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Veröffentlichungsversion / Published Version
Zeitschriftenartikel / journal article

Die Publikation wurde durch den Publikationsfonds der Leibniz-Gemeinschaft für Artikel in Open-Access-Zeitschriften gefördert. / The publication was supported by the Leibniz Association's Open Access Publishing Fund for articles in open access journals.

Empfohlene Zitierung / Suggested Citation:
Sari, E., Bittmann, F., & Homuth, C. (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

frontiers | Frontiers in Education

TYPE Original Research
PUBLISHED 17 April 2023
DOI 10.3389/feduc.2023.1154389

OPEN ACCESS

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SPECIALTY SECTION
This article was submitted to Digital Education, a section of the journal Frontiers in Education

RECEIVED 30 January 2023
ACCEPTED 29 March 2023
PUBLISHED 17 April 2023

CITATION
Sari E, Bittmann F and Homuth C (2023) Explaining inequalities of homeschooling in Germany during the first COVID-19 lockdown.
Front. Educ. 8:1154389.
doi: 10.3389/feduc.2023.1154389

Explaining inequalities of homeschooling in Germany during the first COVID-19 lockdown

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Current studies suggest that the COVID-19 pandemic is worsening existing social inequalities in the field of education worldwide. In this paper, we argue that the pandemic is especially challenging for students from socially disadvantaged and educationally deprived homes, as parental engagement and resources are very important in terms of guiding and supporting students' learning processes during this school closure period. To examine how well parents were able to help their children with schoolwork during the homeschooling period in Germany, we used data from the German National Educational Panel Study (NEPS, n = 3,714) collected during the first such period in May/June 2020 when students were in Grade 7. Taking known mechanisms of inequality of educational opportunity into account, we explored the effects of parents' aspirations and cultural, social, and economic capital on their ability to help their children. Our results showed that although the majority of the examined parents were able to provide good schoolwork support, as expected, we found inequalities related to social background. Parents with low education were twice as likely as highly educated parents to be unable to provide sufficient support. In our multivariate analyses, family resources had a significant positive effect on the likelihood of a parent being able to help. Moreover, regardless of the social or cultural capital endowment of the parents, good household technical equipment was associated with a higher probability of support. Thus, ensuring that students have access to technical home equipment could be a way to promote an educationally supportive learning environment across all social groups.

KEYWORDS

COVID-19, educational inequality, social inequality, social background, homeschooling, learning environment, digital infrastructure, Germany

1. Introduction

Schools in Germany were closed nationwide in Mid-March of 2020 for most of the remaining school year due to the COVID-19 pandemic. With just a few days' notice, teachers, parents, and students were faced with an unprecedented, sudden challenge. While the care burdens of parents of young children increased immensely during this time, schools had to continue to fulfill their educational missions and improvise new digital and analog distance

learning and teaching concepts. Various studies show that this fundamentally changed the everyday lives of families: Children of elementary school age had, on average, significantly fewer social contacts outside their core families than they did before the pandemic but spent an increased amount of time with television, streaming services, and YouTube (Langmeyer et al., 2020: pp. 11–16), while secondary school students were much more likely to use digital learning tools such as educational software than they were before the pandemic (Wolter et al., 2020). Thus, with the COVID-19 pandemic, the learning environments of students changed significantly. Due to the limited opportunities of parents from socioeconomically disadvantaged families and their limited access to educational resources (e.g., reading opportunities), the Joint Research Center of the European Commission predicted an increase in educational inequality for all its member states (EU Commission, 2020).

How has this "COVID-19 shock" affected educational inequality in Germany? The school closing situation has received much attention. However, studies with a broad database on the situation at home are still lacking (for an exception, see Wolter et al., 2020; Dietrich et al., 2021). Therefore, in this paper, we examine how well parents were able to help their children with schoolwork during the first homeschooling/lockdown period in Germany. By doing this, we focus on social inequality of educational opportunity and aim to explore the heterogeneous learning settings during periods of mandatory homeschooling. Thus, we contribute to (a) understanding if and how inequalities increase in such extraordinary situations and (b) pointing out possible approaches to prevent such situations in the future.

We argue that the COVID-19 pandemic has been especially challenging for students from socially disadvantaged and educationally deprived homes, as parental engagement and resources are very important for all schoolchildren in terms of guiding and supporting the learning process during school closure periods. Furthermore, we argue that socially differential parental support (during the pandemic) can be explained by mechanisms of inequality of educational opportunity from the field of the sociology of education.

In particular, research findings on so-called summer learning loss give an idea of how the effects of losses of educational spaces at school vary according to students' social origin and about the consequences in academic achievement that are associated with this inequality-generating mechanism. Studies, especially in the USA, show that children from socially disadvantaged families have considerably less access to educational resources during the holiday period (e.g., books), resulting in a situation where these children tend to fall behind in their educational development during the summer holidays, while children from socially privileged families remain at the same level or even make progress (Cooper et al., 1996; Alexander et al., 2007; Allington and McGill-Franzen, 2017).

In contrast to regular summer holidays, however, education nominally continued during the pandemic. From Mid-May onward, in most of the federal states of Germany, selected grades were able to partially return to school. In Bavaria, for example, this gradual opening was not completed until Mid-June—only a few weeks before summer break. Including the regular Easter and Whitsun holidays, pupils were out of their usual learning environments for up to a total of 3 months. Students in other European countries found themselves in a similar situation during the first and the following three waves of the pandemic.

