

Kozhaya, Mireille

Working Paper

The double burden: The impact of school closures on labor force participation of mothers

Ruhr Economic Papers, No. 956

Provided in Cooperation with:

RWI – Leibniz-Institut für Wirtschaftsforschung, Essen

Suggested Citation: Kozhaya, Mireille (2022) : The double burden: The impact of school closures on labor force participation of mothers, Ruhr Economic Papers, No. 956, ISBN 978-3-96973-120-8, RWI - Leibniz-Institut für Wirtschaftsforschung, Essen, <https://doi.org/10.4419/96973120>

This Version is available at:

<https://hdl.handle.net/10419/262165>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

Mireille Kozhaya

**The Double Burden: The Impact of
School Closures on Labor Force
Participation of Mothers**

#956

Imprint

Ruhr Economic Papers

Published by

RWI – Leibniz-Institut für Wirtschaftsforschung
Hohenzollernstr. 1-3, 45128 Essen, Germany

Ruhr-Universität Bochum (RUB), Department of Economics
Universitätsstr. 150, 44801 Bochum, Germany

Technische Universität Dortmund, Department of Economic and Social Sciences
Vogelpothsweg 87, 44227 Dortmund, Germany

Universität Duisburg-Essen, Department of Economics
Universitätsstr. 12, 45117 Essen, Germany

Editors

Prof. Dr. Thomas K. Bauer

RUB, Department of Economics, Empirical Economics
Phone: +49 (0) 234/3 22 83 41, e-mail: thomas.bauer@rub.de

Prof. Dr. Ludger Linnemann

Technische Universität Dortmund, Department of Business and Economics
Economics – Applied Economics
Phone: +49 (0) 231/7 55-3102, e-mail: : Ludger.Linnemann@tu-dortmund.de

Prof. Dr. Volker Clausen

University of Duisburg-Essen, Department of Economics
International Economics
Phone: +49 (0) 201/1 83-3655, e-mail: vclausen@vwl.uni-due.de

Prof. Dr. Ronald Bachmann, Prof. Dr. Manuel Frondel, Prof. Dr. Torsten Schmidt,
Prof. Dr. Ansgar Wübker

RWI, Phone: +49 (0) 201/81 49-213, e-mail: presse@rwi-essen.de

Editorial Office

Sabine Weiler

RWI, Phone: +49 (0) 201/81 49-213, e-mail: sabine.weiler@rwi-essen.de

Ruhr Economic Papers #956

Responsible Editor: Thomas Bauer

All rights reserved. Essen, Germany, 2022

ISSN 1864-4872 (online) – ISBN 978-3-96973-120-8

The working papers published in the series constitute work in progress circulated to stimulate discussion and critical comments. Views expressed represent exclusively the authors' own opinions and do not necessarily reflect those of the editors.

Ruhr Economic Papers #956

Mireille Kozhaya

**The Double Burden: The Impact of
School Closures on Labor Force
Participation of Mothers**

Bibliografische Informationen der Deutschen Nationalbibliothek

The Deutsche Nationalbibliothek lists this publication in the Deutsche Nationalbibliografie;
detailed bibliographic data are available on the Internet at <http://dnb.dnb.de>

RWI is funded by the Federal Government and the federal state of North Rhine-Westphalia.

<http://dx.doi.org/10.4419/96973120>

ISSN 1864-4872 (online)

ISBN 978-3-96973-120-8

Mireille Kozhaya¹

The Double Burden: The Impact of School Closures on Labor Force Participation of Mothers

Abstract

This paper investigates the effect of school closure on the labor force participation, hours worked, extensive, and the intensive margin of women in Mexico for the years 2017 to 2021. Using a difference-in-differences approach, I analyze how school closure, due to the COVID-19 pandemic, affects the labor supply of women with school-aged children, 6 to 14 years old, versus women with nursery-aged children, 0 to 5 years old. This approach allows me to isolate the impact of school closure from the economic impact of the COVID-19 pandemic. The findings show that on average mothers with children younger than 14 decrease their labor force participation by about 2.6 percentage points. Mothers with school-aged children, however, decrease their labor force participation by an additional 1.7 percentage points and increase their domestic work. While the increase in domestic work occurs immediately after the school closure, the impact on the labor force is only observed several months later. The decrease is observed for all women with low or middle education level, formal and informal employment, and income quantiles. However, I find no decrease for single-mothers and mothers with access to informal child care.

JEL-Codes: J1, J16, J2, J23

Keywords: Child care; COVID-19; women's labor supply; school closure

July 2022

¹ Mireille Kozhaya, University of Wuppertal. - I thank Christian Bredemeier, Kerstin Schneider, Fernanda Martínez Flores, and Franz Westermaier for their constructive comments. All remaining errors are my own. - All correspondence to: Mireille Kozhaya, WIB - Wuppertal Research Institute for the Economics of Education (WIB), University of Wuppertal, Gaußstr. 20, 42119 Wuppertal, Germany, e-mail: kozhaya@uni-wuppertal.de

1 Introduction

School closure is often considered as a way to slow down the spread of different diseases such as influenza or the COVID-19 virus (De Luca *et al.*, 2018; Dave *et al.*, 2021; UNICEF, 2021). According to UNICEF (2021), in the year 2020, 168 million children in 14 countries worldwide were affected by the full school closure due to the COVID-19 pandemic.¹ From March 2020 to February 2021, schools worldwide closed for about 95 days. Latin America and the Caribbean were the regions with the longest school closures, with an average of 158 days. Therefore, school closures in those regions affected women's labor force participation more strongly.

In many countries i) schools were closed for months, and ii) we know to what extent the economic crisis related to the pandemic affected employment (see e.g., Alon *et al.*, 2022; Couch *et al.*, 2022; Collins *et al.*, 2021; Yamamura and Tsustsui, 2021), but we do not know to what extent school closures had an impact on labor market outcomes. Therefore, this paper estimates the impact of the school closure in Mexico on a number of labor indicators for women with school-aged children. Previous studies of the COVID-19 pandemic have analyzed i) the effect of schooling on maternal employment and ii) the overall effect of school closures and the COVID-19 pandemic on the gender inequality in the labor force market. I contribute to these studies by providing new evidence on labor outcome variables for women with school-aged children by i) isolating the economic impact of school closures from the COVID-19 pandemic, ii) expanding on other labor outcomes by looking at domestic work, formal and informal sectors, paid vs. unpaid employment, and the sector of employment, and iii) highlighting the importance of schools as a mean of child care.

In particular, Mexico closed its schools for 214 days, this accounts to more than 1 year of home-schooling. Therefore, in Mexico alone, out of the 168 million children affected globally by school closure, 33.2 million (20%) students missed almost all classroom instruction time, making Mexico rank as the 3rd out of the 14 most affected countries,

¹Not to mention also that more than 1 in 7 children globally have been deprived from at least three quarters of their in-person learning with teachers.

preceded by Bangladesh 36.8 million (22%), and Brazil 44.3 million (26%) (UNICEF, 2021). Many classes in Mexico were shifted to online or via television and many students did not have access to internet.² Thus, because of the lack of support in child care and the increased need for supervision at home, the reincorporation of women in the labor force has been mitigated (Insituto Nacional De Las Mujeres, 2020b).³

To identify the effect, I exploit the school closure announcement in March 20, 2020 as a natural experiment. I compare women with school-aged children 6 to 14 that were directly affected by school closure (treatment group) vs. women that had children in the age range 0 to 5 years that were not directly affected by school closure (control group). Those women with school-aged children were already working more and benefiting from child care provided by the schools, and therefore were directly affected by school closure. Women with nursery-aged children, however, were not directly affected by school closure because their children are too young to attend pre-school and pre-school enrollment rates are low.⁴ Despite the level difference in labor force participation, the trends of women with school-aged children and women with younger children were very similar before the school closure. I exploit this setting to estimate the causal relationship between school closures and maternal labor supply.

First, I implement a DiD approach that exploits school closure in the second quarter of 2020 as the natural cutoff to assign individuals to treatment or to the control group and evaluate the short-run impact of school closure on labor outcomes of women with school-aged children. Second, due to the panel structure of the data, I estimate within mother effects by including individual fixed effects in the estimation to observe women with school-aged children only right before and after the school closure. Third, I estimate the impact of school closure by providing the results of an event study design to observe when

²For the year 2020, estimates show that during the period from March 23 to the beginning of May, almost 11 million children were learning from home via television (Bozkurt *et al.*, 2020). As for internet access, 39.1% of the Mexican students did not have internet (INEGI, 2020).

³By closing schools, many statistics have shown that working parents were obliged to stay home (Baldwin and Weder, 2020; Brynjolfsson *et al.*, 2020).

⁴Pre-school education is part of basic education in Mexico as of the school year 2008-2009 and is for children that are aged 3 to 5 years old. Governments also provide other day care subsidies for children younger than 3 years (Yoshikawa *et al.*, 2007).

the impact of school closure is observed. Then, to test the robustness of my estimations and to show that the control group is not affected by school closure, I provide the results of several placebo tests and the results focusing on a control group restricted to women with children aged 0 to 3. Finally, I show that my estimates are also robust to alternative definitions of the control group such as women without children and men with children in a similar age range.

I use the Mexican Labor Force Survey (ENOE) for the years 2017 to 2021. The data is a rotating panel that interviews households for 5 quarters and is collected on a quarterly basis. It provides rich information on employment and many socio- and demographic characteristics for the households.

This study relates to previous studies investigating the impact of the COVID-19 pandemic on the labor force participation of mothers. Most of the studies focus on developed countries estimating the gender inequality of COVID-19 and school closures on labor force participation and the total hours worked of men and women in the labor market (Couch *et al.*, 2022; Yamamura and Tsustsui, 2021; Collins *et al.*, 2021; Hanzl and Rehm, 2021; Adams-Prassl *et al.*, 2020; Amuedo-Dorantes *et al.*, 2020; Landivar *et al.*, 2020; Rojas *et al.*, 2020).⁵ The latter studies find out that mothers with young children are the ones that are more likely to suffer and carry the burden of reducing hours worked and taking care of children at home.

In particular, Couch *et al.* (2022) use a DiD approach to show that the male-female gap increases for employment and working hours during the COVID-19 pandemic, in the U.S. labor market. Yamamura and Tsustsui (2021) show how school closures in Japan affect parents work-style by using a simple OLS regression. Their findings are also inline with Couch *et al.* (2022) showing that women with primary school children increased teleworking in comparison to men and women with children in high school were not affected. Collins *et al.* (2021) further analyze the U.S. labor market and show that school

⁵Other studies have also checked the impact of school-closures on other outcomes such as the spread of viral diseases (see e.g. Nafisah *et al.*, 2018; Adda, 2016; Cauchemez *et al.*, 2008), stay-at home behaviors (Castillo *et al.*, 2020; Gostin and Wiley, 2020), on working remotely in different sectors (Espitia *et al.*, 2022), on productivity, work engagement, stress (Galanti *et al.*, 2021), on marital relationships (Chasson *et al.*, 2021; Shah *et al.*, 2021), and on children's obesity (Tripathi *et al.*, 2021; Tester *et al.*, 2020).

closure affects women with young children by reducing their working hours up to 5 times relative to fathers.

