Less Work, More Labor: School Closures and Work Hours during the COVID-19 Pandemic in Austria

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Abstract

This paper explores the gendered impact of school closures on paid work hours during the COVID-19 pandemic in Austria. We use data from the Austrian Corona Panel Project covering March 2020 to March 2021 to study adjustments in work hours by gender and parental status. Descriptive data shows general reductions in work time, especially in the first months. From July 2020, mothers reduced work hours more than fathers when schools were closed. Using OLS and fixed-effects models, we confirm that mothers reduced their work hours due to school closures. In contrast, we do not find statistically significant reductions for fathers.

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1 Introduction

The COVID-19 pandemic and the subsequent increase in caregiving needs due to school and day care closures threaten to reinforce traditional gender roles between men and women regarding the division of paid and unpaid labor. The initial European response to the COVID-19 pandemic was an aggressive public health policy in the form of school closures, and Austria presents a particularly salient case. It can be assumed that this served to reduce uncertainty and thus suppressed a labor supply response of households. However, infection risks for the elderly inhibited alternative informal child care arrangements (for instance, through grandparents). Combined with a higher number of school closures this may well have precipitated decisions regarding labor supply adjustment. Furthermore, intra-household bargaining may lead to symmetric or asymmetric reductions in labor supply for women and men. Whether parents reduced work time more than childless workers, and whether these reductions differ by gender are the research questions that this paper aims to answer.

We investigate the effect of school closures over the course of the COVID-19 pandemic on work time by parental status and gender in Austria. Austria is a particularly interesting case, because social norms around mothering are rather conservative, marked by tenuous labor market attachment of women even before before the onset of the crisis with high female part-time rates[1] and one of the highest motherhood pay penalties in comparison to other European countries and the United States (Kleven et al. 2019). Furthermore, Austria was affected relatively early and severely by the pandemic, and policy measures aiming to contain the spread of COVID-19 centered mainly on school closures, along with stores and restaurants. This led to a fairly volatile policy of repeated closures and re-openings of schools. Austria reacted with a strict lockdown to its early first wave after "seeding" the virus across Europe (NYT 2020), closing schools and day care facilities for children of all ages and all-but-essential workplaces. Even though the second wave in November 2020 was more severe than the first wave in terms of the number of cases, the political response was more irresolute. Offices continued to operate virtually unrestricted[2], while schools and day

[1] More than 47 percent of employed women in Austria work part-time (Statistik Austria 2020).

[2] Throughout the pandemic, Austria did not issue a work-from-home directive.

cares closed again, then swiftly opened in the beginning of December only to close again after the Christmas break. This back-and-forth, while possibly dubious from a policy-making point of view, introduces a welcome variance from a research perspective. This paper thus investigates the effects of the radical rationing of child care availability through school and day care closures, combined with blocked informal child care arrangements, on women's and men's labor supply.

A few very recent papers investigate this question for the United States, with mixed results. Using a discrete choice participation equation, Rojas et al. (2020) find no evidence that school closures affected unemployment based on weekly unemployment claims data in a time fixed effects model. Heggeness (2020) finds effects on care leave (but not unemployment) of women (but not men) using the Current Population Survey (CPS) in a difference-in-differences (DiD) model for an "early closing" and a "late closing" group of states. Collins et al. (2021) estimate a logistic regression on a unique data set of elementary school closures, and find that mothers reduced their labor market participation more than fathers, with an even larger gap in regions where teaching was largely remote.

Another set of papers uses work hours, a more granular dependent variable than the binary labor market participation or unemployment. This research indicates that in the United States especially mothers of young children seem to have reduced their work time due to limited availability of child care and schools. Amuedo-Dorantes, Kaushal, and Muchow (2020) use CPS data and a DiD model, and find that school closures in the United States reduced parents' weekly work hours between 11 and 15 percent. This effect is larger for young mothers. Barkowski, McLaughlin, and Dai (2020) find no evidence for a gender difference in the reduction of work hours, although their data show that parents of children younger than 13 reduced their working hours more than parents with older children. Finally, Collins et al. (2020) show that in particular mothers of young children reduced their weekly work hours more than fathers.

Whether these findings transfer to the continental European case is not clear *a priori*. Dullien and Kohlrausch (2021) find that during the first COVID-19 wave in Germany, a loss of 1.1 percent of

aggregate work hours can be attributed to school closures at the macro level. However, in their two-wave survey 20 percent of parents of school-aged children state that they reduced their working time due to child care duties. Alon et al. (2021) provide evidence from six different countries, including Germany and the Netherlands, that – in contrast to previous crises – women were more affected than men by the COVID-19 recession. They establish a negative correlation between the severity of school closure measures and the change in overall labor supply, and show evidence for larger gender gaps in work hours for parents of school-aged children.

We innovate by using high-frequency survey data from the Austrian Corona Panel Project (ACPP, Kittel et al. 2020), which comprises 21 waves and covers the period from March 2020 to March 2021. The ACPP includes a wide variety of questions relating to pandemic-life, including information, attitudes, and behaviors. Our main variables of interest are paid weekly working hours, data on policy measures that concern working hours as well as socioeconomic variables, which are included in all of the waves and therefore offer detailed insight. We augment this dataset with unique, hand-coded data on school closures, as well as data on school and workplace closures from the Oxford COVID-19 Government Response Tracker (OCGRT, Hale et al. 2021) data base.

Descriptive results indicate that – after an initial shock at the beginning of the pandemic – work hours stabilized. However, we find clear descriptive evidence that the difference in work time between mothers and fathers increased in times of school closures. OLS and individual-level fixed effects regression models confirm this finding, showing that mothers reduced their paid working time on average by economically and statistically significant 22.2 percent or 5.8 hours per week during school closures. In contrast, we do not find a statistically significant reduction for fathers.

Furthermore, our findings support the hypothesis that school closures capture the intensity of the COVID-19 crisis and that it might in fact have been the main policy variable, since school closures also affect the work time of childless women and men when controlling for workplace closures. Splitting school closures into two variables, one for under 14 year-olds and one for over 14 year-olds, supports this interpretation: School closures for over 14-year-olds then only affect childless

individuals, whereas school closures for under 14-year-olds mainly affect their mothers.

The contribution of this paper to the existing literature is thus twofold: First, we investigate the change in work time due to school closures from the beginning of the pandemic up to March 2021. This allows us to study medium-run effects of increased child care burden on parental labor market outcomes during the COVID-19 crisis. Second, we show that although short-time work schemes likely stabilized employment and work hours in Austria, school closures still appear to reduce mothers' (but not fathers') work hours. We thus confirm that school closures invoke a gendered labor market response. In addition, we provide preliminary evidence that school closures may be a useful measure for the tightness of policy response to COVID-19.

