and Halawa 2015).

Beyond the issue of accessibility, online mentoring and distance teaching methods were not well planned or effectively strategized. Toquero (2021) shows how learning implemented in response to abrupt school closures was characterized as “emergency remote education” rather than delivered through planned programs. All factors lowering the trajectory of the learning curve of children have the effect of increasing skills gaps and lead to income disruptions, especially in the form of higher unemployment, lower incomes, and increased poverty in least-developed economies.

In addition to income poverty, a measure of “learning poverty” has been introduced by the World Bank and UNESCO Institute for Statistics as an indicator to capture the share of children who have not achieved threshold reading ability. Children who learned online because of school closures lost the opportunity to acquire essential rational, coherent, social, physical, and emotional competencies. The consequences of this are protracted and vary in magnitude across almost all economies. It is revealing that the UNESCO (2021c) study found learning poverty of children in low- and middle-income economies could rise from 53% to 70% because of disruptions brought by the pandemic.

## **B. Impact on Labor Productivity**

School closures have impacted labor productivity too. Since the pandemic began, the female labor force participation rate has decreased, especially among working mothers who have had to care for children. Aaronson and Alba (2021) suggest that the increase in virtual learning due to school closures has led women with younger children to withdraw from work. Though the eventual return to in-person schooling may prompt labor force participation rates to increase, that also remains uncertain, particularly in developing economies, where significant numbers of children remain unvaccinated, and schools are needed as quarantine centers.

According to one survey, a COVID-19 school closure could result in average per capita earnings losses over the affected students' working lives of about \$2,833 in low-income economies, \$6,777 in middle-income economies, and \$21,158 in high-income economies. Scaled to the economy level, total lifetime losses aggregate to \$252 billion to \$360 billion in low-income economies, \$4.8 trillion to \$6.8 trillion across middle-income economies, and \$3.4 trillion to \$4.9 trillion in high-income economies. These losses in turn affect both national and global GDP. Moreover, individuals affected by reduced schooling experience can expect lower income, which makes it difficult for them to meet basic needs such as food security and housing (Psacharopoulos et al. 2020).

An investigation by Richards, Stroub, and Guthery (2020) into the effects of school closures on labor market outcomes in Texas, United States considered two major choices for teachers: (i) to leave teaching jobs in Texas public schools, and (ii) moving to a different public school district in the

state. The authors used the Coarsened Exact Matching (CEM)<sup>1</sup> technique to estimate the different effects of school type, teacher preparation, school performance, and other key factors. Their results show school closures were highly associated with an increase in teachers leaving their jobs, partly voluntarily because of their stress and reaction to technological challenges, and partly due to job losses caused by a lack of funds. Even now, after two years of school closures, most teachers in the study remained unemployed, illustrating the depths of instability in the already vulnerable market for teaching professionals.

### **C. Disproportionately Large Impact on the Marginalized and Vulnerable**

UNESCO (2021c) has highlighted that school closures have had a negative impact on the social and economic life of people across the world, but that it is most severe for marginalized and vulnerable children and their families. For these children, school closures and interruptions have an even greater, negative impact on future socioeconomic opportunities, stalling their necessary development. In most low-income economies, since many children depend on free meals provided by their schools, closures deprive these children of regular nutrition. Parents, many of whom earn low incomes or are paid daily rates, must bear the significant economic cost of foregoing income to stay at home to prepare meals and care for their children. Another concern is the effect of closures on the assessments and high-stakes examinations central to many education systems through exam postponements or cancellations that further inhibit learning in many developing economies (UNESCO 2021a).

When education is disrupted, school students tend to forget some what they learned (Cooper et al. 1996). Proficiencies assimilated by attending school at a younger age set students up to attain more expertise as they grow older. When students forego opportunities to study, they likely have less aptitude and develop fewer overall skills through their lifetimes (Meyers and Thomasson 2017, Gibbs et al. 2019).

Schools have remained closed for more than a year in 8 of the 46 developing economies in Asia and the Pacific (ADB 2021). The resulting learning impairments are estimated to be about 8% of a learning-adjusted year of schooling in the Pacific. Learning-Adjusted Years of Schooling (LAYS) is a measure of the number of years of schooling a child can expect to receive by 18 years of age, adjusted against an economy's average student achievement. In the parts of South Asia that experienced the longest school closures, losses are anticipated to be about 55% of a learning-adjusted year of schooling. Learning deficiencies will shrink the future productivity and lifetime restitutions of impacted students. The current estimate of these deficits is ballparked at \$1.25 trillion for developing Asia, equal to 5.4% of the region's 2020 GDP.

The observed consequences of protracted school closures due to COVID-19 vary among economies. The disruption will impinge on the skills acquired by the students and ultimately impact their efficiency in future work. Intricate details of the methodology, results, and analysis are examined in the following sections.

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<sup>1</sup> Coarsened Exact Matching is a statistical matching procedure used to draw a casual inference from an observational data. Here the balance between the treated and the control group is chosen ex-ante by the user rather than finding it through the cumbersome process of checking and re-estimating.

### III. METHODOLOGY

This study employs GDyn, a multisector, multiregional, recursive dynamic version of the GTAP to measure the economic costs of school closures. This computable general equilibrium model captures interactions and linkages between economic agents, including households, governments, and the rest of the world, and to present insights at a granular level. GDyn can describe changes in employment, labor productivity, technology, endowments, and other economic variables in response to a policy shock over a particular period. Unlike other economic models, GDyn treats time as a continuous variable that is subject to exogenous change with policy, technology, and demographic variables. The model supports comprehensive assessment of the effects of macroeconomic variables across different sectors and the movement of endowment factors between the economies or regions.

The GDyn model extends the standard GTAP model (Hertel 1997) to cover capital accumulation, international capital mobility, and investment. The structure of the GDyn model is constructed by separating the theory of static GTAP from length of run. The ability of the model to capture the movement of endowment commodities, including labor, means that it is well-suited for this type of study.