However, the empirical evidence for school closures for developing countries is scarce and the evidence from developed countries can not be translated to developing countries because i) sector of employment differs, ii) role of the mothers is still traditional, and iii) the lack of government financing for stay-home policies. Very few studies have looked at the general impact related COVID-19 pandemic on working conditions of households. Bundervoet *et al.* (2022) focus on 34 developing countries to evaluate the short-run impact of COVID-19 on the labor force participation of different household members. They find that 36% of the individuals stopped working just after COVID-19. The most affected were women, youth, and lower educated workers that were already considered a disadvantaged group before the COVID-19 pandemic. Egger *et al.* (2021) evaluate nine developing countries by using 16 survey samples and document that the COVID-19 pandemic caused income decreases ranging from 8% to 87% and food insecurities that lasted almost 3 months after the pandemic.

Hoehn-Velasco and Penglase (2021) explore the effect of the pandemic on formal employment in Mexico. The study shows that formal employment decreases by 5%. The authors also show that men recover their jobs faster relative to women.⁶ Only the study done by Alon *et al.* (2022) shows how the COVID-19 pandemic has affected women vs. men's employment and the type of employment sector that was mostly affected, using a DiD approach. The study shows that the recession caused by the COVID-19 in Nigeria causes women with school-aged children to experience the largest drops in employment rates. Furthermore, by looking at the sector of employment the authors show that those mothers that had to go to the workplace and could not work remotely are the ones that suffer the most. Yet no study for developing countries has aimed so far to analyze the direct impact of school closure, independently from COVID-19, on women's labor force

⁶Previous literature (see e.g., Kleven *et al.*, 2019; Sieppi and Pehkonen, 2019; Goldin and Mitchell, 2017; Juhn and McCue, 2017) has shown that women with children suffer long-term effect of a child penalty which is associated to their employment participation by those women preferring family over their career.

participation. This paper aims at filling in this gap.

This study also relates to previous literature investigating the impact of child care subsidies on mothers' labor force participation for developed countries. The studies find mixed evidence; some studies have shown that by increasing child care such as investing in public child care or introducing new kindergartens leads to an increase in maternal employment (Bick, 2016; Brilli *et al.*, 2016; Bauernschuster and Schlotter, 2015; Nollenberger and Rodríguez-Planas, 2015; Cascio, 2009; Baker *et al.*, 2008; Gelbach, 2002; Meyers *et al.*, 2002). Asai *et al.* (2015); Fitzpatrick (2010); Havnes and Mogstad (2011) show, however, that since more families are not living anymore with grandparents, families tend to substitute informal child care by child care programs provided by the government. Therefore, child care availability at home is not correlated with mothers' labor force participation. For developing countries, few studies show that the availability of child care such as increasing the enrollment in pre-schools increases maternal employment (Dang *et al.*, 2019; Martínez and Perticará, 2017; Berlinski and Galiani, 2007).

Accordingly, this paper contributes to the literature in three different ways. First, this is the first paper for developing countries that evaluates the direct impact of an exogenous shock, i.e, the school closure in Mexico, caused by the COVID-19 pandemic on the extensive and the intensive margin of employment for women with school-aged children (6 to 14 years old) relative to women with nursery-aged children (0 to 5 years old) that were not affected by the school closure. Mexico serves as an ideal example because children aged 0 to 5 had low pre-school enrollment rates, giving rise to a new control group that enables to isolate the effect of school closure from the COVID-19 pandemic. This paper also shows, by using an event study design, that i) the labor force participation of those women decreases after several months from school closures because schools have closed for almost one year, and ii) domestic work increases immediately after school closure indicating the increased demand for child care at home.

Second, since mother's labor force participation relies heavily on the presence of child care, such as the presence of grandparents (Bratti *et al.*, 2018; Lumsdaine and Vermeer,

2015)⁷, I further contribute to the literature by analyzing different channels that could mitigate the effect of school closure such as access to informal child care through the presence of grandparents or adult women in the household.

Third, previous studies (see e.g., Alon *et al.*, 2022; Couch *et al.*, 2022; Yamamura and Tsustsui, 2021; Collins *et al.*, 2021) focus on men as the choice of control group in the DiD setting. However, the parallel trend assumption could be violated given that men tend to have a more inelastic labor supply than women (Jaumotte, 2003). In the context of the pandemic, men have also been affected differently than women questioning the choice of the control group. In this analysis, I expand on the work done in the literature by using alternative control groups as follows: i) women with nursery-aged children 0 to 5, ii) women with children aged 0 to 3, iii) women with no children, and iv) men with school-aged children.

In addition, I go further beyond those studies to analyze different heterogeneous effects focusing not only on the labor outcomes but also on different household characteristics such as income and poverty levels, education level, and the region of residence that are affecting women differently. I also analyze different employment characteristics such as formal and informal employment, paid vs. unpaid work, and the sector of employment, because women usually work in the informal and tertiary sectors, which were most affected by the pandemic (ECLAC, 2021).

My findings show that school closure decreases the labor force participation of women with school-aged children by 1.7 percentage points and employment by 1.9 percentage points. A back of the envelope calculation shows that 750 thousand women with children aged 6 to 14 have stopped working because schools closed. These results are mainly driven by a decrease in the informal sector, paid work, and the services sector.⁸ I also find that for women with school-aged children, domestic work increases by almost 1 hour per week, mainly driven by an increase in the time spent taking care of other household members.

Although one additional hour of domestic work per week may seem like a small effect,

⁷text studies have shown that informal child care increases the labor force participation of the mothers (Bratti *et al.*, 2018; Kanji, 2018; Hank and Buber, 2009).

⁸Paid work is a dummy variable whether the individual gets paid conditional on working.

the pre-treatment mean shows that women in the treatment spend 30 hours per week on domestic work and only 20 hours on market work. I further show, using an event study design, that the decrease in the labor force participation of women with school-aged children is observed several months after schools closed. This shows that women did not anticipate that school closures will last long, but since schools remained closed for more than 1 year in terms of instruction time, women were not able to adjust in the labor market and started dropping out of the labor force. When looking at domestic work the effect is directly shown in the third quarter of 2020 when the schools closed, due to the fact that work at home increases directly due to the increase in child care at home.

Furthermore, I show that all women with school-aged children, irrespective of their age, are affected negatively by school closure when looking at income levels, poverty level, education level (except for high education), and rural vs. urban areas. Finally, I find that the labor outcomes of single women or of women having a grandparent or adult women in the household are not affected by school closures. This highlights the importance of informal child care support at home for both men and women, after experiencing a shock like the school closure, especially when women or men are the only breadwinners at home.

This paper is structured as follows: The following section presents the background and provides additional information on the school closure in Mexico. Sections 3 and 4 present my data and identification strategy, Section 5 shows the results, and Section 6 concludes.

2 Background

2.1 Composition of the Labor Market and Statistics

The ILO (2022c) reports that over 2 million moms globally left the labor force participation in 2020 because of job-losses and school closures. Specifically, in Latin America and the Caribbean the labor force participation of mothers with small children decreased from 56.4% in 2019 to 51.5% in 2020 (a 4.9 percentage-point decrease compared to 2.7 percentage points for men). Furthermore, the COVID-19 pandemic had negative impacts

on the female labor force participation and employment conditions for female population 15 years and older. The latter decreased from 52% in 2019 to 46% in 2020. Not to mention that also 56.9% of the women are employed in sectors that were mostly affected by the pandemic.

According to the ILO (2022a) report for Latin America and the Caribbean, the greatest impacts for job losses are shown for certain types of sectors that rely intensively on female labor force such as commerce, restaurants and hotels. Moreover, the loss was mostly observed in micro, small and medium sized enterprises as well as informal employment where women's labor force participation is also predominant. 23.6 million women lost their jobs in the second quarter of 2020, and only 19.3 percent of the jobs were recovered by the end of 2021. Accordingly, more than 4 million women were not able to join or return to their work (ILO, 2022a).

Now by looking at Mexico in particular, in 2018, 78% of men and only 44% of women in Mexico participated in economic activities. This is one of the largest gender gaps among the OECD countries (OECD, 2021d; Insituito Nacional De Las Mujeres, 2018). Female labor force participation in Mexico also differs from the labor markets in other countries because it relies mostly on the informal sector (53.4% of the population) with 58.8% of women being more likely to work in the informal sector than men (50.1%) (ILO, 2018). Looking at the sector of employment in Mexico, the ILO report shows that 72.8% (52.3%) of women (men) work in agriculture, 46.1% (51.9%) in industry, and 60.8% (48.2%) in services. According to INEGI (2021) for the last 10 years, the economic participation of women has grown by 15.7 percentage points, from 33.3% in 2010 to 49% in 2020. However, due to the pandemic, in the months of April and May of the year 2020 female labor force participation fell to almost 35%.

Therefore, Mexico witnessed a decrease in the economically active population by 12 million, being 7 million men and 5 million women. In relative terms, this resembles a decrease by 20% of the male labor force and 22% of the female labor force (Insituito Nacional De Las Mujeres, 2020a). The statistics provided by the Insituito Nacional De Las Mujeres (2020b) show that men recover at a faster rate than women reaching a rate

of 72.5% , which is only 5.5% lower than the pre-pandemic level. The rate of recovery for women seems to be at a slower rate 39%, being 12.7% lower than the pre-pandemic period.

Despite the major improvement in labor force participation only 4 out of 10 women in Mexico participate in the labor market. Therefore women’s participation in paid work still lies behind that of men, due to lack of child care, inappropriate distribution of work at home, inflexible working conditions, and many others (Insituto Nacional De Las Mujeres, 2018). Moreover, women still hold the traditional role in Mexico by taking care of children, therefore, the participation rate of women in domestic work is still very high (96.1%) compared to men (65.4%) (Insituto Nacional De Las Mujeres, 2018). In 2019, the majority of women in Mexico worked part-time 36.62%, and only 19.15% of men had a part-time job (ILO, 2019).

Looking at partnered parents, estimates in 2019 show that women with children in Mexico had, in general, a labor force participation rate by about 36.5% relative to 87.6% for fathers (ILO, 2019). Therefore, the establishment of women into the labor force requires proper access to child care and to establish provisions for maternity care. According to INEGI (2018) 77.4% of working women do not have child care or maternity services in Mexico.⁹ In addition, more than half of the population of women already working (12.4 out of 21.6 million) have at least one school-aged child (Insituto Nacional De Las Mujeres, 2020a).¹⁰ Therefore, school closures may increase the burden of domestic work of women and lead to a disproportionate impact in terms of the labor force participation, in particular, for women with school-aged children.

2.2 School Closure in Mexico

Taking early childhood education and care into account, since the academic year 2008/2009, all Mexican children aged 3 to 6 years old are required by law to attend three years of early

⁹According to article 170 of the Federal Labor Law (*Ley Federal del Trabajo*), women have the right for a rest period of one and a half months before and after birth of the child. For an extensive overview of the maternity services provided in Mexico see (*Ley Federal del Trabajo*, 2012).

