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Learning disruptions during the COVID-19 pandemic: Evidence from household surveys in Southeast Asia

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ADB Working Paper Series

**LEARNING DISRUPTIONS DURING
THE COVID-19 PANDEMIC:
EVIDENCE FROM HOUSEHOLD
SURVEYS IN SOUTHEAST ASIA**

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Abstract

We study children's access to remote learning when schools were closed during the COVID-19 pandemic and their parents' perceptions about learning progress in seven Southeast Asian countries. This is the first regional analysis to systematically document students' access to remote learning based on survey data and to investigate how school closures and remote learning access affected children's learning progress. The results are based on survey responses from 2,200 households. We find that 80% of the respondents felt that their children's learning progress was slower during school closures than it would have been with in-person schooling. Slightly less than half of all children experienced very little or no learning progress. Three characteristics were strongly correlated with learning progress: first, boys were more likely than girls to experience very little or no progress; second, children from households in the top 30% of the income distribution were more likely to progress at the same rate as in in-person classes than children from lower-income households; third, comparing the different remote learning modes, internet-based learning or multiple learning modes provided children with a better chance of maintaining learning progress than other single modes.

Keywords: COVID-19, school closure, learning loss, Southeast Asia

JEL Classification: I21, I28

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1. INTRODUCTION

Children were required to study at home for extended periods during the COVID-19 pandemic. In developing countries in Asia and the Pacific, schools on average were closed for 73% of regular instruction days between February 2020 and October 2021 (Molato-Gayares et al. 2022). Socioeconomically disadvantaged students suffered greater losses as they had less access to remote learning modes and weaker support at home, which significantly widened pre-pandemic learning gaps (Moscoviz and Evans 2022). A recent meta-analysis finds that, among developing countries in Asia and the Pacific where data are available, the losses were around 0.14 standard deviations, equivalent to about half a year of schooling (Dela Cruz et al. 2024). To further put things in perspective, the losses were close to the median impact of a typical education intervention in developing countries designed to improve learning (Evans and Yuan 2022). Lessons from previous incidents of school closures show that learning losses will not automatically be recovered or learning trajectories normalize once schools reopen (Andrabi, Daniels, and Das. 2021; Betthausen, Bach-Mortensen, and Engzell 2023). According to the World Bank (2023), education authorities in most countries, including those in Southeast Asia, do not fully comprehend the need for learning recovery after the pandemic, resulting in a slow recovery.

Studies on learning losses in developing countries are comparatively rare (Moscoviz and Evans 2022; Betthausen, Bach-Mortensen, and Engzell 2023). There does not exist a regional review for Southeast Asia of children's experience during school closures or a quantitative estimate of the extent of learning losses. We contribute to the literature by examining children's educational experiences and their learning progress in seven middle-income Southeast Asian countries using a representative computer-assisted and telephone-based household survey. As the survey took place in late 2022, when all schools in the region had already reopened, our study provides an immediate retrospective review of children's learning progress during the pandemic. Given the lack of student learning assessment pre- and post-pandemic, we rely on parents' assessments of their children's learning progress. Although such assessments introduce subjectivity, they have the advantage of being conducted in a uniform way across countries. Other well-designed studies based on test scores already provide convincing evidence that school closures created significant learning losses (Dela Cruz et al. 2024). Our purpose is not to measure the average effects of school closure, which may be influenced by systematic biases, but rather to explain variations across households that are not affected by such biases. It is encouraging that parental assessments of learning loss are positively associated with the length of school closure as expected.

The survey also provides data on the length of school closures, the mode of education delivery during closures, and internet availability at the household level. This allows us to gauge children's actual access to remote learning modes provided by the government. Furthermore, we examine the correlation between learning progress and children's experiences during school closures, and their individual and household characteristics. We also examine the effect of two government policies, namely the length of school closure and the provision of different remote learning modes.

As a preview of the results, we find that 80% of parents reported that their children experienced slower learning progress during school closures than during in-person schooling – indicating a substantial loss of learning. At a broad level, these losses were driven by the switch from in-person to remote learning, but the extent of disruption was also affected by the variation in access to different modes of remote learning and

differences in the length of school closures. We also document a significant income gradient with higher-income households experiencing less disruption to their learning progress. Finally, we observe that after controlling for other factors, boys experienced greater disruption than girls.

With regard to government policy measures, we find nuanced evidence regarding the correlation between the length of school closure and learning progress. Students in grades 10–12 were more affected by long school closures than children in lower grades. As regards remote learning modes, we find consistent evidence that internet-based modes and multiple (comprising internet and non-internet-based modes) learning modes were associated with a greater chance of experiencing only mild or no learning loss. Paper-based and TV-based modes provided benefits compared to not using any remote learning modes, but the benefits were smaller than for internet-based modes.

We make several contributions to the literature on how COVID-19 and school closures affected learning. First, the Southeast Asian region provides significant insights due to its variations in education quality and policies implemented during the pandemic. Our study also addresses the paucity of studies about the region. Second, our study is more granular than studies that use countries as their unit of analysis. Specifically, we can compare respondents' actual experience to stated government policies on closures and remote learning. Our survey is similar to the World Bank's High Frequency Mobile Phone Surveys of Households to Assess the Impacts of COVID-19 (World Bank 2020). However, our survey contains more detailed questions on children's education experience during the pandemic and their learning progress.

The rest of the paper is organized as follows. The next section describes the data. Section III provides the context of education in Southeast Asia prior to the pandemic, the length of school closures, and government policies on remote learning. Section IV presents descriptive statistics of learning progress. Section V presents a regression analysis of factors associated with learning progress, and Section VI provides heterogeneity analysis. Section VII concludes.

2. DATA

We implemented a household survey in seven countries – Cambodia, Indonesia, the Lao PDR, Malaysia, the Philippines, Thailand, and Viet Nam – to document households' experiences during the pandemic. The survey covered questions on employment, income, and access to social protection programs, along with children's schooling experience. Data were collected from June to October 2022 through computer-assisted telephone interviews conducted by in-country survey firms.¹ The average interview length was 30 minutes. The sample was representative of an urban-rural location and income level, randomly sampled from the population that owns a telephone.² Out of the 7,100 households sampled across the seven countries, 2,216 households reported having at least one child enrolled in primary or secondary

¹ In a computer-assisted telephone interview, survey data are collected by telephone instead of via in-person or face-to-face interviews, and using devices such as computers, smartphones, and tablets to administer the questionnaire and capture the answers. It is a structured interview; an interviewer talks over the phone to an interviewee with a flowing dialogue that is guided by predefined questionnaires that were loaded onto a device.

² The share of urban and rural respondents in the survey was designed to be the same as the share in the population. The sample was also distributed equally across income quantiles. The sampling frame in each country was acquired from telephone companies. The survey firm then took a random sample, with the requirement to meet the quota as above.

school in 2019 (grades 1–12). The share of households with an enrolled child ranged from 30% to 50% across the countries. This subset of households is the focus of our study.

For these households, we asked the respondent (usually a parent) to focus her/his responses on the child with the most recent birthday if more than one child was enrolled in school in 2019. Questions included the child's age and gender, her school participation in 2022, her grade level in 2019 and 2022, the length of school closure experienced by the child, modes of learning from home used by the child, and the respondent's perceptions or views regarding the child's learning progress.³ We did not conduct objective learning assessments due to resource constraints. The learning progress question was only asked to respondents whose child experienced school closure, which was 94% of the sample of households with enrolled children. At the time of the interview, for the households whose child was still enrolled, 91% of respondents indicated that the child had now returned to in-person classes.