The study uses the GTAP 10.0 database which includes 141 economies/regions and 65 sectors. The 141 economies are aggregated into 41 economies/regions with a focus sharpened by covering ADB members and drilling down the detail to utmost granularity. The latest available GTAP data is referenced to 2014 and scaled and calibrated to 2020 by using World Bank data. Future baselines covering 2021–2025 are then updated using growth forecasts from the International Monetary Fund's *World Economic Outlook* database, which account for the impact of COVID-19 and recovery prospects in the medium term. The baselines for 2026–2030 and population and labor growth estimates are updated using the data gathered from scenarios devised by Shared Socio-Economic Pathways (Riahi et al. 2017).

To calibrate the shock, we follow the standard labor economics assumption that the percentage change in earning losses is equal to the percentage change in marginal labor productivity, and that closures among primary, second, and tertiary education institutions are of equal magnitude. Those receiving primary and secondary education go on to make up the unskilled labor force and those receiving tertiary education become skilled labor. Because we may not be able to account for all primary enrollment during COVID-19 and must compute the impact by considering rates of graduation from primary to secondary education and then to tertiary institutions, the enrollment ratio is used to distribute the current enrollment across primary, secondary, and tertiary education levels.

Earnings increase with the number of years of schooling and education of an individual. According to Montenegro and Patrinos (2014), since earnings increase by 9.7% for every year a person attended school, it is reasonable to conclude that the same earnings potential is lost from a year out of school. ADB (2021) shows that the potential loss in earnings due to COVID-19 can be calculated based on the economy-specific gains for every year of schooling. The study accounts for both partial and full school closures. Partial closures are counted as half a day of closure. By aggregating the earning losses of all students in an economy and considering that not all students will later gain employment, the losses are adjusted by the expected adult survival rate and human capital utilization rate as published in the World Bank's Human Capital Index. We consider the earning-loss estimates in the ADB study's pessimistic scenario, which assumes students in Asia lost about 38% of a learning-adjusted year of schooling (ADB 2021).

This earning loss in the ADB study is then multiplied with the primary enrollment ratio and population by primary school age to arrive at the number of students affected, then divided by the unskilled employment in each of the future years for each economy/region. This creates a measure of the shock to labor productivity from an increase in unskilled labor. Similarly, we compute the secondary education category's earning losses, weighted by fraction of secondary school students drawn into unskilled labor in each future year. Finally, we calculate the tertiary education category's earning losses, weighted using the fraction of tertiary students in skilled employment over each future year. Population by school is extracted from UNESCO Institute for Statistics data and World Bank data on enrollment ratios are used to arrive at total enrollment, as shown in Table 1.

**Table 1: Total Enrollment in Primary, Secondary, and Tertiary Levels**

Economy	Primary (million)	Secondary (million)	Tertiary (millions)
PRC	106.25	87.38	50.24
Hong Kong, China	0.38	0.34	0.29
Japan	6.45	6.91	3.84
Korea, Rep. of	2.76	2.73	3.04
Mongolia	0.34	0.31	0.16
Taipei, China <sup>a</sup>	1.75	1.64	0.87
Brunei Darussalam	0.04	0.04	0.01
Cambodia	2.17	0.99	0.22
Indonesia	29.75	24.86	8.04
Lao PDR	0.76	0.64	0.09
Malaysia	3.10	2.55	1.22
Philippines	13.33	11.41	3.59
Singapore	0.23	0.16	0.20
Thailand	4.89	5.85	2.34
Viet Nam	8.72	5.48	1.90
Bangladesh	17.60	15.95	3.52
India	121.70	134.04	36.39
Nepal	3.94	3.63	0.44
Pakistan	23.97	14.35	2.58
Sri Lanka	1.69	2.75	0.34
Kazakhstan	1.51	2.02	0.74
Kyrgyz Republic	0.57	0.73	0.24
Tajikistan	0.89	1.07	0.27

Lao PDR = Lao People's Democratic Republic, PRC = People's Republic of China.

<sup>a</sup>As data of population by school age and the enrollment ratio for Taipei, China was not available, we have distributed its population in the ratio of average population by school age data of the People's Republic of China; Hong Kong, China; Japan; and the Republic of Korea.

Sources: UNESCO Institute for Statistics. UIS.Stat. <http://data.uis.unesco.org/> (accessed 15 January 2022); World Bank. World Development Indicators. <https://databank.worldbank.org/source/world-development-indicators> (accessed 15 January 2022).

The labor productivity loss calculated for closures in secondary education is taken as a shock to the unskilled labor in the model for the period 2023–2030 as it takes at least 3 years for secondary school graduates to enter the unskilled labor force; the loss in primary education is fed into unskilled labor for 2026–2030 as primary school students would take more time to enter the labor force. The loss in tertiary education is also passed into 2026–2030 as college students will need to extend their time in study to complete higher education and join the skilled labor force (Table 2).