¹⁰6.4 million women out of the 12.4 had children under the age of 6 and the other 6 million had children between 7 and 12 years old.

childhood education (Monroy and Trines, 2019). However, preschool enrollment rates are smaller than primary school enrollment rates. In 2015, 98% of children aged 6 to 11 attended school, 93.3% were between 12 and 14 years old, and 77% were between 3 and 5 years old (INEE, 2018).¹¹ In Mexico, preschool or initial education was first established in the education system after the Educational Reform done in 2019, where preschool or initial education has been recognized as part of basic education and therefore compulsory for children aged 3 to 5 years old (Centro de Investigación Económica y Presupuestaria, 2019). Nonetheless, primary school attendance rate was almost universal and pre-school attendance rates are still among the lowest enrollment rates, especially when looking at the 0 to 3 years old children (OECD, 2021c).

The national school closure was implemented on the 20, March 2020. Due to the pandemic, primary and lower secondary schools were closed for almost 214 days, and upper secondary schools closed for 264 days (OECD, 2021b).¹² Therefore, almost 33.2 million children and teenagers had to stay home. School started reopening gradually after 15 months of closure (Mexico Daily News, 2021).¹³ Moreover, Kindergartens had to close as well but few women with nursery-aged children were still able to send their children to daycare unlike women with school-aged children. For example, some child care centers for children younger than 5 remained opened, mostly to allow mothers in "necessary" occupations to continue working.¹⁴ Therefore, to rule out the concern that women with nursery-aged children are also affected by school closure, I provide further analysis with different control groups by taking other control groups that were also not affected by school closure: i) women without children, ii) women with children aged 0 to 3, and iii) men with school-aged children and show that the results remain robust to the alternative definitions of the control groups. A summary of the different definitions used for treatment and control is provided in Table A1 in the Appendix.

¹¹School enrollment rate is 73% for individuals aged 15 to 17.

¹²The number of days closed excludes holidays and weekends.

¹³School closures happened during the period ranging from January 2020 until May 20, 2021 (OECD, 2021b).

¹⁴According to the news, the 221 child care centers owned by the institute of security and social services for state workers (ISSSTE) daycare centers have remained opened (ISSSTE, 2021).

In addition, communication between teachers and students took place mostly through digital tools during the pandemic for the school year 2019/2020. The most used tools are smart-phones 65.7%, followed by laptops 18.2%, desktop computers 7.2%, 5.3% digital television, and 3.6% using tablets. According to OECD (2020) only 57% of the students reported having access to a computer, and for students distributed at the bottom quartile only 14% of them reported having a computer.¹⁵ Home-schooling and online learning was facilitated by teachers and parents, especially mothers. According to Bozkurt *et al.* (2020), mothers of children below the age of 12 were the ones who had the burden of home-schooling, making mothers the ultimate substitute for teachers.

3 Data and Descriptive Statistics

3.1 Data

The data used for this study comes from the Mexican National Survey on Occupation and Employment (ENOE). Since 2005, this data set collects information on a quarterly basis on households in a rotating panel for 5 quarters.¹⁶ The ENOE survey is representative at the state level and records rich information on labor force participation¹⁷, employment and weekly hours worked, parental demographic characteristics (education level, marital status, and monthly income) and household characteristics (number of children, household size, household income, and the age of the children), as well as time spent on several household activities, that is domestic work (as weekly hours spent on building the household, renovating, doing household chores, and taking care of the elderly or children or the sick).

For the main analysis, I restrict the period of observation from 2017 to 2021, i.e.,

¹⁵In Mexico only 51.2% of the households have a computer and only 70% have access to internet. Those statistics are biased to wealthier families living in urban areas (Covarrubias, 2021).

¹⁶As of the 3rd quarter of 2020, the ENOE also started collecting data on a monthly and quarterly basis. Due to COVID-19 the information was not collected for the 2nd quarter of 2020, however, this does not influence the analysis because I am interested in the yearly trajectory change and not only in the change that happened in 2nd quarter of 2020.

¹⁷Labor force participation comprises of those who are employed and unemployed individuals searching for a job.

three years before school closure and 1 year after. This allows me to i) account for pre-treatment differences between the treatment and the control group, and ii) estimate the causal impact of school closure on mothers with school-aged children. Next, I restrict my sample as follows: first, sample of women between 20 and 55 years old. Then, I compare women with school-aged children (6 to 14 years) who are directly affected by the school closure vs. women with nursery-aged children (0 to 5 years) who were not directly affected by school closure. For this sample I observe a total of 382,322 women. In addition, for the robustness tests I further include i) women with no kids, ii) women with children aged 0 to 3, and iii) men with school-aged children.

3.2 Descriptive Statistics

I start my analysis by providing graphical evidence on the development of the labor force participation and hours worked of (i) women with no children, (ii) women with school-aged children, and (iii) women with nursery-aged children.

Figure 1 shows that before school closure, both the labor force participation and hours worked have a level difference between the different groups of women. However, after the school closure we see that both women with no children and women with nursery-aged children rebound fast and go back to levels similar to those before the school closure. However, when looking at women with school-aged children we see that the decrease persists causing the labor force participation and hours worked to still lie behind the levels of what they had before the school closure.¹⁸ This preliminary descriptive inspection shows that indeed the labor force participation of women with school-aged children is more affected than that of women with younger children (or without children).

Next, I show in Table 1 the descriptive statistics for all women with school-aged children (treatment group) and for all women with nursery-aged children (control group). The final column provides the difference between means for the two groups to test if the

¹⁸As of the third quarter of 2021 we see a small drop in the labor force participation of mothers with nursery-aged children, this is can be explained because the president of Mexico started canceling some child care programs. However, this does not affect my results since I provide other definitions for control group to show that my estimation is robust.

difference in means is significant. The table shows that 57% of women in treatment group participate in the labor force, 56% of them are employed, and work almost 20 hours per week in market work and 32 hours per week in domestic work. Now, conditional on working those women work on average 36 hours per week and 46% of them work in the formal sector. Moreover, almost 95% of those women work in paid employment. As for women in the control group, we observe some minor level difference for labor force participation 47%, employment 46%, and conditional on working 54% of women in the control group work in the formal sector. Women in the control group work less in market work (16 hours), and spend more time on domestic work than the treatment (43 hours).

Looking at the sector of employment, on average, 2.5% of treatment and control groups work in the primary sector (agriculture), 17% work in the secondary sector (manufacturing), and 81% in the tertiary sector (services). On average women in the sample are 38 years old and have on average 3 children. 86% of them are married and for 77% of them the spouse is present at home. 5% of them have a grandparent present in the household. As for their education, 2% do not have education, 18% have primary education, 35% have secondary degree, 26% have a high-school degree or vocational training, and almost 20% have a university degree. 58% of the women in treatment and control live in localities with more than 100,000 inhabitants, i.e., highly urbanized areas. Localities are smaller geographical units than municipalities and capture the level of urbanization (high, middle, low, or rural) in the locality the individual resides.

Now comparing the pre-treatment mean of the treatment and control, for some variables, larger differences can be observed. For example, women in the treatment group spend 4 hours more per week in market work and 8 hours less per week in domestic work. In addition, women in the treatment are on average 7.4 years older than women in the control group. However, these level differences are accounted for by the DiD strategy. For the other dependent variables and demographic characteristics the differences are significant, however, they are small in value.

4 Identification Strategy

To evaluate the effect of the school closure caused by the COVID-19 pandemic and better control for pre-COVID trends, I estimate a DiD model exploiting the difference between women with school-aged children (6 to 14 years old) vs. women with nursery-aged children (0 to 5 years old). The model estimated is:

$$Y_{ist} = \alpha_0 + \beta_0(Treated_i \times School-closure_t) + \theta' \mathbf{X}_{ist} + \alpha_{st} + \epsilon_{ist} \quad (1)$$

where Y_{ist} , denotes labor market outcomes of woman i , residing in state s , at survey time t taking into account the quarter and the year of the survey. The labor market outcomes are (i) labor force participation, (ii) weekly hours worked¹⁹, (iii) employment (extensive margin), and (iv) conditional hours worked (intensive margin). I further differentiate between women who work in the formal and informal sectors, paid and unpaid work, and the type of employment sector (primary, secondary, and tertiary sectors). Moreover, I analyze the effect of school closure on hours spent on domestic work. For domestic work I aggregate the reported weekly hours spent on (i) taking care of children or elderly people in the household, (ii) doing household chores, and (iii) renovating the house and fixing household appliances.

$Treated_i$ is a dummy variable that takes the value one for women with school-aged children (6 to 14 years) and zero for women with nursery-aged children (0 to 5 years).²⁰ March 2020 is the period when schools closed, therefore $School-closure_t$ is a dummy variable that takes the value one for the period after the second quarter of 2020 and zero otherwise. β_0 is the coefficient of interest as it captures the change in labor force participation (or other employment outcomes) of the treatment group relative to the control group.

X_{ist} is a vector of women demographic characteristics that are likely to affect the labor

¹⁹Hours worked includes also the zeros for those women who are not employed.

²⁰For the treatment group women with children younger than 6 and older than 14 are not part of the sample. Same holds true for the control group, women with children older than 5 years are not considered.

market outcomes of women, such as age, age squared, marital status, number of children in the household, household size or if the spouse is present. I also control for the presence of a grandparent in the household to account for the access of informal child care. I also add a categorical variable controlling for the education level of the mother²¹, and a dummy variable for localities to take into account whether women were residing in urban areas since they might be more affected by the school closure.²²

I also include state-by-quarter-by-year fixed effects, α_{st} , to capture state specific shocks at the quarterly level, such as reopening of schools and the different state mandates regarding the COVID-19 pandemic, which are more likely to change at the state level. I run another specification for the robustness check, to also account for state linear time trends to capture diverging trends at the state level such as the evolution of the labor force participation of mothers at the state level. In addition, I also provide the results including treatment group specific time trends. The results for both remain robust. Finally, ϵ_{ist} is the error term, and standard errors are clustered at the state-survey year level.

The main identifying assumption of the DiD approach is that in the absence of school closure, both groups of women would have followed the same trend. Therefore, the first threat to the identification strategy is that women with school-aged children and women with nursery-aged children follow different pre-treatment trends. As mentioned previously, women in the treatment group are older. This, for example, could imply that they have more working experience and could be more attached to the labor force than younger women, and thus respond differently to labor shocks. To show that indeed women in the treatment and control groups follow a parallel trend I start by providing graphical evidence of the parallel trend for labor force participation and hours worked for all women (men) with no children, women (men) with school-aged children, and women (men) with nursery-aged children (see Figure 1 (Figure A1 in the Appendix)). Finally, to rule out the existence of pre-trends and to check when the impact of school closure is observed, I follow the same logic as in Eq.(1) but now by estimating an event study design by interacting

²¹None, primary, secondary, high-school, vocational training, or university degree.

²²Localities capture the level of urbanization in the regions where women live, whether high, middle, low, or rural. Localities are smaller geographical regions than municipalities.

the impact of school closure by a quarter-survey-year indicator and present the results of this event study in Figure 2.