3. REGIONAL CONTEXT

School Participation and Learning Outcomes in Southeast Asia Prior to the Pandemic

Before the COVID-19 pandemic, the region was making progress in education. According to the UNESCO Institute for Statistics (2021), successes in Southeast Asia included increased enrollment rates at primary and secondary levels, improvements in basic literacy, and decreased gender gaps in access to education. Khatiwada, Negara, and Suryadarma (2023) show that the lower secondary completion rate, for example, increased significantly in the Lao PDR and Myanmar to around 55%. Timor-Leste caught up with Indonesia and the Philippines with a completion rate close to 90%. Viet Nam reached nearly universal lower secondary completion, joining Brunei Darussalam and Singapore.

Despite the successes in increasing school participation and completion, learning outcomes remain low in most countries in the region. Out of more than 70 countries that participated in the 2018 Program for International Student Assessment (PISA), Indonesia and the Philippines ranked in the bottom 10, with more than half of 15-year-old students categorized as low achievers (OECD 2019). In the 2019 Southeast Asia Primary Learning Metrics survey of fifth graders, only 2% of students in the Lao PDR and 10% in the Philippines, Cambodia, and Myanmar met the Sustainable Development Goals' reading proficiency standard (UNICEF and SEAMEO 2020). At the other end of the spectrum, students in Singapore performed at the top in international assessments, and Vietnamese students performed well above expectations given the country's level of economic development (Dang et al. 2023)

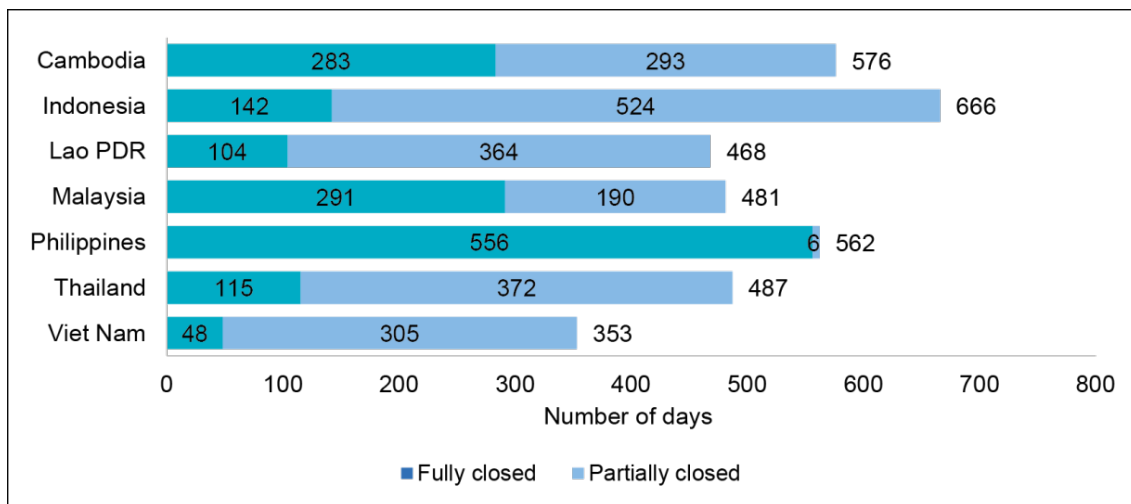
COVID-19-Induced School Closures in Southeast Asia

Figure 1 shows the duration of school closures caused by the COVID-19 pandemic, according to UNESCO. Indonesia had the highest number of closure days in the region. However, 79% of those closures were only partial, which meant that children were able to engage in some in-person class time. No uniform strategy was implemented nationwide, possibly due to Indonesia's relatively high degree of

³ This means we only observed one child per household. This decision was made due to survey logistical factors. The "most recent birthday" was chosen to add an element of random sampling to the child we observed.

government decentralization. There was also no uniform approach across school levels (i.e., primary and secondary). In contrast, the Philippines, which is also an archipelago, had a unified strategy across regions. School facilities were fully closed for much of the period from 2020 to 2022. All students in the country experienced extended periods of fully remote learning.

**Figure 1: Duration of School Closure in Southeast Asia
(February 2020–March 2022)**



Source: UNESCO COVID-19 Global Monitoring Database (<https://en.unesco.org/covid19/educationresponse>) and UIS, March 2022 (<http://data.uis.unesco.org>).

In Thailand, where school closures were also lengthy, although partial, student absenteeism increased in the first few months because the transition to online learning did not happen smoothly (Hulshof and Pirkka Tapiola 2021). Schools in Malaysia were fully closed for more than half the time, facilitated by a nationwide online teaching and learning platform, which enabled at least 3 million out of 5 million students to continue education at home during the pandemic (UNICEF 2020; Asadullah 2023). In the Lao PDR, the government allowed schools to open according to regional variations in the containment of COVID-19. Students from pre-primary to higher education returned to in-person schooling in areas with no new cases of community spread over 14 days, while students in other areas continued with remote learning (UNICEF 2021). Cambodia had nearly a 50–50 split between partial and full closures. The country placed a high priority on rural schools resuming face-to-face classes due to the digital divide, which prevented children in the countryside from accessing remote learning (Turton 2021; Beresford and Theara 2021). Viet Nam had the shortest period of school closure in Southeast Asia due to effective measures to control the spread of the virus. Of 353 days of school closure, almost 90% were partial.

Our survey documented the school closures experienced by children in the respondent households.⁴ We found significant variation in school closures within countries. Overall, 6% of respondents said their children did not experience any school closure. Figure 2 shows that more than 50% of respondents in Indonesia, the Philippines, and Thailand indicated that their children experienced more than nine months of school closure

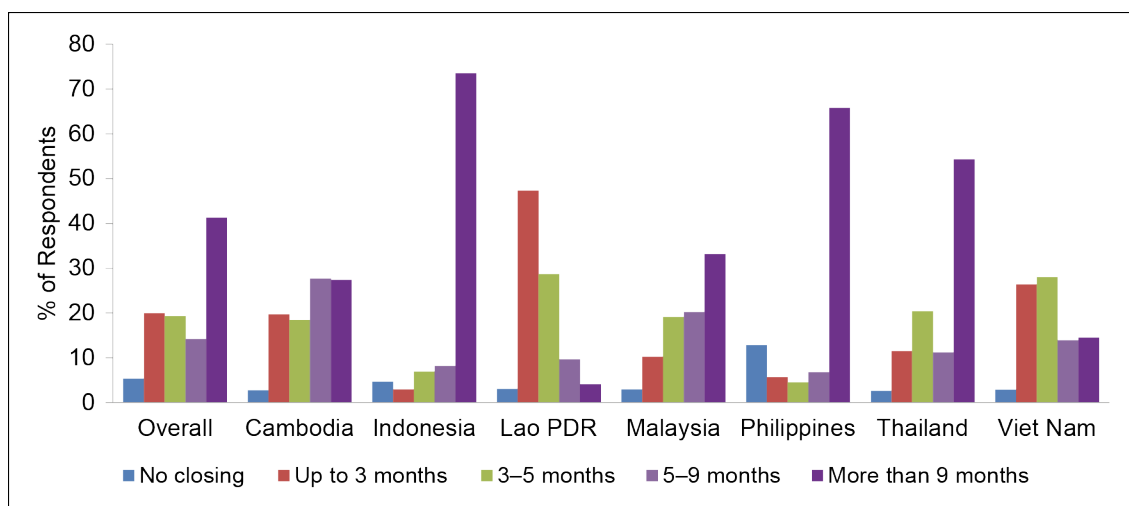
⁴ We did not ask respondents to differentiate between full and partial closures because of a high risk of recall bias.

between February 2020 and October 2022.⁵ At the lower end of school closures, 80% of the respondents in the Lao PDR said that their children experienced up to five months of school closure. Children in Viet Nam, the Lao PDR, and Cambodia experienced the shortest school closures. The survey data are somewhat consistent with the information collected by UNESCO, except for Cambodia, which appeared to show a shorter duration of school closures than the UNESCO data. However, our data have the added benefit of showing within-country variation, which was relatively high in the region.