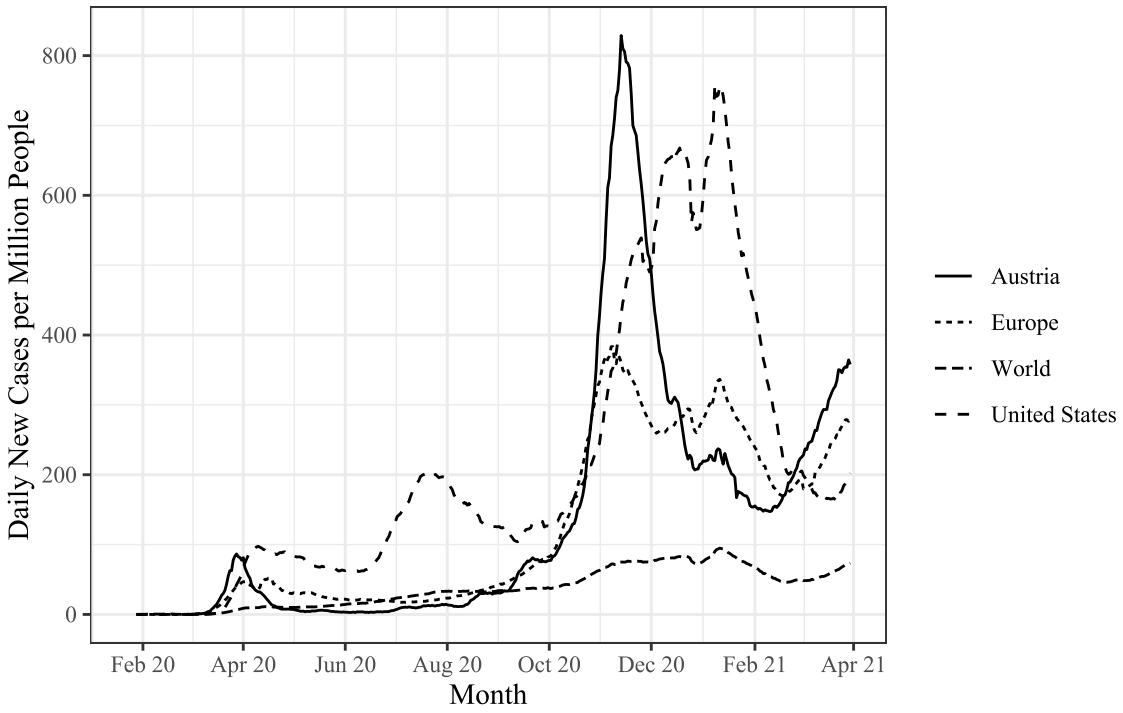
2 The COVID-19 Pandemic in Austria

Austria is a particularly interesting case for investigating the links between school and day care closures, and the labor supply, since its policy response has been highly volatile. Austria was one of the earliest affected countries, as a lax initial policy response to COVID-19 cases in the winter tourism town of Ischgl in Tyrol, a western province of Austria, likely contributed to spreading of the virus throughout Europe (Correa-Martínez et al. 2020; Kreidl et al. 2020). Policy measures were then tightened substantially, and a hard lockdown consisting, among other measures, of school and shop closures reduced the 7-day rolling average of registered daily new infections throughout April and May, with effects lasting roughly until August (see Figure 1).

However, with very few limitations in place until after the fall vacation week in early November 2020, Austria experienced an unprecedented surge of infections in November and December, with new infections reaching the highest level world-wide. A second lockdown in December 2020 and the beginning of January 2021 brought new COVID-19 cases back below the EU-average. Yet, winter sport facilities – in particular skiing resorts – remained open throughout, as did workplaces, and at the time of writing in March 2021, new infections have been once again rising steeply in Austria. Public support for policies in the pandemic has since waned, with less than half approv-

ing of the government's handling; criticism is split roughly equally between those considering the measures to be too lax and those deeming them too strict (Profil 2021).

Figure 1: Daily Confirmed Cases in Austria, Europe, the United States and the World (7-Day Rolling Average) from March 2020 to March 2021



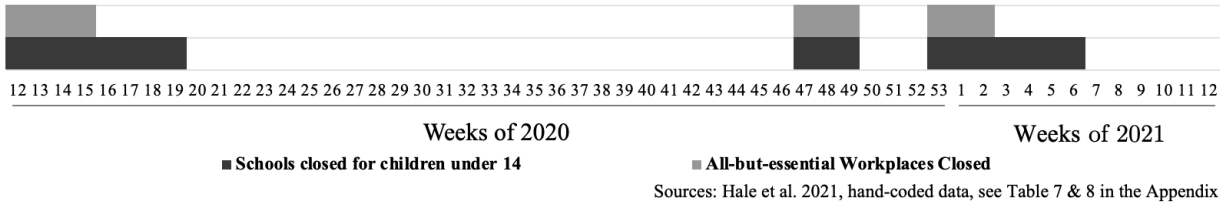
Source: Center for Systems Science and Engineering (CSSE) at Johns Hopkins University

School closures played a key role in restricting social contact in the Austrian policy mix.[3] After the first case of a COVID-19 infection in Austria was documented on February 25, 2020, schools and day care centers, as well as workplaces (excluding essential services) were closed from March 16 onward. As restrictions were slowly eased in May 2020, schools first reopened on May 4 for students in their last year of high school, on May 18 for children under 14, followed by all students on June 3. Schools and shops remained open from June to November 2020. A second nationwide lockdown including a curfew was enacted between November 17 and December 6, 2020, prompting schools to switch to distance learning for children of all ages. Schools briefly re-opened for children under 14 from December 7 until the Christmas break, and closed again for all students

[3]School closures were enacted nationwide throughout 2020 and up to March 2021, although this may change going forward due to increased federalism (ORF 2021). Kindergartens are the responsibility of the federal states and therefore their closings were not unitary since the beginning of the COVID-19 crisis.

after the Christmas break from January 7, 2021. A month later, on February 7, 2021, children of all ages returned to school with restrictions, such as split classes taught in shifts, in place. Figure 2 summarizes the highly volatile profile of repeated opening and closing of Austrian schools.

Figure 2: School and Workplace Closures During the COVID-19 Pandemic by Calender Weeks



Sources: Hale et al. 2021, hand-coded data, see Table 7 & 8 in the Appendix

Finally, in comparison to other high-income countries, Austria experienced an especially deep recession. This is not only due to its dependency on tourism but also because of the number of days in which all-but-essential workplaces were closed, which was high due to the strict lockdown in the first wave and the large number of COVID-19 cases in the second (Huber and Picek 2021). Although stimulus was weak in international comparison (especially in comparison to the US, OECD 2021), it was sizeable for European standards (Ederer 2021). Austria passed two Corona aid packages in quick succession in March 2020 (amounting to four billion Euros and 38 billion Euros, which amounts to roughly 10 percent of the 2020 GDP), and another stimulus package in September 2020 (worth 13 billion Euros, so 3.5 percent of GDP). For employees, support included payments to businesses for funding short-time work, lowering the tax rate in the first income tax bracket, one-off increases in unemployment benefits, and two additional one-off payments in child support (Budgetdienst 2020). These aid packages and labor market measures led to available income dropping less than GDP (-1.9 vs. -5.5 percent respectively, Statistik Austria 2021) relative to 2019[4].