Second, the previous specification may also lead to biased estimates if unobserved factors that occur simultaneously to the schools closure in March 2020 are systematically correlated with the employment outcomes. For instance, as the COVID-19 pandemic was unknown and uncertain, women may have different risk preferences in terms of exposure to the virus. Some women, for example, may adjust more strongly to the pandemic by e.g., limiting social contacts, dropping out of the labor force, etc.. to decrease the risk of a getting the virus. Therefore, to take into account unobserved characteristics that may be correlated with the treatment, I complement my analysis by implementing individual fixed effects model to exploit the within-mother variation to identify the effect of school closure. Taking into account mother fixed effects allows me to control for unobserved characteristics such as the individual risk assessment of the exposure to the virus. The individual fixed effects model is as follows:

$$Y_{it} = \alpha_1 + \beta_1(Treated_i \times School-closure_t) + \eta'P_{it} + \rho_i + \kappa_t + v_{it} \quad (2)$$

where Y_{it} , denotes either labor force participation, hours worked, probability to work, or conditional hours worked of women i , at survey time t . I further test this specification for the outcome variables formal vs informal employment, paid vs unpaid work, and the type of employment sector (see Table A6 in the Appendix). $Treated_i$ is a dummy variable that takes the value one for women with school-aged children (6 to 14) and zero for women with nursery-aged children (0 to 5). $School-closure_t$ is a dummy variable that takes the value one after second quarter of 2020, when the schools closed. P_{it} is a vector of women time varying characteristics such as age and aged squared. ρ_i captures individual fixed effects, κ_t captures state by-quarter-by-year fixed effects. v_{it} is the error term and standard errors are clustered at the state-survey year level. This approach allows me to analyze the within individual impact of school closure and account for the time invariant characteristics that happen at the individual level.

However, I refrain from using it as the main specification because women are only followed for five quarters which allows me to observe only a sub-sample of the women I have in the data. This fixed effects approach allows me to restrict the sample to women who are observed at least once before and once after the school closure. This causes the number of observations in my sample to extremely decrease.

Third, the control group chosen may be partially affected by the nation-wide decision to close schools and child care facilities. 77% of children aged 3-5 attend pre-school, although this share is much lower than primary school enrollment it could imply that the control group is affected if mothers sending their children to pre-school are also affected by the closure. Therefore to rule out this concern, I estimate Eq.(1) by using another definition for the control group. For this I compare women with school-aged children versus women with children in the age range of 0 to 3 (and for women with no children). Then I change the treatment and control group to compare women with nursery-aged children to women with no children. Furthermore, I take into account the difference in men's labor force participation for those men with school-aged children vs. those men with nursery-aged children. In addition, I provide a placebo test showing that my estimates are not driven by differences in the labor force participation of those women.

Moreover, I make use of the information available on income level, poverty level, education level, and place of residence to test some heterogeneity effects such as whether women affected come from poor or rich families or whether they live above or below extreme poverty. The results are presented in more detail in Section 5.2.²³

Finally, I control in a separate specification for father's education level and the number of COVID cases per 1,000 inhabitants as a control variable and for both my results remain robust. I refrain from including those controls in the main specification because they might be endogeneous to the labor force participation of the mothers. Results are available upon request.

²³Another important aspect to look at is what happens to the labor force participation of those women in the treatment when schools re-open. The data is unfortunately now only available for the year 2021.

5 Results

5.1 Baseline Results

In this section, I start by reporting the results from the baseline specification mentioned in Eq.(1), to evaluate the impact of school closure on the labor outcomes of women with school-aged children.

The results are presented in Table 2. Column I reports the results focusing on labor force participation, column II on hours worked, column III on probability to work (extensive margin), and column IV on conditional hours worked (intensive margin). The estimated coefficients indicate that school closure leads to a decrease in the labor force participation by 1.7 percentage points and a decrease in employment by 1.9 percentage points for women in the treatment relative to women in the control group.²⁴ These reductions resemble a 3 percent decrease in the labor force participation and probability of being employed relative to the pre-school closure mean and are in line with the findings from Couch *et al.* (2022) and Yamamura and Tsustsui (2021) that find that the probability to work and engage in the labor force for women with school-aged children decreases relative to other groups.

When looking at the intensive and extensive margins an interesting pattern emerges. The extensive margin confirms that indeed the proportion of women who are employed decreases. However, conditional on being employed, there is a slight increase in the number of hours worked. Therefore, school closures seem to have a direct impact on the decision to participate in the labor force (or to be employed). But if women are still in employment, they tend to adjust the hours worked just by a little. This could be explained by the fact that due to the pandemic more people were working from home and they reported working longer hours (El Herald De México, 2021). However, the proportion of individuals that work from home is still small, almost 19% of the workers.

Next, I exploit the impact of school closure on the same labor market outcomes by

²⁴Table A4 shows that the impact of school closure on the labor force participation remains stable across different specifications, that is by providing in column I only controls, in column II adding time fixed effects, and in column III the state specific linear time trend.

using within-individual variation in order to account for unobservables at the individual level; that is, the individual fixed effects approach. For this, I restrict the sample to women who are observed at least once before and once after the school closure. Nonetheless, since women are only observed for five quarters, this limits the time frame used to shortly before and after the school closure. The results for the individual fixed effects are presented in Table 3 showing similar findings as the baseline specification, however, the coefficients are bigger in magnitude because the effect is only measured for the sub-sample of women, that is, for the same individuals observed twice in the sample and therefore provide the immediate effect on those individuals directly after school closure. The results from the DiD take into account all women in the sample and already account for some of the recovery in 2021.

Then, to evaluate if the school closure lead to an increase in the domestic burden of women, in this case, the outcome variable represents the number of hours per week women spend in unpaid domestic activities. Domestic work is defined as weekly hours spent on building the household, renovating, doing household chores, and taking care of other household members. The results are presented in Table 4. Column I shows that because of school closure, women with school-aged children increase domestic work by 1 hour, this effect might seem small, however, looking at the pre-treatment mean we already see that women are on average working 30 hours in domestic work and spend only 20 hours on market work. This supports the fact that school closures increase the burden of child care at home. When I split the variable to hours spent doing household chores or taking care of children or the elderly, the results show that the increase is driven by taking care of other family members.

Furthermore, to check whether working or non-working women are driving this increase in domestic work, I estimate the same outcome variable as in Table 4 but now splitting the sample to women that work and women that do not work. That is, conditional on working how much time do working women spend on domestic work and the opposite is true, if women are not working how much time do they spend on domestic work. Table A5 in the Appendix shows that women who are not working are the ones who are driving

this effect, that is, they increase domestic work at home and increase their time in taking care of other household members. Women who continue to work seem to lower their time spent on doing other household chores because children are now home. This will be explored more in Section 5.3 by analyzing the informal child care support systems such as the presence of a grandparent.

Finally, to rule out the existence of pre-trends and to check when the impact of school closure starts to affect women in the treatment, I follow the same logic as in Eq.(1) but now by implementing an event study design and estimating the impact of school closure by quarter-survey-year for an event study design to observe when the impact of school closure is observed. For this estimation, I define time zero as of the third quarter of 2021 when schools closed. The first quarter of 2017 is denoted by time -13 and the fourth quarter of 2021 is denoted by time 5, respectively. The reference year is 2018. In this event study I focus on the labor force participation, employment, hours worked, and domestic work as outcome variables because they are the most affected when schools closed. Figure 2 shows the point estimates and the confidence interval at the 95% level by quarter-survey-year. For the pre-treatment period, the graphs show no significant differences between women with school-aged children vs. women with nursery-aged children.²⁵ However, for the post-treatment period, we observe a significant difference between the treatment and control resulting in a decrease in the labor force participation, employment, and hours worked, and an increase in domestic work for women in the treatment group. More specifically, we can see that both labor force participation and employment drop in the second quarter of 2021. A plausible explanation is that at first school closure was announced to be temporary, but because it lasted about 15 months, women started dropping out of the labor force. The graphs below, show that hours worked in the market decrease directly after school closure and that the increase in domestic work also kicks-in directly after schools closed and remains positive and significant for the fourth quarter of 2021.²⁶ This

²⁵Here there might be a concern that the trend is already decreasing before school closure, however, the same estimation is also presented in Figure A2 in the Appendix according to the survey-year and shows that the effect is observed after schools close. Moreover, I include group specific time trends to show that my results are not driven by pre-existing trends.

²⁶Schools started opening in August 2021 which is the third quarter of 2021.

indicates that women with school-aged children were sacrificing working hours in the market to be able to work at home and take care of other household members. These results are in line with the main specification, indicating that school closure affects the decision of women to either drop or remain in the labor market. However, they also highlight the extreme length of school closures is what finally forced women to drop out of the labor force.

5.2 Heterogeneous Results

Now, to further analyze the main effects of the reduction in labor outcomes, I present in this section different heterogeneous analysis that take into account i) employment characteristics, and ii) household characteristics.

5.2.1 Employment Characteristics

First, I start by analyzing the impact of school closure on the type of employment, by testing how school closure affected formal vs. informal work, paid vs. unpaid work, and the sector of employment. The results are reported in Table 5.²⁷ When looking at formal vs. informal work (columns I and II) we observe a strong negative effect for informal work. The results for formal work are almost zero and insignificant. This highlights the fact, that during a crisis, such as COVID-19 pandemic or the school closures, the informal sector is the one that is hit the most because in countries like Latin America, labor regulations are not perfectly enforced and salaried workers can be hired formally or informally. In particular, in Mexico salaried workers, in the formal sector, are protected against firing and layoffs, and firms face a high penalty for firing those employers, in contrast to the informal sector where no regulations or penalties apply (Busso *et al.*, 2012; Levy, 2010). Moreover, statistics from the ILO (2022a) show that most of the women in Latin America

²⁷The sample used here is the same sample used in the baseline results. However, the number of observations differs because the variables are set to missing for some groups. For example, for informal work the variable is set to one if women work in the informal sector, zero if the individual does not work, and missing if the individual works in the formal sector. The same logic applies for the formal, paid and unpaid employment and the type of sector.

self-select themselves in the informal sector by working either in restaurants, hotels, or commerce where most of the job losses occurred because of the crisis.

When looking at paid and unpaid work (columns III and IV), the results indicate that school closure had a stronger negative impact on paid work, and that unpaid work is slightly significant but the coefficient is close to zero. Furthermore, the impact of school closure on the sector of employment (columns V-VII) shows no effect on both agriculture (primary) and manufacturing (secondary), but a decrease by 2 percentage points in the services (tertiary) sector. Those findings are in line with previous literature indicating that women are more likely to work in the informal sector (Piras *et al.*, 2014; Busso *et al.*, 2012) which is mostly hit by the crisis and more specifically in the services where workers can not work remotely. Moreover, the results for informal and services sector remain robust when running individual fixed effects model presented in Table A6 in the Appendix.