We use data from Starting Cohort 2 (Kindergarten children; henceforth: SC2) of the German National Educational Panel Study (NEPS; NEPS Network, 2021)[1] collected in May/June 2020. In an online Supplementary survey, 1,587 parents of approximately 14-year-old pupils were asked in May and June 2020 about their situation during the COVID-19 pandemic (Weiß, 2020) at the end of Grade 7. Not only information on family life during the school closures but also data on family life collected during previous waves of this longitudinal study are considered in our analyses. In addition to the mechanisms of social inequality mentioned above, the technical equipment of households (such as laptops or Wi-Fi) receives attention.

Since there is currently no broad database in Germany with which to explore the consequences of the pandemic on the actual social divergence in skill development, this article provides further evidence on the extent to which school closures have had significant consequences related to educational inequality.

2. State of research

2.1. Educational inequalities during the COVID-19 pandemic and the role of resources

Right at the beginning both teachers and researchers saw the homeschooling situation as a danger that could cause existing educational inequalities in Germany to worsen (Eickelmann and Drossel, 2020; Huebener et al., 2020; Wößmann, 2020).

Across Europe, several researchers have already addressed the issue of education during the COVID-19 pandemic. Certain results from Dutch researchers showed that students made very little progress while learning at home during the COVID-19 pandemic and were even somewhat affected by learning losses; this was especially the case for students whose parents had a low level of education (Engzell et al., 2021). Similar findings were observed in Belgium, where learning losses were the highest in schools with many socioeconomically disadvantaged pupils (Maldonado and De Witte, 2020). The results of the UK Household Longitudinal Study showed that children at risk of poverty received quantitatively more parental support with their schoolwork during the lockdown but that they were less likely to have access to a computer at home (20 vs. 7%), which precluded them from taking part in online courses. As a possible explanation for the additional support, the author of the study considered parents' additional free time due to unemployment (Green, 2020: p. 10). However, the associations are not always entirely clear; for example, Weber et al. (2021) found an effect of social background on post-lockdown reading achievement for Austrian primary school students, but the results did not suggest that this difference was related to social differences in parental involvement. The issue of parental help

1 This paper uses data from the National Educational Panel Study (NEPS; see Blossfeld and Roßbach, 2019). The NEPS is carried out by the Leibniz Institute for Educational Trajectories (LIfBi, Germany) in cooperation with a nationwide network.

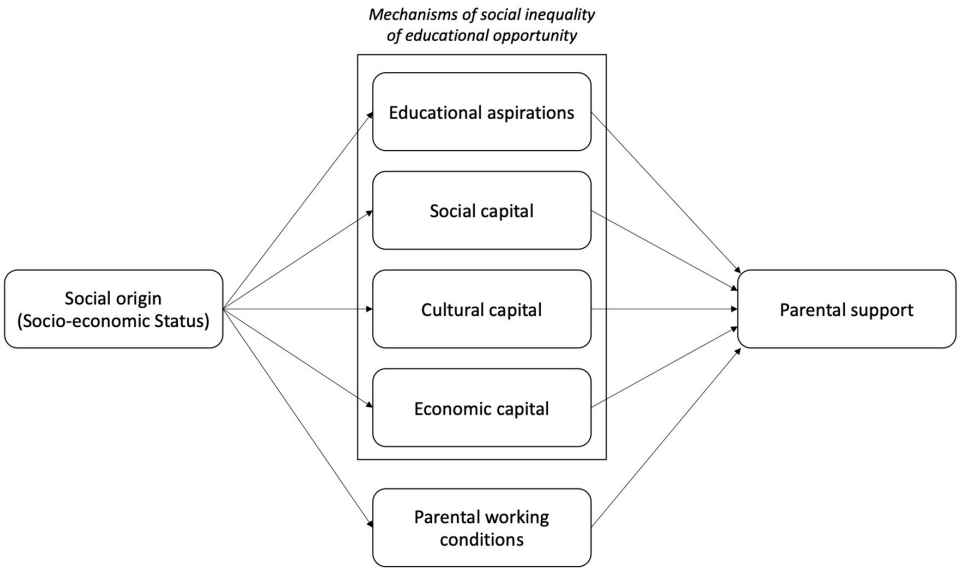

FIGURE 1
Mechanisms of social inequality of parental support during homeschooling. Own illustration.

with schoolwork was also addressed with data from the Dutch LISS panel (Bol, 2020), showing that highly educated parents provided more support with schoolwork during the COVID-19 pandemic than other parents and felt more capable of doing so. Additionally, they had more school-relevant resources at home, such as computers. For the UK, similar social differences in parental support and resources were also found by Pensiero et al. (2021) in the first lockdown; however, the influence decreased in the second lockdown. Similarly, differences in parental support by social background have also been reported in non-European countries (Treviño et al., 2021).

The fact that socially privileged parental homes were able to maintain a conducive learning environment during this time was shown by Jaeger and Blaabaek (2020) from Denmark: They analyzed the borrowing of digital children's books from libraries during the school closures and found that a significantly higher borrowing rate corresponded to individuals with higher income and higher education levels. The authors see this as an indicator of different educational opportunities for pupils and therefore also suspect an increase in educational inequality. Regarding the degree of support received from parents while homeschooling, an Austrian study of 250 secondary school students found no considerable differences based on the examined students' levels of academic performance (Ringeltaube-Stadler, 2020).

As the pandemic continues, more and more studies on students' educational development showed that school closures have generally led to learning gaps (for an overview, see Hammerstein et al., 2021; Zierer, 2021; Schult et al., 2022), even though there is no comprehensive study on how these learning gaps vary by social origin for Germany.