**Table 2: Annual Average Shock to Labor Productivity**

Economy	Unskilled Labor (million)	Skilled Labor (million)	Earning Losses (%)	Annual Average Shock to Labor Productivity		
				Primary	Secondary	Tertiary
PRC	670.12	113.72	3.90	0.073	0.757	5.351
Hong Kong, China	2.41	1.49	7.50	0 <sup>2</sup>	1.437	4.669
Japan	47.56	18.62	7.00 <sup>3</sup>	0	1.333	4.695
Korea, Rep. of	16.71	10.42	7.70	0.053	1.237	6.149
Mongolia	0.95	0.32	5.80	0.179	2.510	10.639
Taipei, China	7.38	3.23	7.00	0.196	2.110	5.902
Brunei Darussalam	0.12	0.09	2.50	0.073	1.368	1.046
Cambodia	7.63	0.91	1.70	0.218	0.453	1.022
Indonesia	111.71	11.58	5.40	0.159	2.044	12.434
Lao PDR	3.12	0.30	1.90	0.173	0.629	1.543
Malaysia	10.74	3.50	9.20	0.431	3.467	9.016
Philippines	32.44	10.09	4.50	0.189	2.681	5.298
Singapore	1.49	1.76	1.50	0	0.262	0.488
Thailand	33.48	5.52	1.60	0	0.408	2.307
Viet Nam	49.25	5.67	1.30	0.096	0.237	1.128
Bangladesh	56.50	4.79	5.20	0.415	2.338	11.021
India	408.43	72.65	4.70	0.343	2.145	6.657
Nepal	14.09	0.69	6.00	0.243	2.775	12.042
Pakistan	58.88	6.07	3.00	0.673	1.190	2.794
Sri Lanka	7.01	1.43	4.50	0	2.473	4.089
Kazakhstan	6.50	2.57	3.20	0	1.066	4.090
Kyrgyz Republic	2.06	0.45	5.90	0.031	2.709	10.947
Tajikistan	1.92	0.39	2.20 <sup>4</sup>	0.117	1.745	4.768

Lao PDR = Lao People's Democratic Republic, PRC = People's Republic of China.

Source: Authors' calculations using data from UNESCO Institute for Statistics. UIS.Stat. <http://data.uis.unesco.org/> (accessed 15 January 2022); World Bank. World Development Indicators. <https://databank.worldbank.org/source/world-development-indicators> (accessed 15 January 2022).

<sup>2</sup> Annual average shock to primary labor productivity is zero in those economies where the secondary enrollment is equal to or greater than 100% as all those in the primary is transferred to secondary.

<sup>3</sup> As earning losses due to COVID-19 were not available for Japan, those of East Asia were used as a substitute.

<sup>4</sup> As earning losses due to COVID-19 was not available for Tajikistan, data for Central Asia were used.

**Table 3: Enrollment Based on Residence and Wealth Quintile**  
(%)

Economy	Primary Education										Lower Secondary										Upper Secondary									
	Residence			Wealth Quintile			Residence			Wealth Quintile			Residence			Wealth Quintile			Residence			Wealth Quintile			Residence			Wealth Quintile		
	Rural	Urban	Poorest	Second	Middle	Fourth	Richest	Rural	Urban	Poorest	Second	Middle	Fourth	Richest	Rural	Urban	Poorest	Second	Middle	Fourth	Richest	Rural	Urban	Poorest	Second	Middle	Fourth	Richest		
PRC	96	98						88	97						42	77														
Mongolia	96	98	93	97	100	99	99	76	96	70	86	95	98	99	35	78	26	49	63	87	95									
Cambodia	71	85	48	64	75	86	90	34	66	17	22	36	52	64	13	48	5	6	11	20	48									
Indonesia	88	96	85	90	92	95	97	47	78	41	52	59	69	81	21	57	17	25	33	44	64									
Lao PDR	79	95	58	80	91	97	98	44	77	16	39	55	73	89	19	56	4	16	26	40	69									
Philippines	91	93	78	92	94	97	98	78	85	52	76	87	91	95	73	83	46	71	83	89	94									
Thailand	98	99	97	97	99	99	100	83	90	66	85	88	91	98	58	71	38	59	63	73	88									
Viet Nam	96	99	90	98	99	99	99	81	89	60	84	88	93	98	48	71	19	44	56	70	90									
Bangladesh	83	83	70	80	87	87	92	64	67	43	58	68	71	83	28	35	12	20	27	33	50									
India	91	93	80	91	94	96	99	79	86	59	75	84	90	96	36	56	13	25	38	53	76									
Nepal	79	83	76	79	80	84	96	64	78	62	69	69	77	91	14	33	10	14	17	30	59									
Pakistan	52	75	28	48	64	78	92	40	67	13	34	52	68	86	15	35	1	8	15	30	55									
Sri Lanka	99	99	98	99	99	100	100	95	95	89	96	96	98	98	35	49	15	28	35	47	68									
Kazakhstan	100	100	100	100	100	100	100	100	100	99	100	100	100	100	93	97	89	94	96	97	99									
Kyrgyz Republic	99	100	100	100	99	99	99	99	99	96	100	99	100	99	84	91	78	85	81	89	96									
Tajikistan	99	97	98	99	99	100	96	94	95	93	91	95	95	96	68	74	63	63	66	73	79									

Lao PDR = Lao People's Democratic Republic, PRC = People's Republic of China.  
Source: UN Statistics Division. UN Data. <http://data.un.org/> (accessed 15 January 2022).

## IV. RESULTS

### A. Change in Gross Domestic Product

The study estimates that earning losses from school closures lead GDP to fall in almost all economies, including the subregions of Asia. Globally, the decline amounts to 0.19% of GDP in 2024, 0.64% in 2028, and 1.11% in 2030. In absolute terms, school closures during COVID-19 would cost the global economy \$943 billion in 2030. Overall, economies with significant population of school children and college-going youth in rural areas—and in the poorest and second wealth quintile—have been worst-hit as they lack access to stable internet connections needed to study online. Also, if the share of unskilled labor employment in the labor force is high, learning and earning losses are significant. That is because a notable portion of the impacted population will migrate to the unskilled labor force.

**Figure 2: Change in Gross Domestic Product Due to Earning Losses from COVID-19 School Closures**  
(deviation from baseline, %)



EU = European Union, Lao PDR = Lao People’s Democratic Republic, PRC = People’s Republic of China, RoCentralAsia = Rest of Central Asia, RoEAsia = Rest of East Asia, RoSEAsia = Rest of Southeast Asia, RoWorld = Rest of the World, RoSouthAsia = Rest of South Asia, US = United States.  
Source: Authors’ calculations using data from Global Trade Analysis Project. GTAP Data Base.  
<https://www.gtap.agecon.purdue.edu/databases/default.asp> (accessed 14 January 2022).