5.2.2 Household Characteristics

Afterwards, I further explore the effect of school closure on different definitions such as income level, poverty level, education level, and locality size to proxy the poverty level of the household. The results are presented in Figure 3. They show the point estimates and the confidence interval of the effect of school closure on women with school-aged children. The figure shows marginal effects of the variable which is interacted with the respective income, poverty level, education level, or regional classification.

In panels A and B of Figure 3, I construct two indicators to measure the impact by poverty level. For the first definition, I interact school closure with a categorical variable indicating the household income per person per quantile (panel A). The first quantile represents households with the lowest income and the fourth quantile families with high incomes respectively. Second, panel B, shows the effect of school closure interacted with the level of poverty, that is above poverty, below poverty, or below extreme poverty

line.²⁸ The results in panel A indicate a general decline in labor force participation of women across all income quantiles, however, the coefficients are slightly more significant for women coming from the lowest income quantile. When focusing on the more precise definition for poverty measure, the results in panel B confirm the findings in panel A, that all women with school-aged children irrespective of their poverty or income level are mostly affected by school closure, eventhough the difference is slightly higher for women living below extreme poverty.

Third in panel C, I check the level of education of the mother because it is correlated to the labor force participation. The variable is categorized to whether the mother has low education (none, primary, and secondary), medium education (high-school and vocational training), and higher education (university degree).²⁹ Finally, panel D shows the interaction of school closure with the locality size to capture also the level of urbanization and the poverty of the region: >100,000 inhabitants means highly urbanized where as <2,500 means rural area. The results in panel C show that women with low and medium education levels are the ones that are affected by the school closure. When focusing on the region of residence, the estimates show that women residing in all areas whether urban or rural are affected, yet for urban areas we see more negative and significant results.³⁰

As a conclusion, Figure 3 is important because it shows that all women were affected by school closure, and that only women who have higher education are the ones that are not affected by school closure. This could be explained by the fact that those women have probably the opportunity to work remotely or organize some type of informal child care to be able to work. Furthermore, the slightly more negative and significant effects observed for poor women residing in urban areas can be explained by the fact that poor women, coming from rural areas, have moved to the city to work without their relatives or other family members, and were therefore the most affected by school closure due to

²⁸For the classification of the poverty variable I rely on the information provided by the CONEVAL (2022) which uses information of the yearly average costs of the baskets of goods for rural and urban regions.

²⁹This variable is categorized according to the definition of education level provided by the OECD (2021a).

³⁰The results are also reported for the hours worked in Figure A3 in the Appendix and show a similar pattern as Figure 3.

the lack of informal child care at home.

Afterwards, to estimate who is affected the most among women with school-aged children by school closure, that is, if younger or older women had to carry the burden more. I interact the impact of school closure with a categorical variable for women with different ages: (i) young women (20-29), (ii) middle-aged women (30-39), and (iii) older women (40 to 55). Figure 4 shows that school closure had a negative and significant impact on the labor force participation and hours worked for all women irrespective of their age.³¹

I can conclude from the results in Figure 3 and Figure 4 that I observe negative impacts on all women with school-aged children living in urban areas irrespective of the income quantile, poverty level (slightly larger for poor women, but negative and significant for all of them), and even age. The results, indicate further that all women with school-aged children were affected by school closure and that their age does not play a role because all women had to stay home and home-school their children. This is a shock that affected all mothers, irrespective of the income quantile, poverty level, and level of urbanization. The only group that seems not to respond are highly educated mothers who are probably more attached to the labor force, could work from home, and could afford child care at home, but these women represent a small group of the sample (17%).

5.3 Mechanisms for Single Mothers and Informal Childcare

Another important channel to look at is access to informal child care systems such as grandparents or other relatives who live in the same area who support mothers in child care because if mothers have support like a grandparent or another adult women the probability of going to work increases (Yamamura and Tsustsui, 2021; Bratti *et al.*, 2018; Aparicio-Fenoll and Vidal-Fernandez, 2015). In fact, informal child care by grandparents is very common in Mexico and 55% of children are cared for by their grandparents while the parents are working (Villegas Raya, 2019). To do this, I construct an indicator that

³¹Figure A4 in the Appendix shows further the labor force participation of mother according to the education level.

takes the value 1 if a grandparent lives in the household and an additional indicator that takes the value 1 if women over the age of 18 live in the household (excluding the grandparent). I exploit this information to estimate heterogeneous impacts in households with and without access to informal child care.³²

Therefore, to test this hypothesis, I start by examining the effect of the presence of grandparent (panel A) and adult women (panel B), conditional on not having a grandparent present, in the household presented in Table 6. Columns I to IV (panel A and B), show that there is a level difference if grandparents or adult women are present in the household. However, the interaction term shows that mothers of school-aged children do not adjust their participation in the labor force after schools close if grandparents or adult women are living in the household. This means that those women are likely to continue working because they have informal systems at home that can alleviate child care needs.

Panel C, presents the results interacted for single women. These group of women are usually highly attached to the labor market because they are the main (and most of the time only) breadwinner of their households. For them, the labor supply is generally very inelastic to shocks. The results in Panel C, confirm this by showing that school closure has almost zero impact on single women, because those women have to go to work to support their children, and therefore have already organized other means for child care.

5.4 Robustness Check

A potential concern is that the differences observed are driven by the differences in the labor outcomes of women in the treatment and control because women in the control group work already less and participate less in the labor force. To rule out this concern, and to show that the effects are mainly driven by school closure, I estimate the same logic in Eq.(1) by introducing i) a placebo school closure for the year 2018, ii) taking only men as treatment group, and iii) taking women with nursery-aged children (0 to 5) as the

³²Unfortunately, the ENOE only indicates that a grandparent is present if they reside in the same household. The presence of a grandparent residing in a different household but same area is not available. The estimates provided in this framework may not be precisely estimated given that sources of informal child care outside the household are not accounted, however they provide valuable information on informal child care within the household.

treatment group.

The results for the placebo test in Table 7 panel A show that the effect of the placebo school closure is almost zero and insignificant for labor force participation, hours worked, the extensive and intensive margins.³³

Second, to show that only women are affected by school closure, I estimate the same baseline specification, but by taking men with school-aged children as the treatment vs. men with nursery-aged children as control presented in panel B. The interaction term in panel B shows that school closure has no impact on the labor outcomes of men (columns I to IV). This supports the results of the baseline specification, indicating that only women are affected by school closure, and more precisely those who have school-aged children.

Third, I further redefine the definition of treatment and control, to define now the treatment as the women who have nursery-aged children vs. women with no children (panel C). By this estimation I want to further emphasize that the decrease in labor force participation of women with school-aged kids is solely driven by the school closure. Therefore, I would expect to see no effect for women with very young children and women with no children. Results in panel C show indeed that school closure has no impact on those women, indicating that women who had school-aged children are affected directly and women with very young children are not. Those findings are also in line with the findings of Couch *et al.* (2022) and Petts *et al.* (2021) that show women with very young children are not as affected as women with school-aged children.³⁴

Furthermore, to explore if the results are robust using alternative control groups and that they are not driven by different trends, I redefine the control group as i) women with children aged 0 to 3, ii) women with no children, and iii) men with school-aged children 6 to 14. The results are presented in Table 8 in panels A, B, and C respectively.

The estimates in Table 8, panel A show that by redefining the control group to women with children aged 0 to 3, the results yield similar coefficients as the baseline specification,

³³I also introduce a placebo year in 2019 to show that the effect is only driven by school closure and the results in Table A7 panel A in the Appendix remain robust.

³⁴The results remain also robust when I further refine treatment as women with children in the age range of 0 to 3 vs. women with no children as the control group in Table A7 panel B in the Appendix.

that is a decrease in the labor force participation and employment of women with school-aged children. Panel B shows the results by changing the control group to women without children, the results also remain robust. That is, the decrease for women with school-aged children is still observed and the coefficients are slightly higher in magnitude.³⁵

Next, by analyzing the gender gap (panel C) for women and men with school-aged children to evaluate the impact of school closures, a similar approach like Couch *et al.* (2022), my treatment group is now defined as women with school-aged children vs. control group, men with school-aged children. The findings in Table 8 panel C, show a decrease in the labor force participation of women in the treatment by 3.7 percentage points in comparison to men and that employment decreases by almost 4 percentage points. Those findings are in line with the results presented by Couch *et al.* (2022) that show that only women with school-aged children vs. men with school-aged children decrease their employment to population ratio by 4.3 percentage points, and the results by Yamamura and Tsustsui (2021) show a similar pattern, that women with school-aged children are the ones that carry the burden of child care.

Next, to better take into account the pre-existing trends between the group of women with school-aged children relative to women with nursery-aged children that might be driving the results. I show in Table 9 panel A, the baseline estimates by adding a group specific time trend. The coefficients in Table 9 show that the labor outcome variables are negative and significant for all labor variables. This shows that the results estimated are not driven by those pre-existing time trends between groups.

Finally, since the teen fertility rate in Mexico is high, I alter the age range of women from 20 to 55, to include now women with school-aged children aged 18 to 55 (Table 9 panel B), and the results remain robust.³⁶ That is a decrease in labor force participation, hours worked and the extensive margin of women in the treatment in comparison to the control group. Moreover, I also change the time period to 2018-2021 (Table 9 panel C)

³⁵I further change the age range of children to test the results for women with children 6 to 17 years old and the results still hold. Results are available upon request.

³⁶The results remain robust also when including women in the age range 20 to 60. Results are presented in Table A8 panel A in the Appendix.

and the results remain robust to the changes in the time frame.³⁷

6 Conclusion

This paper contributes to the literature by providing the first empirical evidence on the direct impact of school closure on the employment of women with school-aged children in developing countries. It also adds to the literature focusing on developed countries (see e.g., Couch *et al.*, 2022; Collins *et al.*, 2021; Adams-Prassl *et al.*, 2020; Amuedo-Dorantes *et al.*, 2020; Landivar *et al.*, 2020) by deviating from previous work that focuses on the gap between men and women, to focus instead on women with children in different age groups and women without children. To estimate the causal impact of school closure due to the COVID-19 pandemic, I compare women with school-aged children to women with nursery-aged children. While both groups of women were exposed to the economic shock of the COVID-19 pandemic, women with children in school age faced a sudden increase in the time children spend at home. In contrast, women with younger children were not as affected by school closures given that their children are too young to be enrolled in the schooling system.

Focusing on women with nursery-aged children to build the control group instead of men, reassures that the parallel trend assumption is not violated. Visual inspection of pre-treatment evolution of treatment and control groups shows that women with children in different age groups (and even without children) despite having level difference in terms of their probability to work, follow very similar trends. In contrast, the path of men and women is hardly comparable because men usually have a much more inelastic labor supply than women due to persisting cultural attitudes (Jaumotte, 2003).

Using data from the Mexican Labor Force Survey (ENOE), I implement a DiD approach that exploits school closure in March 20, 2020 as a natural cutoff to assign women with school-aged children in the treatment group and women with nursery-aged children in the control group. My results show, in line with Couch *et al.* (2022) and Yamamura

³⁷limiting the time frame from 2019 to 2021 also does not affect the estimates, results are presented in Table A8 panel B in the Appendix.

and Tsustsui (2021), that women with school-aged children are the ones that are mostly affected by school closure. The labor force participation of those women decreases by 1.7 percentage points, and their employment by 1.9 percentage points. This effect translates to a decrease in labor force participation and employment by 3%. However, I also deviate from their work to further show that my results remain robust also when accounting for unobservables by using the individual effects model and by showing that in the context of developing countries, the informal sector is affected the most.