The pandemic-related school closures have led to major structural changes: In general, children in Germany spent less time learning during the school closures than they did when they were in school (Grewenig et al., 2020; Wacker et al., 2020; Wößmann et al., 2021). This reduction in learning time was greater for low-achieving than for high-achieving students (Grewenig et al., 2020). Further studies from Germany bear information on this issue as well. A study on the homeschooling situation of high-school students attending the academic school track found that socially disadvantaged students spent considerably less time in homeschooling activities than socially privileged students (Dietrich et al., 2021). In contrast, a study using data from the German National Educational Panel Study (NEPS) reported no effect of parental education on learning time during the first lockdown, but found significant differences for the period afterward: when schools were partially open again, low-educated children spent significantly less time on schoolwork (Zinn and Bayer, 2021). Züchner and Jäkel's (2021) results show that secondary school students whose parents have a low level of education or have a non-German household language rated their self-reported ability to cope with their schoolwork lower. Sander et al. (2021) examined the extent to which parental support of children's learning during school closures was structuring (e.g., parents ensured that regular learning times were kept) or process-related (e.g., they ensured that appropriate learning methods were used). A small difference by household cultural capital was only found for structuring learning support. Moreover, the results also show that the quality of school support is especially important for children from families where the parents have a low level of education. Researchers fear that especially low-achieving pupils could be severely negatively affected in terms of their educational development by these school closures, as they are on average more likely to have disadvantaging home conditions and parents who are unable to help them with their schoolwork (Huebener and Schmitz, 2020).

A pandemic-related increase in social inequality can be expected for Germany, considering that even before COVID-19, socially privileged parents were better able to help their children with their schoolwork than other parents (Anger and Plünnecke, 2020).

2.2. Parental support with homework before the COVID-19 pandemic

A substantial share of studies dealing with school-related parental support refers to help with homework (see for example Wild and Remy, 2002; Moroni et al., 2016; Guill, 2020).

In their literature review on this topic, Luplow and Schneider (2018) summarize that the so far existing studies suggest that parental homework support has a positive effect when it offers good and structured learning conditions and promotes a self-regulated learning behavior, while overprotective or strongly controlling behavior has a rather negative effect. They also conclude that most of the studies show that students in primary and secondary education are supported by their parents in different ways, even in the period prior to the pandemic.

Most studies report no differences in the frequency of parental homework support based on social origin (Wild and Gerber, 2007; Dumont et al., 2014; Moroni et al., 2015; Luplow and Smidt, 2019). There are, however, indications that the quality of homework support differs according to social origin. For example, in the study by Niggli et al. (2007), socially more privileged students experienced a higher degree of indirect parental support for learning, while socially less privileged students were more likely to be controlled by their parents (see also Cooper et al., 2000). Also, when looking on the children's subjective perception of parental support with homework, children whose parents have a higher level of education rate the support skills of their parents higher than children whose parents have a lower level of education (Dumont et al., 2012). Nonetheless, the evidence on the relationship between the quality of homework support and social origin remains rather limited.

2.3. Summer learning loss research and holiday effects in Germany

School closures and homeschooling have led to a radical change in the learning environments of students. These settings have become much more heterogeneous, and the structure of such a setting depends more than ever on the related parental home. Findings from the existing research on summer learning loss show the effect of the extended exposure to heterogeneous learning and living environments on the socially differential educational development of pupils. Specifically, certain US studies revealed that summer holidays can influence the educational development (mostly measured in performance in standardized tests) of pupils. Although the related previous findings are not entirely consistent, as there are also USA studies demonstrating that summer holidays have inconsistent or no effects on the educational development (e.g., von Hippel and Hamrock, 2019), many studies find empirical evidence, especially in terms of differences in the development of their academic performance according to socioeconomic status. These studies demonstrate that socially disadvantaged students experience less positive educational development than socially privileged students (Entwisle and Alexander, 1992; Downey et al., 2004; Alexander et al., 2007; Quinn et al., 2016).

In terms of investigating this social disparity, the "faucet theory" developed by Entwisle et al. (2000) is relevant; this theory explains social differences in educational development by examining their differential access to resources such as books and their socially divergent learning environments. This theory is supported by recent findings such as those of Allington and McGill-Franzen (2017) from the UK, who found that children from lower-income families have far more limited access to books during summer holidays than socially privileged pupils.

To date, for Germany, the limited studies on summer learning loss do not reveal a clear picture. On the one hand, some studies found a decrease in academic performance over holidays but no socially divergent differences (e.g., Coelen and Siewert, 2008a,b). Other studies show differences according to socioeconomic characteristics (Siewert, 2013; Siewert and Coelen, 2020). These inconclusive results are associated with the comparatively short duration of holidays in Germany (Coelen and Siewert, 2008a). In the USA, the summer holidays are approximately 4 weeks longer than they are in Germany. The results regarding other European countries appear similarly heterogeneous; for example, Austrian researchers find differences in students' educational development according to social status (Paechter et al., 2015; Jauch, 2018), while Lindahl (2001) cannot prove this for Sweden. While Sweden has summer holidays that are approximately the same length as those of Germany, the holidays in Austria are 2–3 weeks longer.

Using summer learning loss as a starting point, a US research team designed predictive models for skill development during school closures in the context of the COVID-19 pandemic. However, these researchers did not take homeschooling and teacher support into account; rather, they only assumed an extended school closure period (Kuhfeld et al., 2020: p. 23). Even though important factors are therefore not included, the results of this study indicate immense potential consequences. The researchers found that annual learning gains in reading and especially mathematics skills will be significantly lower than they have been in previous years (Kuhfeld et al., 2020: p. 23). The models also suggest that the spectrum of students' skills is likely to widen and exhibit heterogeneity; indeed, even over the "typical" summer holidays, the highest-performing 30% of students improve their reading skills, while a share of students decline immensely in terms of reading (Kuhfeld et al., 2020: p. 23).

Therefore, on the one hand, there exists a phenomenon of restricted access to educational resources and a related decline in academic performance during the summer holidays, which is, however, rarely researched in Germany. On the other hand, an extraordinary situation is currently taking place that is likely to increase educational inequalities, but little is known about its actual consequences so far. This work addresses this research gap.

