Countries Embracing Maternal Employment Have Opened Schools Sooner after COVID-19 Lockdowns

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Abstract

Covid-19 pandemic related school closures have affected the majority of the world's students and remain a contentious issue. Using data from the UNESCO school data base, the ISSP 2012, and country-level panel regressions, we leverage simultaneous school closures during first-wave Covid-19 lockdowns to estimate the effect of gender ideology on school reopening schedules. We show that societal gender ideology likely has influenced school reopening policies: Societies with more supportive attitudes toward maternal employment have reopened schools significantly sooner, and at higher intensities, than societies with less supportive attitudes toward maternal employment, relative to other reopening measures, and net of infection rates. Our findings suggest a causal effect of gender ideological beliefs on pandemic-related school-closure policies. We test and exclude a variety of potential confounders such as a country's maternal employment rate, GDP, social spending, and cultural values toward children. We argue that school closures may be perceived as less problematic in countries where more people support the ideal of a stay-at-home mom. Gender attitudes may thus represent a set of ideas that affect policy-makers' decision-making via a potential gender ideology bias. However, the specific underlying mechanisms via which the gender ideology effect operates at the policy-maker level remain untested for in our study, and should be investigated by future research.

Since the beginning of the COVID-19 pandemic, a large array of virus transmission control measures has been implemented. Among them have been school closures of an unprecedented scope. In April 2020, almost 90% of the world's enrolled students were affected. Pandemic control measures have unintended, often detrimental, side effects (Polyakova et al. 2020). These are particularly severe in the case of school closures because they lead to a variety of adversarial consequences such as socially stratified learning losses (Jæger and Blaabæk 2020), deteriorating mental health among children and parents (Russell et al. 2020; Golberstein, Wen, and Miller 2020; Calarco et al. 2020), and increases in child maltreatment (Humphreys, Myint, and Zeanah 2020). They also generate a disproportionately high burden for mothers who largely compensate for closed schools. This leads to, for instance, increases in job losses, reductions in paid employment and work hours, and steep increases in time spent with domestic work (Collins et al. 2021; Qian and Fuller 2020; Dias, Chance, and Buchanan 2020; Ma, Sun, and Xue 2020; Del Boca et al., n.d.). School closures thus not only lead to educational, developmental and social losses for children, but they also imply soaring gender inequalities in the domestic sphere and the labor market. Examining the factors that affect the duration and intensity of school closures, net of Covid-19 activity, is therefore of great importance.

While school closures were a near universal occurrence during first-wave lockdowns, subsequent school re-opening pace, relative to other societal reopenings, has varied widely. Similarly, second and third Covid-19 waves in the fall and winter months of 2020 and early 2021 have triggered school closures in some but not other countries and regions. Thus, broad variation in type and usage of pandemic response measures across, and even within,

societies is presenting itself, in particular regarding the schools (Blum and Dobrotić 2020; McGowan 2020). A year into the Covid-19 pandemic, the scientific evidence on the role of schools and the effect of school closures for the spread of SARS-Covid-19 remains mixed and inconclusive (Walsh et al. 2021). Given this lack of clear scientific epidemiological guidance on best Covid-19 pandemic-practices for schools, other factors, such as economic, political or socio-cultural considerations are likely influencing how the relevant political actors have handled schools during the pandemic, and may be important drivers of the observed national and regional differences in school related pandemic policies. However, to date little is known on whether, and, if so, which, socio-cultural aspects produce these differences in the Covid-19 response to school operations. Our study addresses this question. We suggest that gender ideological beliefs serve as an important ideational component which affects policies regulating school operations during the pandemic, and investigate whether societal attitudes toward maternal employment have contributed to country-level variation in school reopening pace and intensity after first-wave Covid-19 lockdowns.

Our study leverages the exogenous shock of the first Covid-19 wave and the ensuing school closures in March 2020, when schools were shuttered almost simultaneously across most nations in the world, to estimate the effect of societal level gender ideology on countries' school reopening schedules. We find that countries with more supportive attitudes toward maternal employment have reopened schools sooner and at greater intensities, relative to other societal reopenings. These findings suggest that the composition of countries' specific mixes of policies aimed at curbing the SARS-CoV-2 virus spread are partly guided by a societies attitudes toward maternal employment. We test and exclude a variety of

potential confounders such as a country's maternal employment rate, GDP, social spending, and cultural values toward children. While the specific underlying mechanisms via which the gender ideology effect operates remain untested for in our study, we theorize, as outlined above, that they operate at the individual level, and may be rooted in policy-makers perceptions regarding the costs and benefits of school closures as a function of their gender attitudes. We borrow from the literature which theorizes the role of ideas on policymaking, lean on the concept of 'ideas as heuristics' in influencing policymaking (Swinkels 2020), and call this potential cognitive bias in policy decision-making *gender ideology bias*.

School closures mean that children need to be educated and cared for at home. It is well documented that women carry out the majority of domestic and care work in families around the globe (Bianchi et al. 2012; Van der Lippe et al. 2011; Treas and Tai 2016; OECD 2018). The potential implications of the pandemic control measures for women and growing gender inequality were widely discussed in the media in March and April 2020 (UNESCO 2021b). It may be assumed that decision-makers were aware that mothers would bear the main responsibility for compensating for closed schools. Thus, we hypothesize that decision-makers' gender attitudes represent a set of ideas that may have affected their school-related pandemic responses, as these attitudes – perhaps unwittingly – were and are shaping their cost-benefit assessments of closing or opening schools.

Background

The role of ideas in policy-making

Scholars studying policymaking increasingly emphasize the importance of ideas, e.g. norms, beliefs, ideologies, attitudes, or cognitive heuristics and biases for policy decision-making (Jacobsen 1995; Schafer and Walker 2006; Campbell 2002; Esping-Andersen 1999). Theorizing on the importance of the role of ideas for policymaking gained momentum in the early 1990s (Goldstein and Keohane, 1993; Jacobsen), and is experiencing a renewed upsurge, coined an ‘ideational turn’, in current policy scholarship (Swinkels 2020). Yet, conceptualizing and measuring ideas has proved challenging, as has assessing their precise pathways of influence on policymaking. Moreover, ideas, social policies, and social outcomes are likely intertwined, affect each other probably only partially, and in feedback loops (Yee 1996). This further complicates assessments of the effect of relevant ideas on policy or other social outcomes (Campbell 2002; Sjöberg 2004; Tjernström and Tietenberg 2008; Gangl and Ziefle 2015).

Despite these difficulties, ideas have evolved as a central explanatory concept for explaining policymaking, in particular with regards to policymaking processes and changes in policies (Swinkels 2020). For ease of conceptualization, Swinkels (2020) suggests to classify ideas as explanatory forces for policymaking around three central analytical lines: ideas as heuristics, ideas as strategic tools, and ideas as institutional frameworks. We lean on the concept of ideas operating as heuristics, also termed ‘cognitive paradigms’ (Campbell 2002), which posits that that human decision-making in general and policymaking specifically is guided by subjective beliefs, and is subject to a variety of

biases (Kahneman 2011). Particularly in situations in which people face acute time pressure, limited information, and complex situations or choices, their decisions can be guided by and based on such cognitive heuristics, biases, and information unrelated to the issue at hand (Tversky and Kahneman 1974; Songer and Lindquist 1996; Stepanikova 2012; Lau and Redlawsk 2001). We argue that cognitive heuristics and subjective beliefs may have served as particularly relevant decision-making tools during the first Covid-19 wave, which has been an unprecedented moment of complex decision-making under pressure, and time sensitivity, worldwide. In addition, the role of decision-makers is increasingly recognized as salient for policymaking (Morin and Paquin 2018). Governmental decision-making on the Covid-19 response in general and during first wave lockdowns in particular was dominated by expert-task forces and the executive (Rajan et al. 2020; Griglio 2020). In other words, decision-making on school operations was made by few selected individuals, while the influence of political discourses and parliaments was low in the Covid-19 pandemic-response policy decision-making process on schools. In addition, firm scientific information on transmission of SARS-Covid-19 in school settings was scant at that time. This situational set-up implies favorable conditions for ideas as heuristics to carry significant weight in the policy decision-making process during first wave Covid-19 lockdowns.