Bundervoet *et al.* (2022) show that the vulnerable groups, like women and the low educated, in the society are most likely to be affected by such recessions. My results show indeed that school closure affects women with low and medium education level, however, this study is the first to deviate from other studies in the literature to show that not only vulnerable groups in the society are affected by the crisis in the economy. I find that school closure affects all women with school-aged children across all income quantiles, poverty levels, urbanization level, and even age. Only women that are highly educated seem not to be affected by this crisis because they can work remotely or they have arranged some type of child care. I further go beyond those studies done to show that women with access to informal child care, such as presence of a grandmother or adult women in the household, are not affected by school closure. My results, also show that single women who are the main breadwinner depend also on other sources of child care and therefore were also not affected by this shock. This points out the importance of other sources of child care for women to be able to stay or join the labor market.

Moreover, since a high proportion of the women work in the informal sector in Mexico, the decrease in the labor force participation is mostly concentrated in that sector. By looking at the type of sector, I observe that agriculture and manufacturing sectors are not affected but the services sector is the mostly affected one because this type of work has to be done in the workplace and can not be done remotely.

The results provided in this paper are highly important because they provide the direct effect of the school closure independently from COVID-19. This sheds the light on the importance of schools as child care provider and that other solutions should be

thought of before closing schools. This also shows that schools are a powerful instrument for women with children to enter the labor force. The COVID-19 pandemic had negative effects on the labor force participation of women and by closing schools this negative effect was made stronger, many women were forced to stay home and care for their children. This might have a long term negative impact on the employment of those women, causing many of them to stay home and not go back to the labor market, or even be penalized for dropping out of the labor force.

My results have important policy implications not only for Mexico, but also for other Latin American countries, where school closures lasted the most, and labor force participation of women is still small. First, school closures have been shown to affect negatively student achievement and attainment (Grewenig *et al.*, 2021; Halloran *et al.*, 2021; Larsen, 2020), but also affected the labor force participation of women with school-aged children. Second, schooling is an important form of child care that enables women to join the labor force (Bick, 2016; Brill *et al.*, 2016). Third, systems are needed in place to deal with shocks that allow for children to continue to attend school in a safe way, such as opening schools for two-shifts, students wearing masks, or regular COVID-19 testing for students and staff (Di Domenico *et al.*, 2021). Fourth, the quality of jobs for women has to increase (mostly informal in the services sectors). Women need to diversify their employment in other industries and have access to decent work. Decent work is a key element for better productivity and in fighting poverty (ILO, 2022b).

Finally, both women and men need to have access to less rigid employment systems because working remotely in Mexico is rather an exception to the employment rules. Due to school closures, this paper has shown that women held the double burden of home-schooling and working in the market. Therefore, gender norms in developing countries should also change so that both men and women will be able to arrange household work and market work ensuring gender equality between both.

References

- ADAMS-PRASSL, A., BONEVA, T., GOLIN, M. and RAUH, C. (2020). Inequality in the Impact of the Coronavirus Shock: Evidence from Real Time Surveys. *Journal of Public Economics*, **189**, 104245.
- ADDA, J. (2016). Economic Activity and the Spread of Viral Diseases: Evidence from High Frequency Data. *The Quarterly Journal of Economics*, **131** (2), 891–941.
- ALON, T., DOEPKE, M., MANYSHEVA, K. and TERTILT, M. (2022). Gendered Impacts of Covid-19 in Developing Countries. *IZA Discussion Paper*, (13827).
- AMUEDO-DORANTES, C., KAUSHAL, N. and MUCHOW, A. N. (2020). Is the Cure Worse than the Disease? County-level Evidence from the COVID-19 Pandemic in the United States. *NBER Working Paper*, (27759).
- APARICIO-FENOLL, A. and VIDAL-FERNANDEZ, M. (2015). Working Women and Fertility: the Role of Grandmothers' Labor Force Participation. *CESifo Economic Studies*, **61** (1), 123–147.
- ASAI, Y., KAMBAYASHI, R. and YAMAGUCHI, S. (2015). Childcare Availability, Household Structure, and Maternal Employment. *Journal of the Japanese and International Economies*, **38**, 172–192.
- BAKER, M., GRUBER, J. and MILLIGAN, K. (2008). Universal Child Care, Maternal Labor Supply, and Family Well-Being. *Journal of Political Economy*, **116** (4), 709–745.
- BALDWIN, R. E. and WEDER, B. (2020). Mitigating the COVID Economic Crisis: Act Fast and do Whatever it Takes. *CEPR Press*.
- BAUERNSCHUSTER, S. and SCHLOTTER, M. (2015). Public Child Care and Mothers' Labor Supply—Evidence from Two Quasi-Experiments. *Journal of Public Economics*, **123**, 1–16.
- BERLINSKI, S. and GALIANI, S. (2007). The Effect of a Large Expansion of Pre-primary School Facilities on Preschool Attendance and Maternal Employment. *Labour Economics*, **14** (3), 665–680.
- BICK, A. (2016). The Quantitative Role of Child Care for Female Labor Force Participation and Fertility. *Journal of the European Economic Association*, **14** (3), 639–668.
- BOZKURT, A., JUNG, I., XIAO, J., VLADIMIRSCHI, V., SCHUWER, R., EGOROV, G., LAMBERT, S., AL-FREIH, M., PETE, J., OLCOTT JR, D. *et al.* (2020). A Global Outlook to the Interruption of Education due to COVID-19 Pandemic: Navigating in a Time of Uncertainty and Crisis. *Asian Journal of Distance Education*, **15** (1), 1–126.
- BRATTI, M., FRATTINI, T. and SCERVINI, F. (2018). Grandparental Availability for Child Care and Maternal Labor Force Participation: Pension Reform Evidence from Italy. *Journal of Population Economics*, **31** (4), 1239–1277.

- BRILLI, Y., DEL BOCA, D. and PRONZATO, C. D. (2016). Does Child Care Availability Play a Role in Maternal Employment and Children’s Development? Evidence from Italy. *Review of Economics of the Household*, **14** (1), 27–51.
- BRYNJOLFSSON, E., HORTON, J. J., OZIMEK, A., ROCK, D., SHARMA, G. and TUYE, H.-Y. (2020). COVID-19 and Remote Work: An Early Look at US Data. *NBER Working Paper*, (2734).
- BUNDERVOET, T., DÁVALOS, M. E. and GARCIA, N. (2022). The Short-Term Impacts of COVID-19 on Households in Developing Countries: An Overview based on a Harmonized Dataset of High-Frequency Surveys. *World Development*, **153**, 105844.
- BUSO, M., FAZIO, M. V. and LEVY, S. (2012). The Productivity Costs of Excessive Informality in Mexico. *IDB Working Paper*, (341).
- CASCIO, E. U. (2009). Maternal Labor Supply and the Introduction of Kindergartens into American Public Schools. *Journal of Human Resources*, **44** (1), 140–170.
- CASTILLO, R. C., STAGUHN, E. D. and WESTON-FARBER, E. (2020). The Effect of State-Level Atay-at-Home Orders on COVID-19 Infection Rates. *American Journal of Infection Control*, **48** (8), 958–960.
- CAUCHEMEZ, S., VALLERON, A.-J., BOELLE, P.-Y., FLAHAULT, A. and FERGUSON, N. M. (2008). Estimating the Impact of School Closure on Influenza Transmission from Sentinel Data. *Nature*, **452** (7188), 750–754.
- CENTRO DE INVESTIGACIÓN ECONÓMICA Y PRESUPUESTARIA (2019). Educación inicial. Incorporación a La Educación Básica y Obligatoria. Available at: <https://ciep.mx/educacion-inicial-incorpacion-a-la-educacion-basica-y-obligatoria/>.
- CHASSON, M., BEN-YAAKOV, O. and TAUBMAN-BEN-ARI, O. (2021). Meaning in Life Among New Mothers Before and During the COVID-19 Pandemic: The Role of Mothers’ Marital Satisfaction and Perception of the Infant. *Journal of Happiness Studies*, **22** (8), 3499–3512.
- COLLINS, C., LANDIVAR, L. C., RUPPANNER, L. and SCARBOROUGH, W. J. (2021). COVID-19 and the Gender Gap in Work Hours. *Gender, Work and Organization*, **28**, 101–112.
- CONEVAL – CONSEJO NACIONAL DE LA EVALUACIÓN DE LA POLÍTICA DE DESARROLLO SOCIAL (2022). Evolucion De Las Lineas De Pobreza Por Ingresos. Available at: <https://www.coneval.org.mx>.
- COUCH, K. A., FAIRLIE, R. W. and XU, H. (2022). The Evolving Impacts of the COVID-19 Pandemic on Gender Inequality in the US Labor Market: The COVID Motherhood penalty. *Economic Inquiry*, **60** (2), 485–507.
- COVARRUBIAS, M. (2021). Covid-19 Widens the Digital Divide in Mexico. *Hertie School*, available at: <https://www.hertie-school.org/en/news/detail/content/covid-19-widens-the-digital-divide-in-mexico>.

- DANG, H.-A., HIRAGA, M. and NGUYEN, C. V. (2019). Childcare and Maternal Employment: Evidence from Vietnam. *World Bank Policy Research Working Paper*, (8856).
- DAVE, D., FRIEDSON, A. I., MATSUZAWA, K. and SABIA, J. J. (2021). When do Shelter-in-Place Orders Fight COVID-19 Best? Policy Heterogeneity Across States and Adoption Time. *Economic Inquiry*, **59** (1), 29–52.
- DE LUCA, G., VAN KERCKHOVE, K., COLETTI, P., POLETTI, C., BOSSUYT, N., HENS, N. and COLIZZA, V. (2018). The Impact of Regular School Closure on Seasonal Influenza Epidemics: a Data-Driven Spatial Transmission Model for Belgium. *BMC Infectious Diseases*, **18** (1), 1–16.
- DI DOMENICO, L., PULLANO, G., SABBATINI, C. E., BOËLLE, P.-Y. and COLIZZA, V. (2021). Modelling Safe Protocols for Reopening Schools During the COVID-19 Pandemic in France. *Nature Communications*, **12** (1), 1–10.
- ECLAC – ECONOMIC COMMISSION FOR LATIN AMERICA AND THE CARIBBEAN (2021). The COVID-19 Pandemic has Caused a Setback of Over a Decade in Labor Market Participation for Women in the Region. *ECLAC*, available at: <https://www.cepal.org/en/pressreleases/covid-19-pandemic-has-caused-setback-over-decade-labor-market-participation-women/>.
- EGGER, D., MIGUEL, E., WARREN, S. S., SHENOY, A., COLLINS, E., KARLAN, D., PARKERSON, D., MOBARAK, A. M., FINK, G., UDRY, C. *et al.* (2021). Falling Living Standards During the COVID-19 Crisis: Quantitative Evidence from Nine Developing Countries. *Science Advances*, **7** (6), eabe0997.
- EL HERALDO DE MÉXICO (2021). En México, Trabajan Más Desde La Casa, Según La OIT. Available at: <https://heraldodemexico.com.mx/economia/2021/11/22/en-mexico-trabajan-mas-desde-la-casa-segun-la-oit-355926.html>.
- ESPITIA, A., MATTOO, A., ROCHA, N., RUTA, M. and WINKLER, D. (2022). Pandemic Trade: COVID-19, Remote Work and Global Value Chains. *The World Economy*, **45** (2), 561–589.
- FITZPATRICK, M. D. (2010). Preschoolers Enrolled and Mothers at Work? The Effects of Universal Prekindergarten. *Journal of Labor Economics*, **28** (1), 51–85.
- GALANTI, T., GUIDETTI, G., MAZZEI, E., ZAPPALÀ, S. and TOSCANO, F. (2021). Work from Home during the COVID-19 Outbreak: The Impact on Employees’ Remote Work Productivity, Engagement, and Stress. *Journal of Occupational and Environmental Medicine*, **63** (7), e426.
- GELBACH, J. B. (2002). Public Schooling for Young Children and Maternal Labor Supply. *American Economic Review*, **92** (1), 307–322.
- GOLDIN, C. and MITCHELL, J. (2017). The New Life Cycle of Women’s Employment: Disappearing Humps, Sagging Middles, Expanding Tops. *Journal of Economic Perspectives*, **31** (1), 161–82.