3. Theoretical framework and hypotheses

Students, who otherwise spend a considerable part of their everyday lives at school institutions and whose learning settings are thus similar to a certain extent, were exposed to much more heterogeneous learning environments during the school closures. They spent much more time with their families, comparable to school holidays. According to the sociological literature on inequality of educational opportunity, several mechanisms

can be expected to impact parental support in the context of homeschooling.

3.1. Educational aspirations

Parents who have high educational aspirations for their children are more inclined than others to invest in supporting their children regularly (Haller, 1968; Paulus and Blossfeld, 2007; Ditton and Krüsken, 2010). Parents with high social statuses have high aspirations for their children due to the motive of status maintenance (Breen and Goldthorpe, 1997). Thus, ceteris paribus, it can be assumed that high-status parents are more prone than others to invest in supporting their children while homeschooling.

3.2. Cultural capital

Based on the assumption that socially underprivileged parents are less familiar with the academic sphere and have less educationally relevant capital than others (Bourdieu, 1986), it can be assumed that these parents are less able to help their children with their schoolwork and with the special challenges of homeschooling, e.g., they are less able to explain educational content or provide support regarding technical equipment (hard- and software), specialist knowledge on learning strategies, how to structure learning environments and learning time, or how to use provided learning resources most effectively.

3.3. Social capital

Social capital and social norms also play a role (Coleman, 1988) as, depending on the type and quality of families' social networks, learning groups may be formed or parents may adapt their actions to an environment that is conducive or even obstructive to education. Parents with considerable social capital can obtain necessary information from other parents or teachers or can arrange for private (paid or unpaid) tutoring.

3.4. Economic capital

Usually, educational success is believed not very dependent upon economic resources in Germany, as even higher education is virtually free. However, as homeschooling mainly occurs via online learning platforms and tools, the number of connected devices in a household that are suitable for remote learning (mainly PCs or tablets, but also a printer or high-capacity WI-FI coverage) becomes important. Since schooling before the pandemic was almost completely analog, parents of low-income families who did not have enough hardware, such as those who did not have enough computers for all household members or those that did not have enough money to spend on new ones, were in a difficult position. As soon as programs to help these families by either supporting them financially or providing hardware directly were established, low-income parents had to spent time and energy on applying for these programs instead of helping their children with their homework. Furthermore, low-income families tend to live in small apartments, so without a quiet, separate workspace, it is harder for each member to remotely learn and work.

In addition to these mechanisms of social inequality of educational opportunity, there is another important factor to consider: parental working conditions. Parents of high social statuses often have occupations (e.g., classic white-collar jobs) that allow them to work from home or work flexible hours; thus, they are often able to help their children with homeschooling. Parents with low-status jobs (e.g., manual labor) often cannot easily reconcile their work with helping children. To understand the effects of social origin on parental support, parental working conditions must be controlled for.[2]

Taking these arguments together, we propose the model illustrated in **Figure 1** to explain differential parental support during homeschooling.

Based on this theoretical model and findings from previous research, we derive the following hypotheses:

1. Parental support during homeschooling is dependent on the parental socioeconomic status, i.e., parents with high social statuses may provide more help during the pandemic.
2. The effect of the parental socioeconomic status on providing support is mediated by educationally relevant capital endowments and educational aspirations and is conditional on parental working conditions.

4. Data and methods

4.1. Data

The empirical analyses used to test our hypotheses are based on data from the German National Education Panel Study (NEPS) (Blossfeld and Roßbach, 2019). Longitudinal individual panel data has been collected for the NEPS according to a multicohort-sequence design since 2008 with a focus on education and learning environments, performance, and sociodemographic family background. For the present study, data from Starting Cohort 2 (Kindergarten; SC2) were used (Skopek et al., 2012; NEPS Network, 2021). The original target population of SC2 was all children around age four attending a kindergarten in 2010/11. Before 2020, 11 yearly surveys were conducted among children and their parents. Furthermore, an additional NEPS survey was conducted online (CAWI) between 13 May 2020 and 22 June 2020 (Weiß, 2020) when students were in Grade 7. This addendum contained relevant information about the situation during the crisis and how the living and learning conditions of pupils and their parents changed. This means that the data were gathered directly after the peak of the COVID-19 incidence rate, which marked the most critical phase of the first wave of the epidemic in Germany and the COVID-19 pandemic. At this time, all schools and other educational institutions were closed. No other NEPS data were collected during the school closure period for this starting cohort,

2 Interdependencies between the mechanisms are theoretically implied and known from the literature, but they are not essential in this context.

so we use all available information for this population. We assume that the pandemic had an impact on all students, and we have therefore not selected or excluded any particular age group.

It must be acknowledged that this extra survey elicited a lower response rate than the other waves (realization rate 27.3%), which can be attributed to the online and self-administered nature of the study (no interviewer present), its unexpected timing (unplanned extra-survey), the special pandemic situation and the much shorter survey time (less than 6 weeks to participate in the study). We provide a table with the variables used in **Supplementary Table A1**. The sample was restricted to include only students who participated in wave 9 of the survey. By doing so, we avoid imputing values for students who dropped out earlier, which might create unreliable results. After having performed multiple imputation, the final sample size that can be used in the following analyses is 3,714.

4.2. Operationalization

The central dependent variable of all the models in this study is whether the examined parents were able to help their children with schoolwork during the COVID-19 lockdown ("I was not able to help my child with schoolwork"). The parents' answers were measured on a five-point Likert scale ranging from 1 "does not apply at all" to 5 "fully applies." To enable a more intuitive interpretation of the results, we reversed the scale so that higher numerical values described a greater propensity to be able to help children with their schoolwork. A single item was used for this variable.