For Asia as a whole, the impact of learning losses from school closures is most pronounced in the Kyrgyz Republic (a 5.5% contraction in GDP against the baseline assuming no COVID-19), Nepal (a 5.0% decline), Mongolia (a 4.9% decline), and Bangladesh (a 4.9% decline). These economies have had the longer school closures and deepest earning losses. According to UNESCO data, schools in Nepal closed for 82 weeks because of the pandemic, while in Bangladesh schools were out for 73 weeks.

For South Asia, the effect is deepest in Nepal, where GDP is forecast to fall by 0.48% in 2023, 1.42% in 2025, 4.34% in 2028, and 4.97% in 2030 as a result of the school closures. The share of unskilled labor employment in Nepal is well above other South Asian economies, so the impact looks more pronounced. In terms of absolute change, India experiences the highest GDP decline in South Asia, at about \$98.84 billion in 2030. In percentage terms, its GDP decreases by 0.34% in 2023, 1.36% in 2026, and 3.19% in 2030. India has notable enrollment in secondary education and among students in rural areas. Pandemic-induced school closures have also been more extensive there. The impact is also significant in Bangladesh, where full school closures have been significant and the share of unskilled in the labor force is high.

Considering Southeast Asia, the impact is highest in Malaysia, where the GDP decline is 0.42% in 2023, 1.19% in 2026, and 4.24% in 2030. In absolute terms, Indonesia experiences the subregion's highest decline in GDP, of about \$45 billion, and in percentage terms it endures a 0.37% decline in 2023, followed by 1.94% in 2027, and 4.45% in 2030. Schools were closed for 77 weeks in Indonesia, the longest absence in the region. It is also important to note that Indonesia has a higher share of unskilled labor in the labor force than the baseline. Malaysia also has high rate of school closures. Declines in GDP are also high in economies like the Philippines (with GDP falling by 3.27%), Cambodia (down 1.5%), and Viet Nam (down 1.37%), where school enrollment in rural areas is considerably high. The model estimates that GDP in Singapore will continue to increase, given that earning losses due to school closures are low enough to be compensated. This is due to the small share of unskilled in the Singapore labor force and that school closures have not been as extensive as elsewhere in the subregion.

In East Asia, Mongolia experiences the highest GDP decline, at about 1.08% in 2025, 2.42% in 2028, and 4.92% in 2030. School closures in Mongolia totalled nearly 56 weeks. Enrollment of people in the rural, poorest wealth quintile is high but they lack access to online education. The GDP of Hong Kong, China declines notably by about 1.91%, while that of the Republic of Korea shrinks by 1.55%. Secondary and tertiary enrollment for both is high. The model estimates that for the People's Republic of China (PRC), GDP declines for the years from 2023 through 2030 except during 2024 and 2025. The decline in 2030 is estimated at 0.73%.

Among Central Asian economies, school closures in the Kyrgyz Republic have the most negative impact. GDP declines by 0.37% in 2023, 2.69% in 2026, and 5.53% in 2030. Kazakhstan and Tajikistan also experience declines of 2.21%, and 1.72% in 2030, respectively. In Kazakhstan and the Kyrgyz Republic, there is a notable enrollment in school education in rural areas and given that accession to secondary and tertiary levels from primary is higher, so is the estimated impact of school closures on GDP (Table 4).



