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# Lost Wages: The COVID-19 Cost of School Closures<sup>1</sup>

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*Abstract:* Social distancing requirements associated with COVID-19 (coronavirus) have led to school closures. In mid-April, the United Nations Educational, Scientific and Cultural Organization reported that 192 countries had closed all schools and universities, affecting more than 90 percent of the world's learners: 1.5 billion children and young people. The closures are expected to reduce learning and will lead to future losses in earnings and labor productivity. Schooling attainment leads to increased earnings. What is not known is how much earnings will decline due to the school closures. Starting with the fact that every year of schooling equates to 8-9 percent in additional future earnings, this paper uses the number of months of education closures to estimate the loss in marginal future earnings. The findings show that the school closures reduce future earnings, and this loss is equivalent to 15 percent of future gross domestic product. The school closures will have a large and long-lasting impact on the earnings of future workers. It is also likely that students from low-income countries will be affected most. These estimates are conservative, assuming that the closures will end after four months and school quality will not suffer.

*JEL codes:* I26; I20; J24

*Keywords:* education, earnings, Covid-19

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# LOST WAGES: THE COVID-19 COST OF SCHOOL CLOSURES

## Introduction

In mid-April, [UNESCO](#) reported that 192 countries had closed all schools and universities, affecting more than 90 percent of the world's learners: 1.5 billion children and young people. While some governments are starting to order teachers and students back to work, education—one of the most important drivers in human capital investment—continues to be largely closed for business.

When children lose out on education, they lose out on future opportunities including economic benefits, such as additional earnings, with far-reaching consequences. Some modeling suggests that the loss of learning during the extraordinary systemic crisis of World War II still had negative impact on former students' lives some 40 years later.<sup>1</sup> And the impact of lost learning is not limited to the individual level: For whole societies closing down education today, there will likely be significant consequences tomorrow.

In this paper, we estimate the costs in expected lifetime earnings to current students of the COVID-19 school closures, as well as how these losses will lead to reductions in gross domestic product (GDP) across low-, middle-, and high-income countries. These preliminary estimates are presented as a starting point to help governments make increasingly informed choices about school closures, and to start a global debate on controlling and mitigating the economic downward spiral that COVID-19 is already creating. We realize that lifetime earnings and productivity are only some of the costs borne by children and youth of COVID-19. For example, van Lancker and Parolin argue that school closures are likely to affect children's health and social well-being.<sup>2</sup> We hope that future research will consider the full costs of the COVID-19 school closures to children and youth worldwide.

## Evidence on the Costs of Previous Pandemics and Crises

Research indicates that the negative effects on earnings of previous pandemics are long-lasting. The 1918 influenza generated impacts that lasted into the 1980s.<sup>3</sup> Cohorts in utero during the pandemic displayed reduced educational attainment, increased rates of physical disability, lower income, lower socioeconomic status, and higher transfer payments compared with other birth cohorts. Research suggests that pandemics reduce income by 5-9 percent.<sup>4</sup>

This reduction in income is similar to the reduction in earnings from fiscal crises. Research has shown, for example, that graduating in a recession year leads to earnings losses that could last a decade or more, especially for high-educated youth in rigid labor markets.<sup>5</sup> Altonji, Kahn, and Speer (2016) estimate that initial earnings losses incurred by recession-year college graduates in the U.S. are as high as 10 percent due to reductions in full-time work and wages. They also find a small but persistent reduction in wages after the initial earnings losses.<sup>6</sup>

Some researchers have produced several single-year estimates of the impacts of pandemics on GDP. Three cases illustrate some of the possible outcomes in a rapid onset pandemic: a mild case (as in the 1968 flu pandemic, cost of 0.7 percent of GDP), a moderate case (as in the 1958 flu

pandemic, cost of 3.1 percent of GDP), and a severe case (as in the case of the 1918 pandemic, cost of 4.8 percent of GDP). Others have estimated even higher impacts of up to 10 percent a year based on lost productivity and other consequences during the outbreak, such as mortality, morbidity, and absenteeism from work.<sup>7,8</sup>

While each pandemic is different, they all affect economic output. The Black Death (1347-1352), which led to the deaths of more than 75 million people around the world,<sup>9</sup> devastated many urban areas, and led to a reduction in available labor and higher agricultural wages.<sup>10</sup> The Spanish Flu of 1918-1920 led to deaths of up to 100 million people<sup>11</sup> and curtailed economic activity, with negative effects lasting into the 1980s.<sup>12</sup> The economic impact of the 2003 outbreak of severe acute respiratory syndrome (SARS) in the UK, France, Belgium, and The Netherlands was estimated at 0.5-2% of GDP.<sup>13</sup>