Mode of Remote Learning during School Closures

In Southeast Asia, all countries implemented multimodal learning delivery during school closure. In Cambodia, the government acknowledged the limitation of the country’s cyber infrastructure in supporting remote learning. With assistance from the international community, schools received grants to procure basic equipment to facilitate continuous learning through short message services (SMS) and instant messaging software (Muñoz-Najar et al. 2021), taking advantage of high mobile phone penetration in both urban and rural areas. TV, radio, and government and private platforms were also used to deliver learning in Cambodia. Likewise in Malaysia and the Lao PDR, SMS and social media were used in addition to government platforms, private internet platforms, and TV (Asadullah 2023). The Philippines, on the other hand, only used government and private internet platforms. Indonesia and Viet Nam, meanwhile, used all possible channels, which included government platforms, private internet platforms, SMS, TV, radio, paper/postal, and home visits by teachers (Molato-Gayares et al. 2022). For Thailand, Muñoz-Najar et al. (2021) show that school reopening—not remote learning—was the priority in 2021. However, over time, public pressure led to a change in the strategy and an adoption of digital platforms.

Figure 2: Length of School Closure Experienced by Students, by Country



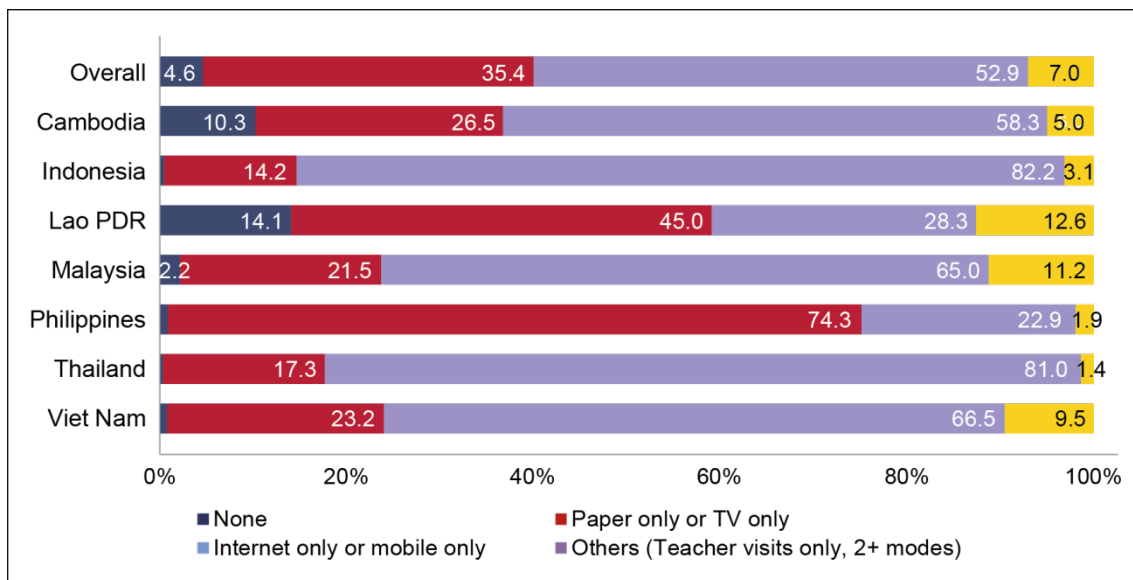
Source: Authors’ estimates from the survey.

Despite government efforts to implement multiple remote learning modes as described above, our household survey showed that virtually all children only used one learning mode (Figure 3). The share of children that did not use any remote learning mode was negligible in five countries, but not in Cambodia and the Lao PDR. In these two

⁵ In the interview, we asked respondents to exclude official school breaks.

countries, the share of children who were officially in school but did not access any remote learning mode was 10.3% and 14.1%, respectively. UNESCO (2021) indicates that in the Lao PDR, digital readiness for the delivery of good-quality educational content during school closures was low. Access to media platforms, such as TV, radio, and the internet, was generally low, and therefore many children did not access remote learning.

Figure 3: Remote Learning Mode Usage, by Country



Source: Authors' estimates from the survey.

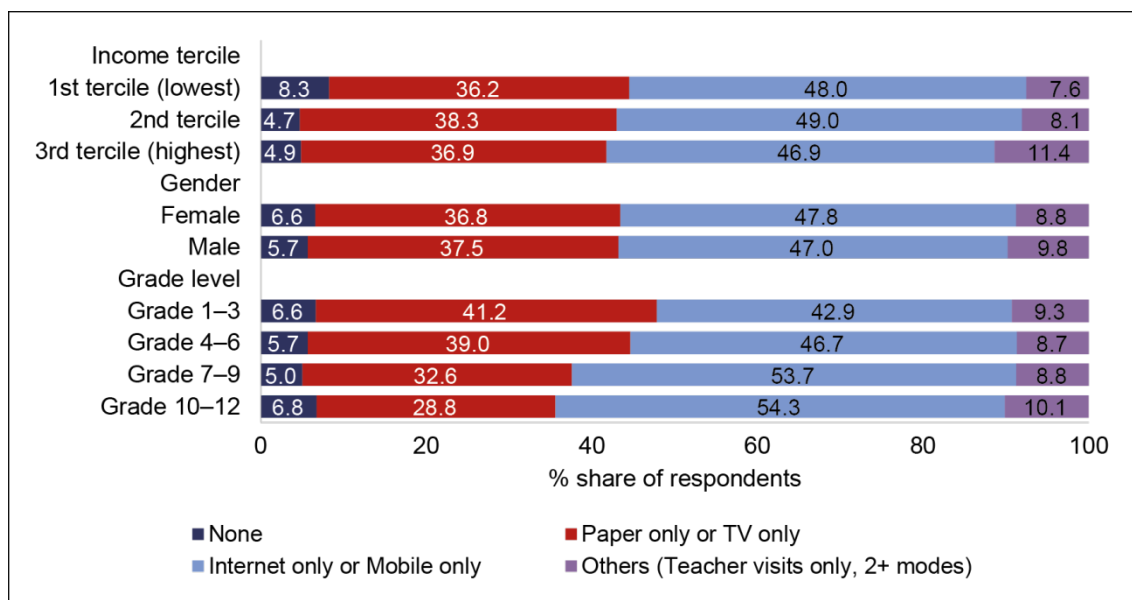
The most widely used delivery mode across five of the seven countries (excluding the Lao PDR and the Philippines) was the internet. In the Philippines, the main mode for continuing learning during school closures was paper-based study modules from teachers, which students received at designated pickup points, where they also dropped off completed assignments. This kind of setup was used by most of the households that do not own digital devices or do not have a stable internet connection (Turton 2021).

