Seismo

Swiss Journal of Sociology, 50 (3), 2024, 381–399

The Impact of Coronavirus-Related School Closures on Socioeconomic Inequalities in the Perceived Risk of School Failure in Switzerland

Michael Grätz*, Florence Lebert**, and Oliver Lipps***

Abstract: We investigate the medium-term effects of the coronavirus-related school closures in Switzerland on students' self-perceived risk of school failure. We test whether these affected students differently depending on their families' socioeconomic resources. We draw on a sample of students aged 14 to 25 from the Swiss Household Panel (SHP) and find no medium-term change in students' risk of school failure due to the school closures. This finding did not vary by family socioeconomic background.

Keywords: Coronavirus, educational inequalities, risk of school failure, school closures, social origin

L'impact des fermetures d'écoles liées au coronavirus sur les inégalités socio-économiques dans la perception du risque d'échec scolaire en Suisse

Résumé : Nous étudions les effets à moyen terme des fermetures d'écoles liées au coronavirus, dans le contexte suisse, sur la perception du risque d'échec scolaire rapportée par les élèves. Nous examinons si ces effets diffèrent selon les ressources socio-économiques des familles en utilisant un échantillon d'élèves (14 à 25 ans) du Panel suisse de ménages (PSM). Les résultats ne montrent aucun changement de la perception du risque d'échec scolaire des élèves à moyen terme suite aux fermetures d'écoles. Ce résultat ne varie pas en fonction du milieu socio-économique de la famille.

Mots-clés : Coronavirus, inégalités scolaires, risque d'échec scolaire, fermetures d'écoles, origine sociale

Die Auswirkungen von Coronavirus-bedingten Schulschliessungen auf sozioökonomische Ungleichheiten in dem wahrgenommenen Risiko des Schulversagens in der Schweiz

Zusammenfassung: Wir untersuchen die mittelfristigen Auswirkungen der Coronavirus-bedingten Schulschliessungen in der Schweiz auf das von den Lernenden wahrgenommene Risiko eines Schulversagens. Wir prüfen, ob die Lernenden je nach sozioökonomischen Ressourcen ihrer Familien unterschiedlich betroffen sind. Dazu stützen wir uns auf eine Stichprobe von Lernenden (14–25 Jahre) aus dem Schweizer Haushalt-Panel (SHP). Das wahrgenommene Risiko eines Schulversagens verändert sich mittelfristig nicht durch die Schulschliessungen. Dieses Ergebnis variiert nicht nach dem sozioökonomischen Hintergrund der Familie.

Schlüsselwörter: Coronavirus, Bildungsungleichheiten, Risiko von Schulversagen, Schulschliessungen, soziale Herkunft

* Swiss Centre of Expertise in Life Course Research (LIVES), University of Lausanne; Swedish Institute for Social Research (SOFI), Stockholm University; CH-1015 Lausanne; michael.gratz@unil.ch; https://orcid.org/0000-0001-7920-1021

** Swiss Centre of Expertise in the Social Sciences (FORS); florence.lebert@fors.unil.ch; https://orcid.org/0000-0002-6701-2685

*** Swiss Centre of Expertise in the Social Sciences (FORS); Institute of Sociology, University of Bern; oliver.lipps@fors.unil.ch; https://orcid.org/0000-0001-9865-2311

DOI 10.26034/cm.sjs.2024.6165

1 Introduction[1]

When the World Health Organization (WHO) declared the outbreak of the COVID-19 pandemic in March 2020, many countries all over the world closed their schools as a measure to contain the spread of the novel coronavirus. From March 16 to May 11, 2020, Switzerland experienced an eight-week-long closure of schools during the first coronavirus infection wave. Even though there were no further full school closures during the subsequent infection waves, teaching was still disrupted in the school year starting in August 2020 because of rules requiring close contact persons and infected students to quarantine.

Social scientists have pointed out early that school closures may lead to learning losses among pupils affected by the school closures and could increase socioeconomic inequalities in education (Hanushek and Woessmann 2020). Contrary to these expectations, empirical findings have been mixed with some studies finding a large learning loss and an increase in socioeconomic inequalities in education due to the school closures (Bol 2020; Dietrich et al. 2021; Engzell et al. 2021; Helm et al. 2021; Easterbrook et al. 2022) and others finding neither a learning loss nor an increase in socioeconomic inequalities in education (Berger et al. 2021; Birkelund and Karlson 2023). The evidence is also mixed for Switzerland, the country we focus on in the present study. Tomasik et al. (2021) reported an increase in socioeconomic inequalities in education due to the school closures in Switzerland, which was not found by Grätz and Lipps (2021). Both studies, however, found that the school closures reduced, on average, the amount of time students invested into learning (Grätz and Lipps 2021) and resulted in lower test scores (Tomasik et al. 2021) during the school closures.

Whilst earlier studies focused on the consequences of school closures for learning during the time of the school closures, the data is now available to study the more medium-term consequences of the school closures after schools re-opened. It is, on the one hand, possible that learning losses during the school closures were quickly recovered after the re-opening of schools. On the other hand, it is conceivable that in a process of cumulative disadvantage, initial small learning losses have grown bigger over time (DiPrete and Eirich 2006; Cunha and Heckman 2007). To distinguish between these two possibilities, it is important to investigate the evolution of the effects of the school closures and the socioeconomic heterogeneity in these effects after the re-opening of schools. It might be too early to investigate the long-term consequences of the school closures because most students affected by the school

1 Grätz acknowledges funding from the Swiss National Science Foundation (SNSF) under grant agreement TMSGI1_211627 and by the Forskningsrådet om Hälsa, Arbetsliv och Välfärd (Forte) [2016-07099]. This study has used data collected by the Swiss Household Panel (SHP), which are available at https://www.swissubase.ch/en/catalogue/studies/6097/19802/overview. The SHP is based at the Swiss Centre of Expertise in the Social Sciences (FORS) and financed by the Swiss National Science Foundation.

closures are still in school. However, we can investigate the medium-term effects of the school closures using data on students collected during the three school years following the onset of the COVID-19 pandemic.

There are different educational outcomes, which the coronavirus-related school closures might have affected. For the present study, we use perceived risk of school failure as an outcome variable. The question asks students the likelihood to fail in school in the next 12 months on a scale from 0 ("no risk at all") to 10 ("a sure risk"). An advantage is that the perceived risk of school failure takes account of the fact that school failure is a multifaceted phenomenon that is not only dependent on performance but might as well be the result of the further strain caused by the COVID-19 pandemic. Therefore, perceived risk of school failure is an interesting outcome to be analysed.