The parental socioeconomic status was measured using the International Socio-Economic Index of Occupational Status (ISEI; Ganzeboom et al., 1992) scores (taken from the parent with the higher score, if both were available) as a continuous variable. The ISEI incorporates the occupational prestige of a person and therefore includes aspects such as income, educational level, and social position. For a more convenient interpretation through multivariate analyses, we z-standardized this variable so that its effects could be expressed in terms of standard deviations from the mean. The scale ranges from 16 to 90 with higher values indicating a higher social status.

Next, we introduced the hypothesized mediating variables. As proxies to measure cultural capital, we used the overall number of books in a household, measuring them according to three categories (0–100, 101–200, and more than 200), and parental educational background.[3] We categorized the information about the highest educational certificate of the examined parents into three groups (no degree, low degree, or intermediate degree (*max. Mittlere Reife*); higher education eligibility (*Abitur*); or any tertiary degree). We consider this variable not only as an indicator and mediator of the parents' knowledge and skills but also as an indicator of their educational orientation. Each variable was measured using a single item.

The overall social capital of the parents was measured using a positional generator indicating whether they had friends or acquaintances with certain occupations (for example, lawyers, medical doctors, teachers, or nurses; see Schulz et al., 2017). From this information, a z-standardized scale was constructed with a mean of zero to indicate each parent's average social capital. Note that 13 items were used in the construction of this variable, for details refer to the cited report.

As an indicator of economic capital, we used the parents' overall satisfaction with their technical required learning equipment at home, such as a quiet place to study, a computer, or other materials. The parents rated the sufficiency of the equipment on a four-point Likert scale. Both variables were single-item measurements.

The final theoretically motivated mediator was whether the parents had high idealistic educational aspirations for their children, i.e., whether they aspired to higher education entrance qualification (*Abitur*). A single item was used to measure aspirations.

To account for potential spurious correlations, we defined a set of control variables. As presented above in **Figure 1**, parental working conditions are an important factor of the examined issue; therefore, they were asked where the responding parent worked *predominantly during the lockdown*: from home, partly from home, or not from home at all. This information is not available for the other parent (if present in the household). A single item was used to measure this variable.

Further control variables were Pupil's age in 2020 (measured in years), the gender of each child, whether each child had a migration background, whether the family of each child lived in West or East Germany (including Berlin) and whether his/her parents were living together or not, the level of monitoring provided by each child's parents. Since there are different types of secondary schools in Germany, each of them having a different level of academic demand and leading to a different educational degree if successfully completed, we control for the type of school track currently attended by each child grouped into these categories: academic track (*Gymnasium*), comprehensive school (*Gesamtschule*), or any other lower track (*Grundschule*/*Hauptschule*/*Realschule*). Previous parental help was measured with an item from the 2015/16 survey that indicated the overall homework help that the responding parents provided for their children ("How often do you help your child with homework") with answers given on a five-point scale ("never" to "always"). In addition, we used a second item that measured the hours that the parents spent helping their children work on school-related projects per week during the lockdown. Overall motivation was measured as the time that each child spent working on school (hours per week during the lockdown) and with a second item that measured the level of difficulty faced in motivating the child during lockdown to work on school at home (five-point Likert-scale).

4.3. Methods

We used nested and stepwise model construction to both test the significance of the added variables and see whether this approach would reduce the effect of our central independent variable, social origin, which hinted at a mediation process. In total, we utilized eight nested models, to which we added new variables in blocks. The dependent variable was always whether the

3 These can be seen as rather crude measures or simple proxies for this complex construct as discussed by Lareau and Weininger (2003).

TABLE 1 Descriptive statistics of the complete sample.

	Mean	SD	Min	Max	Share imputed
Ability to help with schoolwork	3.72	1.14	1.0	5.0	0.60
Parental socioeconomic status (ISEI)	60.67	14.81	16.0	90.0	0.01
Parental education					
Low education	0.28	0.45	0.0	1.0	0.00
Higher education eligibility	0.23	0.42	0.0	1.0	0.00
Tertiary education	0.49	0.50	0.0	1.0	0.00
Migration background	0.23	0.42	0.0	1.0	0.00
Eastern Germany	0.14	0.35	0.0	1.0	0.23
Single parent	0.17	0.38	0.0	1.0	0.14
Parental help with homework in 2015/16	3.24	1.11	1.0	5.0	0.18
Time child spent studying for school (in hours)	15.75	9.00	0.0	123.3	0.60
Time parents spent helping the child (in hours)	5.17	6.07	0.0	132.3	0.60
Level of difficulty faced in motivating child at home	3.03	1.31	1.0	5.0	0.60
Working conditions					
Home office	0.34	0.47	0.0	1.0	0.68
Not from home	0.52	0.50	0.0	1.0	0.68
Partly from home	0.14	0.34	0.0	1.0	0.68
Number of books					
0–100 books	0.28	0.45	0.0	1.0	0.13
101–200 books	0.22	0.41	0.0	1.0	0.13
More than 200 books	0.50	0.50	0.0	1.0	0.13
Social capital STD	0.02	0.98	−4.7	3.8	0.13
Technical equipment	3.53	0.73	1.0	4.0	0.60
High parental aspirations	0.79	0.41	0.0	1.0	0.23
Female pupil	0.51	0.50	0.0	1.0	0.00
School track of pupil					
Lower (secondary) school	0.17	0.38	0.0	1.0	0.12
Comprehensive school	0.20	0.40	0.0	1.0	0.12
Academic track	0.62	0.48	0.0	1.0	0.12
Pupil's age in 2020 (in years)	14.16	0.35	12.6	15.7	0.00

Data: German National Educational Panel Study (NEPS) SC2 (doi: 10.5157/NEPS:SC2:9.0.0). Own illustration, imputed data $m = 100$.

examined parents could help their children during lockdown with schoolwork. The design was as follows:

First, the empty model (baseline) only included the measure of social origin, which was the ISEI of the parents as a continuous variable. The second model included all the sociodemographic control variables. The following models incorporated the theorized mediators. Finally, a complete model was computed that included all the variables and mediators.