The unfamiliarity with modern technologies among Vietnamese preschool teachers and the limited digital skills of Vietnamese parents posed challenges during the period of remote learning (UNICEF 2020). In Malaysia, digital adoption may not have been as great a barrier as in other Southeast Asian countries; nonetheless, complaints of frustration from Malaysian mothers were raised (Tan 2021). This is because, like women elsewhere, they carried the burden of juggling work while helping their children with digital learning at home. Asadullah (2023) finds a significant socioeconomic divide by income and location – online lessons were not accessed regularly by poorer or more remote households. Therefore, the effects of households' socioeconomic conditions on internet access and the digital skills of both students and parents impacted children's learning disruptions in Malaysia.

Figure 4 shows the distribution of remote learning modes in Southeast Asia by household income, gender, and grade level in 2019.⁶ Overall, we find that the share of children who did not access any learning mode was highest among the bottom 30% of the income distribution. Also, a higher share of children from the highest 30% of income distribution accessed multiple modes.

The majority of secondary school children (grades 7–12) were engaged in the online-only mode, while those at the primary level (grades 1–6) were more equally split between paper-only and online-only. Children in grades 10–12 were more likely than other grade groups to not use any remote learning modes, followed by children in grades 1–3. Gender differences in remote learning mode usage were small.

Figure 4: Remote Learning Mode Usage, by Income, Gender, and Grade Level



Source: Authors' estimates from the survey.

Internet Access

Digital access is an important support for remote learning. In our survey, 48% of children relied solely on an internet-based learning mode (including mobile in Figure 4). Figure 5 shows that most surveyed households in Cambodia and the Philippines had no internet connection in their home.⁷ For the Philippines, this is consistent with Figure 3, which shows that only 23% of children used the internet-only learning mode. However, in Cambodia, 58% of children used only the internet-based learning mode despite the results showing that 70% have no access to the internet at home. This could mean that children accessed the internet at locations outside the home.⁸

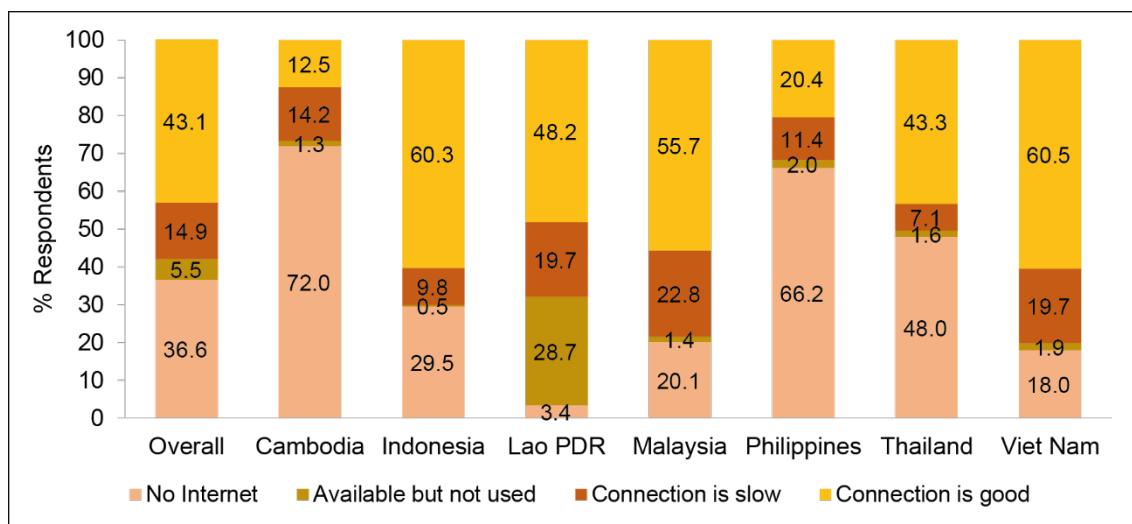
⁶ We define the tercile as bottom 30%, middle 40%, and upper 30%.

⁷ The wording in the survey is: "Please describe the internet connection in your home." In-country survey firms then translated the question into the local language. Therefore, we could not clearly ascertain whether the response included internet access through a smartphone, as it depended on the respondents' viewpoint. The variation could also be country-specific.

⁸ A cross-tabulation between internet access and remote learning mode in Cambodia shows that households without internet access were the least likely to have used an internet-based or mobile-based learning mode.

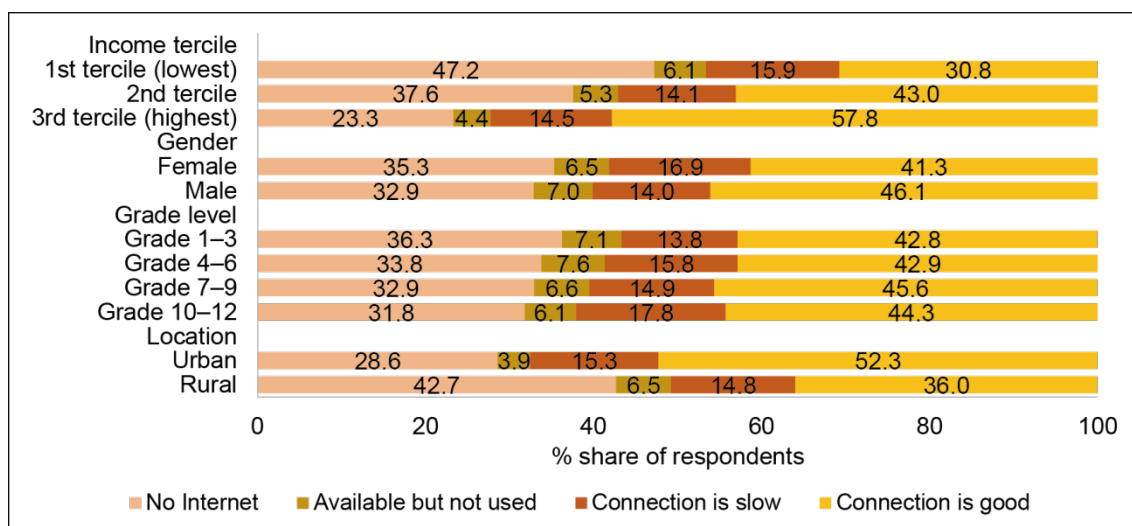
The share of households without internet access was also quite high in Thailand, despite being an upper-middle-income economy. In the Lao PDR, close to 30% of respondents said that they did not use the internet even though the service is available. The share of this category was minuscule in other countries, indicating a possible price barrier in the Lao PDR to service access or device purchase. In contrast, most households in Indonesia, Malaysia, and Viet Nam indicated that they had a good internet connection. In all countries, only a relatively small share of households had poor internet access.

Figure 5: Household Internet Access, by Country



Source: Authors' estimates from the survey.

Figure 6: Internet Access, by Income, Gender, and Grade Level



Source: Authors' estimates from the survey.