The COVID-19 aid packages contained concrete measures affecting work time. Especially short-time work was heavily used in Austria, which saved up to 1.2 million jobs in 2020 (AMS 2021). By December 2020, Austria had spent 5.5 billion euros, 1.5 percent of GDP, on short-time work. While women make up almost half of the employees on short-time work schemes, they receive only about

[4]So far, there is limited data on gender differences.

40 percent of the payouts (Hehenberger and Pixer 2021). Furthermore, Austria extended paid leave for parents during the pandemic. Each parent is entitled to one week of paid leave due to school closures, one week of care leave for sick children, and up to four weeks of "special care leave" per (school) year[5].

3 Data

In order to investigate the effects of school and daycare closures on labor market outcomes, we augment the panel data of the Austrian Corona Panel Project (ACPP, Kittel et al. 2020) by unique data on school closures, as well as data on school and workplace closures from the Oxford COVID-19 Government Response Tracker data base (OCGRT, Hale et al. 2021). The ACPP contains twenty-one waves between March 2020 and March 2021, which were conducted weekly from April to June 2020, and monthly before and after. It is representative based on gender, age, region and education.

The ACPP covers a broad set of questions relating to pandemic life, including information, attitudes, and behaviors. For the purpose of this paper, the key variables are paid weekly work hours as dependent variable. Our controls include socio-economic variables (gender, children, age, education, migration background, and income) as well as work time variables (short-time work, working from home and furlough). We supplement the ACPP by weekly data on school closures – our main explanatory variable, which we describe below – and workplace closures. The data for the latter comes from the OCGRT.

Since paid work hours are only surveyed for employees and/or self-employed, the estimations exclude the unemployed, pensioners, students, persons in military or community service, parental or educational leave, and those not in the labor force. Work hours are top coded at 80. This yields a total of 22,410 observations, of which 15,363 contain work hours. Weekly working hours are

[5] see Arbeitsvertragsrechts-Anpassungsgesetz § 18b (https://www.ris.bka.gv.at/NormDokument.wxe?Abfrage=Bundesnormen&Gesetzesnummer=10008872&Paragraf=18b).

reported as current average paid hours worked per week including overtime.

School closures is our main explanatory variable. As Table 7 in the Appendix shows, we code the status of day care centers (ages 0 to 5) and schools (primary school and junior high school for ages 6 to 14 years, and senior high school from 15 to 18 years of age) for each wave of the ACPP from newspaper sources and press releases.[6] We define both school closures and parental status for children age 14 or younger, since we expect older children to require less supervision[7]. The resulting data set matches well with the OCGRT for all ages, but is more fine-grained for under 14 year-olds.[8]

For our controls, we consider three age cohorts (30 years or younger, 31 to 50 years, and 51 years and older) and three education categories (less than secondary degree, secondary school degree or equivalent, and tertiary degree). Migration background is defined as the person themselves, or at least one parent, being born outside of Austria. Income is a dummy variable with a cutoff at 2,700 Euro of net monthly household income. In order to control for other factors which may affect work time in the estimation of the intensive margin, we include a dummy variable capturing whether the worker reported being furloughed, that is, involuntarily having to reduce vacation time. We also include a control variable for short-time work, which was used extensively in Austria during the pandemic compared to Anglo-Saxon countries (Adams-Prassl et al. 2020; AMS 2021). We also include a dummy variable indicating whether an individual is working from home. Finally, we attempt to control for unobservable pandemic-related factors by including a variable for waves in which workplaces were closed. This variable comprises three values, which are defined in the OCGRT as (1) "recommend closing (or recommend work from home)," (2) "require closing (or work from home) for some sectors or categories of workers" and (3) "require closing (or work from home) for all-but-essential workplaces" (see Table 7 in the Appendix for details).

Table 1 provides an overview of the summary statistics of our variables. Mothers and fathers make

[6]For a detailed overview of sources, see Table 8 in the Appendix.

[7]At 14, children are considered of age in several respects in Austria, including sexual consent, criminal responsibility, and self-determination in medical, religious, and educational matters.

[8]For a robustness check, we use the full four values of the OCGRT; see section 4.1.

Table 1: Summary Statistics for Different Groups in the ACPP (weighted)

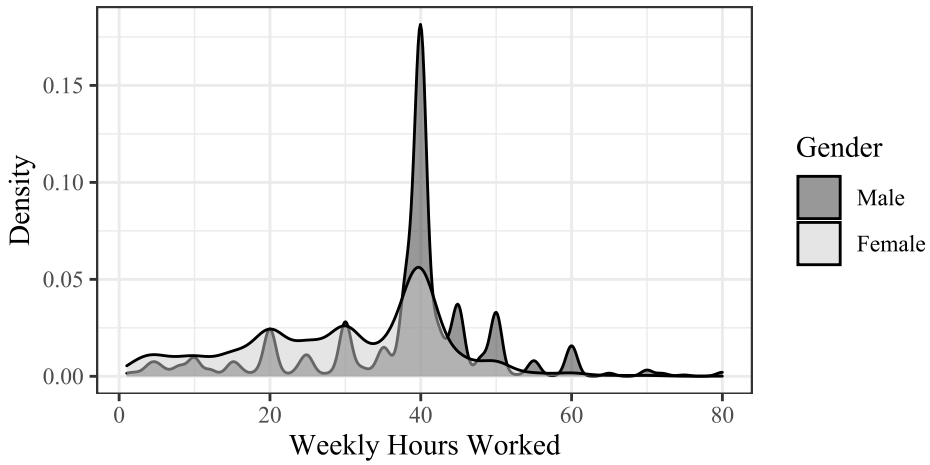
		Parents		No Children	
	Full Sample	**Mothers**	**Fathers**	**Women**	**Men**
Paid Weekly Working Hours					
Mean	33.8	26.3	37.1	29.3	37.2
Median	39.0	25.0	40.0	35.0	40.0
SD	13.6	13.8	10.8	13.8	13.2
Age Group (in %)					
15-30 Years	28.4	18.4	19.9	33.6	33.0
31-50 Years	46.0	76.0	67.3	31.2	33.4
51-65 Years	25.6	5.7	12.8	35.3	33.6
Education (in %)					
Below Secondary	61.5	56.2	68.6	55.5	65.3
Secondary	25.1	25.0	19.5	28.0	23.0
Tertiary	13.5	18.8	11.9	16.5	11.7
Migration Background (in %)	29.6	36.0	38.4	28.1	23.8
High Income (in %)	45.5	52.5	55.5	37.1	48.9
Work-time Related Variables (in %)					
Work from Home	26.2	27.3	26.6	24.7	27.6
Short-time Work	16.3	14.5	18.1	17.3	15.6
Furlough	5.8	8.0	6.6	5.4	5.3
N	22410.0	3317.0	3275.0	7665.0	8153.0