- GOSTIN, L. O. and WILEY, L. F. (2020). Governmental Public Health Powers During the COVID-19 Pandemic: Stay-at-Home Orders, Business Closures, and Travel Restrictions. *Jama*, **323** (21), 2137–2138.
- GREWENIG, E., LERGETPORER, P., WERNER, K., WOESSMANN, L. and ZIEROW, L. (2021). COVID-19 and Educational Inequality: How School Closures Affect Low-and High-Achieving Students. *European Economic Review*, **140**, 103920.
- HALLORAN, C., JACK, R., OKUN, J. C. and OSTER, E. (2021). Pandemic Schooling Mode and Student Test Scores: Evidence from US States. *NBER Working Paper*, (29497).
- HANK, K. and BUBER, I. (2009). Grandparents Caring for their Grandchildren: Findings from the 2004 Survey of Health, Ageing, and Retirement in Europe. *Journal of Family Issues*, **30** (1), 53–73.
- HANZL, L. and REHM, M. (2021). Less Work, More Labor: School Closures and Work Jours During the COVID-19 Pandemic in Austria. *ifso working paper*, (12).
- HAVNES, T. and MOGSTAD, M. (2011). Money for Nothing? Universal Child Care and Maternal Employment. *Journal of Public Economics*, **95** (11-12), 1455–1465.
- HOEHN-VELASCO, L. and PENGLASE, J. (2021). Does Unilateral Divorce Impact Women’s Labor Supply? Evidence from Mexico. *Journal of Economic Behavior and Organization*, **187**, 315–347.
- INSITUTO NACIONAL DE LAS MUJERES (2018). Indicadores Básicos. Available at: http://estadistica.inmujeres.gob.mx/formas/panorama_general.php?IDTema=6&pag=1.
- INSITUTO NACIONAL DE LAS MUJERES (2020a). La Participación De Las Mujeres En El Mercado Laboral Mexicano: Efectos En El Corto Plazo De La Pandemia COVID-19. Available at: http://cedoc.inmujeres.gob.mx/documentos_download/Folleto_Covid_19_Mercado_laboral_VoBo_171120.pdf.
- INSITUTO NACIONAL DE LAS MUJERES (2020b). Las Mujeres y El Trabajo En El Contexto De La Pandemia En México. Available at: http://cedoc.inmujeres.gob.mx/documentos_download/BA6N12.pdf.
- ISSSTE – INSTITUTO DE SEGURIDAD Y SERVICIOS SOCIALES DE LOS TRABAJADORES DEL ESTADO (2021). Desde El Inicio De La Pandemia, Las Estancias Infantiles Del ISSSTE Permanecen En Operación. Available at: <https://www.gob.mx/issste/>.
- INEGI – INSTITUTO NACIONAL DE ESTADÍSTICA Y GEOGRAFÍA (2018). *Mujeres y Hombres En México*. INEGI, México.
- INEGI – INSTITUTO NACIONAL DE ESTADÍSTICA Y GEOGRAFÍA (2020). *En México Hay 80.6 Millones De Usuarios De Internet Y 86.5 Millones De Usuarios De Teléfonos Celulares: Endutih 2019*. INEGI, México.
- INEGI – INSTITUTO NACIONAL DE ESTADÍSTICA Y GEOGRAFÍA (2021). *Estadísticas a Propósito Del día Internacional De La Mujer*. INEGI, México.

- INEE – INSTITUTO NACIONAL PARA LA EVALUACIÓN DE LE EDUCACIÓN EN MÉXICO (2018). *La Educación Obligatoria en México Informe 2018*. INEE, México.
- ILO – INTERNATIONAL LABOR ORGANIZATION (2018). Women and Men in the Informal Economy: A Statistical Picture. **3**.
- ILO – INTERNATIONAL LABOR ORGANIZATION (2019). ILOSTAT Database. Available at: <https://ilostat.ilo.org/data/>.
- ILO – INTERNATIONAL LABOR ORGANIZATION (2022a). América Latina y Caribe: Políticas De Igualdad De Género y Mercado De Trabajo Durante La Pandemia. Available at: https://www.ilo.org/americas/publicaciones/WCMS_838520/lang--es/index.htm.
- ILO – INTERNATIONAL LABOR ORGANIZATION (2022b). Decent Work. Available at: <https://www.ilo.org/global/topics/decent-work/lang--en/index.htm>.
- ILO – INTERNATIONAL LABOR ORGANIZATION (2022c). Over 2 million Moms left the Labour Force in 2020 According to New Global Estimates. Available at: https://ilostat.ilo.org/over-2-million-moms-left-the-labour-force-in-2020-according-to-global-estimates/?utm_source=rss&utm_medium=rss&utm_campaign=over-2-million-moms-left-the-labour-force-in-2020-according-to-new-global-estimates.
- JAUMOTTE, F. (2003). Female Labour Force Participation: Past Trends and Main Determinants in OECD Countries. *OECD Working Paper*, (376).
- JUHN, C. and MCCUE, K. (2017). Specialization then and now: Marriage, Children, and the Gender Earnings Gap Across Cohorts. *Journal of Economic Perspectives*, **31** (1), 183–204.
- KANJI, S. (2018). Grandparent Care: A Key Factor in Mothers’ Labour Force Participation in the UK. *Journal of Social Policy*, **47** (3), 523–542.
- KLEVEN, H., LANDAIS, C. and SØGAARD, J. E. (2019). Children and Gender Inequality: Evidence from Denmark. *American Economic Journal: Applied Economics*, **11** (4), 181–209.
- LANDIVAR, L. C., RUPPANNER, L., SCARBOROUGH, W. J. and COLLINS, C. (2020). Early Signs Indicate that COVID-19 is Exacerbating Gender Inequality in the Labor Force. *Socius*, **6**, 2378023120947997.
- LARSEN, M. F. (2020). Does Closing Schools Close Doors? The Effect of High School Closings on Achievement and Attainment. *Economics of Education Review*, **76**, 101980.
- LEVY, S. (2010). *Good Intentions, Bad Outcomes: Social Policy, Informality, and Economic Growth in Mexico*. Brookings Institution Press.
- LEY FEDERAL DEL TRABAJO (2012). Nueva Ley publicada en el Diario Oficial de la Federación el 1º de abril de 1970. Available at: https://www.senado.gob.mx/comisiones/desarrollo_social/docs/marco/Ley_FT.pdf.

- LUMSDAINE, R. L. and VERMEER, S. J. (2015). Retirement Timing of Women and the Role of Care Responsibilities for Grandchildren. *Demography*, **52** (2), 433–454.
- MARTÍNEZ, C. and PERTICARÁ, M. (2017). Childcare Effects on Maternal Employment: Evidence from Chile. *Journal of Development Economics*, **126**, 127–137.
- MEXICO DAILY NEWS (2021). After 17 months, Schools Reopen for In-Person Classes. Available at: <https://mexiconewsdaily.com/news/after-17-months-schools-reopen-for-in-person-classes/>.
- MEYERS, M. K., HEINTZE, T. and WOLF, D. A. (2002). Child Care Subsidies and the Employment of Welfare Recipients. *Demography*, **39** (1), 165–179.
- MONROY, C. and TRINES, S. (2019). Education in Mexico. *World Education News+Reviews (WES)*, available at: <https://wenr.wes.org/2019/05/education-in-mexico-2>.
- NAFISAH, S. B., ALAMERY, A. H., AL NAFESA, A., ALEID, B. and BRAZANJI, N. A. (2018). School Closure During Novel Influenza: a Systematic Review. *Journal of Infection and Public Health*, **11** (5), 657–661.
- NOLLENBERGER, N. and RODRÍGUEZ-PLANAS, N. (2015). Full-Time Universal Childcare in a Context of Low Maternal Employment: Quasi-Experimental Evidence from Spain. *Labour Economics*, **36**, 124–136.
- PETTS, R. J., CARLSON, D. L. and PEPIN, J. R. (2021). A Gendered Pandemic: Childcare, Homeschooling, and Parents’ Employment During COVID-19. *Gender, Work and Organization*, **28**, 515–534.
- PIRAS, C., MORRISON, N. *et al.* (2014). The Gender Dividend: Capitalizing on Women’s Work. *Inter-American Development Bank*.
- ROJAS, F. L., JIANG, X., MONTENOVO, L., SIMON, K. I., WEINBERG, B. A. and WING, C. (2020). Is the Cure Worse than the Problem Itself? Immediate Labor Market Effects of COVID-19 Case Rates and School Closures in the US. *NBER Working Paper*, (27127).
- SHAH, S. M. A., MOHAMMAD, D., QURESHI, M. F. H., ABBAS, M. Z. and ALEEM, S. (2021). Prevalence, Psychological Responses and Associated Correlates of Depression, Anxiety and Stress in a Global Population, during the Coronavirus Disease (COVID-19) Pandemic. *Community Mental Health Journal*, **57** (1), 101–110.
- SIEPPI, A. and PEHKONEN, J. (2019). Parenthood and Gender Inequality: Population-Based Evidence on the Child Penalty in Finland. *Economics Letters*, **182**, 5–9.
- TESTER, J. M., ROSAS, L. G. and LEUNG, C. W. (2020). Food Insecurity and Pediatric Obesity: a Double Whammy in the Era of COVID-19. *Current Obesity Reports*, **9** (4), 442–450.
- OECD – THE ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT (2020). School Education During COVID-19: Were Teachers and Students Ready? Available at: <https://www.oecd.org/education/Mexico-coronavirus-education-country-note.pdf>.