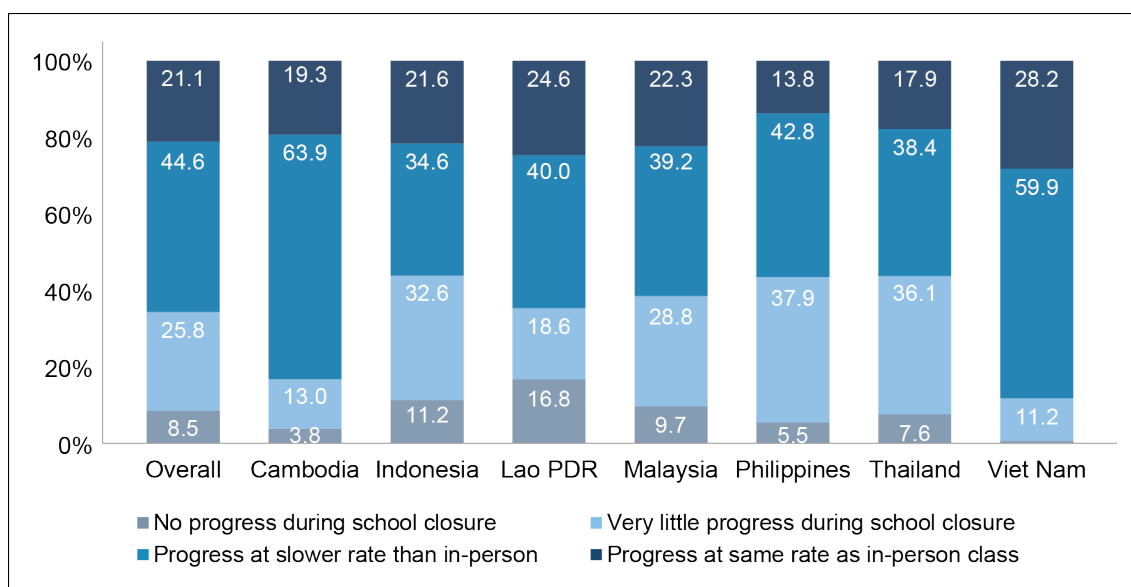
Figure 6 shows the breakdown of internet access by different subgroups. Unsurprisingly, we find a strong income gradient with regard to internet access and the quality of the connection. Even among children in households in the top third of income distribution, close to a quarter had no internet access.

4. LEARNING PROGRESS DURING THE COVID-19 PANDEMIC

Our measure of learning progress is the respondents' (i.e., parents') perception of the progress of their child between 2019 and 2022. The question provided four possible responses: no learning progress, very little progress, progress slower than in in-person instruction, and the same learning progress as in in-person instruction. The last response is our indicator of school closures not affecting learning progress – in other words, no learning loss.

Figure 7 shows that up to 10% of parents in five of the seven countries felt their children made no progress in learning during school closures. The rate was highest for Indonesia (11%) and the Lao PDR (17%). Overall, parents of 8% of the children who had been in school prior to the pandemic felt that their children made no progress during closures. At the other end of the distribution, between 14% and 28% of parents believed that school closures had not disrupted their child's learning progress. The overall share for the seven countries is 21%. Most parents chose the two middle responses indicating that, while their child continued to learn during school closure, their learning progress was slower than it would have been with in-person instruction. Considering the four responses together, our data show that 79% of children experienced a loss in learning progress, with 34% experiencing substantial loss (i.e., no progress or very little progress). The results suggest that learning disruption leading to learning loss affected a significant share of children in middle-income countries in Southeast Asia.

Figure 7: Parents' Perceptions of Learning Progress during COVID-19 School Closures, by Country



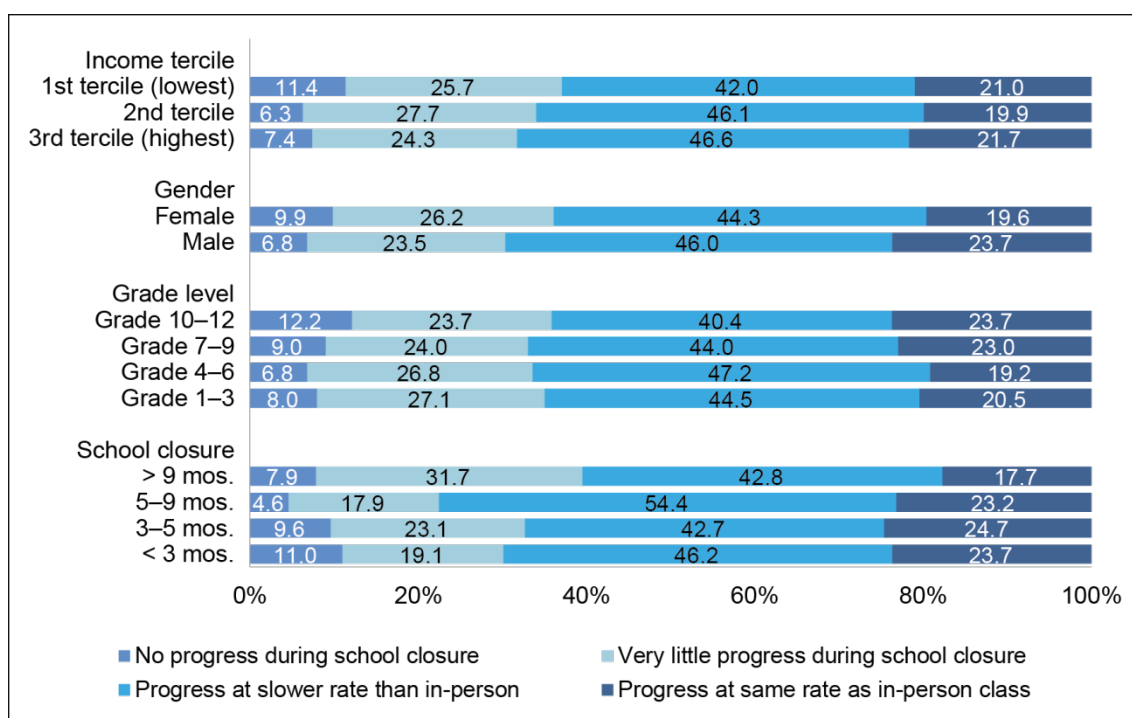
Source: Authors' estimates from the survey.

Figure 8 shows the perceptions of learning progress by income, gender, grade, and length of school closure. Across the three income categories, around 20% of parents felt that their child's progress was not disrupted during school closures. However, income appeared to be a factor affecting the share of children who experienced no learning progress. Among households in the lowest income tercile, 11.4% felt that their

child made no progress during closures. This rate was higher than for households in the middle (6.3%) and upper (7.4%) income categories. The overall disparity supports global findings regarding the effect of income on learning progress during school closures (Moscoviz and Evans 2022; Betthausen, Bach-Mortensen, and Engzell 2023).

The figure also shows that a slightly higher share of children at the secondary level (grades 7–12) made no learning progress compared to those at the primary level (grades 1–6). However, more secondary school students did not experience any learning loss. The length of school closures was similar for these two grade groups (Figure A1 in the Appendix), indicating that the experience during school closures, rather than the length, accounted for this difference.

Figure 8: Parents’ Perceptions of Learning Progress during COVID-19 School Closures, by Income, Gender, Grade Level, and Length of School Closures



Source: Authors’ estimates from the survey.

The final aspect we examine is how learning progress may be affected by the length of school closures. Jack et al. (2023) find that those states in the United States with a higher share of in-person learning had milder learning losses. Jakubowski, Gajderowicz, and Patrinos (2023) also find that learning losses were larger for children whose schools were closed longer. These results are intuitive and might be expected. However, in Southeast Asia we find more nuanced results. Comparing the two extremes, namely children who experienced five months of school closure or less and those who experienced more than nine months of closure, we find that children who experienced short closures were more likely to feel no learning disruption than children with long closures. However, we also find that children who faced short closures were also more likely to experience no learning progress at all. To explain these results, we suggest there may have been more adaptation (including the adoption of remote learning mechanisms) among schools facing long closures. This may have enabled them to deliver some learning to the students, albeit at a much

slower pace than during in-person schooling. Meanwhile, some schools that were only closed for a short time may not have delivered any learning while they were closed. Finally, when we compare children who experienced five to nine months of school closure with those who faced more than nine months, the longer closures did indeed result in a greater learning disruption.