Past crises led to persistent earnings declines lasting several years.<sup>14</sup> In China, secondary school closures in rural areas immediately after the Cultural Revolution led to a sharp 35 percent decline in high school completion rates among the affected cohort and negative labor market outcomes a decade later.<sup>15</sup> Importantly, research has shown that the losses in earnings due to crises are not distributed equally. Earnings among workers in lower paying jobs tend to suffer the sharpest losses. More educated workers suffer less because, as Nobel laureate Theodore Schultz (1975) argued, educated (or skilled) workers are better able to cope with the disequilibria brought on by events such as economic crisis because they can adapt to the changing needs of employers and new technologies. In addition, educated workers are better able to seek information about job opportunities from family, friends, advertisements, former employers, radio, and the labor bureau.<sup>16</sup>

In certain crises, the rates of return to education may rise due to the increased unemployment rates among the less educated. This creates a pool of unemployed less educated workers, which in turn dampens wages of less educated workers.<sup>17</sup> For example, in Argentina, during the volatile periods of 1992-2002, the earnings of educated workers were less affected by crises than the earnings of less educated workers.<sup>18</sup> In fact, urban households in Argentina with more educated heads (at the secondary or higher education level) experienced constant increases in family income during the Argentine crisis of the 1990s.<sup>19</sup> In contrast, urban households with less educated heads mostly experienced declines in incomes or experienced modest gains during certain years. Similar patterns have been found in other countries during crises, including Greece, Latvia, Mexico, and the República Bolivariana de Venezuela.<sup>20</sup>

However, most previous research on returns to education have left unexplored the question of whether and to what extent the returns to additional years of schooling vary with educational quality. DeCicca and Krashinsky (2020)<sup>21</sup> attempt to fill this gap by examining returns to schooling with three common measures of school quality: pupil-teacher ratio, relative teacher salaries, and length of the school year. They find evidence that the returns to schooling do vary among U.S. states with varying degrees of school quality, especially with respect to relative teacher salaries.

Prior to COVID-19, several researchers across the world estimated the potential losses in GDP of school closures as part of a pandemic mitigation strategy. In the U.K., Sadique, Adams, and Edmunds (2008) found that closing all schools for four weeks would cost between 0.1 and 0.4

percent of GDP.<sup>22</sup> In the U.S., Lempel, Epstein, and Hammond (2009) estimate that the costs of closing schools for four weeks borne by current workers—due to absenteeism and productivity losses—represent a reduction in GDP by about 0.3 percent.<sup>23</sup> These estimates attempt to account for the one-time losses in GDP due to worker absenteeism and losses in productivity; they do not account for learning losses and future lifetime earning losses resulting from school closures, a main contribution of our paper.

In the case of COVID-19, Andresen, Bensnes, and Løkken (2020) attempted to quantify the costs of school closures in Norway and found a one-off loss of NOK 2.2 billion (US\$213.8 million) for the 5 percent of students whose progression was delayed, plus an additional NOK 1.7 billion (US\$165.1 million) for each day schools and kindergartens remain closed.<sup>24</sup> Their approach was to model for forfeited future personal returns to education as a result of school closures. To do this, they added an estimate for lost productivity among parents, faced with caring for their children at home during the shut-down. In contrast, the evidence we present here focuses on estimating lifetime losses in future earnings for the current global cohort of school and university students.

## Methods and Data

We used a simple model to assess the economic impact of school closures because of the virus. We applied the model to three country income groups—low-, middle-, and high-income countries, using the World Bank classification<sup>25</sup>—and use the average of the three to derive global estimates. We expressed the loss in terms of lower wages due to lower productivity, and in terms of lost GDP:

$$L = PV(Y \cdot \alpha \cdot r) \cdot (S \cdot \beta)$$

where  $L$  is the total loss;  $PV$  is the present value of lost earnings;  $Y$  is the mean annual earnings;  $\alpha$  is an adjustment factor to account for the part of the school year when schools were closed;  $r$  is the rate of return on one year of schooling;  $S$  is the total number of students; and  $\beta$  is an adjustment factor to allow for some distance learning during the period of school closure.