Gender ideology as ideas that affect school-related Covid-19 response policymaking

Ideas as heuristics or cognitive paradigms originate from ‘microfoundations’, i.e. policymakers cognition (Swinkels 2020, 288), or their ‘taken-for-granted worldviews’ (Campbell 2002, 22). We hypothesize that policymakers’ own ideas on gendered societal

roles, or their perceptions of their societies' ideas on such gendered roles, represent a crucial set of ideas that has served as heuristics in the Covid-19 response decision-making process on school operations.

In sociological scholarship there is broad agreement that gender ideology among individuals and on the societal level – sometimes also referred to as gender attitudes, values, norms, or culture – is closely linked to and likely influences behavior and decision-making, in particular behavior that produces gendered outcomes (Davis and Greenstein 2009; Pessin 2018; Collins et al. 2021; Scarborough, Sin, and Risman 2019). On the level of individuals, significant relationships between gender ideology and a variety of gendered individual- and couple-level outcomes have been documented in a large number of countries (Carlson and Lynch 2013; Carriero and Todesco 2018; Cunningham 2005; Kaufman 2000; Khoudja and Fleischmann 2018; J. Kim and Luke 2020; Davis and Greenstein 2004; 2020; Hudde and Engelhardt 2020; Nitsche and Grunow 2018; 2016; Thébaud, Kornrich, and Ruppner 2019; Davis and Greenstein 2009). On the macro level, research has found correlations between gender ideology and a variety of social outcomes, such as fertility, motherhood-earnings penalties, mothers' employment participation and working hours, and the gendered division of housework (Arpino, Esping-Andersen, and Pessin 2015; Boeckmann, Misra, and Budig 2015; Budig, Misra, and Boeckmann 2012; Fuwa 2004; Treas and Tai 2016; Van der Lippe and Van Dijk 2002; Hudde 2018). While studies that have assessed the influence of gender ideology or ideas on gendered social roles on social policies are scarce, there is evidence that values, ideology, and attitudes affect policy-making in other societal domains (Guth et al. 1995; Segal and Cover 1989; Facchini and Mayda 2008; Mooney and Lee 2000). We therefore hypothesize that gender

ideology serves as a meaningful source of ideas to have affected Covid-19 response related policymaking on schools, because closed schools have immediate, deep and long-lasting unequal effects on men and women, in particular on fathers and mothers.

Gender ideologies incorporate a variety of shared cultural beliefs about both the gendered traits and the social responsibilities of men and women (Ridgeway and Correll 2004; Charles and Grusky 2005). Generally speaking, gender essentialist beliefs support the idea of “separate gender spheres,” also called “traditionalism,” in which women’s responsibilities are seen as centered on the family and private realm, and men’s responsibilities are seen as centered on the labor market. This traditionalism stands in opposition to “gender egalitarianism,” or the idea of “joint spheres,” in which women and men are seen as equally adapted to and responsible for performing tasks in the family or private realm on the one hand, and the labor market or public realm on the other (Davis and Greenstein 2004; 2009). Recent scholarship has demonstrated that individuals’ gender ideological thinking is complex, and goes beyond a simple dichotomization of “egalitarian versus essentialist” ideologies (Knight and Brinton 2017; Scarborough, Sin, and Risman 2019; Hudde 2018). Rather, a variety of gender ideological constructs with mixed elements of egalitarian and essentialist ideas seem to exist co-exist in, for instance, the ideals of “intensive parenting” or “egalitarianism with essentialist elements” (Grunow, Begall, and Buchler 2018). This makes it necessary to conceptualize and measure gender ideology specific to certain relevant tasks, such as gendered ideals of childrearing, or beliefs about the labor market involvement of mothers. Maternal employment is among the social outcomes most heavily affected by Covid-19 school closures (Heggeness 2020; Collins et al. 2021; Carson, Ruppanner, and Ratcliff 2020; Del Boca et al., n.d.). We therefore chose

attitudes regarding maternal employment as the relevant measure for gender ideology for our study and hypothesize that gender ideological beliefs about maternal employment likely played a central role in social policy decision-making regarding pandemic-related school measures.

Our unit of analysis are countries, and we cannot directly observe decision-making processes among individuals or groups of policymakers. Thus, our analyses rest on the assumption that societal level measures of the population's gender ideology capture well the average attitudes of the relevant actors in political power (or at least the ideation they adjust their decision-making to), who gave recommendations for and made decisions on school reopening schedules during and after first wave Covid-19 lockdowns. Specifically, we suggest that policy-makers who embrace gender essentialist values, which include the ideal of a stay-at-home mother, likely perceived the costs of school closures as lower: i.e., they may assume that mothers and children are well-served when caretaking occurs in the home rather than in schools, or that mothers' contributions to the labor market are less valuable. In sum, we suggest that decision-makers who embrace gender egalitarian attitudes, including the idea that mothers should have equal opportunities to gainful employment and own career development, likely perceived the overall cost of school closures as higher, whereas those with gender essentialist ideals perceived them as lower. We term this gender attitudinal bias, which is potentially operating in pandemic school closure and reopening decision-making, *gender ideology bias*.

Method and Data

Analytic Strategy

To analyze how attitudes toward maternal employment have affected school reopening schedules, we leverage the random shock of the first Covid-19 wave and the ensuing school closures, which were employed by most countries around the globe in March 2020, regardless of their gender ideology. We estimate the time to school reopening from the day of maximum lockdown in each country. We conceptualize the day of maximum lockdown as the day when the maximum amount of time was spent in residential areas, measured by Google COVID-19 Community Mobility Reports, for each country (Google LLC 2020). Average maximum time in residential areas, and subsequent declines therein, do not differ between the two attitudinal country groups (see Figure 1). Also, schools were shuttered in all but four countries, and school attendance is compulsory in all countries (UNESCO Institute for Statistics 2020), which means all countries had equal incentives to reopen schools. This strategy ensures that all countries had the same reopening conditions, in other words, their expected outcome in terms of school opening timing and intensity is the same, i.e. exchangeable (Hernán and Robins 2020). Hence, differences in reopening timing and intensity – relative to other societal reopenings – are rooted in deliberate prioritization.

We use descriptive statistics and panel regression models to estimate the causal effect of gender ideology, measured as attitudes toward maternal employment, on the time to school-reopenings and intensity thereof. The assumption on which our identification strategy of the causal effect of gender ideology rests is that no other factors, which are correlated with gender ideology but omitted from the analysis, drive the effect (*omitted-*

variable bias). We have conducted an extensive set of robustness checks to challenge this assumption (described below). Gender ideology was measured before the pandemic started. It reflects often deeply engrained beliefs, which within societies tend to change only slowly and incrementally (Sullivan, Gershuny, and Robinson 2018; Knight and Brinton 2017). The pandemic shock was unexpected and hit countries irrespective of their gender ideology, therefore our estimate of gender ideology on school reopening schedules is not contaminated by self-selection into the external pandemic shock, i.e. by reverse causality (Engel 2016). As argued, decision-making is particularly affected by heuristics and biases under acute time pressure and limited information. We therefore analyze the time between each country's maximum lockdown (April 3, on average) and the beginning of the summer break or any other academic break that is at least four weeks long. Our approach has limitations, which lie in the lack of individual level data from policymakers to test the suggested causal mechanism, and the observational nature of the data; despite the random shock, treatment was not randomized, thus, we cannot exclude the existence of unmeasured confounders, despite the extensive set of robustness checks we conducted. Limitations and threats to the causal inference of this study are discussed in greater detail in the discussion section.