5. CORRELATES OF LEARNING PROGRESS DURING THE COVID-19 PANDEMIC

The previous section considered basic statistical associations between learning progress and various factors. In this section, we estimate a model to examine the presence, size, and significance of correlations. We estimate the following model:

$$y_{chi} = \alpha + \beta X_c + \gamma X_h + \delta G_c + \mu_i + \varepsilon_{chi}, \quad (1)$$

where y_{chi} is the (parents' perception of the) learning progress of child c living in household h in country i as defined in the previous section. The first group of independent variables consists of the vector X_c , containing the child's grade in 2019 and gender. We group the grades such that we can compare the experience of children who were in transition between levels (e.g., grades 4–6 in 2019 and therefore transitioning to junior secondary school during the pandemic) and those who were not (e.g., grades 1–3 in 2019). The vector X_h contains household characteristics, including internet access, gender, education, employment of the household head in 2022, household income in 2022, and urban versus nonurban residence.⁹ Finally, G_c contains government policies related to the length of school closure and the remote learning mode used by the child. We also include country fixed effects to control for unobserved country-level characteristics.¹⁰ Table A1 in the Appendix provides the summary statistics of our variables.

We estimate the model using an ordered probit for learning progress, where zero is no progress, one is very little progress, two is slower progress than in in-person schooling, and three is the same progress as in in-person schooling. Table 1 presents the average marginal effects for the four outcomes.

We find that boys were more likely than girls to experience no progress or very little progress during school closures (this result is different from the simple associations on gender presented in Figure 8). In addition, the chance of experiencing the same learning progress as during in-person schooling was 4.5 percentage points lower for boys than for girls. This is a large coefficient since the sample mean of experiencing the same progress was 0.21. Since boys had better access to the internet (Figure 6) and both genders used similar modes of learning (Figure 4), this is a finding that is hard to explain and warrants further research. There is increasing evidence from some Southeast Asian countries and globally that boys are falling behind in learning outcomes even during normal times (Suryadarma 2015; David, Albert, and Vizmanos

⁹ Household income level in 2022 could be endogenous, as children who dropped out of school may be working to supplement income, or poor households could have received government programs while near-poor households missed out. We argue that a household's place in the income distribution grouping of bottom 30%, middle 40%, and top 30% is less prone to endogeneity as COVID-19 shocks to income, subsequent government programs, and other income shocks are unlikely to be sufficiently large to move households to a different tercile.

¹⁰ We do not include a more granular level of fixed effects, such as country-province, due to insufficient variation in the dependent variable at these levels.

2018; UNESCO 2022a). This could reflect girls' better study habits or greater motivation to learn, which could have been important for effectively utilizing remote learning opportunities when schools were closed.

We find similar learning progress regardless of a child's grade in 2019. This is a different outcome compared to some other developing countries, including Pakistan, India, Mexico, Brazil, and Kenya, where children from lower grades experienced greater learning loss (UNICEF 2022). In our sample, children in lower grades had the same internet access as those in higher grades but engaged more in paper- or TV-based learning modes. This suggests that for younger children, the effectiveness of paper, TV, the internet, and/or mobile phones may have been similar or complementary. We examine this issue further in the next section.

Children from households in the top 30% of the household income distribution had a 3.3 percentage point higher chance of not experiencing learning loss than children from the bottom 30%. Wealthier children also had a lower chance of experiencing no progress by 1.8 percentage points, which is a large correlation. Children from the middle 40% of income appear to have experienced the same learning progress as children from the bottom 30%. The income effect on learning progress is well established in literature. In this paper, we find a difference between low and high household income, but not between low and medium.

We examine the correlation between learning progress and two government policies: school closures and the use of remote learning modes. On the former, we do not find statistically significant evidence that the length of school closures was correlated with learning progress. The signs of the coefficients are as expected: Longer school closures were correlated with a greater chance of experiencing no or very little learning, and a lower chance of experiencing the same learning progress as in in-person schooling. The lack of statistical significance may mask the nuances that we discussed in the previous section. We delve into this issue further in the next section.

With respect to learning modes, we find that, when compared to not using any remote learning mode, using a learning mode was significantly correlated with a higher chance of achieving the same progress as with in-person schooling. The point estimate of the internet/mobile mode is similar to multiple modes of around 16 to 18 percentage points relative to no remote learning mode. This is larger than the point estimate for paper or TV, which is 11 percentage points relative to no learning mode. Therefore, internet-based or mobile-based learning modes appear to have provided a better chance of limiting learning loss or maintaining learning progress. To support this finding, even after controlling for learning modes, we find that having a good internet connection at home was positively correlated with the probability of achieving the same learning progress as with in-person schooling by 3.4 percentage points relative to no internet connection.

Table 1: Correlates of a Child's Subjective Learning Progress

	Average Marginal Effects of Learning Progress			
	No Progress	Very Little Progress	Slower Progress than In-person	Same Progress as In-person
Child gender (1=Male)	0.025** (3.56)	0.034** (3.53)	-0.013** (3.42)	-0.045** (3.54)
Grade level				
Grade 4–6 in 2019	-0.001 (0.14)	-0.002 (0.14)	0.001 (0.14)	0.002 (0.14)
Grade 7–9 in 2019	-0.007 (0.79)	-0.010 (0.79)	0.004 (0.80)	0.013 (0.78)
Grade 10–12 in 2019	-0.005 (0.42)	-0.006 (0.41)	0.003 (0.43)	0.008 (0.41)
Income tercile				
2nd tercile	-0.012 (1.35)	-0.015 (1.35)	0.007 (1.33)	0.020 (1.35)
3rd tercile (highest)	-0.018* (1.99)	-0.025* (1.97)	0.010* (1.97)	0.033* (1.97)
School closure length				
3–5 mos.	0.005 (0.42)	0.006 (0.42)	-0.002 (0.42)	-0.009 (0.42)
5–9 mos.	-0.014 (1.21)	-0.022 (1.21)	0.006 (1.17)	0.030 (1.21)
More than 9 mos.	0.012 (1.03)	0.016 (1.00)	-0.007 (1.05)	-0.021 (1.00)
Internet condition				
Available but not used	-0.010 (0.58)	-0.013 (0.56)	0.006 (0.61)	0.017 (0.56)
Connection is slow	-0.002 (0.18)	-0.003 (0.18)	0.001 (0.18)	0.004 (0.18)
Connection is good	-0.019 (1.92)	-0.026 (1.94)	0.01 (1.82)	0.034* (1.96)
Location (1=Urban)	0.004 (0.54)	0.005 (0.54)	-0.002 (0.54)	-0.007 (0.54)
Household head highest education completed				
High school and vocational	0.005 (0.55)	0.006 (0.55)	-0.002 (0.55)	-0.008 (0.55)
Tertiary education	0.006 (0.58)	0.008 (0.59)	-0.003 (0.57)	-0.011 (0.59)
Household head work status in 2022				
Self-employed	-0.005 (0.42)	-0.006 (0.42)	0.003 (0.41)	0.008 (0.42)
Wage-employed	-0.004 (0.34)	-0.005 (0.34)	0.002 (0.33)	0.007 (0.34)
Mode of remote instruction used				
Paper only or TV only	-0.134** (4.47)	-0.092** (7.15)	0.112** (4.45)	0.114** (6.65)
Internet only or mobile only	-0.158** (5.17)	-0.127** (9.10)	0.125** (4.94)	0.160** (8.61)
Others (Teacher visits only or multiple modes)	-0.167** (5.43)	-0.143** (7.00)	0.127** (5.09)	0.183** (6.56)
Sample mean	0.08	0.26	0.45	0.21
Country FE			Yes	
Pseudo R ²			0.03	
Observations			2,216	

Notes: Z-test statistics in parentheses. The reference levels for dummy variables are grades 1–3 for school level; 1st tercile (lowest) for income tercile; 0–3 months for school closure; no internet for internet condition; below high school level for household head's highest education completed; unemployed for household head's work status; rural for urban dummy variable; none for mode of instruction. All regressions include fixed effects at country level. Regression represents marginal effects dy/dx estimated using ordered probit regression where the dependent variable, i.e., self-reported progress, is ordered categorical variable with the values 0=no progress; 1=very little progress; 2=slower progress; 3=same rate of progress); * $p < .01$; ** $p < .05$; *** $p < .001$.