Source: ACPP, Kittel et al. 2020

up 14.8 and 14.6 percent of the full sample, respectively. Paid weekly work hours are highest for men without children under 14 on average (at about 37.2 hours per week), and lowest for mothers (26.3 hours). Median weekly work hours range from 25 for mothers to 40 for both fathers and childless men. Individuals between 31 and 50 years of age make up the largest share in all groups, except for women without children, where 35 percent are between 51 and 65 years of age. As is to be expected, the oldest age group (51 to 65 years) is underrepresented in the parent samples. 62 percent of the sample's individuals hold less than a secondary degree; this share is higher for men and lower for women. The highest share of university degrees is in the sample for mothers at 19 percent. About 30 percent of individuals in the sample have a migration background; parents are more likely to have a migration background, at 38 percent for fathers and 36 percent for mothers.

The income threshold roughly splits the sample in half, except for (younger) childless women. Over a quarter of individuals reports working from home, between 15 and 18 percent being on short-time work, and around 6 percent being furloughed.

Figure 3: Density of Paid Weekly Hours Worked by Gender

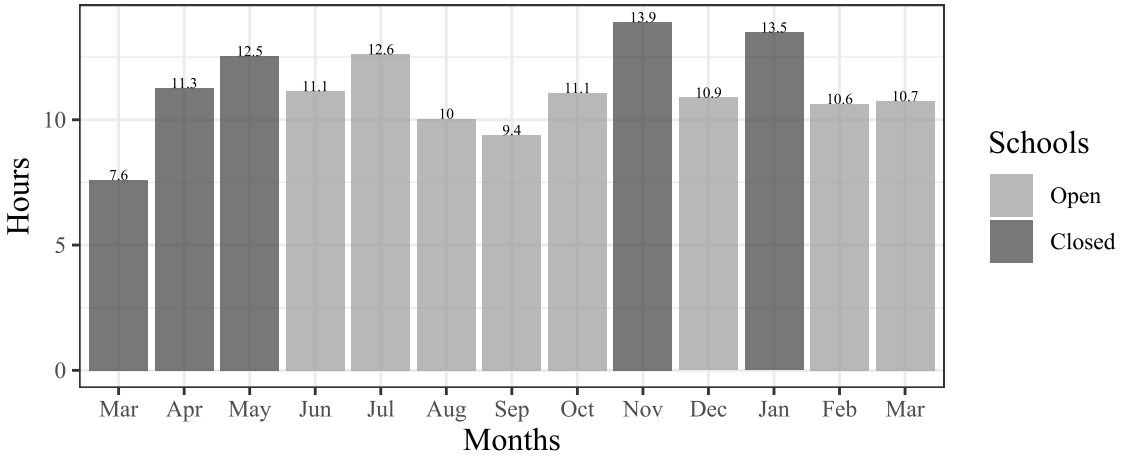


Source: ACPP, Kittel et al. 2020

Figure 3 shows the density of paid weekly work hours for women and men. It provides visual evidence of bunching, which is particularly noticeable at full time work of 40 hours for women and especially for men. Furthermore, women are more likely than men to report working part time. Figure 4 shows the monthly difference in average working hours of parents by gender, color-coded by the state of school closures.[9] Open schools appear to be associated with a smaller difference in work hours between fathers and mothers. This is especially salient for the second half of 2020 after the initial shock of the pandemic in March and April 2020 had worn off over the summer months (which included the traditional vacation month of August).

[9]For the level of monthly average work hours by gender and parental status, see Appendix figure 5.

Figure 4: Difference in Paid Work Hours between Fathers and Mothers by Month, March 2020 to March 2021



Source: ACPP, Kittel et al. 2020

4 Results

We investigate next whether the gendered link between labor force participation and work time with school closures carries over to a multivariate analysis. To do so, we first estimate the effect of school closures on weekly work hours using an OLS regression, before turning to individual-level fixed effects models.

The following equation shows our OLS regression with wave dummies:

$$log(WH_i) = \beta_0 + \delta_1 SC + \delta_2 F + \delta_3 M + \delta_4 SC \times M + \delta_j X + \gamma_1 x_{wave} + \epsilon_i, \qquad (1)$$

where the dependent variable $log(WH_i)$ is the natural logarithm of an individual's paid weekly working hours, and SC denotes school closures. F indicates women, M mothers with children younger than 14 in the household, and $SC \times M$ is the interaction of school closures with mothers. The control vector X contains gender, age, education, income, migration background and workplace closures. We also extend the control vector X by variables which comprise measures that directly affect work time, namely short-time work, being furloughed and working from home. We include a wave dummy x_{wave} with the first week of April 2020 as baseline.

Table 2: The Effect of School Closures on Paid Weekly Working Hours (OLS)

	Dependent variable:		
	log(Paid Weekly Work Hours)		
	(1)	(2)	(3)
Schools Closed	−0.087**	−0.082**	−0.072*
	(0.040)	(0.040)	(0.040)
Female	−0.277***	−0.219***	−0.219***
	(0.014)	(0.016)	(0.016)
Mother		−0.201***	−0.163***
		(0.026)	(0.030)
Mother × Schools Closed			−0.082*
			(0.042)
Age 31-50	0.022	0.052***	0.053***
	(0.019)	(0.020)	(0.020)
Age 51-72	0.006	0.00004	0.001
	(0.020)	(0.020)	(0.020)
Edu High School	−0.001	0.012	0.012
	(0.016)	(0.016)	(0.016)
Edu University	−0.019	−0.011	−0.011
	(0.019)	(0.019)	(0.019)
High Income	0.127***	0.138***	0.138***
	(0.013)	(0.013)	(0.013)
Migration	−0.052***	−0.045***	−0.046***
	(0.016)	(0.016)	(0.016)
Work Closed Some	−0.004	0.0002	−0.0004
	(0.037)	(0.037)	(0.037)
Work Closed All	−0.228***	−0.231***	−0.231***
	(0.054)	(0.053)	(0.054)
Work from home	0.023	0.024	0.024
	(0.016)	(0.016)	(0.016)
Short-time Work	−0.475***	−0.483***	−0.483***
	(0.021)	(0.021)	(0.021)
Furlough	−0.199***	−0.192***	−0.192***
	(0.032)	(0.032)	(0.032)
Constant	3.601***	3.573***	3.569***
	(0.035)	(0.035)	(0.035)
Wave Dummy	Yes	Yes	Yes
Observations	12,392	12,392	12,392
R^2	0.175	0.182	0.182
Adjusted R^2	0.173	0.180	0.180
Residual Std. Error	0.570 (df = 12361)	0.568 (df = 12360)	0.568 (df = 12359)