**Table 4: Impact on Gross Domestic Product of COVID-19 Pandemic**

Economy	Deviation from Baseline (%)										Absolute Change (\$ million)									
	2023	2024	2025	2026	2027	2028	2029	2030	2033	2034	2035	2036	2037	2038	2039	2048	2050			
Australia	-0.04	-0.19	-0.24	-0.36	-0.52	-0.66	-0.81	-0.87	-547	-2,845	-3,632	-5,454	-7,842	-9,954	-12,088	-12,963				
New Zealand	-0.02	-0.07	-0.07	-0.09	-0.12	-0.13	-0.13	-0.15	-55	-172	-167	-217	-277	-300	-309	-361				
Pacific	-0.04	-0.14	-0.18	-0.27	-0.37	-0.46	-0.55	-0.66	-24	-88	-116	-173	-235	-293	-352	-418				
PRC	-0.20	0.24	0.24	-0.33	-0.34	-0.34	-0.35	-0.73	-25,351	29,264	29,862	-40,563	-41,806	-41,806	-43,048	-90,256				
Hong Kong, China	-0.11	-0.29	-0.44	-0.56	-0.76	-0.91	-1.26	-1.91	-425	-1,084	-1,621	-2,092	-2,836	-3,394	-4,668	-7,115				
Japan	-0.07	-0.14	-0.21	-0.95	-0.95	-0.25	-0.22	-0.23	-3,831	-7,578	-10,886	-49,866	-49,866	-12,990	-11,420	-11,943				
Korea, Rep. of	-0.03	-0.07	-0.08	-0.37	-0.39	-0.40	-0.68	-1.55	-479	-1,174	-1,205	-5,838	-6,154	-6,313	-10,726	-24,599				
Mongolia	-0.33	-0.69	-1.08	-1.69	-2.04	-2.42	-3.97	-4.92	-42	-88	-137	-215	-260	-308	-505	-625				
Taipei, China	-0.03	-0.06	-0.07	-0.07	-0.08	-0.08	-0.08	-0.08	-186	-373	-435	-435	-497	-497	-497	-497				
RoEAsia	-0.16	-0.44	-0.61	-1.17	-1.38	-1.43	-1.94	-2.41	-118	-336	-464	-883	-1,043	-1,083	-1,474	-1,826				
Brunei Darussalam	-0.13	-0.31	-0.43	-0.13	-0.22	-0.39	-0.60	-0.58	-17	-41	-57	-17	-29	-51	-79	-76				
Cambodia	-0.12	-0.35	-0.55	-0.67	-0.88	-1.08	-1.31	-1.50	-28	-83	-130	-160	-210	-258	-311	-356				
Indonesia	-0.37	-0.62	-1.01	-1.63	-1.94	-3.00	-4.08	-4.45	-3,751	-6,340	-10,295	-16,604	-19,760	-30,561	-41,566	-45,333				
Lao PDR	-0.13	-0.15	-0.27	-0.31	-0.36	-0.44	-0.58	-0.86	-23	-27	-48	-54	-63	-77	-103	-153				
Malaysia	-0.42	-0.74	-1.17	-1.19	-1.55	-1.89	-2.61	-4.24	-1,429	-2,556	-4,020	-4,088	-5,326	-6,494	-8,967	-14,565				
Philippines	-0.36	-0.62	-1.00	-0.95	-1.26	-1.57	-2.11	-3.27	-1,252	-2,157	-3,478	-3,321	-4,400	-5,479	-7,337	-11,381				
Singapore	-0.01	-0.03	0.00	0.09	0.13	0.18	0.23	0.20	-33	-102	6	325	466	641	791	715				
Thailand	-0.09	-0.07	-0.06	-0.92	-0.29	-0.14	-0.10	-0.15	-448	-326	-265	-4,369	-1,396	-650	-460	-698				
Viet Nam	-0.07	-0.30	-0.42	-0.59	-0.79	-0.94	-1.12	-1.37	-167	-726	-1,015	-1,429	-1,917	-2,283	-2,736	-3,340				
RoSEAsia	-0.14	-0.35	-0.55	-0.69	-0.78	-0.97	-1.23	-1.50	-99	-241	-376	-474	-539	-668	-849	-1,030				
Bangladesh	-0.43	-0.88	-1.34	-1.91	-2.97	-3.39	-3.81	-4.90	-1,226	-2,490	-3,801	-5,396	-8,390	-9,578	-10,765	-13,843				
India	-0.34	-0.63	-0.97	-1.36	-1.32	-1.53	-2.08	-3.19	-10,544	-19,532	-30,076	-42,245	-41,007	-47,508	-64,367	-98,844				
Nepal	-0.48	-0.93	-1.42	-1.90	-3.18	-4.34	-4.14	-4.97	-129	-251	-385	-513	-861	-1,174	-1,121	-1,346				
Pakistan	-0.13	-0.23	-0.37	-0.39	-0.54	-0.69	-0.92	-1.44	-459	-792	-1,286	-1,347	-1,869	-2,391	-3,216	-5,029				

continued on next page

Table 4 continued

Economy	Deviation from Baseline (%)										Absolute Change (\$ million)									
	2023	2024	2025	2026	2027	2028	2029	2030	2033	2034	2025	2026	2027	2028	2029	2030				
Sri Lanka	-0.23	-0.44	-0.69	-0.66	-0.93	-1.17	-1.62	-2.84	-2.25	-4.30	-6.75	-6.44	-9.07	-1,140	-1,570	-2,756				
RoSouthAsia	-0.32	-0.63	-0.98	-1.34	-1.95	-2.50	-2.91	-3.92	-94	-182	-282	-386	-563	-720	-838	-1,131				
Canada	-0.04	-0.09	-0.12	-0.22	-0.32	-0.44	-0.56	-0.71	-674	-1,606	-2,133	-4,063	-5,992	-8,084	-10,279	-13,088				
US	-0.07	-0.26	-0.36	-0.56	-0.80	-1.03	-1.26	-1.43	-16,935	-60,178	-81,619	-128,469	-183,036	-234,257	-286,107	-325,123				
RoWorld	-0.09	-0.22	-0.30	-0.44	-0.60	-0.75	-0.91	-1.15	-13,252	-31,622	-42,969	-63,437	-85,953	-108,213	-131,425	-165,164				
EU	-0.01	-0.20	-0.20	-0.22	-0.29	-0.31	-0.32	-0.27	-2,181	-41,064	-41,507	-46,051	-59,651	-63,632	-65,601	-54,462				
Switzerland	-0.02	-0.13	-0.15	-0.20	-0.28	-0.33	-0.38	-0.41	-117	-988	-1,154	-1,527	-2,097	-2,505	-2,895	-3,114				
Norway	-0.03	-0.43	-0.48	-0.60	-0.82	-0.96	-1.11	-0.99	-124	-1,962	-2,197	-2,741	-3,751	-4,423	-5,073	-4,561				
Russian Federation	-0.02	-0.12	-0.19	-0.26	-0.35	-0.43	-0.50	-0.52	-445	-2,311	-3,489	-4,880	-6,622	-8,092	-9,431	-9,824				
Kazakhstan	-0.10	-0.23	-0.33	-0.67	-0.81	-0.95	-1.33	-2.21	-188	-418	-606	-1,214	-1,467	-1,721	-2,409	-4,001				
Kyrgyz Republic	-0.37	-1.17	-1.69	-2.69	-3.52	-4.89	-5.01	-5.53	-53	-165	-240	-381	-499	-694	-710	-784				
Tajikistan	-0.11	-0.27	-0.44	-0.50	-0.58	-0.67	-1.00	-1.72	-9	-21	-34	-38	-45	-51	-77	-132				
RoCentralAsia	-0.12	-0.26	-0.41	-0.71	-0.83	-1.12	-1.12	-1.63	-121	-261	-412	-710	-830	-1,120	-1,120	-1,639				
Armenia	-0.02	-0.07	-0.07	-0.07	-0.07	-0.05	-0.03	-0.03	-3	-10	-9	-10	-9	-7	-4	-4				
Azerbaijan	0.00	-0.08	-0.15	-0.25	-0.36	-0.46	-0.55	-0.54	-2	-36	-68	-112	-163	-210	-253	-245				
Georgia	-0.07	-0.19	-0.27	-0.38	-0.49	-0.58	-0.66	-0.83	-15	-37	-52	-74	-95	-114	-130	-162				
Turkey	-0.05	-0.13	-0.16	-0.21	-0.27	-0.32	-0.36	-0.50	-647	-1,531	-1,895	-2,544	-3,207	-3,759	-4,253	-5,924				

EU = European Union, Lao PDR = Lao People's Democratic Republic, PRC = People's Republic of China, RoCentralAsia = Rest of Central Asia, RoEastAsia = Rest of East Asia, RoSEAsia = Rest of Southeast Asia, RoWorld = Rest of the World, RoSouthAsia = Rest of South Asia, US = United States.