Consequently, in the present study we analyse two research questions: First, were there any medium-term effects of the school closures during the first coronavirus wave in Switzerland on students' perceived risk of school failure? Second, did these effects vary by family socioeconomic status (SES)?

We particularly focus on socioeconomic inequalities in students' responses because theories about the emergence of socioeconomic inequalities in education such as the compensatory advantage model predict that socioeconomically advantaged families respond to life events occurring to their children in a compensatory way (Bernardi 2014). The closure of schools during the coronavirus pandemic provides an exogenous shock, which allows us to test the predictions of this model. Furthermore, the instructional regime model developed by Raudenbush and Eschmann (2015) expects a reduction of time students spend in school to have more negative consequences for children from socioeconomically disadvantaged families because of lower educational skills enhancing quality of the instructional regime at home in these compared to in socioeconomically advantaged families.

We investigate the two research questions in the context of Switzerland, a country with a rather short duration of school closures compared to other European countries (OECD 2021). Estimates obtained in Switzerland may therefore be lower bound estimates of the consequences of coronavirus-related school closures. At the same time, Switzerland has a comparatively high level of socioeconomic inequalities in education (Pfeffer 2008). For that reason, inequalities could have increased in Switzerland more than in other countries with rather short school closures, such as Denmark and Sweden.

It should be noted that school closures were not the only reason why students may have been affected by the COVID-19 pandemic. They could also have been affected directly by the pandemic leading to health issues or they could have experienced trauma related to death or serious illness of relatives and friends as well as stress in case one or both of their parents lost a job during the pandemic. Common to other research in the social sciences on the COVID-19 pandemic, we cannot isolate

the effect of the school closures from these other consequences of the pandemic. For that reason, our estimates must be interpreted as total effects of the COVID-19 pandemic with all its consequences.

2 Theory and Background

The novel coronavirus led to unprecedented changes in the education system. The OECD reported that between 1 January 2020 and 20 May 2021, on average across all OECD countries, lower secondary education was disrupted for 100 and primary education for 75 days with considerable variation across countries (OECD 2021). There are several mechanisms through which the coronavirus-related school closures may have affected educational outcomes and socioeconomic inequalities in education.

2.1 Increasing Risks for School Failure After Coronavirus-Related School Closures

When schools were physically closed, they shifted to online teaching and learning. Consequently, the importance of autonomous learning and the students' self-discipline increased (Pelikan et al. 2021). Indeed, students spent less time on learning activities than they were used to in face-to-face schooling (Andrew et al. 2020; Grewenig et al. 2021). Accordingly, research has shown that students' school performance dropped after school closures, especially in science and mathematics (Svaleryd and Vlachos 2022; Di Pietro 2023). Overall, in 2021 students did not fully outweigh the learning losses caused by the school closures in 2020 (Di Pietro 2023). 18 months into the pandemic, a study from the U.S. found lasting detrimental effects of school closures on reading and math skills (Kuhfeld et al. 2022). In line with this, a German study observed significant learning losses after school closures, which were highest for low-achieving students (Schult et al. 2022). One year after the onset of the pandemic, reading skills slightly increased, but mathematical operations competencies slightly decreased. Only competencies with numbers reached pre-pandemic levels. In a Belgian study, scores in Dutch language, mathematics, science, and social sciences dropped significantly after school closures (Gambi and De Witte 2021). Whereas in 2021 test scores in science showed signs of improvement (though not significant), only test scores in social sciences improved significantly. In contrast, further learning losses were observed in Dutch language. In Denmark, Birkelund and Karlson (2023) found no general learning loss due to the coronavirus-related school closures.

Persisting learning deficits rooted in the school closures might have led to subsequent school failure. In a qualitative study, parents expressed intense fear of school failure of their children due to learning gaps that could not be closed subsequently (Drvodelić and Domović 2022). Moscoviz and Evans (2022) found increased school dropout rates in some African countries. However, learning losses

might not be the main reason for school dropout in these low-income countries. To date, very little is known about the perceived risks of school failure due to the pandemic. Assuming that students learn more when attending school compared to an online and home learning setting, we believe that the school closures increased the risk for subsequent learning backlogs and finally school failure.

In the medium term, however, both individuals and schools responded to and may have adapted to the school closures and consequently buffered some adverse effects of the school closures. For instance, students might have increased their efforts to catch up with schoolwork while teachers may have become more generous in their marking. We therefore expect after a first increase in the perceived risk of school failure, a rebound effect in the medium term, which reduces the perceived risk of school failure.

Based on these considerations, we formulate the following Hypothesis 1:

The coronavirus-related school closures increased the perceived risk of school failure immediately after the school closures. In the subsequent years, this increase in the perceived risk of school failure was reduced again.

2.2 Socioeconomic Differences in the Impact of Coronavirus-Related School Closures on the Perceived Risk of School Failure

The expectations of social scientists about the consequences of the coronavirus-related school closures were largely informed by the literature on the consequences of exogenous variation in the length of schooling for educational attainment and socioeconomic inequalities in education (Raudenbush and Eschmann 2015). This literature argues that the variation in the learning environment students experience in school is smaller than the variation in the learning environment students experience at home. Because schooling tends to reduce the differences in learning environments, we expect that a reduction in the time students spend in school increases socioeconomic inequalities in education.

The compensatory advantage model goes a step further. It argues that socioeconomically advantaged families respond to disadvantageous life events that may endanger the educational careers of their offspring by increasing their investments (Bernardi 2014). Socioeconomically disadvantaged families lack the resources and/or the motivation or realization of the importance of such responses. Applied to the context of the coronavirus-related school closures, the compensatory advantage model predicts that socioeconomically advantaged families will invest more after the coronavirus-related school closures.

For that reason, both theories predict an increase in socioeconomic inequalities in education in the medium-term because of the school closures. However, they predict these increases to take place for different reasons. The instructional regime model developed by Raudenbush and Eschmann (2015) argues that socioeconomic

inequalities in education increase due to a stronger decrease in school involvement from children from socioeconomically disadvantaged families. The compensatory advantage model, however, predicts that inequalities increase due to an increase in school involvement from children from socioeconomically advantaged families (compensation).