Notes: This table shows the results of an OLS regression with log paid work time as dependent variable. Robust standard errors in brackets. $*p < 0.1, **p < 0.05, ***p < 0.01$. Base categories are schools open, male, persons without children and fathers, age 15-30, less than high school education, low income, no migration background, workplaces open, not working from home, no short time work, and not furloughed. The baseline of the wave dummy is March 2020. Source: own calculations, data: ACPP, Kittel et al. 2020

Table 2 starts with our base model, sequentially adding mothers in model (2), and the interaction term of mothers and school closings ($Mother \times SchoolsClosed$) for our preferred specification in model (3). The results show that school closures are negatively correlated with paid work time. The reduction amounts to about 7 percent. Furthermore, mothers on average additionally reduce weekly work hours (model (2)). Finally and most importantly, given these two, the interaction term of mothers with schools closed is also negative (model (3)). That is, mothers on average reduced their work hours by about another 8 percent during times of school closures. The control variables age, education, and income all have the expected signs. Having a migration background is negatively correlated with weekly work hours. Our work time variables short-time work and furlough capture some reductions in weekly work hours, as intended, while working from home *increases* them. The required closure of all-but-essential workplaces reduces working time statistically significantly, as we would expect.

In order to more precisely estimate the gender gap in working hours and to leverage the panel structure of the ACPP data, we now turn to person-level fixed effects models. These permit us to study the adjustments in weekly working hours of an individual during the COVID-19 pandemic, while controlling for individual characteristics that remained unchanged over its course. In order to allow the effects between population groups to vary, we split our data into six sub-samples: all women, all men, mothers, fathers, and women and men without children. We then estimate the following individual-level fixed effects model:

$$log(WH_{it}) = \delta_1 SC + \delta_j X + \gamma_1 x_{wave} + \alpha_i + \epsilon_{it} \tag{2}$$

The dependent variable $log(WH_i)$ is again the natural logarithm of an individual's paid weekly working hours. Our main variable of interest ist SC, school closures. The vector of controls X now contains workplace closures, short-time work, work-from-home, and furlough, which (unlike the other control variables of the OLS model) vary over the period of observation and can thus be included. x_{wave} contains time-fixed effects, and α_i time-invariant individual effects, which should

cover age, education, migration background, sector, or constant personal preferences.

We estimate this model for six groups – (1) all women, (2) all men, (3) mothers, (4) fathers, and childless (5) women and (6) men –, as Table 3 shows. Hausman tests (Table 9 in the Appendix) suggest that a fixed effects model is the correct model choice for all six specifications, while random effects models are also possible for models (3) and (4).[10]

Table 3: Person-level Fixed Effects Model (weighted) Comparing the Change in Paid Weekly Work Hours for Women, Men, Mothers and Fathers, and Persons without Children

	Dependent variable:					
	log(Paid Weekly Work Hours)					
	Women	Men	Mothers	Fathers	Women no Child	Men no Child
	(1)	(2)	(3)	(4)	(5)	(6)
Schools Closed	−0.134***	−0.109***	−0.222***	−0.067	−0.093**	−0.126***
	(0.035)	(0.027)	(0.060)	(0.049)	(0.042)	(0.032)
Work Closed Some	0.004	−0.014	−0.007	0.054	0.007	−0.047
	(0.034)	(0.026)	(0.058)	(0.047)	(0.041)	(0.032)
Work Closed All	−0.173***	−0.241***	−0.004	−0.332***	−0.258***	−0.190***
	(0.037)	(0.028)	(0.062)	(0.051)	(0.045)	(0.033)
Work from Home	−0.021	−0.052***	0.026	−0.167***	−0.041*	0.008
	(0.020)	(0.016)	(0.035)	(0.029)	(0.025)	(0.019)
Short-time Work	−0.366***	−0.331***	−0.281***	−0.324***	−0.392***	−0.342***
	(0.023)	(0.017)	(0.044)	(0.029)	(0.027)	(0.021)
Furlough	−0.124***	−0.064***	−0.045	−0.135***	−0.194***	−0.015
	(0.028)	(0.020)	(0.042)	(0.036)	(0.037)	(0.025)
Wave FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,373	8,990	1,824	2,709	4,549	6,281
R^2	0.128	0.116	0.099	0.120	0.148	0.120
Adjusted R^2	0.025	0.027	−0.015	0.028	0.044	0.028

Notes: This table shows the results of time- and person-level fixed effects regressions with log paid weekly work hours as dependent variable for six groups. Standard errors are in brackets and clustered at the individual level. $*p < 0.1, **p < 0.05, ***p < 0.01$. Base categories are schools open, workplaces open, not working from home, no short time work, and not furloughed. The baseline of the wave dummy is March 2020. Source: own calculations, data: ACPP, Kittel et al. 2020

The results of the fixed effects model are shown in Table 3. Both women and men reduce their paid work time in periods when schools are closed; only fathers do not show a statistically significant effect (model (4)). Our main finding is that women reduce their work time more than men during school closures (models (1) and (2)), and this effect is driven by mothers of children under 14

[10] See section 4.1 for random effects models for models (3) and (4).

years of age (model (3)). These mothers on average decrease their paid weekly work hours by economically and statistically significant 22 percent in periods with school closures. Since mothers on average work roughly 26.3 hours per week, this amounts to a reduction of about 5.8 weekly work hours. Childless men and women also show lower work hours in these waves; it is thus possible that the school closures variable also captures indirect policy effects.[11]

School closures may be better at flagging intensive phases of the COVID-19 pandemic than our control variable for workplace closures, although all groups except mothers reduced their work hours statistically significantly during periods when all-but-essential workplaces were closed. The effect is economically significant – the average reduction ranges from 19 percent for childless men to 32 percent for fathers. We do not find an effect on work hours from periods when only some workplaces shut down or switched to working from home.

Short-time work and being furloughed, both policy instruments designed to reduce working hours in times of low economic activity and in order to reduce unemployment as discussed in Section 2, have the expected negative signs and explain some variation in work time. Working from home reduces weekly work hours, statistically significantly for men in general, fathers, and women without children under the age of 14.

These findings fit well with the existing literature. In the short-run, Collins et al. (2020) find that mothers of younger children reduce their working hours by 1.5 to 2 hours per week, while they do not find significant reductions for fathers. While Amuedo-Dorantes, Kaushal, and Muchow (2020) report work time reductions for both mothers and fathers from the beginning of the pandemic to May 2020, they show that mothers reduced their work hours a lot more than fathers (by 30 versus 11 percent, respectively). Our data covers a longer time period and our findings corroborate these results for Austria.