Data

School opening status. Information on school closure status is from the UNESCO database “global monitoring of school closures caused by COVID-19” (UNESCO, 2020). This database contains day- and country-specific information on the status of school

closure in 210 countries. For most countries, data availability starts in mid-to-late March and for all countries, data availability for school status starts before the date of maximum lockdown (see below). School status in the database is available in four categories: (1) most or all schools closed due to COVID-19; (2) most schools closed due to an academic break; (3) partly open; and (4) fully or almost fully open. The ‘partly open’ group includes cases where schools are “open/closed in certain regions only; and/or (b) open/closed for some grade levels/age groups only; and/or (c) open but with reduced in-person class time, combined with distance learning (hybrid approach)” (UNESCO 2021a). For our main analyses, academic breaks are coded as missing; as a robustness check, breaks are coded as closed. We show descriptive results for the remaining three categories and regression analysis for the distinction between completely closed on the one hand, and at least partly opened on the other hand. Regression analyses for the distinction between completely or partly closed on the one hand, and completely opened on the other hand are shown in the supplementary material. At the peak of the first wave in late March and early April 2020, schools were shuttered in more than 95% of all countries worldwide and 31 of the 35 sample countries.

Attitudes towards maternal employment. Information on attitudes toward maternal employment is from the Changing Gender Roles IV-module of the 2012 International Social Programme (ISSP) 2012 (ISSP Research Group, 2016). This dataset is best suited for our research purposes because it contains several relevant items, and it covers a large number of countries. We run iterated principal factor analysis over a battery of items that deal with women’s – and particularly mothers’ – roles in the labor market and the home. They include items on the perceived effects of maternal employment on children and

families, ideas about what women want, and questions about who should earn the money in a family. Overall, they measure the ideological dimension of “maternal employment” well. Cronbach’s alpha for the eight items is 0.77 which supports that these four items capture one latent, underlying factor and that it makes sense to condense the items into one single variable. Table 1 shows the summary statistics for the single items and the factor variable, including the question wording and their factor loading. All items are (re)coded such that higher numerical values represent attitudes more supportive of maternal employment. For ease of descriptive analysis, we split the countries into two country groups: those with more supportive attitudes toward maternal employment (“more egalitarian”, N=18), and those with less supportive attitudes toward maternal employment (“less egalitarian”, N=17).

Table 1. Summary table for attitudes toward maternal employment (ISSP micro-level data of respondents from the 35 sample countries). n = 37,610.

	mean	sd	range	histogram	factor loading
Factor: attitudes towards maternal employment	0.00	0.90	-2.35; 1.94
Items used to compute the factor:					
<i>Warm relation:</i> A working mother can establish just as warm and secure a relationship with her children as a mother who does not work. ^a	3.74	1.17	1;5		0.42
<i>Child suffers:</i> A pre-school child is likely to suffer if his or her mother works. ^b	2.92	1.24	1;5		0.69
<i>Family suffers:</i> All in all, family life suffers when the woman has a full-time job. ^b	2.98	1.26	1;5		0.69
<i>Want home:</i> A job is all right, but what most women really want is a home and children. ^b	2.89	1.23	1;5		0.60
<i>Housewife:</i> Being a housewife is just as fulfilling as working for pay. ^b	2.87	1.20	1;5		0.43
<i>Men money:</i> A man’s job is to earn money; a woman’s job is to look after the home and family. ^b	3.25	1.31	1;5		0.68
<i>Work school:</i> Do you think that women should work outside the home under the following circumstances? After the youngest child starts school. ^c	0.89	0.31	0;1		0.37
<i>Work U6:</i> Do you think that women should work outside the home under the following circumstances? When there is a child under	0.67	0.47	0;1		0.51

school age.^c

Notes: Weights are applied. Factor loading refers to iterated principal factor analysis.

Answer categories for the items:

^a: 1 = strongly disagree; 5 = strongly agree

^b: 1 = strongly agree; 5 = strongly disagree

^c: 0 = stay at home; 1 = work part-time or work full-time

Mobility data as a proxy for lockdown intensity. Aggregate data on the change in time spent in residential areas, compared to a pre-COVID-19 reference period, comes from the Google COVID-19 Community Mobility Reports (Google LLC 2020). This mobility information serves as a control measure for a country's general position on the lockdown-open continuum. Any effective lockdown measure will reduce people's mobility and increase their time spent at home and is an indication of the general degree of closure or opening of a society. We assume that the less time people spent in residential areas, the greater the degree of societal and institutional openings in this society. Google Mobility Reports are available for 134 countries. The moment of "maximum lockdown" refers to the day when the time spent in residential areas was highest in each country, which occurred, on average, on April 3 (in 30 of the 35 sample countries, the date of maximum lockdown falls into the 15-day period between March 25th and April 9th).

Infection cases. Information on daily new infection cases is provided by Our World in Data (OWID) (Roser et al. 2020). OWID draws these data from the European Centre for Disease Prevention and Control (ECDC).

Sample Selection

Sample countries. The selection of countries in our core analytic sample is mainly determined by the availability of ISSP data on gender ideology. ISSP covers 41 countries

across the world. Of these, Spain is excluded from the analyses because of measurement inconsistency: in Spain, a four-point scale was used for the first six items displayed in Table 1, instead of the five-point scale that was used in the other countries. For two countries, China and Iceland, Google Mobility Reports are not available. For Taiwan, information on school openings is not available. Google Mobility Reports indicate that the countries generally follow the pattern of a clear lockdown peak, followed by a gradual opening. Our analyses are based on such a pattern: we focus on the timing between the maximum level of national lockdown (of the first major lockdown wave) and the subsequent opening of schools. Two countries diverge substantially from this pattern and are therefore excluded from the sample: Japan and Chile. Japan experienced a first, shorter lockdown phase, followed by a second, longer lockdown phase. The maximum lockdown that is observed in the data in early May is already part of the second lockdown wave. Chile was in an intense and still slightly intensifying lockdown for at least half a year, and the maximum lockdown was reached much later in the other countries, at the end of June. This leaves 35 countries from all continents for the main analyses. However, in the additional robustness checks, 69 countries are included in at least one of the regression models, see the supplementary material for details.

Sample period. Our sample period for the regression analyses covers the time from the maximum lockdown to the first academic break that is at least four weeks long (i.e. the summer holiday and the end of the academic year in most countries in the northern hemisphere). In most countries, the summer holiday begins on July 1st (21 out of the 35 sample countries). The first countries to start the summer holiday are the Philippines (May 1st) and Finland (May 15th). The last countries to start the summer holiday are Belgium,

Austria, and Mexico (July 11th and August 1st). Five countries do not have a longer holiday during the period of observation (Argentina, Australia, India, South Africa, and South Korea). To keep the sample coherent, we cut these observations off at August 1st, the date when all other countries' holidays have started. On average, that period between maximum lockdown and the last sample day is 89 days.