Overall, the table shows that, among different individual, household, and government policy dimensions, three aspects were strongly correlated with learning progress during school closures. First, boys had a higher risk of experiencing very little or no progress. They also had a lower chance of making regular progress. Second, children from households in the top 30% of the income distribution had a higher chance of progressing at the same rate as in in-person classes or having only mild learning loss. Third, out of the different remote learning modes, using an internet-based or mobile-based learning mode or multiple learning modes provided children with the best chance of maintaining learning progress or only experiencing mild learning loss.

6. HETEROGENEITY

This section explores heterogeneity based on student characteristics, specifically gender and grade in 2019. We also examine heterogeneity based on household income and the education of the household head, but do not present them as we find no systematic differences. The same model is used as in Equation 1, with an ordered probit. However, we present the marginal effects for only one of the learning outcomes – that of having the same progress as with in-person schooling (i.e., no disruption and therefore no learning loss). This analysis is a deeper dive that attempts to provide a fuller explanation of the main regression results in Table 1.

The first two columns of Table 2 provide the results for gender. The statistical significance is the same for boys and girls for all variables except in two cases. In the first case, boys with a good internet connection had a greater chance of making regular learning progress (i.e., no learning loss) by 6.7 percentage points. This is a large correlation given the sample mean of 0.54. The variable for internet connection is not significant for girls (and has the opposite sign). It is also not significant in the overall results provided in Table 1. In the second case, girls who experienced 9 months of school closure had a lower chance (by 7.7 percentage points) of making regular learning progress than those who experienced less than 3 months of closure. This is intuitive as long closures should result in more disruption to learning. However, for boys and the overall sample, the variable (i.e., long closures) is not significant.

Columns 3–6 examine heterogeneity by grade level (grade groups). This may be an important source of heterogeneity because those who were in grades 4–6, 7–9, and 10–12 in 2019 all faced transitions to a higher level of education (or graduation) during school closures. Summary statistics from the full sample indicate that 86% of students in the final years of high school experienced learning loss. The shares were lower for the other grade groups (63% to 77%), indicating less learning loss.

For grades 1–3, the gender variable is significant, and the sign is negative. This suggests that girls were more likely to maintain learning progress than boys in this lower grade group. There was no significant gender difference for the other grade groups.

Table 2: Correlates of Achieving the Same Learning Progress as in In-person Schooling, by Child Individual Characteristics

	(1)	(2)	(3)	(4)	(5)	(6)
Variables	Male	Female	Grade 1–3 in 2019	Grade 4–6 in 2019	Grade 7–9 in 2019	Grade 10– 12 in 2019
Child gender (1=Male)	–	–	–0.045*	–0.047	–0.034	–0.066
			(2.24)	(1.90)	(1.23)	(1.76)
Grade level						
Grade 4–6 in 2019	0.002	0.002	–	–	–	–
	(0.11)	(0.07)				
Grade 7–9 in 2019	0.017	0.007	–	–	–	–
	(0.82)	(0.25)				
Grade 10–12 in 2019	0.001	0.025	–	–	–	–
	(0.03)	(0.78)				
Income tercile						
2nd tercile	0.018	0.017	0.043	0.020	–0.015	0.026
	(0.96)	(0.69)	(1.83)	(0.73)	(0.44)	(0.59)
3rd tercile	0.026	0.038	0.033	0.066*	–0.000	0.044
	(1.22)	(1.46)	(1.29)	(1.96)	(0.00)	(0.94)
School closure length						
3–5 mos.	0.003	–0.031	–0.002	0.019	0.019	–0.146*
	(0.11)	(0.97)	(0.06)	(0.51)	(0.42)	(2.03)
5–9 mos.	0.037	0.009	0.033	0.029	0.114*	–0.153
	(1.26)	(0.25)	(0.89)	(0.66)	(2.03)	(1.91)
More than 9 mos.	0.017	–0.077*	0.015	–0.002	–0.008	–0.190**
	(0.66)	(2.31)	(0.44)	(0.07)	(0.19)	(2.79)
Internet condition						
Available but not used	0.077	–0.056	0.063	–0.104*	0.029	0.163
	(1.91)	(1.15)	(1.17)	(2.16)	(0.44)	(1.53)
Connection is slow	0.025	–0.025	0.005	–0.040	0.037	0.036
	(0.96)	(0.71)	(0.16)	(0.97)	(0.80)	(0.69)
Condition is good	0.067**	–0.002	0.040	–0.051	0.053	0.124**
	(2.89)	(0.08)	(1.37)	(1.39)	(1.49)	(2.70)
Urban	–0.020	0.015	0.031	–0.021	–0.022	–0.049
	(1.20)	(0.72)	(1.40)	(0.83)	(0.77)	(1.30)
Household head education level						
High school and vocational	0.005	–0.028	–0.005	0.021	–0.014	–0.047
	(0.28)	(1.09)	(0.20)	(0.74)	(0.42)	(1.03)
Tertiary education	–0.010	–0.009	–0.016	0.036	–0.029	–0.035
	(0.44)	(0.30)	(0.57)	(1.01)	(0.72)	(0.67)
Household head work status in 2022						
Self-employed	0.044	–0.050	–0.008	0.032	0.005	0.029
	(1.78)	(1.49)	(0.24)	(0.86)	(0.10)	(0.59)
Wage-employed	0.032	–0.036	0.007	0.018	–0.039	0.059
	(1.38)	(1.10)	(0.23)	(0.53)	(0.91)	(1.24)
Mode of instruction used						
Paper only or TV only	0.132**	0.186**	0.093**	0.049	0.198**	0.112*
	(3.53)	(3.89)	(3.35)	(1.16)	(6.44)	(2.19)
Internet only or Mobile only	0.199**	0.197**	0.147**	0.089	0.228**	0.192**
	(5.08)	(4.00)	(4.42)	(1.94)	(8.49)	(3.96)
Others (Teacher visits only or multiple modes)	0.221**	0.22**	0.125**	0.157*	0.241**	0.224**
	(4.91)	(3.98)	(2.91)	(2.48)	(4.31)	(2.87)
Sample mean	0.54	0.46	0.37	0.26	0.23	0.14
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo R^2	0.04	0.03	0.03	0.04	0.06	0.07
Observation	1,206	1,010	839	566	511	300

Notes: The dependent variable is subjective learning progress defined in Section IV. The table shows the average marginal effect estimated using ordered probit regression; only the fourth outcome is shown (achieving same learning progress as in in-person schooling). Z-test statistics in parentheses. Reference levels for dummy variables are grade 1–3 for grade level group; 1st tercile (lowest) for income tercile; 0–3 months for school closure; no internet for internet condition; below junior level for household head's highest education completed; unemployed for household head's work status in 2022; rural for urban dummy variable; none for mode of learning; * $p < .01$; ** $p < .05$; *** $p < .001$.