Yet, naturally, our results should be interpreted with caution. First, we are unable to account for the effect of expectations in our estimates, although they likely play an important mediating role in

[11] We investigate this question by including school closures for over 14 year olds in Section 4.1.

determining work time reductions. Given the volatility of policy measures in Austria, which swung between hard lockdowns and almost complete openings, expectations may well have been unstable. If high uncertainty leads to a weaker reduction of work time, then our estimated effects are likely to be conservative. Second, the short-time work schemes and the special care leave implemented in the COVID-19 pandemic in Austria might have stabilized employment and work hours despite additional child care duties for parents. This would also suggest that our estimates for the effect of school closures are conservative.

4.1 Robustness Checks

We check the robustness of our results by, first, differentiating our main explanatory variable – school closures – into schools closed for under 14 year-olds and schools closed for over 14 year-olds, in order to explore whether the school closure variable may capture the strictness of containment measures. Second, we estimate random effects models for mothers and fathers, the two specifications where Hausman tests permitted them. And third, we investigate the effect of school closures on labor supply at the extensive margin, that is labor force participation (which amounts to reducing working hours to zero and dropping out of the labor force).

To investigate in more detail whether school closures in fact capture the stringency of COVID-19 policy measures, we add a third value to our previously binary school closures dummy variable, namely school closures for over 14 year-olds. This variable is hand-coded from official and newspaper sources and checked against the OCGRT like our main explanatory variable (see Tables 7 and 8). The school closures variable may now take the values 0 (open for all), 1 (closed for 15-18 year-olds), or 2 (closed for all). School closures for over 14 year-olds were more extensive than those for under 14 year-olds. We also extend the mother and father samples by parents of children between 15 and 18 years old[12], in order to not contaminate our sample of childless parents.

The results in Table 4 show that school closures for under 14 year-olds do in fact impact mothers'

[12]Naturally, the samples of persons without children are then smaller.

work hours negatively, while school closures for over 14 year-olds have no statistically significant effect. Fathers' work hours do not react to either of the school closures variables, while both childless women and men are the only specifications in which schools closed for over 14 year-olds have a statistically significant impact.[13] Childless men show an effect for both school closures variables. The coefficients for our control variables are qualitatively robust to this change in our main explanatory variable. That school closures for over 14 year-olds has no statistically significant effect for parents, but does have one for childless adults supports our hypothesis that the school closures variable may capture policy stringency in high incidence phases of the COVID-19 pandemic.

Table 4: Person-level Fixed Effects Model (weighted) Comparing the Change in Weekly Work Hours for Women, Men, Mothers and Fathers of Children under 18, and Persons without Children

	Dependent variable:					
	log(Paid Weekly Work Hours)					
	Women	Men	Mothers	Fathers	Women no Child	Men no Child
	(1)	(2)	(3)	(4)	(5)	(6)
Schools Closed >14	0.036	−0.016	−0.046	0.054	0.086**	−0.068**
	(0.033)	(0.026)	(0.057)	(0.043)	(0.041)	(0.033)
Schools Closed All	−0.134***	−0.109***	−0.240***	−0.060	−0.063	−0.137***
	(0.035)	(0.027)	(0.058)	(0.044)	(0.044)	(0.034)
Work Closed Some	0.004	−0.014	−0.033	0.047	0.026	−0.055
	(0.034)	(0.026)	(0.056)	(0.043)	(0.042)	(0.033)
Work Closed All	−0.173***	−0.241***	−0.067	−0.300***	−0.253***	−0.199***
	(0.037)	(0.028)	(0.058)	(0.045)	(0.048)	(0.035)
Work from Home	−0.021	−0.052***	0.043	−0.137***	−0.064**	0.005
	(0.020)	(0.016)	(0.033)	(0.026)	(0.026)	(0.020)
Short-time Work	−0.366***	−0.331***	−0.328***	−0.327***	−0.387***	−0.339***
	(0.023)	(0.017)	(0.040)	(0.027)	(0.028)	(0.022)
Furlough	−0.124***	−0.064***	−0.091**	−0.119***	−0.166***	−0.012
	(0.028)	(0.020)	(0.042)	(0.032)	(0.039)	(0.026)
Wave FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,373	8,990	2,288	3,189	4,085	5,801
R^2	0.128	0.116	0.115	0.115	0.144	0.123
Adjusted R^2	0.025	0.027	0.008	0.023	0.039	0.031

Notes: This table shows the results of time- and person-level fixed effects regressions with log paid weekly work hours as dependent variable for six groups. Standard errors are in brackets and clustered at the individual level. $*p < 0.1, **p < 0.05, ***p < 0.01$. The base categories are schools open, workplaces open, not working from home, not in short-time work, and not furloughed. The baseline of the wave dummy is March 2020. Source: own calculations, data: ACPP, Kittel et al. 2020

[13] That childless women increase their working hours in periods where schools are only closed for older students might be explained by the fact that containment measures were actually relaxed during these phases.

Our second robustness check concerns model choice. We use random instead of fixed effects models to estimate the effects of school closures on work hours for the two specifications where Hausman tests suggested that they are a valid alternative.[14] Table 5 compares the results of the fixed and the random effects models, showing that the results are robust to model choice. In fact, the main difference is a higher explanatory power of the random effects models.

Table 5: Random and Fixed Effects Models (weighted) Comparing the Change in Paid Weekly Work Hours for Mothers and Fathers

	Dependent variable:			
	log(Paid Weekly Work Hours)			
	Mothers FEs	Mothers REs	Father FEs	Fathers REs
	(1)	(2)	(3)	(4)
Schools Closed	−0.222***	−0.219***	−0.067	−0.065
	(0.060)	(0.059)	(0.049)	(0.050)
Work Closed Some	−0.007	0.001	0.054	0.041
	(0.058)	(0.057)	(0.047)	(0.048)
Work Closed All	−0.004	−0.003	−0.332***	−0.329***
	(0.062)	(0.061)	(0.051)	(0.052)
Work from Home	0.026	0.042	−0.167***	−0.129***
	(0.035)	(0.033)	(0.029)	(0.027)
Short-time Work	−0.281***	−0.321***	−0.324***	−0.338***
	(0.044)	(0.042)	(0.029)	(0.028)
Furlough	−0.045	−0.047	−0.135***	−0.144***
	(0.042)	(0.042)	(0.036)	(0.036)
Constant		3.291***		3.624***
		(0.062)		(0.043)
Wave FE	Yes	Yes	Yes	Yes
Observations	1,824	1,824	2,709	2,709
R^2	0.099	0.275	0.120	0.410
Adjusted R^2	−0.015	0.266	0.028	0.405

Notes: This table shows the results of a time- and person-level fixed effects regressions in comparison to random effects regressions with log paid weekly work hours as dependent variable. Standard errors are in brackets and clustered at the individual level. $*p < 0.1, **p < 0.05, ***p < 0.01$. The base categories are schools open, workplaces open, not working from home, not in short-time work, and not furloughed. The baseline of the wave dummy is March 2020. Source: own calculations, data: ACPP, Kittel et al. 2020

[14] The strong exogeneity requirements of random effects models notwithstanding, in particular that covariates are uncorrelated with the unobserved heterogeneity in our model (that is, the time-invariant characteristics are iid across all observations).