Method

We present results from descriptive analyses in Figures 1, 2a, and 2b. Figure 2c shows predicted values from a panel regression linear probability model (LPM). We choose linear probability models over non-linear ones, e.g. probit or logit, because linear models are generally more robust and flexible; at least if – as in our case – the sample size is sufficiently large (Battey, Cox, and Jackson 2019). Further, linear models are easy to interpret and allow for insightful visual representations of the results, see e.g. the comparison of model-based predictions and observed opening rates in Figure 2C (Hellevik 2009; Mood 2010). We run a panel regression model (daily observations nested in countries) with random effects (random intercept) at the country level. The dependent variable is binary and captures whether schools are fully closed or at least partly open. The predictor of interest is time-constant gender ideology. we are interested in understanding how ideology is associated with changes in school closures as time passes, therefore ideology is interacted with time since maximum lockdown and the square-term of time since maximum lockdown. The models control for Google Mobility data as a proxy measure for a country's general position on the lockdown-open continuum, and for daily

SARS-CoV-2 infection rates, to further ensure differences in school reopening schedules by gender ideology are not driven by a differential burden of SARS-CoV-2 activity. The lockdown-measure enters as linear and square-term; infection cases as linear and logged term.

Because of the interaction terms, the estimated coefficients are rather difficult to interpret from regression tables. Therefore, we plot predicted probabilities of open schools by time and countries' gender ideology, and compare them to the descriptive patterns (Figure 2C). Note that the displayed predictions are based on the day-specific average values of mobility and infection cases. As an example, the points for day 40 after the maximum lockdown are not predicted for the grand average value of mobility and infection cases, but for the average mobility and infections data on day 40 over all countries. The displayed prediction curves are predicted for the average attitude score of the less egalitarian country group (value of the attitude variable = -0.34; displayed in orange) and for the average attitude score of the more egalitarian country group (value of the attitude variable = 0.36; purple). The full regression table can be found in the supplementary material, together with numerous robustness checks.

Results

Impact of Gender Attitudes on School Reopening Timing and Intensity

The lines in figures 1 and 2a show changes in mobility relative to the maximum lockdown, defined as the day of most time spent in residential areas, across the 35 countries (lines are

smoothed). Broadly, all countries follow a similar shape: a sharp increase in time spent at home, followed by a moderate decrease. Throughout all figures, purple denotes countries with more supportive attitudes toward maternal employment; orange denotes countries with less supportive attitudes toward maternal employment. Figures 1 and 2A show that the average mobility patterns did not differ between the more egalitarian and the less egalitarian country groups. However, the average school reopening timing varied substantially: school reopenings occurred much sooner after maximum lockdown in the more egalitarian country group. In Figure 1, dots on the single-country mobility lines indicate the day of school reopening in each of the countries. Country lines without a dot had not yet reopened schools at the last day of observation. For countries that never fully closed schools, the dot is at day zero. There are clearly more purple dots, and they are located closer in time to the maximum lockdown. On average, schools reopened 28 days sooner in the more egalitarian group, and at 14% above the average time spent in residential areas, compared with at 8% in the less egalitarian group. In other words, reopening the schools was given a higher priority than other societal reopenings in the more egalitarian countries.

Figure 1. General mobility levels and school openings in single countries and country groups.

Figure 2A indicates that 40 days after the maximum lockdown, about half of the more egalitarian countries, but only about one-quarter of the less egalitarian countries, had reopened schools, at least in some regions or for some grades. The intensity of school openings also varied by gender ideology: 80 days after lockdown, schools were fully reopened in about 45% of the more egalitarian countries, but in less than 10% of the less egalitarian societies (Figure 2A).

Figure 2B shows a scatterplot of school reopening timing and the factor value (continuous measure) for ideology on maternal employment for all countries. A significant linear trend is present: a more egalitarian ideology correlates with faster school reopenings ($r = -.42$). A number of countries had not yet reopened schools before the first day of summer break, and most of these countries are in the less egalitarian group. Some of the countries with schools that were still closed at the last observation are in the Americas, where the lockdowns started sooner relative to the SARS-CoV-2 infection peak. Therefore, further testing of whether the association between gender ideology and school reopenings holds

when controlling for infectious activity is necessary.

Figure 2C shows model-based predicted values of school openings by ideological group, net of country-specific SARS-CoV-2 infection rates and residential mobility levels (dashed lines with confidence interval bands). The figure shows that the model-based predictions generally correspond well to the observed opening rates (solid lines). During the two weeks immediately after the maximum lockdown, schools were closed in most countries, and predicted school closure probabilities did not vary significantly between the two groups. Thereafter, school reopenings occurred significantly faster in the egalitarian country group, particularly between 20-70 days after maximum lockdowns, which confirms that the descriptive pattern holds.

Figure 2. **Panel A:** trajectories concerning general mobility and school openings in countries that are less, and countries that are more supportive towards maternal employment. **Panel B:** Bivariate association between the maximum lockdown and the school opening in the country against the continuous ideology-measure. **Panel C:** Actual school opening trajectories of less and more egalitarian countries compared to model-based predictions (panel regression model that predicts school openings based on gender ideology, interacted with days since maximum lockdown, controlling for general mobility levels and for infection cases).

Robustness Checks and Further Analyses

We conducted several robustness checks (details in supplementary material). First, in order to test the robustness of our attitudinal measure, we replicated our main model using the

single attitudinal items from the ISSP 2012 instead of the factor variable, which yields robust results ($n_{\text{countries}} = 35$).

Second, we utilized an alternative source of attitudinal data, the European/World Value Surveys (EVS/WVS, Wave 2017-2020), to replicate a subset of the analysis in a larger sample of countries ($n_{\text{countries}} = 61$). EVS/WVS cover more countries but have fewer suitable attitudinal items. However, there is one item that is included in both, the ISSP and the latest wave of WVS/EVS. The regression model with this item and the larger sample of countries confirms our main result.

Third, we apply a different modelling strategy and study school openings using survival analysis. These analyses test whether gender ideology affects the school opening rate (hazard rate). However, using survival analysis, we can only study countries that were closed at the date of maximum lockdown (which is the case for 31 out of the 35 countries in our main sample). Results are robust for this alternative modeling strategy, i.e. the effect of gender ideology is highly significant and a one-point increase in the standardized attitudes measure reduces the predicted time to school opening by around a third.

Fourth, we tested for alternative explanations related to countries' resources and readiness to 'pandemic-proof' schools, to organize digital distance learning, to respond to a health emergency, and to the countries' age structure. We controlled for a country's GDP, social spending measured as share of GDP spent on social expenditures, degree of digitalization measured with the Digital Adoption Index by the World Bank, and health system capacity measured with the Global Health Security Index (GHS) by the Johns Hopkins Center for Health Security, the Nuclear Threat Initiative (NTI) and the Economist Intelligence Unit

(EIU) (separate models). We used a measure for the median population age to control for age structure, because countries with older populations are more vulnerable to severe SARS-CoV-2 cases. Our findings are robust to controlling for either of these factors.

Fifth, we examined the timing of school holidays and an alternative coding of academic breaks. We control for the time between maximum lockdown and the beginning of an academic break (summer holiday in the Northern Hemisphere) because e.g. countries with earlier summer break may have opened schools sooner, to provide students with at least some time in school before the start of summer break. Further, we test coding summer breaks as ‘closed’ instead of cutting the observations off, because countries may have deliberately delayed school holidays due to the pandemic situation. The main effect remains robust in these models.

Sixth, we examined whether ‘lived’ gender roles, measured as maternal employment rates, affected school reopening schedules, rather than ideal gender roles. Policy-makers in the less egalitarian countries may have perceived school closures as less costly, because of lower maternal employment rates in these societies – which might be an accurate assessment, if only direct, economic costs are taken into account. Yet, while the groups of countries differ in maternal employment rates of very young children (under school age), average employment rates of mothers of school aged children aged 6-14 are very similar (74% in less compared to 77% in more egalitarian countries). Controlling for the employment rate of mothers with school-aged children does not change our findings. This supports the idea that decision-making was in fact driven by bias, and not by an accurate economic assessment.