We estimated linear (OLS) regression models in this stepwise fashion. However, to test the robustness of our findings, we performed multiple robustness checks. First, since the dependent variable was originally measured on a five-point Likert scale, we ran ordinal logistic models. Second, we computed the results for subsamples of the children according to their academic performance. For this, we used the competence tests of the NEPS, which measure the performance of children in terms of both mathematics and German. We divided the sample at the median to form two groups (low and high performers) to see whether the results differed according to the competence levels of the children; additionally, we constructed a model that included all the children independent of their performance. We compared the results for both mathematics and German but found no substantial differences.

All the analyses were conducted with Stata 16.1. To account for missing information due to non-response, we performed multiple imputation by chained equations (MICE) and used $m = 100$ imputations. We also imputed the dependent variable and included all the observations since various auxiliary variables and weights were included to control for the selection and sampling design (Sullivan et al., 2015). The imputation models were adapted to fit the distribution of the imputed models. For example, we utilized linear, logistic, ordered logistic, multinomial and truncated regressions, depending on the scale level of every variable. Afterward we checked that the generated missing values were fitting to the distribution and no impossible values (outside the normal range) were produced. We also checked for convergence and found no issues. The imputation model was performed after selecting the analytical sampled, see also Section "4.1. Data."

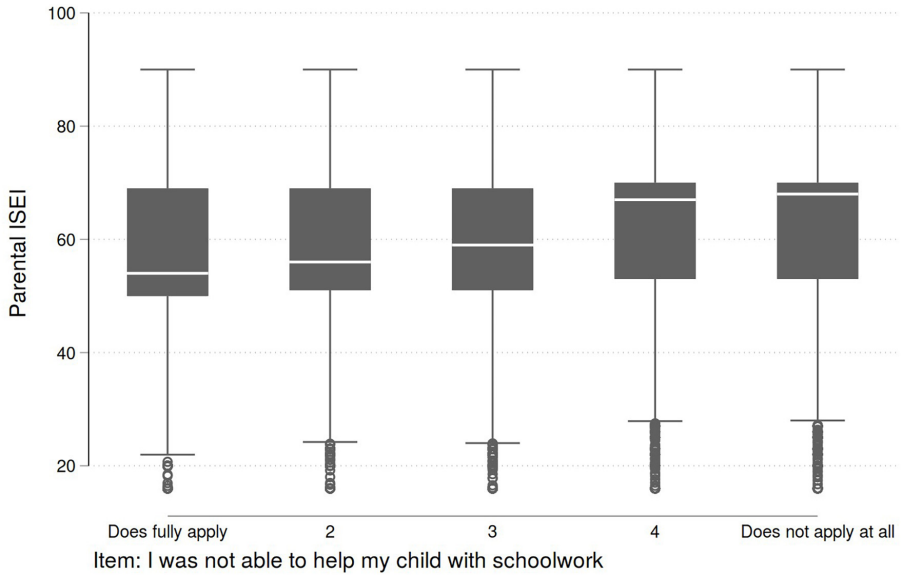

FIGURE 2
Ability to help by family SES (ISEI). Data: NEPS SC2 (doi: 10.5157/NEPS:SC2:9.0.0). Own illustration; imputed data *m* = 100. Higher numerical values on the *x*-axis indicate a greater ability to help children with schoolwork. The white circles indicate the outliers.

Using only the non-imputed sample, we found comparative results that did not lead to different conclusions. Only the respondents who participated in the last regular survey, namely, wave nine, were included in the following analyses. By doing so, we ensured that information was available on all the relevant background variables, such as socioeconomic status, for most of the participants. Hence, we regarded wave nine as the anchor that served as a baseline for imputing the critical COVID-19 information, for which much less data were available.

Table 1 gives a descriptive overview of all the variables. To enable a better understanding of the relationship between the dependent variable and social status, we also provide a comparison between two extreme social status groups (low social status vs. high social status) in **Supplementary Table A2**. For this analysis, we have split up the sample by the median ISEI to create two equal groups (N = 1,857 per group). The total sample size available after imputation for the main analyses is hence 3,714.

5. Results

On average, the parents were able to help their children relatively well (arithmetic mean: 3.72). We began testing Hypothesis 1 by looking at the bivariate relation between our outcome variable (being able to help) and family social status. As depicted in **Figure 2**, we found the theorized relationship, as the parents with higher ISEI values were more able to help (higher numerical values on the *x*-axis) than the others.

Next, Table 2 shows the results of the multivariate analysis. We started with the baseline model (M1) that only included parental ISEI, continued by adding all the control variables in the next model (M2), then tested each mediator individually (M3–M7), and completed the analyses with the saturated model including all the mediators (M8).

In M1, we found that ISEI exerted a statistically positive influence, meaning that a parent's ability to help increased by 0.136 points when his/her ISEI score increased by one standard deviation. This result supported our first hypothesis about the positive relationship between social status and parental support during homeschooling.