Source: Authors' calculations using data from Global Trade Analysis Project. GTAP Data Base. <https://www.gtap.agecon.purdue.edu/databases/default.asp> (accessed 15 January 2022).

## B. Change in Employment

Among the South Asian economies, Nepal experiences the highest decline in the employment among both skilled and unskilled labor (Tables 5 and 6). Employment of skilled labor in Nepal declines by 1.15% in 2025 and by 3.84% in 2030, while declines for unskilled labor are 1% in 2025 and 3% in 2030. Both drive the economy's shrinking GDP. Also, the share of unskilled labor is high in Nepal. Sri Lanka and Bangladesh experience major losses of employment. According to the model, employment of unskilled labor in Sri Lanka declines by 2.63% and that of skilled labor by 2.65% in 2030. In Bangladesh, skilled employment falls by 3.18% and unskilled labor employment declines by 3.16% in 2030. In India, jobs for skilled labor in 2030 decline by 1%, and by 2% for unskilled labor.

**Table 5: Change in Employment of Skilled Labor**  
(%)

Economy	2023	2024	2025	2026	2027	2028	2029	2030
Australia	-0.024	-0.215	-0.240	-0.324	-0.449	-0.538	-0.623	-0.591
New Zealand	-0.005	-0.047	-0.041	-0.052	-0.071	-0.080	-0.085	-0.086
Pacific	-0.028	-0.132	-0.151	-0.205	-0.267	-0.322	-0.376	-0.427
PRC	-0.167	0.894	0.848	0.272	0.244	0.242	0.220	-0.517
Hong Kong, China	-0.085	-0.376	-0.456	-0.542	-0.767	-0.859	-1.127	-1.526
Japan	-0.060	-0.184	-0.235	-0.983	-1.000	-0.304	-0.288	-0.247
Korea, Rep. of	0.005	-0.020	-0.015	-0.293	-0.313	-0.320	-0.594	-1.411
Mongolia	-0.222	-0.608	-0.855	-1.367	-1.586	-1.826	-3.230	-3.864
Taipei, China	-0.113	-0.221	-0.320	-0.304	-0.336	-0.342	-0.602	-0.869
RoEAsia	-0.094	-0.621	-0.688	-1.159	-1.311	-1.281	-1.703	-1.919
Brunei Darussalam	-0.069	-0.800	-0.920	-0.998	-1.723	-2.320	-2.805	-1.754
Cambodia	-0.048	-0.573	-0.620	-0.615	-0.735	-0.803	-0.886	-0.768
Indonesia	-0.327	-0.497	-0.842	-1.386	-1.598	-2.543	-3.476	-3.580
Lao PDR	-0.059	0.052	-0.024	-0.023	0.014	-0.047	-0.184	-0.456
Malaysia	-0.315	-0.662	-0.974	-0.859	-1.101	-1.286	-1.829	-3.108
Philippines	-0.275	-0.490	-0.760	-0.598	-0.800	-0.994	-1.396	-2.316
Singapore	-0.017	-0.019	-0.022	0.030	0.021	0.026	0.022	-0.055
Thailand	-0.061	-0.059	-0.037	-0.891	-0.290	-0.145	-0.133	-0.149
Viet Nam	-0.026	-0.395	-0.430	-0.501	-0.638	-0.691	-0.783	-0.826
RoSEAsia	-0.091	-0.572	-0.650	-0.679	-0.762	-0.831	-0.974	-1.052
Bangladesh	-0.244	-0.509	-0.759	-1.107	-1.974	-2.153	-2.323	-3.190
India	-0.214	-0.376	-0.563	-0.731	0.170	0.076	-0.367	-1.015

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Table 5 *continued*

Economy	2023	2024	2025	2026	2027	2028	2029	2030
Nepal	-0.347	-0.837	-1.155	-1.422	-2.778	-3.612	-3.085	-3.848
Pakistan	-0.111	-0.270	-0.374	-0.357	-0.491	-0.603	-0.809	-1.251
Sri Lanka	-0.159	-0.407	-0.603	-0.485	-0.784	-0.880	-1.179	-2.651
RoSouthAsia	-0.226	-0.501	-0.722	-0.924	-1.461	-1.813	-2.018	-2.822
Canada	-0.012	-0.026	-0.036	-0.088	-0.135	-0.192	-0.252	-0.333
US	-0.038	-0.251	-0.290	-0.404	-0.561	-0.683	-0.802	-0.858
RoWorld	-0.042	-0.120	-0.151	-0.232	-0.326	-0.411	-0.499	-0.638
EU	-0.001	-0.193	-0.183	-0.195	-0.258	-0.271	-0.277	-0.220
Switzerland	-0.015	-0.192	-0.199	-0.233	-0.307	-0.346	-0.383	-0.369
Norway	-0.035	-0.654	-0.675	-0.779	-1.026	-1.144	-1.248	-0.873
Russian Federation	0.041	-0.385	-0.373	-0.395	-0.521	-0.559	-0.585	-0.313
Kazakhstan	-0.058	-0.310	-0.374	-0.687	-0.845	-0.968	-1.326	-2.000
Kyrgyz Republic	0.083	-0.631	-0.643	-1.623	-2.623	-3.179	-3.684	-4.187
Tajikistan	-0.115	-0.358	-0.478	-0.537	-0.612	-0.681	-0.984	-1.638
RoCentralAsia	-0.096	-0.398	-0.493	-0.675	-0.726	-0.724	-0.864	-1.252
Armenia	-0.015	-0.085	-0.085	-0.092	-0.103	-0.100	-0.093	0.505
Azerbaijan	-0.023	-0.221	-0.250	-0.303	-0.390	-0.431	-0.461	-0.682
Georgia	-0.031	-0.163	-0.179	-0.240	-0.315	-0.371	-0.422	-0.047
Turkey	-0.028	-0.100	-0.114	-0.167	-0.230	-0.279	-0.326	-0.429