We also test, seventh, for alternative cultural-attitudinal explanations. Gender ideology may be correlated with attitudes toward children, for instance child-rearing values, or with a society's attitudes toward social norm adherence. Recent research demonstrates that nations which are culturally "tight", i.e. they show strict control of and abidance to social norms, had significantly fewer Covid-19 cases and deaths (Gelfand et al. 2021). Thus, if gender ideology is correlated with conformity-values or cultural "tightness", the effect of gender ideology on school closure policies may be spurious. We therefore control for two indices that capture these dimensions, child-rearing values (Tillman 2013) and cultural "tightness"(Eriksson et al. 2021) and our main finding stays robust, further underscoring an effect of gender ideology on school closure durations that is independent of other cultural framings.

Finally, we conducted a placebo test, and estimated the effect of gender ideology on the reopening pace of other containment measures, using the Oxford covid-19 government response tracker. We compute an index of all government containment responses, except for closure of educational facilities. Attitudes toward maternal employment do not predict the liftings of the other containment measures. This further underscores that *gender ideology bias* is relevant for school-related pandemic policies, which have far-reaching gendered implications, but not for other containment measures, which's consequences are less gendered.

Discussion and Conclusions

Across the world, school closures have become a commonly used, yet highly debated Covid-19 pandemic containment measure. A year into the pandemic, it is well documented that school closures lead to an earthshattering array of adversarial consequences for children, adolescents, and families, and that they exacerbate social and gender inequalities. At the same time, conclusive scientific evidence on a societies' overall development of SARS-CoV-2 transmission rates in the case of open versus closed schools, isolated from other measures, is still lacking, as are clear-cut criteria for whether and when schools shall be shuttered to slow transmissions (Heavey et al. 2020; S. Kim et al. 2020; Stein-Zamir et al. 2020; Li et al. 2020; Macartney et al. 2020; Abdollahi et al. 2020; Behörde für Schule und Berufsbildung 2020; Lee and Raszka 2020; Ehrhardt et al. 2020; Auger et al. 2020; Walsh et al. 2021). Also, little is known on whether school closures may be effective in slowing transmissions, if at all, because they restrict children's or because they decrease parents' mobility. Unfortunately, such evidence is not easy to come by and will likely remain amiss for a while. It requires tracing transmission-chains in schools, families and communities, differentiated by adults and children, children's ages, and hygiene- and distancing measures practiced inside and outside of schools. It also requires a deeper understanding of children's and parents' whereabouts, caregiver-arrangements and social contacts when schools are shuttered, in particular in case of extended school closures when (working-) parents may have exhausted time, financial and emotional resources for home-based care and schooling. Stagnation or even increases in SARS-CoV-2 transmissions in the public and private realm may well result when kids are moved from controlled school

settings to potentially less well-supervised and less-regulated private settings, because they will likely continue to have social contacts, including increased contacts with the elderly (Brooks et al. 2020). Indeed, a tracing study from Austria demonstrates that around 90 percent of transmission clusters occurred in households and private or health-related social settings, while only about 2.5% occurred in school settings, during the first half of November 2020 when schools were fully open (AGES - Österreichische Agentur für Gesundheit und Ernährungssicherheit GmbH 2020). While evidence on SARS-CoV-2 transmissions in schools is rapidly emerging, studies on changes in family- and community-based SARS-CoV-2 transmission rates as a consequence of shuttered schools are largely lacking, and with them clear guidance for policy-makers on school related decision-making for pandemic containment. To complicate the picture, the debate on whether evidence from in-school transmission studies shall be evaluated in terms of their absolute numbers, or relative to rates of virus spread in the surrounding communities, and how much school-based SARS-CoV-2 transmission justifies shuttering schools in the face of the many negative mental health, educational, and social consequences, is nowhere near settled (Oster 2020).

In the absence of such clear epidemiological guidance, policy-makers' decision-making on how to handle schools in the pandemic is left to their own judgement. Indeed, emerging research suggest that policy-makers have largely relied on ideational factors for making decisions related to the handling of schools in the pandemic. For instance, leaders across Europe may have been guided by their political goal-priority mixes such as by work-family focused versus education focused versus social inequality-prevention focused pandemic containment strategies (Blum and Dobrotić 2020). Also, partisanship and the strength of

teachers' unions have likely driven school reopening decisions across US school districts in the Fall of 2020, while SARS-CoV-2 infection rates have not (Hartney and Finger 2020).

Our study demonstrates that societal gender attitudes are another important ideational aspect which has impacted school reopening pace and intensity after first wave Covid-19 lockdowns around the world. We find strong and robust evidence for an effect of gender attitudes on school reopening policies in the early phase of the pandemic, an effect that we term *gender ideology bias*. Hence, our findings contribute both to the literature on the relevance of ideas in policy-making, and the literature on gender ideology as a driver of social outcomes. During first wave lockdowns, the gendered consequences of the school closures were not yet systematically documented. Yet, early predictions of growing gender inequality triggered by the pandemic voiced during first lockdowns indeed turned out as correct. Today, studies show that fathers have shared the increased domestic and childcare work during lockdowns, yet, substantial gender imbalances in work divisions at the expense of mothers have remained or widened, and led to even larger gender gaps in domestic and care work in terms of absolute contributions in many societies (Götzinger et al. 2020; Farré et al. 2020; Yildirim and Eslen-Ziya 2020; Hank and Steinbach 2020; Craig and Churchill 2021; Del Boca et al., n.d.; Hipp and Bünning 2020; Meraviglia and Dudka 2021; Shafer, Milkie, and Scheibling 2020; Fodor et al. 2020). Also, mothers have disproportionately lost or reduced employment compared with fathers (Alon et al. 2020). In other words, *gender ideology bias* and other biases leading to extended school closures have profound social and gendered consequences.

Our study has limitations. First, we assume that our measures for average societal gender

attitudes represent well the attitudes of policy-decision makers, or at least the ideation they adjust their decision-making to. However, in this study, we are not able to trace this *gender ideology bias* at the individual level. Second, we exclude an array of plausible alternative explanations and factors which may mediate the effect of ideology on school reopening schedules. However, in the absence of randomized treatments, our observational study estimates the effect of gender ideology on school reopening by using causal inference methods, and thus rests on the assumption that no omitted-variable bias is present. In other words, we cannot be absolutely certain that other unobserved factors, which are caused by or strongly correlated with gender ideology themselves, may drive our findings and pose a threat to causal inference. For instance, while we can exclude that the gender ideology effect is driven by child-rearing values or rule adherence norms, we cannot exclude that there may be other cultural factors, which may ultimately drive both, gender ideology and the prioritization of school reopenings. Third, we show the relevance of gender ideology and the likely existence of a *gender ideology bias* for policy-decision making regarding schools during a pandemic, yet, our findings are not necessarily extendable to non-pandemic times, which allow for more time for and less pressure in decision-making. Finally, political leaders from different countries may have communicated with and influenced each other during first lockdowns, which might imply that our study does not meet the ‘stable unit treatment value assumption’ of causal inference, which implies that there is no interference between units, i.e. they react independently from one another (Rubin 1980; Gangl 2010).

To close, our study suggests that gender ideation plays an important role for school closure policy-decision making in the Covid-19 pandemic. Much is at stake for societies’ futures

when the well-being, mental health, educational prospects of children, as well as gender and social inequality are compromised due to shuttered schools. Despite their limitations, our results therefore offer an important self-reflection tool for those in decision-making positions, urging them to consider their potentially hidden gender role ideation and assumptions on mothers' roles before making far-reaching decisions on school closures. Our findings also imply that countries with unequal gender role ideals more readily implement pandemic containment measures that compromise gender equality, which likely implies steeper losses in women's empowerment in societies that where less gender equal to begin with.

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Supplementary Information: Countries Embracing Maternal Employment Have Opened Schools Sooner after COVID-19 Lockdowns

--- Replication files will be provided online upon publication ---

The sections *Data and Measures* and *Country Selection and Sample Exclusion* combine the information for main analyses and robustness checks.