We begin by assuming that every additional year of schooling equates to about 9 percent in additional future earnings.<sup>26</sup> Of course, the returns vary by country and country group, but not by very much (see Table 1). Therefore, the returns to education estimate,  $r$ , that we use here is 9 percent. We then use the number of months of education closures to estimate the loss in marginal future earnings. For example, if *Country X* closes its schools and universities for four months, the loss in marginal future earnings would be 3.3 percent per year over a student’s working life. Therefore, our earnings adjustment for *Country X*,  $\alpha$ , is 0.33.

Table 1: Returns to Schooling (Percent)

Income group	Returns
Low	9.3
Middle	9.2
High	8.2
World	8.8

Source: Psacharopoulos and Patrinos (2018)

We use mean annual earnings data from [WorldData.info](http://WorldData.info), the main source of reliable information that includes a (small) sample of low-income countries. To estimate the present value (PV) of lifetime earnings, we assume a working life of 45 years and a 3 percent discount rate for all groups. We use data for the total number of students,  $S$ , from [UNESCO](http://UNESCO).

We assume that some of the learning loss will be mitigated by distance learning measures. Therefore, we include  $\beta$ , an adjustment factor to allow for some distance learning during the period of school closure. We assume an optimistic level  $\beta$ , at 0.9, indicating that only 10 percent of students suffer learning loss due to the distance learning opportunities, a conservative estimate that assumes that having distance learning opportunities equates with learning. The actual learning losses might be much higher.<sup>27</sup> Our estimate of distance learning coverage comes from [UNESCO](http://UNESCO). Finally, we use [World Bank data](http://World Bank data) on GDP by country.

## Findings

We apply our model and assumptions to the world’s country groups and to the world economy overall. The estimated present value loss in earnings at the individual level is US\$612 in low-income countries, US\$4,425 in middle-income countries, and US\$37,982 in high-income countries. At the global level, this loss is US\$9,787 at the individual level.

While this may not sound like too much of an individual price for young people to pay in the fight against COVID-19, a look at the impact for all affected students—more than 1.5 billion—is much more sobering. The total estimated losses range from US\$78 billion in low-income countries, to US\$4.5 trillion in middle-income countries, and US\$8.8 trillion in high-income countries. The global impact is US\$13 trillion.

In terms of GDP, by country income group, the losses range from 13 percent in low-income countries, 14 percent in middle-income countries, and 16 percent in high-income countries. Taking the average for the three regions gives us a world estimate of 15 percent (see Table 2).

Table 2: Cost of school closures due to earnings losses as a percent of GDP, by country income group and for the world

Income Group	Losses as % of GDP
Low	13
Middle	14
High	16
World	15

The estimates clearly differ by country income group because there are many more students in middle-income countries and much higher earnings in high-income countries. The estimated losses for low-income countries are devastating given already low earnings, depressed growth forecasts, and higher levels of poverty. In middle-income countries, the estimated losses are also substantial, since more than 1 billion of the 1.5 billion students affected by school closures live in middle-income countries.

## Discussion

We estimated the costs of COVID-19 school closures on lifetime earnings for today's enrolled students, and we estimated the losses in GDP for low-, middle- and high-income countries as well as the world as a whole. Our estimates of the costs of the COVID-19 school closures are troubling. The estimated present value loss in earnings at the individual level is US\$612 in low-income countries, US\$4,425 in middle-income countries, and US\$37,982 in high-income countries. At the global level, this loss is US\$9,787.

While these figures may seem a manageable price for young people to pay in the fight against COVID-19, when taking into account all affected students—more than 1.5 billion across the globe—the final estimate is much more sobering. Our total estimated losses in foregone lifetime earnings for current enrolled students range from US\$78 billion in low-income countries, to US\$4.5 trillion in middle-income countries, and US\$8.8 trillion in high-income countries. The total global losses amount to US\$13 trillion.

In terms of GDP, the losses range from 13 percent in low-income countries, 14 percent in middle-income countries, and 16 percent in high-income countries. Taking the average for the three regions gives us a world estimate of 15 percent (see Table 2).

One limitation of our research is that it does not sufficiently account for differences in the quality of schooling across countries. In addition, our study does not take into account differences in labor force participation rates for different groups, including males and females. It also does not consider distributional aspects. It is expected that socioeconomically disadvantaged groups will fare worse in terms of income losses. We also do not provide separate estimates of the effects by level of education. Yet, it is most likely that those from poorer backgrounds and lower levels of schooling will suffer most. We hope to address these questions in future research.

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