For grades 4–6, children from high-income households were more likely to maintain learning progress than those from the poorest households. The variable is not significant for the other grade groups. As this income variable is significant in the full sample (Table 1), the result here suggests that this grade group was driving the full sample results. The grade 4–6 group also showed some interesting results regarding the mode of remote learning and internet access. For example, this grade group showed no significant effects of paper, TV, internet, or mobile modes on maintaining learning progress. This ran counter to the other grade groups, which all showed significant effects for these modes. Furthermore, the 4–6 grade group showed a significant but negative effect of learning progress regarding the availability (but nonuse) of internet access on learning progress.

For grades 7–9, the only variable that differs from the other grade groups is the 5–9-month school closure period. This grade group was more likely to maintain learning progress during that period of closure than during a short closure period of 1–3 months.

For grades 10–12, the results for school closure length also differ from other grade groups. Senior high school students that experienced closure of 3–5 months and 9 months or more were more likely to have their learning progress interrupted than students who only experienced 1–3 months of closure. This is generally what would be expected, with longer closures related to more learning disruption. Senior high-schoolers were also more likely to progress when the household had a good internet connection, and this confirms a similar result in Table 1.

7. CONCLUSION

Our household survey documented substantial variation between countries on school closures, government response, and education situation. We also find substantial within-country variation on these aspects, which are not documented in previous studies, as the majority focus on country-level analysis. Overall, only about 20% of the respondents felt that children experienced the same learning progress during school closures as during in-person schooling. The vast majority, 80%, felt that their children suffered learning loss. Experiences varied between countries. For example, only about 10% of respondents in Viet Nam felt that their children experienced no or very slow progress, but more than 40% did so in Indonesia, Thailand, and the Philippines. We observe a significant difference in learning progress based on household income. Children from the bottom 30% of households based on income were more likely to experience very little or no progress during school closures than those from the top 30%. Boys had a greater chance of experiencing learning loss than girls. The heterogeneity results suggest that boys fell behind, especially in the lower grades (1–3). Therefore, efforts to support boys' learning recovery should start in these grades.

In regard to government policy, we find nuanced evidence that the length of school closure was correlated with education outcomes. Children who had been in grades 10–12 prior to school closures were negatively affected by longer school closures. However, this correlation did not generally hold for children in lower grades. With respect to remote learning modes, we find that, while most children used a remote mode, virtually all of them only used one – either paper-based, TV-based, or internet/mobile-based. A smaller proportion used multiple modes. Comparing different learning modes, we find consistent evidence that using internet-based or mobile phone-based learning modes was associated with a greater chance of not experiencing

learning loss. Paper-based and TV-based learning modes also provided benefits, but they were smaller.

Our results point to the following three recommendations for policymakers. First, attention must be paid to boys, and children from lower-income households. They were most affected by school closures. Specific policies may be needed to ensure they can recover faster and catch up with girls and those with a higher income.

Second, governments should avoid long school closures for the upper grades. Children in lower grades were affected less. They also still have several years of schooling in which to receive help to catch up. Lengthier school closures posed a higher risk for children in higher grades. With less chance of recovering learning, such closures are more likely to have a permanent negative impact (scarring effect) on these older students. Attention should be given to getting high-schoolers back to in-person schooling more quickly than students in lower grades. Also, policies related to adult education or job-relevant training programs might help these young people recover learning, as many may have left school by the time schools reopen.

Third, internet-based or mobile-based remote learning modes were more effective than paper-based or TV-based ones. Given the likelihood of future education disruptions, governments should consider helping households to gain access to the internet and devices, as well as the skills and motivation to use them.

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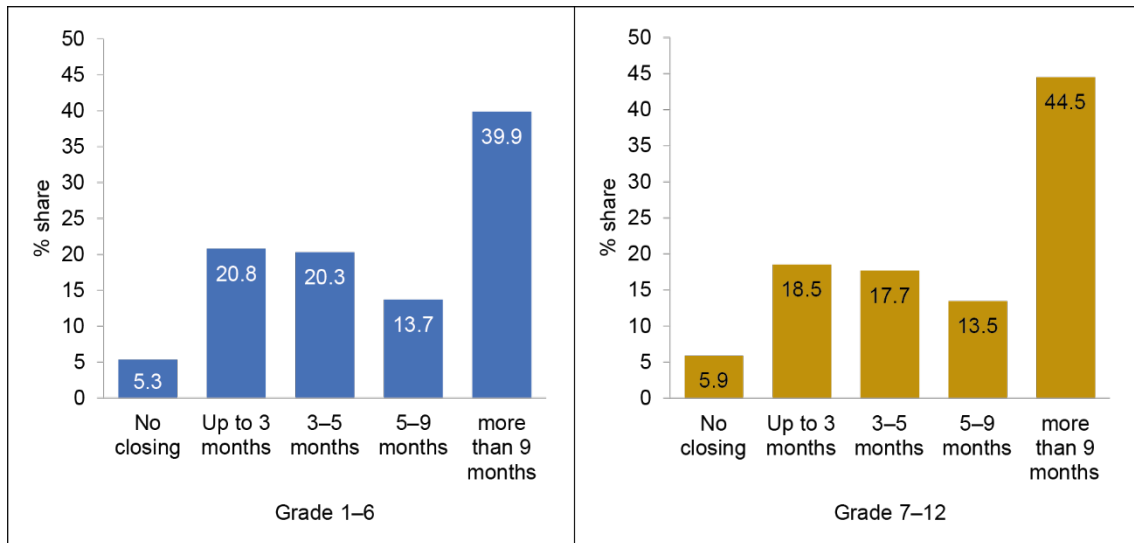
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APPENDIX

Figure A1: Distribution of the Length of School Closures, by Grade in 2019



Source: Authors' estimates from the survey.

Table A1: Summary Statistics

Variable	Mean	Std. Dev.
Child education outcomes		
Dropout (yes=1)	0.09	0.29
Re-enrollment plan, conditional on dropping out (yes=1)	0.45	0.50
Grade progression (grades)	2.17	0.93
Self-rated progress		
No progress (yes=1)	0.08	0.28
Very little progress (yes=1)	0.26	0.44
Slower progress than in-person (yes=1)	0.45	0.50
Same progress as in-person (yes=1)	0.21	0.41
Child characteristics		
Child's sex (male=1)	0.55	0.50
Child's age in 2019	13.45	3.83
Urban (yes=1)	0.44	0.50
School closure		
No closure	0.06	0.23
Up to 3 months	0.20	0.40
3–5 months	0.19	0.40
5–9 months	0.14	0.34
More than 9 months	0.42	0.49
Internet connections		
No internet	0.37	0.48
Available but not used	0.05	0.23
Connection is weak	0.15	0.36
Connection is good	0.43	0.50
Mode of remote learning		
Paper only or TV only	0.47	0.50
Internet only or Mobile only	0.48	0.50
Others (Teacher visits only or multiple modes)	0.18	0.38
None	0.06	0.24
Household head characteristics		
Educational attainment (1=lowest (primary); 11=highest (postgrad))	1.89	0.80
Household head's employment		
Wage employment	0.36	0.48
Self-employment	0.46	0.50
Unemployed	0.18	0.38