Data and Measures

School status and opening. Information on school closure status is from the UNESCO database “global monitoring of school closures caused by COVID-19” (UNESCO, 2020). Please see this methodical note for more information: https://en.unesco.org/sites/default/files/en_methodological_note_-_unesco_map_on_covid-19_caused_school_closures_reopening_final.pdf

The data can be accessed here: <https://en.unesco.org/covid19/educationresponse>

Gender ideology (attitudes toward maternal employment). Information on attitudes toward maternal employment are from the Changing Gender Roles IV-module of the 2012 International Social Programme (ISSP) 2012 (ISSP Research Group, 2016).

The data can be accessed here: <https://dbk.gesis.org/dbksearch/SDesc2.asp?DB=D&no=5900>

Robustness checks: Alternative source for measuring gender ideology (attitudes toward maternal employment). An alternative source of attitudinal data is the World Value Survey (WVS) / European Value Survey (EVS) (EVS/WVS, 2020). These surveys cover more countries but have fewer suitable attitude items. There is one item that is included in both the ISSP and the latest wave of WVS/EVS (survey years: 2017-2020): *Child suffers* (“a pre-school child is likely to suffer if his or her mother works”). We conducted a robustness checks with this single item from the WVS/WVS to test our findings on a different, and larger set of countries ($n_{\text{countries}} = 61$; see Table S1 for the list of all countries).

The data can be accessed here: https://search.gesis.org/research_data/ZS7505

Mobility patterns as measures of social activity. To measure where societies are located on the lockdown-normality continuum, we use aggregate mobility patterns provided by the Google Covid-19 Community Mobility Reports (Google LLC, 2020).

The data can be accessed here: <https://www.google.com/covid19/mobility/index.html?hl=en>

Covid-19 infection cases. Information on daily new infection cases is provided by *Our World in Data* (OWID) (Roser *et al.*, 2020). OWID draws these data from the European Centre for Disease Prevention and Control (ECDC).

The data can be accessed here: <https://ourworldindata.org/coronavirus> ;
<https://covid.ourworldindata.org/data/owid-covid-data.csv> (this link starts the download)

Robustness checks: Gross domestic product (GDP) per capita. Information on gross domestic product (GDP) per capita is also provided by *Our World in Data* (OWID), and is published within the Covid-19 summary table linked above (<https://covid.ourworldindata.org/data/owid-covid-data.csv>) (Roser *et al.*, 2020). OWID draws these data from the World Bank.

Robustness checks: A country’s level of digitization – Digital Adoption Index by the World Bank. A country’s level of digitization determines feasibility of digital, remote learning. As a measure for a country’s level of digitization, we use the World Bank’s Digital Adoption Index, a worldwide index that

measures countries' digital adoption among government, businesses, and the population.

The data can be accessed here: <https://www.worldbank.org/en/publication/wdr2016/Digital-Adoption-Index>

Robustness checks: Health system capacity – median age and the *Global Health Security Index (GHS)* by the *Johns Hopkins Center for Health Security*, the *Nuclear Threat Initiative (NTI)* and the *Economist Intelligence Unit (EIU)*. Age predicts the probability that an infected person required medical care, therefore, a country's median age is a proxy for the share of severe infection cases (Dowd *et al.*, 2020). Data on median age is provided within the data on Covid-19 cases, see above. To capture the preparedness and capacity of a country's health system, we use the Global Health Security Index (GHS) and median age of the population. The GHS was specifically designed to capture a country's preparedness for "biological threat", including "infectious disease outbreaks" (Cameron, Nuzzo and Bell, 2019).

The data can be accessed here: <https://www.ghsindex.org/report-model/>

Robustness checks: Government primary expenditures. Data on government primary expenditure – a proxy for the size of the welfare state – is from the International Monetary Fund (IMF), and is measured as percent of Gross Domestic Product.

The data can be accessed here: https://www.imf.org/external/datamapper/prim_exp@FPP/

Robustness checks: Child-rearing values, conformity vs. individual autonomy. Data on child-rearing values is from the World Value Survey (WVS) / European Value Survey (EVS) – see above. These surveys include a question on characteristics that respondents find desirable in children. The index for conformity vs. individual autonomy values is constructed following Tillman (2013). It is a score that counts how many values are named that are rather associated with conformity and order (good manners, obedience, and religious faith; these enter as +1 each), and how many values that are rather associated with individual autonomy and self-expression (independence, imagination, and tolerance; these enter as -1). These data are available for 27 of our sample countries.

[Data access: see above → "Robustness checks: Alternative source for measuring gender ideology"]

Robustness checks: Cultural tightness-looseness. Data on cultural "tightness-looseness" come from Gelfand *et al.* (2021) who draw them from Eriksson *et al.* (2021). This measure is a proxy for the strength of societal norms and the tolerance for people who violate them. It is an average over six items which include the following: "There are many social norms that people are supposed to abide by in this country", "There are very clear expectations for how people should act in most situations", "In this country, if someone acts in an inappropriate way, others will strongly disapprove", and "People in this country almost always comply with social norms". This measure is available for 23 of our sample countries.

The data can be accessed here: <https://osf.io/zvnd3/>

Robustness checks: Maternal employment. Data on maternal employment come from the OECD Family Database ("The labour market position of families"), and refer to the employment rates of mothers whose youngest child is aged 6-14, which corresponds to compulsory school ages in many countries (OECD, no date). These data are available for 26 countries from our sample.

The data can be accessed here: <https://www.oecd.org/social/family/database.htm>
https://www.oecd.org/els/soc/LMF_1_2_Maternal_Employment.xlsx (this link starts the download)

Regression Tables: main model and two further models

Table S3 displays the linear probability regression model, which was the basis for the predicted probabilities displayed in Fig. 4 in the main paper. The model is a panel regression model (daily

observations nested in countries) with random effects (random intercept) at the country level.

Note that the predictions as displayed in Fig. 2 C) in the main paper and in Fig. S1 in this appendix are based on the day-specific average values of mobility and infection cases. As an example, the points for day 40 after the maximum lockdown are not predicted for the grand average value of mobility and infection cases, but rather for the average mobility and infections data on day 40 over all countries. The displayed prediction curves are predicted for the average attitude score of the less egalitarian country group (value of the attitude variable = -0.34; displayed in orange) and for the average attitude score of the more egalitarian country group (value of the attitude variable = 0.36; purple).

The second model in this table compares the categories “all schools in country are open” vs. “all schools are closed or some are open”. Fig. S1 plots the predicted probabilities based on this model. This model confirms that egalitarian attitudes are also significantly associated with schools being fully open.

The third model uses a dependent variable that makes use of all available information on school openings. The variable is coded zero if all schools in the country are closed, 0.5 if schools are partly open, and one if schools are fully open. The results are consistent: e.g., at 40 days after maximum lockdown, the predicted value of the outcome variable is 0.19 points higher for the average attitude score of the more egalitarian country group than for the average attitude score of the less egalitarian country group. However, as the value of this outcome variable is more difficult to interpret (it cannot be easily interpreted as a predicted probability), we do not show these models in the main paper.

Robustness Checks

We perform a number of additional tests to examine whether our results are robust. To examine the results from these further analyses, we compare the effect of attitudes at day 40 after the maximum lockdown in various different models and specifications. This effect is calculated as the marginal effect (of an increase of one standard deviation) of the standardized attitude variable at day 40 (the interaction term between attitudes and time implies that the effect of attitudes is different at different times). All predictor variables are standardized. All alternative resulting predictor coefficients of maternal employment ideology are depicted in Fig. S2 below, which shows point estimates and confidence intervals. Each graphed predictor corresponds to one alternative model, which is discussed below in the order in which the depicted coefficients are shown, from top to bottom.