Previous research has shown that the success of home learning during the COVID-19 pandemic depended on the home environment and the support students received from their parents (Svaleryd and Vlachos 2022). In line with the compensatory advantage model, children in socioeconomically advantaged families received more support from their parents (Bol 2020; Hammerstein et al. 2021) and their parents felt more capable in supervising their offspring's home learning (Bol 2020; Easterbrook et al. 2022; Sari et al. 2023). Lower-educated parents and those with lower incomes were more overwhelmed with home schooling (Heers and Lipps 2022). Some studies also found students in highly educated families to spend more time on learning compared to children in disadvantaged families (Dietrich et al. 2021; Hammerstein et al. 2021; Easterbrook et al. 2022). However, Helm et al. (2021) did not find strong evidence for a socioeconomic gradient in studying time. Grätz and Lipps (2021) found that students with highly educated parents reduced their studying time more during school closure compared to students with less educated parents. Yet, although they depicted a steeper decline, they still invested more time in learning as they started at a higher level.

In addition, students from socioeconomically disadvantaged families had less access to online learning and were more likely to lack material resources such as computers, tablets, and internet connections (Bol 2020; Hammerstein et al. 2021; Helm et al. 2021; Panagouli et al. 2021; Easterbrook et al. 2022). Moreover, children from low educated and financially disadvantaged families were less likely to have their own bedroom and a quiet space to learn (Bol 2020; Easterbrook et al. 2022).

Existing research remains inconclusive as to whether socioeconomic differences in the home learning environment during the coronavirus-related school closures led to socioeconomic differences in the impact of the coronavirus-related school closures on academic performance. Birkelund and Karlson (2023) found no general learning loss of the school closures in Denmark and no differences between children from different socioeconomic backgrounds. Similarly, Berger et al. (2021) did not find an effect of parental education on self-regulated learning in Germany. Overall, however, in most studies and countries, children in socioeconomically disadvantaged families experienced bigger learning losses during school closure compared to their more advantaged counterparts and had more difficulties keeping up with schoolwork (Engzell et al. 2021; Hammerstein et al. 2021; Helm et al. 2021; Betthäuser et al. 2023). In Belgium, policy interventions such as summer schools were mainly targeting vulnerable pupils. Possibly due to this compensating factor, schools with many students in disadvantaged neighbourhoods depicted a lower average decrease

in test scores (Gambi and De Witte 2021). However, the study also revealed higher learning deficits in schools with a high share of pupils with low-educated mothers. Agostinelli et al. (2022) found a persistent negative effect of the school closures on pupils' skill accumulation one year after the outbreak of the pandemic. For students in socioeconomically advantaged neighbourhoods this negative effect was offset through increased parental support. Their parents were more likely to work from home compared to parents in disadvantaged neighbourhoods. In addition, socioeconomic segregation due to school closure made students from disadvantaged areas more likely to be surrounded by low-achieving peers, which may have contributed to increasing socioeconomic inequalities in education.

Due to better home learning conditions during the school closures and the availability of more resources to compensate for potential learning deficits in children from socioeconomically advantaged families, we expect a weaker increase in the perceived risk of school failure for children from socioeconomically advantaged families as well as a quicker recovery than for children in socioeconomically disadvantaged families.

We formulate Hypothesis 2:

The increase in the perceived risk of school failure due to the coronavirus-related school closures was smaller and the recovery was quicker for students from high than for students from low SES families.

2.3 Variation by Age and Educational Track

The consequences of the school closures may have varied by the age of the students. Younger students may have been affected more than older students as they are less used to autonomous learning. In addition, there may have been variation by the type of education someone attended. Following school online may be more difficult than following university courses, which have always heavily relied on students investing time into learning outside of class. Previous findings showed that primary school students had bigger learning losses than secondary students (Tomasik et al. 2021; Uğraş et al. 2023). Also, university students showed some adaptability to online teaching (Sim et al. 2021). In our empirical analysis, we analyse these components together by distinguishing between students in general training/education, vocational training, and university for Hypothesis 3a and age groups for Hypothesis 3b.

We formulate Hypothesis 3a:

The increase in the perceived risk of school failure due to the coronavirus-related school closures was stronger for students in general training than for university students or those in vocational education.

And Hypothesis 3b:

> *The increase in the perceived risk of school failure due to the coronavirus-related school closures was stronger for younger than for older students.*

3 The Swiss Case

Switzerland is an interesting test case to study the medium-term consequences of the coronavirus-related school closures for educational outcomes. First, compared to other countries, the school closures were rather short. Whilst it is important to analyse countries that experienced long school closures, it is also important to assemble evidence from countries which disrupted schooling for a shorter period. According to the OECD (2021), Switzerland closed the primary and lower secondary schools for 34 days in 2020 (OECD average: 59 for primary and 65 days for lower secondary education, excluding school holidays, public holidays, and weekends) and the upper secondary schools for 56 days (OECD average: 71 days). This is putting Switzerland towards the lower but not to the bottom end of all OECD countries (OECD 2021). School closures in Switzerland were longest in tertiary education with 91 days compared to 70 days on average for OECD countries (OECD 2021).

Second, internationally comparative research usually finds that socioeconomic inequalities in education are high in Switzerland, meaning that there is a strong association between an individual's family socioeconomic background and his/her school outcomes. For instance, Pfeffer (2008) reported that Switzerland is one of the countries with the highest inequality in educational attainment in an analysis of 19 European and American countries. This is often attributed to the Swiss school system being strongly selective and highly stratified (Pfeffer 2008; Buchmann et al. 2016). Whereas in primary school all pupils learn together independent of their performance, lower secondary school has up to four different school levels with specific academic requirements (Buchmann et al. 2016). Students are allocated to these different school tracks early. In most cantons, students start lower secondary school after 6 years of primary school, i. e. around age 12. In principle, track allocation to lower secondary school is based on grades, the evaluation and recommendation of the teacher, as well as the parents' preferences (Neuenschwander and Garrett 2008). However, empirical research has shown that the family's socioeconomic background has a strong impact on the student's track allocation (e. g., Becker 2010; Buchmann et al. 2016). Although students are regularly re-evaluated and the educational system allows for transfers from one level to another, such transfers are rarely done, and the first track allocation is nearly irreversible (Neuenschwander 2007; Felouzis and Charmillot 2013). Due to the low mobility between the different school levels and the strong influence of the type of lower secondary education for the subsequent

type of upper secondary level, the course for the student's educational career is widely set at the age of 12 (Felouzis and Charmillot 2013; Buchmann et al. 2016).