Lastly, we examine the effect of school closures on the extensive margin of labor supply. Concretely, we specify the reduced-form logit model:

$$LF_i = \beta_0 + \delta_1 SC + \delta_2 F + \delta_3 P + \delta_4 SC \times F \times P + \delta_j X + \gamma_1 x_{wave} + \epsilon_i, \qquad (3)$$

where LF is labor force participation of individual i, and SC denotes school closures. F indicates women, P parents with children under 14 in the household, and $SC \times F \times P$ is the interaction of school closures with mothers. The control vector X contains gender, age, education, income, migration background and workplace closures. We include a wave dummy x_{wave} with the first week of April 2020 as baseline.[15] For our estimations of the extensive margin, we exclude persons in military or community service, as well as persons under 18 and over 65 years of age. Our dependent variable labor force participation is a dummy variable indicating whether the person reports to be working for pay as employee or self-employed including the unemployed actively looking for a job, during the respective wave. In the full sample, labor force participation is 87 percent. It is lower among women than among men, but especially so for women without children under the age of 14 (79 percent).

The results in Table 6 show that women's labor force participation is lower than men's also when controlling for covariates, and that there is an additional negative effect for mothers. Age, education, and income all have the expected signs. We do not observe statistically significant effects for workplace closures, school closures or the interaction term of school closures with mothers on the probability of being in the labor force. We thus do not find an additional effect of school closures on the labor force participation of mothers. One possible interpretation of this finding is that while school closures did lead to mothers' reducing their work time, COVID-19 policy measures in Austria succeeded in keeping them in the labor force.

[15] Employment status is not covered in the March 2020 survey.

Table 6: The Extrinsic Margin of Effect of School Closures on Labor Force Participation

	Dependent variable:
	Labor Force
Schools Closed	0.200
	(0.203)
Female	−0.725***
	(0.064)
Mother	−0.270**
	(0.131)
Mother × Schools Closed	0.174
	(0.181)
Age 31-50	2.055***
	(0.079)
Age 51-72	1.799***
	(0.088)
Edu High School	0.013
	(0.065)
Edu University	0.942***
	(0.103)
High Income	0.280***
	(0.061)
Migration	−0.073
	(0.064)
Work Closed Some	0.294
	(0.206)
Work Closed All	−0.187
	(0.186)
Constant	1.123***
	(0.167)
Wave Dummy	Yes
Observations	17,221
Log Likelihood	−4,842.865
Akaike Inf. Crit.	9,743.731

Notes: This table shows the results of a logit regression with labor force participation as dependent variable. Robust standard errors in brackets. $*p < 0.1, **p < 0.05, ***p < 0.01$. Base categories are schools open, male, no children, age 15-30, less than high school education, low income, no migration background, and workplaces open. The baseline of the wave dummy is April 2020. Source: own calculations, data: ACPP, Kittel et al. 2020

5 Conclusion

This paper investigates the impact of school closures on paid work time during the COVID-19 pandemic in Austria. It uses high frequency survey data from the Austrian Corona Panel Project (ACPP) from March 2020 to March 2021 and hand-coded data on week-by-week school closures to test for gender differences in the effect of school closures for mothers and fathers of children under 14 – i.e., children with still high care needs – on weekly hours of paid work.

We find descriptive evidence that both women and men reduced their paid work time due to the COVID-19 crisis, especially in the first months of the pandemic in spring 2020. However, after work hours stabilized around July 2020, mothers reduced work hours more than fathers in periods with mandatory school closures.

This descriptive finding is corroborated by both OLS and person- and time-fixed effects models. The OLS model controls for a host of socio-economic factors including age, education, migration status; other factors which may potentially reduce work time in the pandemic, i.e. short-time work, furloughs, and work-from-home; as well as workplace closures, which should account for the stringency of COVID-19 policy measures and thus the intensity of the pandemic.

The fixed effects models control for work-time variables and workplace closures, and show that women in general reduce their work hours more than men. This effect is predominantly driven by mothers, whose weekly work hours fell by an economically and statistically significant 22 percent on average during periods with school closures, or approximately 5.8 hours. In contrast, we cannot confirm a statistically significant change in work hours for fathers. We therefore confirm that school closures prompt a gendered labor market response.

However, we also find an effect of school closures on the work time of childless women and men, which leads us to conjecture that school closures may in fact capture indirect policy effects and thus represent the tightness of COVID-19 measures better than workplace closures. Splitting school closures into two variables, one for under 14 year-olds and one for over 14 year-olds, supports this

hypothesis: School closures for over 14 year-olds now only affect childless individuals, whereas school closures for under 14 year-olds mainly affect their mothers.

These findings are robust to alternative definitions (i.e., parents defined as those with children under 18 rather than under 14) and to model choice (i.e., fixed versus random effects). Estimating a logit model for labor force participation (i.e., the extreme form of hours reduced to zero and a change in labor market status) shows robust gender and parental effects, but fails to confirm the effect of school closures. This may be due to pandemic policy in Austria, which was aimed at maintaining employment mainly through short-time work.

Our results thus strongly suggest that the additional child care responsibilities impacted paid work time differently by gender. Since working from home could not be squared with monitoring children in the long run (Derndorfer et al. 2021), mothers appear to have reduced their work time, while fathers' work time was largely unaffected after the initial shock phase. Especially in the medium run, the COVID-19 pandemic thus reinforced the traditional division of paid and unpaid labor within households in Austria. This development, if diagnosed correctly, will likely have important ramifications for gender differences in economic outcomes, ranging from the gender pay gap, to the gender pension gap, and to the representation of women in top positions, as the lower work time of women relative to men is consistently shown to be an important explanatory factor for all of these economic disadvantages for women. Our results also provide some indication that the COVID-19 policy response in Austria may have exacerbated these trends – by using school closures as an indirect way of promoting limited workplace closures, policy makers forced women to stay at home to care for their children. Policies based on the evidence presented here, in contrast, would focus on counteracting these trends, in order to mitigate the well-documented negative long-run effects of weaker labor market attachment of women. Chief among such equity-promoting policies is the restoration of reliable child care in schools and day care facilities.