Gender ideology: single items. As an alternative measure for attitudes toward maternal employment, and to test whether the effect might be driven by a single, specific aspect of attitudes, we test all attitudinal items separately (the models are the same as the main model displayed in Table S3, with the exception that the composite attitude variable is replaced by the single item). The results show that there is a significant and substantial effect of all single items, and that the effect does not rely on one specific operationalization of attitudes.

Sample selection and variation. The ISSP contains one item that is also part of the latest wave of WVS/EVS. To test whether the results also hold for different samples of countries, we run a model that includes this item from the WVS/EVS data. The result is robust: there is a substantial and significant effect of more supportive attitudes toward maternal employment. This indicates that our results are not dependent on the specific sample of countries.

Alternative modeling strategy. In the main analyses, we ran linear probability models (LPMs). As a robustness check, we apply a different modelling strategy and study school openings using survival analysis. These analyses test whether gender ideology has an effect on the school opening rate (*hazard rate*). However, using survival analysis, we can only study countries that were closed at the date of maximum lockdown (which is the case for 31 out of the 35 countries in our main sample). As Table S4

shows, results are robust for this alternative modeling strategy. A one-point increase in the standardized attitudes measure reduces the predicted time to school opening by 34.3%.

Controlling for GDP. As a further robustness check, we include gross domestic product per capita (GDP) in the model. Richer countries (=higher GDP) might be able to ease lockdown measures faster than poorer countries because they have more resources to open safely (e.g., resources to cover the cost of hygiene and security measures, such as the usage of face masks and disinfection); and their medical systems are more advanced, which means that they can sustain higher infection rates without their medical systems collapsing (e.g., they have more hospital beds and medical ventilators). Attitudes toward maternal employment are associated with the level of economic development of a country, as captured by the GDP. For the main models, we have chosen not to include GDP, as it might result in overadjustment (Schisterman, Cole and Platt, 2009). For this additional model, GDP is logged and enters the regression as the main term, and in interaction with days since maximum lockdown, and with the square-term of days since maximum lockdown. As Fig. S2 shows, the effect of attitudes on school openings remains robust when we include the control for GDP (however, the standard errors increase).

Controlling for level of digitization. A country's level of digitization determines feasibility of digital, remote learning. Digitization and gender ideology are both closely linked to economic and social development. In consequence, digitization and gender ideology are also correlated. Therefore, as a further robustness check, we control for a country's level of digitization. The aim is to rule out the possibility that gender ideology is a significant and substantial predictor, because it captures an effect that is actually due to the digitization. The index for digitization – the Digital Adoption Index by the World Bank – enters the regression as the main term, and in interaction with days since maximum lockdown, and with the square-term of days since maximum lockdown. As Fig. S2 shows, the effect of attitudes on school openings remains robust.

Controlling for health system capacity and age structure. Covid-19 is particularly dangerous for countries that have low capacities in the health care system, and that have an older population. Such countries might generally react with harsher containment measures, including school closures. To account for this, we run a robustness check where we control for median age and a measure of health system capacity, the Global Health Security Index (GHS). As shown in Fig. S2, the coefficient of gender ideology remains robust. We further test the two most relevant sub-dimensions of the GHS-Index and results are robust (results not shown here). These are the sub-dimensions: “3. Rapid Response – Rapid response to and mitigation of the spread of an epidemic” and “4. Health System - Sufficient and robust health system to treat the sick and protect health workers” (Cameron, Nuzzo and Bell, 2019; Ravi *et al.*, 2020). GHS-Index and median age enter the regression as the main terms, and in interaction with days since maximum lockdown, and with the square-term of days since maximum lockdown. As Fig. S2 shows, the effect of attitudes on school openings remains robust when we include the controls for health system.

Controlling for government primary expenditures. Countries with higher government primary expenditures might open schools sooner for two reasons. First, countries with a relatively large welfare state might have a culture of prioritizing public institutions over private ones and might therefore be more likely to prioritize school openings over, e.g., shop openings. Second, countries with a larger welfare state might have greater resources, e.g. personnel, to make schools pandemic proof. To account for this, we run a robustness check that controls for government primary expenditure as percent of the GDP. This measure enters the regression as the main term, and in interaction with days since maximum lockdown, and with the square-term of days since maximum lockdown. The coefficient of gender role attitudes remains robust.

Controlling for timing of school holidays. We control for the time between maximum lockdown and the beginning of an academic break (summer holiday in the Northern Hemisphere) because e.g. countries with an earlier summer break (relative to the pandemic) may have opened schools sooner, to provide students with at least some time in school before the start of summer break. This measure enters the regression as the main term, and in interaction with days since maximum lockdown, and with the square-term of days since maximum lockdown. As Fig. S2 shows, the effect of attitudes on school openings remains robust when we include the control for timing of school holiday.

Code schools during holidays as “closed”. In our main analyses, school holidays are coded as missing (and not as “open” or “closed”). This makes sense if we take holiday periods as exogenous: the academic calendar is neither cause nor consequence of the pandemic. However, it might be that some countries change their preset holiday schedules in response to the COVID-19 pandemic. Both directions of change are possible: countries could extend/advance or shorten/postpone holidays. Countries might be motivated to extend/advance holidays, e.g. to avoid bothering with remote learning. Countries could also be motivated to shorten/postpone holidays, e.g. to compensate for the child’s cognitive and social backlog and potentially the parental burden caused by an earlier period of school closure. Therefore, we run a further model with an outcome variable that codes school holidays as “school closed completely”. As Fig. S2 shows, the effect of attitudes on school openings remains robust when we code school holidays as closed.

Controlling for child-rearing values, conformity vs. individual autonomy. Societies with high support of child-rearing values that emphasize children’s conformity over autonomy may be more inclined to open schools later. Therefore, we control for an index that captures child-rearing values and distinguishes between countries that put more emphasis on child qualities that are associated with conformity and order vs. individual autonomy and self-expression. The index for child-rearing values enters the regression as the main term, and in interaction with days since maximum lockdown, and with the square-term of days since maximum lockdown. As Fig. S2 shows, the effect of attitudes on school openings remains robust when we include the control for child-rearing values.

Controlling for cultural tightness-looseness. Previous research suggests that countries with stronger societal norms and lower tolerance for people who violate them, i.e. “tighter” societies, are less affected by the pandemic. Because this general tightness-looseness dimensions might also be related to gender role attitudes, we run a further robustness check that includes this measure. The index for societal “tightness” enters the regression as the main term, and in interaction with days since maximum lockdown, and with the square-term of days since maximum lockdown. As Fig. S2 shows, the effect of attitudes on school openings remains robust when we include the control for cultural “tightness”.

Including maternal employment. As we stated in the main manuscript, the maternal employment rate acts as an alternative explanatory mechanism for the timing of school reopenings. It might be the case that the differences in the timing of school openings are driven by unbiased, rational cost-benefit considerations; and that high maternal employment rates increase the cost of school closures. Therefore, we compare the explanatory effect of attitudes with the explanatory effect of the employment rate of mothers of school-aged children. The employment rate of mothers of school-aged children is generally quite high, at 76% on average. Indeed, the maternal employment rate is below 70% in only three countries (Turkey: 35.6%; Mexico: 50.8%; Ireland: 60.7%).

Fig. S3 compares predictions from three regression models. The first includes only attitudes (our main regression model, as displayed in Table S3); the second includes employment rates instead of attitudes; and the third includes both attitudes and employment rates. A comparison of the first two models shows that the effect of attitudes is around twice as large as the effect of employment rates. The third model shows that once attitudes are introduced, employment rates no longer have an effect, but the effect of

attitudes remains relatively stable and statistically significant. This result supports our main findings. Please see our discussion in response to this line of argument in the main article.