EU = European Union, Lao PDR = Lao People's Democratic Republic, PRC = People's Republic of China, RoCentralAsia = Rest of Central Asia, RoEAsia = Rest of East Asia, RoSEAsia = Rest of Southeast Asia, RoWorld = Rest of the World, RoSouthAsia = Rest of South Asia, US = United States.

Source: Authors' calculations using data from Global Trade Analysis Project. GTAP Data Base. <https://www.gtap.agecon.purdue.edu/databases/default.asp> (accessed 15 January 2022).

**Table 6: Change in Employment of Unskilled Labor**  
(%)

<b>Economy</b>	<b>2023</b>	<b>2024</b>	<b>2025</b>	<b>2026</b>	<b>2027</b>	<b>2028</b>	<b>2029</b>	<b>2030</b>
Australia	-0.033	-0.205	-0.241	-0.319	-0.434	-0.519	-0.600	-0.583
New Zealand	-0.015	-0.041	-0.045	-0.057	-0.075	-0.084	-0.090	-0.112
Pacific	-0.035	-0.129	-0.158	-0.210	-0.270	-0.323	-0.375	-0.435
PRC	-0.174	0.281	0.271	-0.299	-0.309	-0.311	-0.324	-0.713
Hong Kong, China	-0.105	-0.378	-0.478	-0.566	-0.799	-0.892	-1.161	-1.594
Japan	-0.067	-0.138	-0.197	-0.947	-0.954	-0.260	-0.247	-0.251
Korea, Rep. of	-0.010	-0.042	-0.053	-0.337	-0.358	-0.370	-0.649	-1.497
Mongolia	-0.231	-0.490	-0.753	-1.190	-1.342	-1.514	-2.854	-3.565
Taipei,China	-0.124	-0.195	-0.308	-0.292	-0.312	-0.316	-0.574	-0.864
RoEAsia	-0.126	-0.575	-0.676	-1.144	-1.285	-1.249	-1.669	-1.951
Brunei Darussalam	-0.064	-0.681	-0.801	-0.845	-1.503	-2.061	-2.516	-1.553
Cambodia	-0.065	-0.413	-0.489	-0.470	-0.556	-0.615	-0.696	-0.677
Indonesia	-0.298	-0.468	-0.783	-1.277	-1.448	-2.365	-3.281	-3.450
Lao PDR	-0.057	-0.007	-0.072	-0.024	0.029	0.032	-0.031	-0.220
Malaysia	-0.365	-0.623	-0.992	-0.881	-1.111	-1.297	-1.846	-3.229
Philippines	-0.321	-0.591	-0.918	-0.732	-0.903	-1.072	-1.448	-2.379
Singapore	-0.022	-0.038	-0.044	0.006	-0.015	-0.014	-0.023	-0.105
Thailand	-0.077	-0.049	-0.043	-0.903	-0.298	-0.156	-0.148	-0.198
Viet Nam	-0.038	-0.329	-0.375	-0.440	-0.556	-0.605	-0.696	-0.798
RoSEAsia	-0.102	-0.401	-0.501	-0.527	-0.549	-0.618	-0.765	-0.907
Bangladesh	-0.293	-0.586	-0.891	-1.219	-2.055	-2.209	-2.350	-3.165
India	-0.243	-0.438	-0.675	-0.853	-0.566	-0.656	-1.080	-2.016
Nepal	-0.337	-0.676	-0.998	-1.188	-2.164	-2.953	-2.394	-3.065
Pakistan	-0.093	-0.160	-0.262	-0.169	-0.209	-0.244	-0.373	-0.797
Sri Lanka	-0.243	-0.483	-0.745	-0.673	-0.864	-0.985	-1.304	-2.637
RoSouthAsia	-0.229	-0.432	-0.673	-0.787	-1.178	-1.445	-1.568	-2.394
Canada	-0.028	-0.052	-0.077	-0.129	-0.175	-0.231	-0.291	-0.376
US	-0.051	-0.166	-0.225	-0.331	-0.457	-0.571	-0.685	-0.774
RoWorld	-0.061	-0.148	-0.202	-0.278	-0.364	-0.446	-0.530	-0.674
EU	-0.006	-0.139	-0.138	-0.150	-0.199	-0.211	-0.217	-0.188
Switzerland	-0.016	-0.024	-0.041	-0.068	-0.098	-0.128	-0.160	-0.213
Norway	-0.032	-0.528	-0.557	-0.647	-0.854	-0.957	-1.049	-0.749
Russian Federation	0.033	-0.263	-0.257	-0.268	-0.352	-0.375	-0.387	-0.198
Kazakhstan	-0.066	-0.199	-0.269	-0.548	-0.645	-0.726	-1.045	-1.837