When all the controls were added to M2, the effect of ISEI only slightly weakened. High parental aspirations did not have an independent effect on the ability to help (M3), while technical equipment did (M4). The same held for all the other mediators tested afterward. The smaller the effect of ISEI became, the stronger the mediating pathway was. When examining this metric, it could be observed that the number of books in a household and parental education level were especially strong mediators, as the effect of ISEI was almost reduced to zero when these factors were included (M6 and M7). When testing all the mediators simultaneously, we found that the effect of ISEI was very close to zero and not statistically significant. Since multiple mediators had statistically significant effects, we could conclude that they worked partly independent of each other. We observed that the effect of working conditions decreased when the examined mediators were taken into account, but they remained significant. This suggests that, as hypothesized, a parent's place of work does depend on his/her social status; however, in addition to this, it independently contributes to explaining parental help with schoolwork. Therefore, we can accept our second hypothesis on the mechanisms of social inequality.

6. Discussion

During the COVID-19 lockdown and resulting school closures, the learning and living environments of students changed fundamentally. This article aimed to explore how these heterogenized learning environments impacted educational

TABLE 2 Determinants of parental support during homeschooling.

Model	M1	M2	M3	M4	M5	M6	M7	M8
	Baseline	Controls added	High aspirations	Technical equipment	Social capital	Books	Parental education	All mediators
Parental ISEI (Std.)	0.136***	0.115**	0.107**	0.105**	0.093*	0.061	−0.046	−0.076#
	(0.037)	(0.037)	(0.038)	(0.037)	(0.038)	(0.038)	(0.042)	(0.043)
Pupil's age in 2020 (in years)		−0.166*	−0.157#	−0.162#	−0.156#	−0.151#	−0.117	−0.107
		(0.084)	(0.083)	(0.083)	(0.083)	(0.083)	(0.083)	(0.081)
Female pupil		−0.220***	−0.222***	−0.195**	−0.211***	−0.200**	−0.208***	−0.169**
		(0.062)	(0.062)	(0.061)	(0.062)	(0.062)	(0.060)	(0.059)
Migration background		−0.098	−0.109	−0.100	−0.078	−0.046	−0.071	−0.032
		(0.083)	(0.083)	(0.083)	(0.083)	(0.081)	(0.082)	(0.081)
School track of pupil								
Lower (secondary) school		Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Comprehensive school		0.018	−0.014	−0.009	0.018	0.018	−0.010	−0.029
		(0.100)	(0.104)	(0.100)	(0.101)	(0.100)	(0.100)	(0.102)
Academic track		−0.135	−0.207#	−0.165#	−0.146	−0.164#	−0.214*	−0.246*
		(0.094)	(0.108)	(0.093)	(0.094)	(0.095)	(0.094)	(0.105)
Eastern Germany		−0.027	−0.026	−0.029	−0.006	−0.028	−0.028	−0.021
		(0.088)	(0.088)	(0.087)	(0.086)	(0.088)	(0.087)	(0.085)
Single parent		−0.225**	−0.228**	−0.195*	−0.208*	−0.213*	−0.214**	−0.169*
		(0.083)	(0.084)	(0.082)	(0.084)	(0.083)	(0.082)	(0.081)
Parental help with homework in 2015/16		0.055#	0.057*	0.049#	0.056#	0.061*	0.069*	0.064*
		(0.028)	(0.029)	(0.028)	(0.028)	(0.028)	(0.028)	(0.028)
Time child spent studying for school (in hours)		−0.001	−0.001	−0.001	−0.001	−0.002	−0.001	−0.002
		(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Time parents spent helping the child (in hours)		0.025***	0.024***	0.028***	0.026***	0.028***	0.026***	0.031***
		(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.006)
Level of difficulty faced in motivating child at home		−0.226***	−0.224***	−0.212***	−0.219***	−0.220***	−0.222***	−0.201***
		(0.027)	(0.027)	(0.027)	(0.027)	(0.028)	(0.027)	(0.027)
Working conditions								
From home		Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Not from home		−0.291***	−0.289***	−0.289***	−0.279***	−0.256***	−0.178*	−0.164*
		(0.074)	(0.073)	(0.073)	(0.073)	(0.074)	(0.075)	(0.074)
Partly from home		−0.180	−0.171	−0.203#	−0.168	−0.140	−0.149	−0.144
		(0.111)	(0.112)	(0.113)	(0.110)	(0.112)	(0.110)	(0.111)
High parental aspirations			0.138					−0.019
			(0.100)					(0.100)
Technical equipment				0.203***				0.202***
				(0.048)				(0.047)
Social capital (Std.)					0.103**			0.053
					(0.036)			(0.035)

(Continued)

TABLE 2 (Continued)

Model	M1	M2	M3	M4	M5	M6	M7	M8
	Baseline	Controls added	High aspirations	Technical equipment	Social capital	Books	Parental education	All mediators
Number of books								
0–100 books						Ref.		Ref.
101–200 books						0.189*		0.088
						(0.094)		(0.096)
More than 200 books						0.418***		0.266**
						(0.089)		(0.091)
Higher education eligibility							0.435***	0.371***
							(0.091)	(0.093)
Tertiary degree							0.730***	0.617***
							(0.094)	(0.097)
Constant	3.720***	6.899***	6.708***	6.104***	6.707***	6.370***	5.666***	4.654***
	(0.037)	(1.197)	(1.192)	(1.200)	(1.183)	(1.186)	(1.197)	(1.186)

Data: German National Educational Panel Study (NEPS) SC2, (doi: 10.5157/NEPS:SC2:9.0.0); n = 3,714. Unstandardized linear regression coefficients; standard errors are in parentheses. $^{\#}p < 0.10$, $^{*}p < 0.05$, $^{**}p < 0.01$, and $^{***}p < 0.001$.

inequalities in Germany. More specifically, our research interest was to determine how well parents were able to help their children with schoolwork during this homeschooling period, which is dependent upon the following socioeconomic factors and resources: parental education, books at home, parental aspirations, social capital, and sufficient technical equipment. Based on previous findings and the presented mechanisms of social inequality of educational opportunity, it could be assumed that the lack of resources experienced by socially less privileged students leads to an increase in educational inequalities during homeschooling periods.