Placebo Test Using an Alternative Outcome Variable. If it is true that gender ideology predicts school openings only through the proposed mechanism, then gender ideology should not predict (changes in) other containment policy measures that are not closely related to gender ideology. Either, these other openings measures should not be correlated with gender ideology, or the control variables should capture the spurious correlation. In other words, the association between gender ideology and school reopenings is not spurious and driven by an unobserved third variable that is correlated with gender ideology and predicts the general speed of lifting containment measures. To test this, we run a placebo test where we exchange the outcome variable. We draw data from the *Oxford covid-19 government response tracker* (Hale *et al.*, 2020). This data collection contains information on government responses concerning the following containment measures: closing of educational facilities, closings of workplaces, cancellation of public events, limits on private gatherings, closing of public transport, orders to confine to the home.

We compute an index of all government containment responses, except for closure of educational facilities¹. If the effect of gender ideology on school reopenings is in fact causal and runs through the proposed mechanism of *gender ideology bias*, then gender ideology should predict school openings, but not the liftings of the other containment measures.

Fig. S4 compares the coefficient of gender ideology on two different outcome variables: school reopenings and an index of other liftings of the other containment measures. To make the coefficient of gender ideology comparable in the two models, the alternative outcome variable is recoded to have the same mean and standard variation as the main outcome variable. Results show that gender ideology does not predict liftings of the other containment measures. The coefficient is statistically insignificant and close to zero. This robustness check provides further support for the proposed causal mechanism of *gender ideology bias*.

Fig. S1. Predictions for the schools being fully open based on a panel regression model that predicts school openings based on gender role attitudes interacted with the number of days since maximum lockdown; controlling for general lockdown intensity and for infection cases (model 2 from Table S2).

¹ This indicator measures something slightly different than our main measure for school openings, e.g. the measure from the *Oxford covid-19 government response tracker* covers not only schools, but also universities. However, additional tests show that results are robust for this alternative measure.

Fig. S2. Robustness checks 1.

Fig. S3. Robustness checks 2. Comparing the effects of attitudes and of employment rates of mothers of schoolchildren.

Fig. S4. Robustness checks 3. Placebo Test.

Table S1. Overview of countries included in the main analyses and different robustness checks (“X” represents that the country is part of that analysis).

Country	Main analyses ¹ N = 35	WVS, item: <i>suffer child</i> N = 61	Control for child-rearing values N = 27	Control for “cultural tightness- looseness” N = 23	Employment rates of mothers N = 26
Argentina	X	X	X	X	
Australia	X	X	X	X	
Austria	X	X	X	X	
Bangladesh		X			
Belarus		X			
Belgium	X				X
Bolivia		X			
Bosnia and Herze		X			
Brazil		X			
Bulgaria	X	X	X		X
Canada	X			X	X
Colombia		X			
Croatia	X	X	X		X
Czechia	X	X	X	X	X
Denmark	X	X	X		X
Ecuador		X			
Egypt		X			
Estonia		X			
Finland	X	X	X	X	X
France	X	X	X		X
Georgia		X			
Germany	X	X	X	X	X
Greece		X			
Guatemala		X			
Hungary	X	X	X	X	X
India	X			X	
Indonesia		X			
Iraq		X			
Ireland	X			X	X
Israel	X			X	X
Italy		X			
Jordan		X			
Kazakhstan		X			
Kyrgyzstan		X			
Latvia	X			X	X
Lebanon		X			
Lithuania	X	X	X		X
Malaysia		X			

Country	Main analyses ¹ N = 35	WVS, item: <i>suffer child</i> N = 61	Control for child-rearing values N = 27	Control for “cultural tightness- looseness” N = 23	Employment rates of mothers N = 26
Mexico	X	X	X	X	X
Netherlands	X	X	X	X	X
New Zealand		X			
Nicaragua		X			
Nigeria		X			
North Macedonia		X			
Norway	X	X	X		
Pakistan		X			
Peru		X			
Philippines	X	X	X		
Poland	X	X	X	X	X
Portugal	X	X	X	X	X
Romania		X			
Russia	X	X	X	X	X
Serbia		X			
Slovakia	X	X	X	X	X
Slovenia	X	X	X		X
South Africa	X				
South Korea	X	X	X	X	
Spain		X			
Sweden	X	X	X	X	
Switzerland	X	X	X		X
Tajikistan		X			
Thailand		X			
Turkey	X	X	X	X	X
Ukraine		X			
United Kingdom	X	X	X	X	X
United States	X	X	X	X	X
Venezuela	X				
Vietnam		X			
Zimbabwe		X			
Argentina	X	X	X	X	

Table S2. Summary table for time-varying, day-specific control variables (macro-level data). ncountries = 35; ncountries X days = 3,109.

	mean	sd	range	histogram
Percent change in time spent in residential areas	12.89	7.63	-2.24;34.32
Daily new cases per million inhabitants, smoothed	22.76	30.89	0.07;202.84
Daily new cases per million inhabitants, smoothed and logged ^a	2.43	1.26	0.07;5.32

Notes: Logged values are computed for the number of daily new cases plus one (to avoid negative values).

Table S3. Main regression model, regression model for alternative codings of the outcome variable, table for one robustness check.

	Main model		(2)		(3)	
	0 = schools fully closed 1 = schools at least partly open		0 = schools fully or partly closed 1 = schools fully open		0 = schools fully closed 0.5 = schools partly open 1 = schools fully open	
Days since max. lockdown	-0.00430***	(-5.16)	-0.00574***	(-7.66)	-0.00574***	(-7.66)
Days since max. lockdown ²	0.0000358***	(5.84)	0.0000767***	(13.81)	0.0000767***	(13.81)
Attitudes (higher = more egalitarian)	0.0366	(0.34)	-0.0887	(-1.11)	-0.0887	(-1.11)
Days since max. lockdown # Attitudes (higher = more egalitarian)	0.0139***	(9.34)	0.00830***	(6.15)	0.00830***	(6.15)
Days since max. lockdown ² # Attitudes (higher = more egalitarian)	-0.000132***	(-9.32)	-0.0000230	(-1.79)	-0.0000230	(-1.79)
Time spent in residential areas	-0.0609***	(-18.19)	-0.0366***	(-12.14)	-0.0366***	(-12.14)
Time spent in residential areas ²	0.000488***	(5.96)	0.000672***	(9.05)	0.000672***	(9.05)
Infection cases	-0.00113***	(-3.41)	0.000410	(1.37)	0.000410	(1.37)
Infection cases, logged	-0.0720***	(-6.71)	-0.0462***	(-4.76)	-0.0462***	(-4.76)
Constant	1.382***	(20.87)	0.599***	(10.84)	0.599***	(10.84)
Observations: countries	35		35		35	
Observations: countries X days	3109		3109		3109	

t statistics in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Infection cases and time spent in residential areas are smoothed using linear polynomial smoothing.

Table S4. Parametric survival analysis, loglogistic survival distribution. Sub-sample: all countries where schools were closed at the date of maximum lockdown.

	Survival analysis	
Attitudes (higher = more egalitarian)	0.657***	(-3.52)
Time spent in residential areas	1.192	(1.24)
Time spent in residential areas ²	0.996	(-0.95)
Infection cases	1.038	(1.88)
Infection cases, logged	0.545	(-1.74)
Observations: countries	31	
Number of failures (= school openings)	20	
Time at risk: countries X days	1756	

Exponentiated coefficients displayed (e.g. the value of 0.657 for attitudes shows that an increase in the attitudes measure reduced the predicted time to school opening 34.3%).

t statistics in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Infection cases and time spent in residential areas are smoothed using linear polynomial smoothing.

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