4 Data, Variables, and Method

4.1 Data and Sample Selection

We use data from the Swiss Household Panel (SHP). The SHP is an ongoing longitudinal, nationally representative household survey interviewing all family members from 14 years of age onwards on a wide range of topics such as health, employment, and schooling (Tillmann et al. 2021; SHP Group 2024; Voorpostel et al. 2024). Interviews are mainly conducted by telephone. In each wave, fieldwork is carried out between September and February of the following year. For our analyses, we employ a sample of adolescents and young adults from 14 to 25 years, drawn in 1999 (original sample), 2004 (first refreshment sample), and 2013 (second refreshment sample). The information we use comes from eight waves from the years 2015 to 2022. An individual was included in the sample if (a) she or he participated in the self-reported questionnaire, (b) lived together with at least one parent, and (c) was in education in the corresponding year. An individual could be included in up to eight waves and the sample size varies by year of interview. We started with an initial sample with non-missing perceived risk of school failure of 6 808 observations (2 233 individuals) in the age range of 14 to 25. Non-missing information on household income was available for 6 556 observations, and parental educational level for 6 761 observations.

4.2 Variables

The dependent variable measured the *perceived risk of school failure*: "How do you evaluate the risk of your failing at school / in your studies in the next 12 months, if 0 means 'no risk at all' and 10 'a sure risk'?" We treat this variable as a continuous one.

We measure the student's *family SES* with two different indicators: parental education and household income. *Parental education* is considered high if either the mother or the father has tertiary education (ISCED 1997 = 5/6), and low otherwise. *Household income* is considered high if the OECD equivalized income is higher than 57 360 CHF per year, which is the median OECD household equivalized income *in our sample*. This income is slightly smaller than the median OECD household income of *all households* in the SHP between the years 2015 and 2022 (60 000 CHF).

To measure students' educational track, we use the following categories:

- students in *general training*: incomplete compulsory school; only completed compulsory school; 2 to 3 years general training school; maturity (high school).

- *university* students: university; academic high school (bachelor, master, doctorate, post-graduate degree, university of teacher education, university of applied sciences, teacher training school).
- students in *vocational education*: elementary vocational training (firm and school); apprenticeship (CFC/EFZ level); 2 to 3 years full-time vocational school; vocational maturity; 1-year school of commerce / au pair / residential, language course; vocational high school with master or federal certificate; technical or vocational school; vocational high school.

To take account of the respondents' age, they were grouped into three age categories: aged 14 to 16, 17 to 20, or 21 to 25. We construct dummy variables for language (Swiss-German, French, or Italian) and gender (male respondents coded as 1).

Descriptive statistics are reported in Table 1.

Table 1 Descriptive statistics

Variable	Mean	SD	N
Perceived risk of school failure	2.07	2.12	6 808
At least one parent with tertiary education	0.68		6 761
Household income higher than the median income	0.50		6 556
Male	0.50		6 808
Age 14–16	0.34		6 808
Age 17–20	0.41		6 808
Age 21–25	0.26		6 808
General training	0.40		6 808
Vocational training	0.34		6 808
University	0.26		6 808
Language French	0.34		6 808
Language Swiss-German	0.60		6 808
Language Italian	0.06		6 808

4.3 Method

Our analysis compares unweighted mean values between the pre-corona-related school closures (2019) and the post corona-related school closures (2020 to 2022). In addition to reporting the means at the population level, which allows us to answer our first research question, we address our second research question by comparing the means across SES groups.

The waves from 2015 to 2019 allow us to observe whether there was a general time trend, which could have been disrupted by the school closures. Our analysis

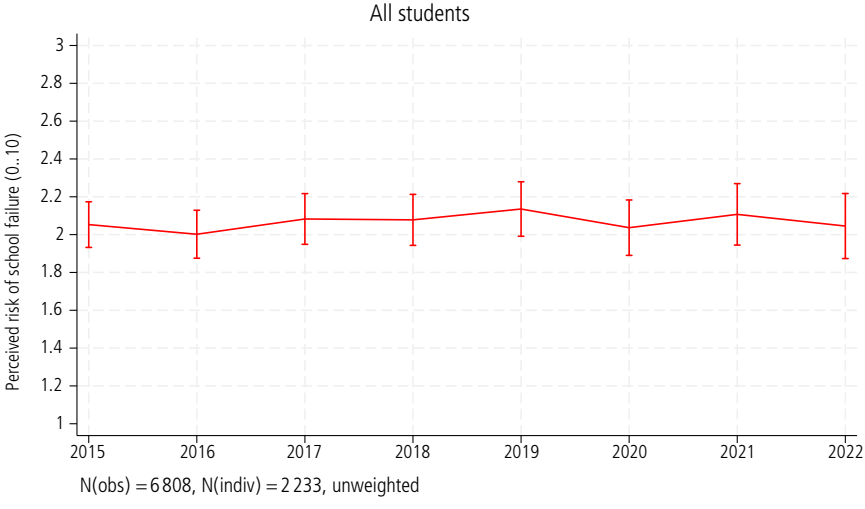
allows us to construct difference-in-differences estimates in which the change between 2019 and 2020 (2021, 2022) is compared to the change between 2018 and 2019, 2017 and 2018, etc. Our research design allows us therefore to identify the causal effect of the coronavirus-related school closures and is equal to the designs used in previous research (e. g., Engzell et al. 2021; Birkelund and Karlson 2023). We estimate pooled linear regression models, controlling for language and gender. Our key independent variables are wave dummies (main effects), and wave dummies interacted with family SES, educational track, and age group.

5 Results

We report marginal effects from these regressions via a series of figures depicting the variation in the risk of school failure between 2015 and 2022. We report four figures, which correspond to our hypotheses. First, we show the change in the risk of school failure at the population level. Second, we test for variation by family socioeconomic background. Third, we estimate variation by three types of education: general training, vocational training, and university. Fourth, we distinguish three different age groups. The estimates underlying the figures are reported in Table A1 in the *Appendix*.

Figure 1 reports the estimates for the combined sample of all students.