Since we are at the beginning of understanding the COVID-19 pandemic and its economic impacts, many questions remain open. Investigating the concrete mechanisms through which parents form

choices around the allocation of work time in the household, especially with regard to expectations for the development of the pandemic and school closures. Second, placing our findings in an international comparison would be a natural avenue for future research, to answer whether work time effects of school closures extend to countries beyond those covered by the literature so far. Especially in a European context it would be interesting to ask whether the Austrian policy response to the COVID-19 pandemic and its gendered impact on work time was unique. Finally, investigating the distributional effects of these work time choices through formal modeling may yield interesting insights into the long-run consequences of the COVID-19 pandemic.

6 References

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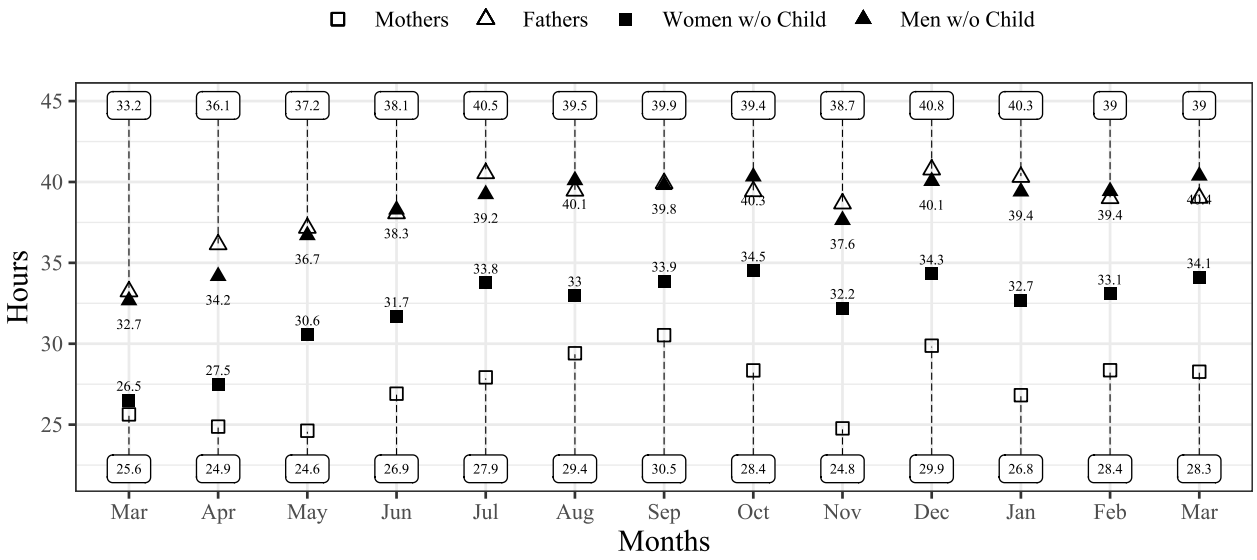
7 Appendix

Figure 5: Average Paid Work Hours by Month, March 2020 to March 2021



Source: ACPP, Kittel et al. 2020

Table 7: School and Workplace Closings: Hand-Coded and OCGRT Data

			Hand-coded Data on School Closures				OCGRT Data	
Wave	**Start**	**End**	**Final Variable**	**0-5 years**	**6-14 years**	**15-18 years**	**School Closures**	**Workplace Closures**
1	2020-03-27	2020-03-30	closed	closed	closed	closed	require closing (some levels)	require closing (all-but-essential)
2	2020-04-03	2020-04-08	closed	closed	closed	closed	require closing (some levels)	require closing (all-but-essential)
3	2020-04-10	2020-04-16	closed	closed	closed	closed	require closing (some levels)	require closing (all-but-essential)
4	2020-04-17	2020-04-21	closed	closed	closed	closed	require closing (some levels)	require closing (some)
5	2020-04-24	2020-04-29	closed	closed	closed	closed	require closing (some levels)	require closing (some)
6	2020-05-01	2020-05-06	closed	closed	closed	closed	require closing (some levels)	require closing (some)
7	2020-05-08	2020-05-13	closed	closed	closed	closed	require closing (some levels)	require closing (some)
8	2020-05-15	2020-05-20	closed	closed	closed	closed	require closing (some levels)	require closing (some)
9	2020-05-23	2020-05-27	open	open	open	closed	require closing (some levels)	require closing (some)
10	2020-05-29	2020-06-03	open	open	open	closed	require closing (some levels)	require closing (some)
11	2020-06-12	2020-06-17	open	open	open	open	all schools open with alterations	require closing (some)
12	2020-06-26	2020-07-01	open	open	open	open	all schools open with alterations	require closing (some)
13	2020-07-10	2020-07-15	open	open	open	open	all schools open with alterations	recommend closing
14	2020-08-14	2020-08-19	open	open	open	open	all schools open with alterations	recommend closing
15	2020-09-11	2020-09-18	open	open	open	open	all schools open with alterations	recommend closing
16	2020-10-16	2020-10-23	open	open	open	open	all schools open with alterations	require closing (some)
17	2020-11-13	2020-11-20	closed	closed	closed	closed	require closing (all levels)	require closing (all-but-essential)
18	2020-12-11	2020-12-18	open	open	open	closed	all schools open with alterations	require closing (some)
19	2021-01-15	2021-01-22	closed	closed	closed	closed	require closing (all levels)	require closing (all-but-essential)
20	2021-02-12	2021-02-19	open	open	open	open	require closing (some levels)	require closing (some)
21	2021-03-12	2021-03-19	open	open	open	open	require closing (some levels)	require closing (some)

[a] Sources for hand-coded data can be found in Table 8. Waves with changes are bold.

[b] Source for OCGRT data: Hale et al. 2021

Table 8: Sources for Hand-Coded on School Closures in Austria

Wave	Date	Event/COVID-19 Measure	Source
1	2020-03-16	Initial closures of schools	Der Standard (2020a)
6	2020-05-04	Students in their last year of high school return to school	BMBWF (2020)
9	2020-05-18	Children under 14 return to school	BMBWF (2020)
11	2020-06-03	All children return to school	BMBWF (2020)
17	2020-11-17	Schools close for all	ORF (2020)
18	2020-12-07	Children under 14 return to school	Der Standard (2020b)
19	2020-01-07	Schools close for all	Der Standard (2020c)
20	2020-02-07	All children return to school (with alterations)	BMBWF (2021)

Table 9: Hausman Tests for Different ACPP Sub-Samples

Sample	Hausman Test p-Value	Model
Women	0.00255	Only FEs
Men	0.00000	Only FEs
Mothers	0.75690	FEs and REs
Fathers	0.99900	FEs and REs
Women w/o Children	0.00000	Only FEs
Men w/o Children	0.00000	Only FEs

Source: own calculations, ACPP, Kittel et al. 2020