*continued on next page*

Table 6 *continued*

<b>Economy</b>	<b>2023</b>	<b>2024</b>	<b>2025</b>	<b>2026</b>	<b>2027</b>	<b>2028</b>	<b>2029</b>	<b>2030</b>
Kyrgyz Republic	-0.106	-0.920	-1.086	-1.919	-2.692	-3.192	-3.655	-3.964
Tajikistan	-0.121	-0.284	-0.424	-0.507	-0.594	-0.679	-0.999	-1.690
RoCentralAsia	-0.105	-0.276	-0.387	-0.578	-0.616	-0.621	-0.769	-1.233
Armenia	-0.008	-0.058	-0.054	-0.054	-0.052	-0.044	-0.031	0.136
Azerbaijan	-0.016	-0.209	-0.232	-0.273	-0.347	-0.384	-0.410	-0.615
Georgia	-0.038	-0.146	-0.174	-0.216	-0.260	-0.293	-0.319	-0.306
Turkey	-0.049	-0.122	-0.158	-0.205	-0.257	-0.300	-0.341	-0.456

EU = European Union, Lao PDR = Lao People's Democratic Republic, PRC = People's Republic of China, RoCentralAsia = Rest of Central Asia, RoEAsia = Rest of East Asia, RoSEAsia = Rest of Southeast Asia, RoWorld = Rest of the World, RoSouthAsia = Rest of South Asia, US = United States.

Source: Authors' calculations using data from Global Trade Analysis Project. GTAP Data Base.  
<https://www.gtap.agecon.purdue.edu/databases/default.asp> (accessed 15 January 2022).

In Southeast Asia, employment of both skilled and unskilled labor declines most in Indonesia. Unskilled labor employment declines by 1.27% in 2026 to 3.45% in 2030 and skilled labor employment declines by 1.38% in 2026 and by 3.58% in 2030. Malaysia, the Philippines, Brunei Darussalam, Cambodia, and Viet Nam also suffer notable declines.

Considering East Asia, Mongolia experiences the highest decline of skilled labor, by 1.58% in 2027 and 3.86% in 2030, and the biggest fall in employment for unskilled labor: by 1.34% in 2027 and by 3.56% in 2030. The model also predicts significant declines in employment in Hong Kong, China (1.59% decline for unskilled labor and a 1.52% decline in jobs for skilled labor against the baseline) and in the Republic of Korea, where unskilled labor employment falls by 1.50% and that of skilled labor decreases by 1.41%. The model estimates that skilled labor employment in the PRC decreases by 0.51% in 2030, while that of unskilled labor initially increases by 0.28% in 2024, but then falls by 0.29% in 2026 and by 0.31% in 2028, before extending the decline with a 0.71% contraction in 2030.

In Central Asia, the Kyrgyz Republic experiences the maximum decline, with employment of skilled labor declining by 4.18% in 2030 and that of unskilled labor by 3.96% the same year. Falling employment for both groups is also observed in other economies like Kazakhstan, Azerbaijan, and Tajikistan.

## V. CONCLUSIONS

The study estimates that school closures lead to declines in global GDP and employment. Moreover, the losses in global GDP and employment increase over time. Declines in global GDP amount to 0.19% in 2024, 0.64% in 2028, and 1.11% in 2030. In absolute terms, the cost to the global economy in 2030 alone is \$943 billion.

Considering skilled labor, global losses to employment amount to declines of 0.05% in 2024, 0.25% in 2026, and 0.75% in 2030. The study estimates that school closures will deny about 5.44 million people around the world employment in the skilled labor force by 2030. Also, in terms of absolute costs, lost wages to the baseline scenario total \$94.86 billion. For unskilled labor, the global contraction in employment is estimated to be 0.22% in 2025, 0.51% in 2027, and 1.15% in 2030. Around 35.69 million people around the world would have made into the unskilled labor force had the pandemic did not lead schools to close. In terms of cost, lost wages amount to \$121.54 billion in 2030.

Across Asia, GDP and employment losses differ significantly. In economies with significant student populations from rural areas, those in the poorest and second wealth quintile have been the worst hit. This is because a lack of access stable internet connections and online education hampers their learning opportunities. Learning and earning losses are also significant in economies where the share of unskilled labor employment in the overall labor force is high. This is because school closures will push a notable portion of the impacted students into unskilled jobs.

We make three policy recommendations about actions to mitigate these impacts while building a more resilient education system:

*Support learning recovery.* The most immediate challenge is for governments to provide effective support for students impacted by school closures to recover from lost opportunities. The first step is to conduct assessments of learning losses among the impacted school-age population. It is important to identify the learning gap and specific learning needs of individuals. Effective learning programs should be devised to offer appropriate support such as tutoring or special classes and help them to bridge the learning gap.

*Invest in education and skills.* The pandemic impact on education affects the future workforce and their skills. It is essential that governments prioritize spending on education even as they pare back fiscal budgets after expanded spending on COVID-19 mitigation measures. Governments need to direct adequate funding and resources to young populations most affected by closures, such as those from the poor, rural, and socially disadvantaged groups. It is important to keep school-age children in education as much as possible by providing financial support and incentives, while giving additional support for skills training to youth already out of school. The pandemic promoted rapid digital transformation, which education systems should be better prepared to support as a key driver for productivity and economic growth. Digital skills and awareness are key to narrowing the digital divide and unleashing digital potential for inclusive and sustainable growth.

*Embrace the digital transformation in education.* The pandemic revealed key constraints of education systems, including the lack of digital curriculums, digital teaching tools, and materials. If not more important, it exposed the lack of digital competences among teachers and trainers. It is essential to seize opportunities to make progress during the post-pandemic recovery, rebuilding education systems to allow both face-to-face and remote learning and to integrate digital tools and devices into teaching methods, improve digital skills through developing school curriculums and training teachers to deliver effective learning.

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## Potential Economic Impact of COVID-19-Related School Closures

The coronavirus disease (COVID-19) and related school closures created substantial disruptions in children's education. The prolonged school closures will impact the skills that they acquire and their productivity when they mature as professionals. This study examines medium- and long-term economic impacts of COVID-19-related school closures using Global Trade Analysis Project or GTAP, a computable general equilibrium model. It also evaluates the labor productivity effect per year of schooling loss due to the pandemic at different levels of schooling—primary, secondary, and tertiary.

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