Figure 1 Perceived risk of school failure before (2015–2019) and after (2020–2022) the coronavirus-related school closures for students aged 14–25



The change in the perceived risk of school failure between 2019 and 2020 reports the change observed after the first school closures. The values of 2021 and 2022 refer to the more medium-term consequences. Hypothesis 1 expected an increase in the perceived risk of school failure in 2020, but a decrease in the subsequent years. However, though we see some small variations over the years since 2015, these are not statistically significant. The pandemic and post-pandemic years 2020 to 2022 are no exception to this trend. Figure 1 neither shows an immediate increase in perceived risk of school failure nor does it depict a decrease in the subsequent years.

Difference-in-differences estimates of the medium-term consequences of the school closures can be obtained by comparing the change between 2019 and 2022 to the change between 2016 and 2019. These difference-in-differences estimates are essentially 0 because there was neither a change in the perceived risk of school failure between 2019 and 2022 nor between 2016 and 2019. We can therefore reject Hypothesis 1 and conclude that the coronavirus-related school closures did not change the perceived risk of school failure.

We turn to the second hypothesis, which expected socioeconomic heterogeneity in the effects of the school closures on the risk of school failure with a smaller increase and a quicker recovery for students from high SES compared to students from low SES families. The results at the population level may mask important heterogeneity between social groups. If the consequences of the coronavirus-related school closures for education were positive in socioeconomically advantaged families and negative for socioeconomically disadvantaged families, we may observe no effect at the population level due to this heterogeneity. Therefore, Figure 2 compares the changes in the perceived risk of school failure between students with lower- and higher-educated parents and students with lower and higher parental income.

The results are not in line with Hypothesis 2. Figure 2 shows some non-significant variations over the years, but no clear trend. Independent from the parental educational level, we do not observe any change from 2019 to 2020. There were neither any significant changes between 2020 and 2022. For both the offspring of lower- and higher-educated parents, the change in the risk of school failure between 2019 and 2022 was 0. The same holds if we distinguish the sample by parental income. Hence, the difference-in-differences estimates are 0 for all four groups defined by different indicators of parental socioeconomic background.

Figure 3 shows whether changes in the risk of school failure vary by type of education (Hypothesis 3a). This is, however, not the case as all the changes over time are non-significant. Yet, we observe some convergence of the different school types over time: while the perceived risk of school failure for university students tended to be higher than for the other school types until around 2019, the perceived level is roughly the same for all school types (see overlapping confidence intervals) from 2020 onwards. However, the difference-in-differences estimates are 0 for all three types of education. Therefore, we find no support for Hypothesis 3a.

Figure 2 Perceived risk of school failure before (2015–2019) and after (2020–2022) the coronavirus-related school closures by socioeconomic subgroups

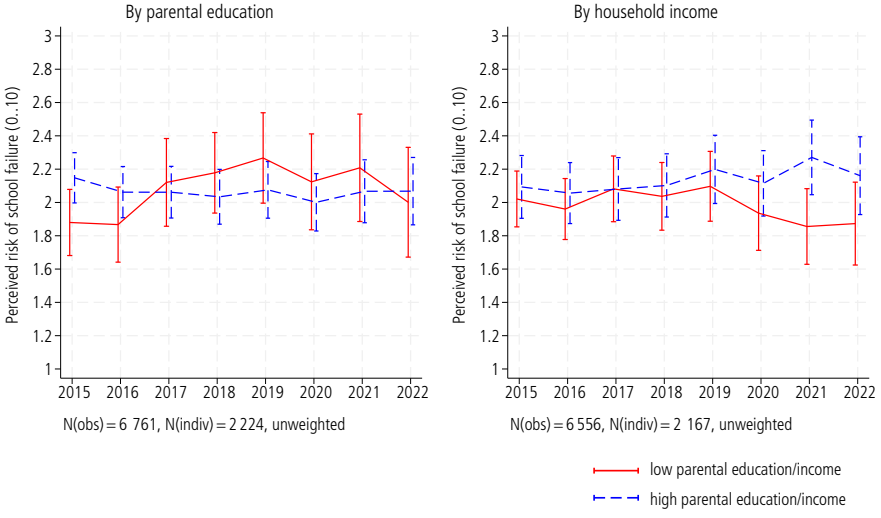
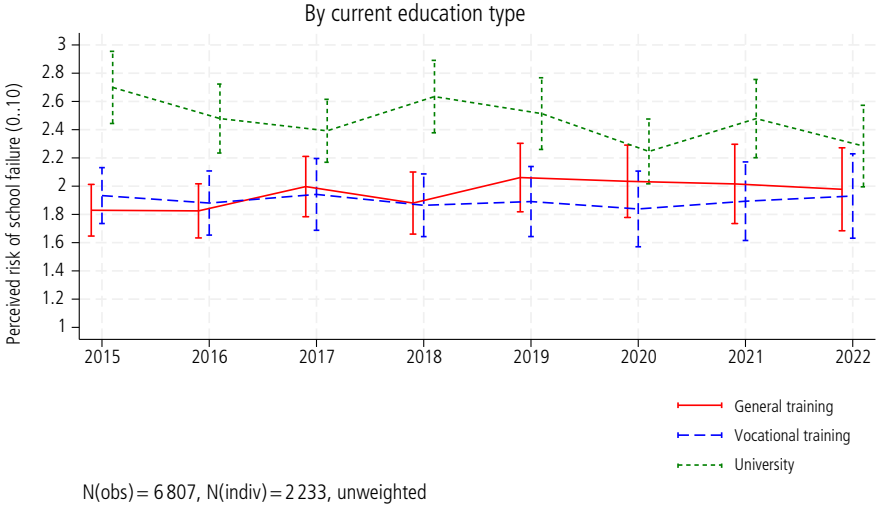


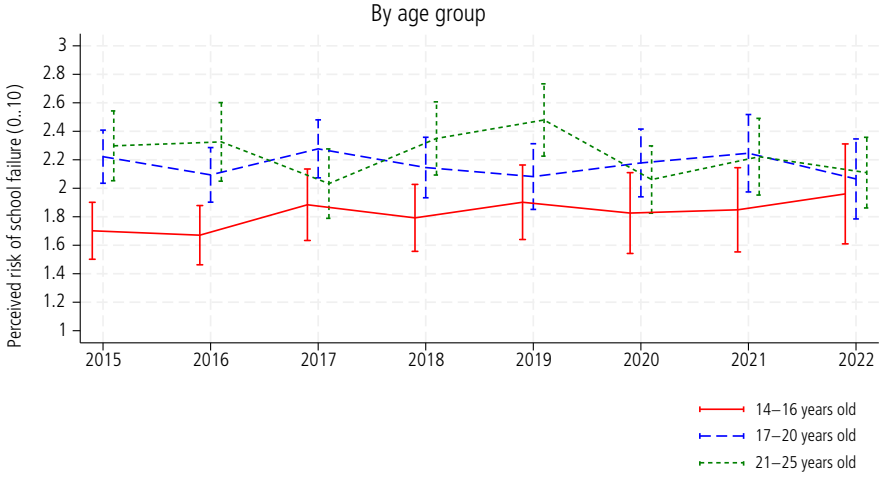
Figure 3 Perceived risk of school failure before (2015–2019) and after (2020–2022) the coronavirus-related school closures by type of education