To examine the extent to which the known mechanisms of social inequality were relevant during these school closures, we analyzed data from the German National Educational Panel Study (NEPS).

The stated theoretical framework contributes to the understanding on how social inequalities increase under such extraordinary conditions. Our results showed that high-status parents were more able to help their children with schoolwork than low-status parents. This finding was in line with our theoretical expectations since on average, parents with high social statuses have more resources available to spend on the education of their children. They not only have greater incentives to help their children (as explained by status maintenance motives) but are also better able to provide the necessary support on their own, even in critical situations such as the COVID-19 lockdown.

The multivariate results revealed that the number of books in a household and parental educational qualifications are especially strong mediators of the examined relationship. This was in line with our expectations since it is well known that the number of books in a household, as it represents objective cultural capital, is highly correlated with the educational aspirations and orientations of parents. Parents who invest in this capital hold high educational aspirations for their children and invest in their educational success. The same held for parental educational qualifications, which not only strongly correlate with the number of books in a household but also reflect the educational trajectories of parents. Parents who hold high educational qualifications have a strong incentive to enable their children to reach these qualifications as well since they are aware of the exceptional influence of education on the life course of an individual. Our results showed that high parental aspirations did not have an independent effect on the examined parents' ability to help, while technical equipment and social capital did. To explain this lack of effect on the part of parental aspirations, we argued that while aspirations do indeed differ across social groups (see **Supplementary Table A2**), we could only examine whether aspirations affected the parents' *ability* to help their children, not whether they were *motivated* to do so. Whether a given parent could help during such an extraordinary situation was therefore conditioned more by the actual circumstances and opportunities within the parental home than by the parent's aspirations. This explanation was corroborated by the result that an independent effect could be demonstrated on the part of the parents' social networks. In addition, this explanation was also supported by the effect that parental working conditions had on parental support. Even when all the mediators were taken into account, parents who did not work from home were significantly less able to help their children. This effect showed the consequences of parents having a much more limited ability to shape their children's learning environments. The same applied to being a single parent, which was also associated with a lower probability of being able to help.

Even though our results are insightful, they have several limitations. First, we did not use an objective measure of parental support; rather, we had only the self-reported data of parents who assessed their support options themselves. This self-assessment could differ by social status due to different understandings of concepts and/or different levels of social desirability. Additionally, we did not have any data from the children of these parents, who might have rated their parents' abilities differently. Second, the respondents of SC2 are members of a selective group that has been scientifically monitored for the last 10 years. This group

contains a large proportion of highly educated parents. We tried to account for this issue through the use of imputation and weighting, but it should still be taken into account when trying to generalize our findings. Third, although we consider information from the previous waves, we cannot perform an actual panel analysis with these data.

Regarding the question of how the school closures affected educational inequalities in Germany, our findings indicate that these inequalities may be increasing. So, the concerns of politicians and researchers, that social inequalities may have increased as a result of the pandemic, seem reasonable. Socially disadvantaged parents have few material and immaterial resources to maintain an education-promoting learning environment. As the results from the summer learning loss research suggest, the longer a homeschooling phase lasts, the wider such social gaps are likely to become. However, we also see that the amount of technical equipment that families have is positively correlated with the likelihood that parents can help their children. As shown by the recent studies mentioned in this paper, the use of digital resources has already increased during school closures. Thus, providing sufficient digital infrastructure for educational institutions would not only help students and teachers stay in touch but also help parents across all social groups maintain an educationally supportive learning environment. From this perspective, promoting further digitalization in the school context would help to reduce inequalities. However, technical equipment can only compensate for some of these differences. Especially in regard to imparting knowledge or explaining specific educational content, parents with little education are at a disadvantage. Therefore, this group needs strong (virtual) school support to compensate for the existing deficits in their home learning environments. Considering the unprecedented circumstances facing teachers and their increased workloads, this is certainly a great challenge for schools.

We believe it is likely that this inequality in parental support will also manifest in differences in academic performance, like the summer learning loss research already suggests. Further research should therefore address this issue and examine how students' educational development differed according to social origin. This aspect will play an important role even after the pandemic has been contained, as educational inequalities ultimately manifest in unequal life and career trajectories.

Data availability statement

The data analyzed in this study is subject to the following licenses/restrictions: We used data from the German National Educational Panel Study (NEPS): Starting Cohort Kindergarten (SC2), doi: 10.5157/NEPS:SC2:9.0.0. The SC2 data is available, free of charge, to individuals with a valid NEPS data usage contract via three modes of access-download, RemoteNEPS and on-site. From 2008 to 2013, NEPS data was collected as part of the Framework Program for the Promotion of Empirical Educational Research funded by the German Federal Ministry of Education and Research (BMBF). As of 2014, NEPS has been carried out by the Leibniz Institute for Educational Trajectories (LIfBi) at the University of Bamberg in cooperation with a nationwide network. More information is available here: https://www.neps-data.de/Data-Center/Data-and-Documentation/Start-Cohort-Kindergarten. Requests to access these datasets should be directed to the Research Data Center: https://www.neps-data.de/Data-Center/Data-Access.

Author contributions

ES, FB, and CH contributed to the conception and design of the study and wrote the sections of the manuscript. ES was responsible for the introduction, state of the research, discussion, and wrote the first draft of the manuscript. FB performed the statistical analysis. CH was responsible for the theoretical background and hypotheses. All authors contributed to the manuscript revision, read, and approved the submitted version.

Funding

The publication of this article was funded by the Open Access Fund of the Leibniz Association.

Acknowledgments

An earlier version of this manuscript was uploaded as a preprint to SocArXiv (see Sari et al., 2021).

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/feduc.2023.1154389/full#supplementary-material

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