N(obs) = 6 807, N(indiv) = 2 233, unweighted

Finally, we test whether changes in the perceived risk of school failure vary by age (Hypothesis 3b). Figure 4 shows that there is no variation by age. Yet, as for the different school types, some convergence of the different age groups can be observed. Whereas on average the perceived risk of school failure was significantly lower in the youngest age group compared to the oldest group until 2019 (the middle group being somewhere between the other two groups), all the age groups converged from 2020 onwards. However, the difference-in-differences estimates are 0 for all three age grops. Therefore, we also reject Hypothesis 3b.

Figure 4 Perceived risk of school failure before (2015–2019) and after (2020–2022) the coronavirus-related school closures by age



N(obs) = 6 808, N(indiv) = 2 233, unweighted

6 Discussion and Conclusion

What are the long-term consequences of the coronavirus-related school closures? Of course, it will take more time until we can answer this question comprehensively. However, we can study the medium-term effects of the school closures in Switzerland – and our results suggest that these were not strong with respect to students' perceived risk of school failure. We find no evidence that the coronavirus-related school closures increased socioeconomic inequalities in students' subjective risk of school failure. These results suggest that it is also unlikely that there will be large

negative long-term consequences of the school closures in Switzerland increasing socioeconomic inequalities in education.

Our findings are not in line with the two theories discussed above, which predict an increase in socioeconomic inequalities in education because of the school closures. We expected socioeconomic inequalities in education to increase, either due to the increased time spent on learning at home in unequal learning environments or due to an increased investment of resources for children in socioeconomically advantaged families. However, our results do not provide evidence for these expectations.

It is, of course, possible that the rather short school closures in Switzerland (56 days in 2020) were not a strong enough disruption of learning to have long-term consequences for socioeconomic inequalities in education. Therefore, our results should not be generalized to countries that experienced significantly longer school closures. At the same time, it should be noted, however, that the length of the school closures in Switzerland in 2020, whilst towards the lower end among all OECD countries, was not untypical. Many countries closed their schools for a similar or even a shorter time, including the Netherlands, England, France, Denmark, Finland, and Sweden. Our results are very much in line with an earlier Danish study, which found no medium-term effects of the school closures in Denmark 14 months after the school closures (Birkelund and Karlson 2023). It is interesting to note that we observe similar findings in Switzerland.

Although we did not find confirmation for our hypotheses, we still observed that after the onset of the pandemic, university students converged with the other students and the older students converged with the younger students in terms of perceived risk of school failure. This unexpected observation might be explained by some adaptation of older, especially university, students. Indeed, online learning does not only bring strain and disadvantages but might as well benefit some students. From a certain age, students learning online might be more in control of their study environment and schedule, can repeatedly access learning content, and therefore increase learning at their own pace, and finally, might increase motivation and self-efficacy (Sim et al. 2021). However, more research would be needed to conclusively explain our observations.

It is important to keep in mind that the present analysis – as all other research on the effects of the pandemic – does not isolate the effect of the school closures alone but estimates one overall effect of the pandemic, which includes the school closures, on children's education. If for instance, the pandemic had health consequences, led to the death of family members, or had effects on the employment situation or income of the parents of the children included in our analysis, this is all part of the effect we estimate. This point applies to all studies that estimate the effects of coronavirus-related school closures on child education, but we think it is nevertheless important to point out that the pandemic may have affected school involvement through other mechanisms than school closures as well.

Furthermore, the present study focused on the perceived risk of school failure only, which is a subjective measure of the students' expectations. Yet, the school closures might have had a significant impact on the students' objective academic performance or other educational outcomes. For the perceived risk of school closure, whether a school transition is imminent or where exactly a student stands on his/her educational path also likely matters. However, the data did not allow taking imminent school transitions into account as we can only identify school transitions once they have happened. If no school transition happened in a specific year, it is not possible to distinguish between students who did not have an imminent transition ahead of them and therefore remained in the current training and the students who had an imminent transition ahead of them but failed the transition. Therefore, it was not possible to accurately assess and take into consideration the individual position on a school path or imminent school transitions. Despite these drawbacks, our study provides an interesting insight into medium-term effects of the school closures in Switzerland and the role of the socio-economic background of the students.

7 References

Agostinelli, Francesco, Matthias Doepke, Giuseppe Sorrenti, and Fabrizio Zilibotti. 2022. When the Great Equalizer Shuts Down: Schools, Peers, and Parents in Pandemic Times. *Journal of Public Economics* 206, https://doi.org/10.1016/j.jpubeco.2021.104574.

Andrew, Alison, Sarah Cattan, Monica Costa Dias, Christine Farquharson, Lucy Kraftman, Sonya Krutikova, Angus Phimister, and Almudena Sevilla. 2020. Inequalities in Children's Experiences of Home Learning During the COVID-19 Lockdown in England. *Fiscal Studies* 41: 653–683.

Becker, Rolf. 2010. Soziale Ungleichheit im Schweizer Bildungssystem und was man dagegen tun könnte. Pp. 91–108 in *Schulübergang und Selektion*, edited by Markus P. Neuenschwander and Hans-Ulrich Grunder. Zurich: Rüegger.

Berger, Fred, Claudia Schreiner, Wolfgang Hagleitner, Livia Jesacher-Rößler, Susanne Roßnagl, and Christian Kraler. 2021. Predicting Coping with Self-Regulated Distance Learning in Times of COVID-19: Evidence from a Longitudinal Study. *Frontiers in Psychology* 12: https://doi.org/10.3389/fpsyg.2021.701255.

Bernardi, Fabrizio. 2014. Compensatory Advantage as a Mechanism of Educational Inequality: A Regression Discontinuity Design Based on Month of Birth. *Sociology of Education* 87: 74–88.

Betthäuser, Bastian A., Anders M. Bach-Mortensen, and Per Engzell. 2023. A Systematic Review and Meta-Analysis of the Evidence on Learning During the COVID-19 Pandemic. *Nature Human Behavior* 7: 375–385.

Birkelund, Jesper F., and Kristian B. Karlson. 2023. No Evidence of a Major Learning Slide 14 Months into the Covid-19 Pandemic in Denmark. *European Societies* 25: 468–488.

Bol, Thijs. 2020. Inequality in Homeschooling during the Corona Crisis in the Netherlands: First Results from the LISS panel. *SocArXiv*, https://doi.org/10.31235/osf.io/hf32q.

Buchmann, Marlis, Irene Kriesi, Maarten Koomen, Christian Imdorf, and Ariane Basler. 2016. Differentiation in Secondary Education and Inequality in Educational Opportunities: The Case of Switzerland. Pp. 111–128 in *Models of Secondary Education and Social Inequality*, edited by Hans-Peter Blossfeld, Sandra Buchholz, Jan Skopek, and Moris Triventi. Cheltenham: Edward Elgar Publishing.

Cunha, Flavio, and James J. Heckman. 2007. The Technology of Skill Formation. *American Economic Review* 97: 31–47.

Dietrich, Hans, Alexander Patzina, and Adrian Lerche. 2021. Social Inequality in the Homeschooling Efforts of German High School Students during a School Closing Period. *European Societies* 23: 348–369.

Di Pietro, Giorgio. 2023. The Impact of Covid-19 on Student Achievement: Evidence from a Recent Meta-Analysis. *Educational Research Review*, https://doi.org/10.1016/j.edurev.2023.100530.

DiPrete, Thomas A., and Gregory M. Eirich. 2006. Cumulative Advantage as a Mechanism for Inequality: A Review of Theoretical and Empirical Developments. *Annual Review of Sociology* 32: 271–297.

Drvodelić, Maja, and Vlatka Domović. 2022. Parents' Opinions about their Children's Distance Learning During the First Wave of the Covid-19 Pandemic. *CEPS Journal* 12: 221–241.

Easterbrook, Matthew J., Lewis Doyle, Vladislav H. Grozev, Natasza Kosakowska-Berezecka, Peter R. Harris, and Karen Phalet. 2022. Socioeconomic and Gender Inequalities in Home Learning During the COVID-19 Pandemic: Examining the Roles of the Home Environment, Parent Supervision, and Educational Provisions. *Educational and Developmental Psychologist* 40: 27–39, https://doi.org/10.1080/20590776.2021.2014281.

Engzell, Per, Arun Frey, and Mark D. Verhagen. 2021. Learning Loss Due to School Closures During the Covid-19 Pandemic. *Proceedings of the National Academy of Sciences* 118: https://doi.org/10.1073/pnas.2022376118.

Felouzis, Georges, and Samuel Charmillot. 2013. School Tracking and Educational Inequality: A Comparison of 12 Education Systems in Switzerland. *Comparative Education* 49: 181–205.

Gambi, Letizia, and Kristof De Witte. 2021. The Resiliency of School Outcomes after the COVID-19 Pandemic: Standardised Test Scores and Inequality One Year after Long Term School Closures. *FEB Research Report Department of Economics*.

Grewenig, Elisabeth, Philipp Lergetporer, Katharina Werner, Ludger Woessmann, and Larissa Zierow. 2021. COVID-19 and Educational Inequality: How School Closures Affect Low- and High-Achieving Students. *European Economic Review* 140: https://doi.org/10.1016/j.euroecorev.2021.103920.

Grätz, Michael, and Oliver Lipps. 2021. Large Loss in Studying Time During the Closure of Schools in Switzerland in 2020. *Research in Social Stratification and Mobility* 71: https://doi.org/10.1016/j.rssm.2020.100554.

Hammerstein, Svenja, Christoph König, Thomas Dreisörner, and Arun Frey. 2021. Effects of COVID-19-Related School Closures on Student Achievement: A Systematic Review. *Frontiers in Psychology* 12: https://doi.org/10.3389/fpsyg.2021.746289.

Hanushek, Eric A., and Ludger Woessmann. 2020. The Economic Impacts of Learning Losses. *OECD*, available at: https://www.oecd-ilibrary.org/education/the-economic-impacts-of-learning-losses_21908d74-en?crawler=true&mimeType=application%2Fpdf (09. 07. 2022).

Heers, Marieke, and Oliver Lipps. 2022. Overwhelmed by Learning in Lockdown: Effects of Covid-19-Enforced Homeschooling on Parents' Wellbeing. *Social Indicators Research*, 164: 323–343, https://doi.org/10.1007/s11205-022-02936-3.

Helm, Christoph, Stephan Huber, and Tina Loisinger. 2021. Was wissen wir über schulische Lehr-Lern-Prozesse im Distanzunterricht während der Corona-Pandemie? Evidenz aus Deutschland, Österreich und der Schweiz. *Zeitschrift für Erziehungswissenschaft* 24: 237–311.

Kuhfeld, Megan, James Soland, Karyn Lewis, Erik Ruzek, and Angela Johnson. 2022. The COVID-19 School Year: Learning and Recovery Across 2020–2021. *AERA Open* 8: https://doi.org/10.1177/23328584221099306.

Moscoviz, Laura, and David K. Evans. 2022. *Learning Loss and Student Dropouts During the COVID-19 Pandemic: A Review of the Evidence Two Years After Schools Shut Down.* Working Paper No. 609, Center for Global Development.

Neuenschwander, Markus P. 2007. Bedingungen und Anpassungsprozesse bei erwartungswidrigen Bildungsverläufen. Pp. 83–104 in *Übergänge im Bildungswesen*, edited by Thomas Eckert. Münster: Waxmann.

Neuenschwander, Markus P., and Jessica L. Garrett. 2008. Causes and Consequences of Unexpected Educational Transitions in Switzerland. *Journal of Social Issues* 64: 41–57.

OECD. 2021. The State of Global Education: 18 Months into the Pandemic. Retrieved from: https://www.oecd-ilibrary.org/docserver/1a23bb23-en.pdf?expires=1652868009&id=id&accname=ocid195770&checksum=6A4176F5F85287820B306FF6854DEA5D (6. 6. 2022).

Panagouli, Eleni, Androniki Stavridou, Christina Savvidi, Anastasia Kourti, Theodora Psaltopoulou, Theodorus N. Sergentanis, and Artemis Tsitsika. 2021. School Performance Among Children and Adolescents during COVID-19 Pandemic: A Systematic Review. *Children* 8 (12): 1134, https://doi.org/10.3390/children8121134.

Pelikan, Elisabeth R., Marko Lüftenegger, Julia Holzer, Selma Korlat, Christiane Spiel, and Barbara Schober. 2021. Learning During COVID-19: The Role of Self-Regulated Learning, Motivation, and Procrastination for Perceived Competence. *Zeitschrift für Erziehungswissenschaft* 24 (2): 393–418.

Pfeffer, Fabian P. 2008. Persistent Inequality in Educational Attainment and Its Institutional Context. *European Sociological Review* 24 (5): 543–565.

Raudenbush, Stephen W., and Robert D. Eschmann. 2015. Does Schooling Increase or Reduce Social Inequality? *Annual Review of Sociology* 41: 443–470.

Sari, Elif, Felix Bittmann, and Christoph Homuth. 2023. Explaining Inequalities of Homeschooling in Germany during the First COVID-19 Lockdown. *Frontiers in Education* 8: https://doi.org/10.3389/feduc.2023.1154389.

Schult, Johannes, Nicole Mahler, Benjamin Fauth, B., and Marlit A. Lindner. 2022. Long-Term Consequences of Repeated School Closures during the COVID-19 Pandemic for Reading and Mathematics Competencies. *Frontiers in Education* 13, https://doi.org/10.3389/feduc.2022.867316.

SHP Group. 2024. Living in Switzerland Waves 1–24 (including a long file) + Covid 19 Data [Dataset]. FORS – Swiss Centre of Expertise in the Social Science. Financed by the Swiss National Science Foundation, distributed by FORS, Lausanne. https://doi.org/10.48573/58nw-6a50.

Sim, Sandra P.-L., Hannah P.-K. Sim, Cheng-Sim Quah. 2021. Online Learning: A Post COVID-19 Alternative Pedagogy for University Students. *Asian Journal of University Education* 16 (4): 137–151.

Svaleryd, Helena, and Jonas Vlachos. 2022. COVID-19 and School Closures. Pp. 1–25 in *Handbook of Labor, Human Resources and Population Economics*, edited by Zimmermann, Klaus F.

Tillmann, Robin, Marieke Voorpostel, Erika Antal, Nora Dasoki, Hannah Klaas, Ursina Kuhn, Florence Lebert, Gian-Andrea Monsch, and Valérie-Anne Ryser. 2021. The Swiss Household Panel (SHP). *Journal of Economics and Statistics,* https://doi.org/10.1515/jbnst-2021-0039.

Tomasik, Martin J., Laura A. Helbling, and Urs Moser. 2021. Educational Gains of In-Person vs. Distance Learning in Primary and Secondary Schools: A Natural Experiment during the COVID-19 Pandemic School Closures in Switzerland. *International Journal of Psychology* 56 (4): 566–576.

Uğraş, Mustafa, Erdal Zengin, Stamatis Papadakis, and Michail Kalogiannakis. 2023. Early Childhood Learning Losses during COVID-19: Systematic Review. *Sustainability* 15 (7): https://doi.org/10.3390/su15076199.

Voorpostel, Marieke, Robin Tillmann, Florence Lebert, Ursina Kuhn, Oliver Lipps, Valérie-Anne Ryser, Erika Antal, Nora Dasoki, Claire Janssen, and Boris Wernli. 2024. *Swiss Household Panel User Guide (1999–2022), Wave 24, February 2024.* Lausanne: FORS.

APPENDIX

Table A1 Estimates underlying Figures 1 to 4 reported in manuscript

	Figure 1: all students	Figure 2 left: by parental education		Figure 2 right: by household income		Figure 3: by current education type			Figure 4: by age group		
Year		Low	High	Low	High	General training	Vocational training	University	14–16	17–20	21–25
2015	2.053	1.880	2.148	2.021	2.093	1.830	1.933	2.699	1.702	2.222	2.298
	(0.062)	(0.101)	(0.077)	(0.085)	(0.096)	(0.093)	(0.101)	(0.130)	(0.102)	(0.095)	(0.125)
2016	2.002	1.867	2.062	1.960	2.056	1.825	1.881	2.479	1.671	2.094	2.326
	(0.065)	(0.115)	(0.078)	(0.093)	(0.093)	(0.098)	(0.116)	(0.125)	(0.106)	(0.098)	(0.141)
2017	2.083	2.120	2.062	2.082	2.081	1.997	1.942	2.392	1.884	2.277	2.033
	(0.068)	(0.134)	(0.079)	(0.101)	(0.096)	(0.109)	(0.130)	(0.114)	(0.128)	(0.104)	(0.124)
2018	2.078	2.178	2.034	2.037	2.102	1.880	1.865	2.634	1.792	2.146	2.350
	(0.069)	(0.123)	(0.084)	(0.104)	(0.097)	(0.112)	(0.113)	(0.131)	(0.120)	(0.108)	(0.131)
2019	2.135	2.267	2.076	2.097	2.199	2.061	1.891	2.514	1.902	2.082	2.479
	(0.073)	(0.138)	(0.087)	(0.107)	(0.104)	(0.124)	(0.126)	(0.129)	(0.133)	(0.118)	(0.129)
2020	2.037	2.124	2.001	1.936	2.115	2.034	1.839	2.246	1.826	2.178	2.061
	(0.075)	(0.147)	(0.088)	(0.114)	(0.100)	(0.131)	(0.137)	(0.117)	(0.145)	(0.121)	(0.120)
2021	2.107	2.208	2.067	1.856	2.271	2.016	1.893	2.478	1.849	2.246	2.222
	(0.083)	(0.164)	(0.096)	(0.116)	(0.114)	(0.143)	(0.142)	(0.141)	(0.151)	(0.139)	(0.137)
2022	2.045	2.001	2.068	1.873	2.161	1.978	1.930	2.284	1.960	2.065	2.110
	(0.088)	(0.168)	(0.103)	(0.127)	(0.119)	(0.150)	(0.152)	(0.147)	(0.179)	(0.143)	(0.126)

Note: N(obs) = 6 808, N(indiv) = 2 233, unweighted.