- OECD – THE ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT (2021a). Adult Education Level. Available at: <https://data.oecd.org/eduatt/adult-education-level.htm>.
- OECD – THE ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT (2021b). Education at a Glance 2021: OECD Indicators. Available at: <https://www.oecd-ilibrary.org/sites/2a39f90d-en/index.html?itemId=/content/component/2a39f90d-en>.
- OECD – THE ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT (2021c). Education GPS. Available at: <https://gpseducation.oecd.org/CountryProfile?primaryCountry=MEX&treshold=10&topic=EO>.
- OECD – THE ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT (2021d). The Pursuit of Gender Equality: An Uphill Battle. Available at: <https://www.oecd.org/mexico/Gender2017-MEX-en.pdf>.
- UNICEF – THE UNITED NATIONS CHILDREN’S FUND (2021). COVID-19 and School Closures. *New York*, available at: <https://data.unicef.org/resources/one-year-of-covid-19-and-school-closures/>.
- TRIPATHI, S., CHRISTISON, A. L., LEVY, E., MCGRAVERY, J., TEKIN, A., BOLLIGER, D., KUMAR, V. K., BANSAL, V., CHIOTOS, K., GIST, K. M. *et al.* (2021). The Impact of Obesity on Disease Severity and Outcomes Among Hospitalized Children with COVID-19. *Hospital Pediatrics*, **11** (11), e297–e316.
- VILLEGAS RAYA, D. (2019). Los Abuelos Cuidan a 55% De Los Niños De Madres Que Trabajan: INEGI. *Forbes Mexico*, available at: <https://www.forbes.com.mx/los-abuelos-cuidan-a-55-de-los-ninos-de-madres-que-trabajan-inegi/>.
- YAMAMURA, E. and TSUSTSUI, Y. (2021). The Impact of Closing Schools on Working from Home during the COVID-19 Pandemic: Evidence Using Panel Data from Japan. *Review of Economics of the Household*, **19** (1), 41–60.
- YOSHIKAWA, H., MCCARTNEY, K., MYERS, R., BUB, K. L., LUGO-GIL, J., RAMOS, M. A., KNAUL, F., GAYTAN, F. X., BUITRAGO, C., RINCÓN, C. *et al.* (2007). Early Childhood Education in Mexico: Expansion, Quality Improvement and Curricular Reform. *Innocenti Working Paper*, UNICEF.

Figures



Figure 1: LABOR FORCE PARTICIPATION AND HOURS WORKED OF WOMEN ACCORDING TO SURVEY YEAR

Source: ENOE, authors' analysis.

Notes: – The figure illustrates labor force participation and hours worked of women with no kids vs. women with school kids who are aged 6 to 14 years old and vs. women who have nursery-aged kids 0 to 5 years old. School closures happened in the second quarter of 2020. Schools started reopening in the third quarter of 2021.

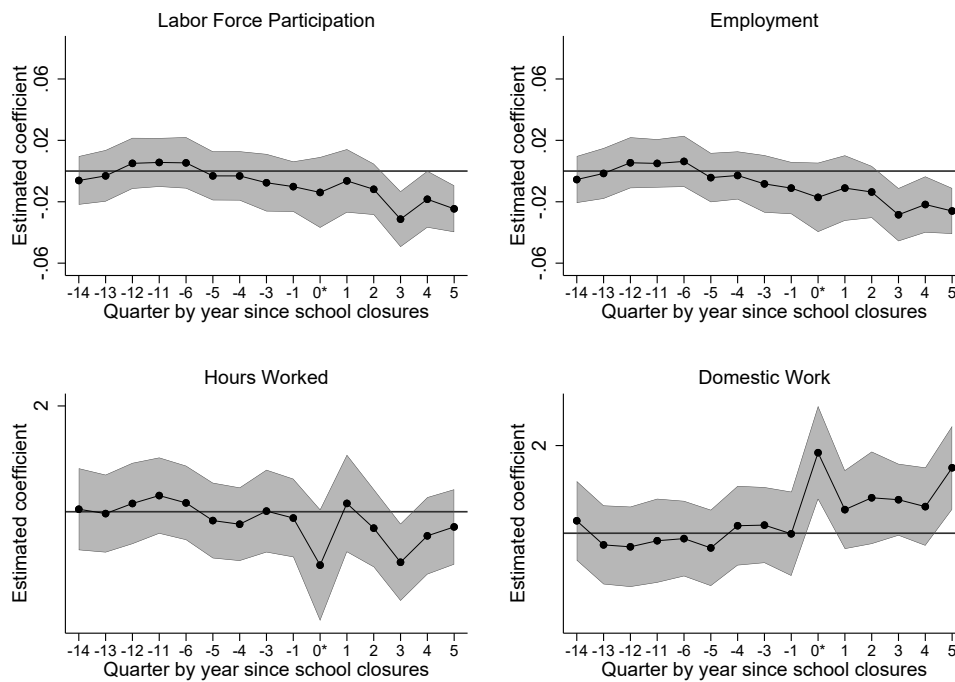


Figure 2: EVENT STUDY: IMPACT OF SCHOOL CLOSURE ON LABOR OUTCOMES OF WOMEN WITH CHILDREN BY QUARTER SURVEY YEAR

Source: ENOE, authors' analysis.

Notes: – The set up of the event study design sets the time at zero as of the 3rd quarter of 2020 when schools closed. The regression includes the full set of controls and state-by-quarter-by-year fixed effects. The grey area represents the confidence interval at a 95% level. time -2 is missing because no data was collected in the 2nd quarter of 2020 due to the pandemic. The year of reference is 2018, this is why the time -7 till -10 are omitted. Standard errors are clustered at the state-year level .

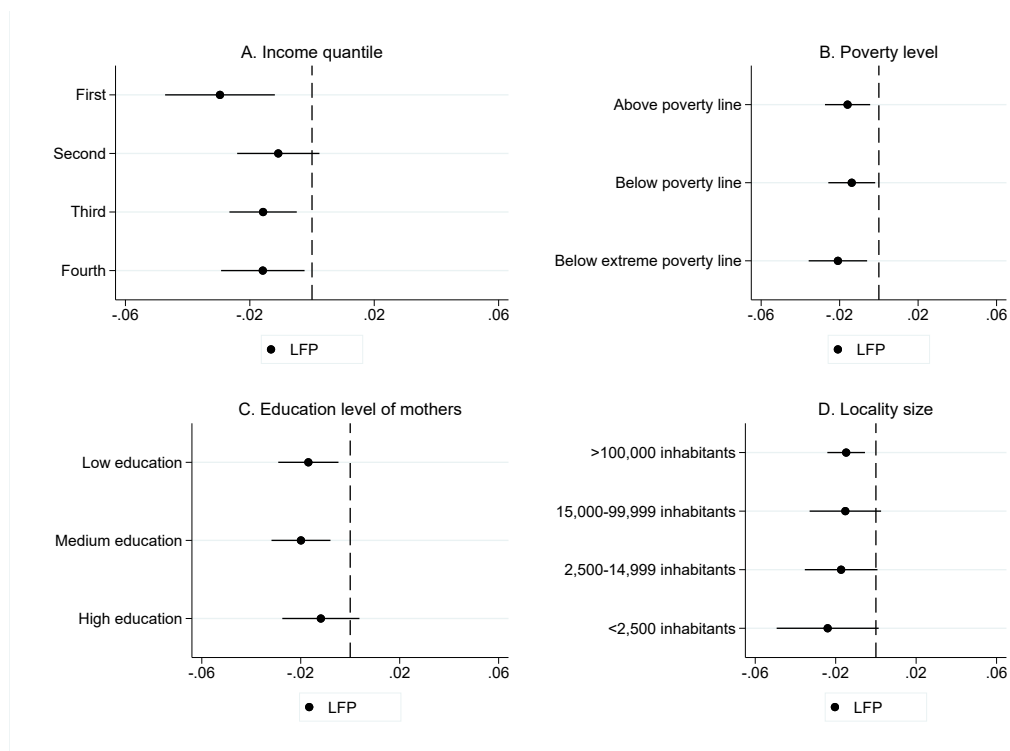


Figure 3: HETEROGENEOUS IMPACTS OF SCHOOL CLOSURE - LFP

Source: ENOE, authors' analysis.

Notes: – Each panel shows for the years 2017 till 2021 the marginal effects of interacting the “Treated x School-closure” indicator with the respective categorical variable i.e., poverty level, income quantile, education level, and locality size. The results are calculated using as the dependent variable a binary variable indicating if women with school-aged children are participating in the labor force. The regressions include the full set of control variables and state-by-quarter-by-year-fixed effects.

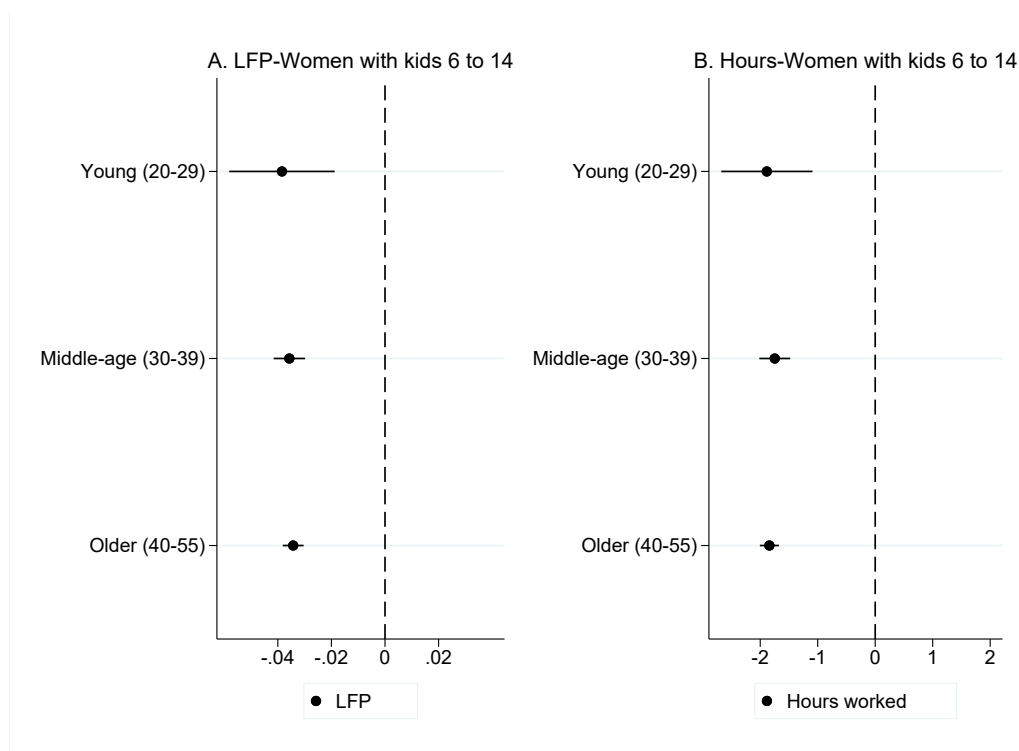


Figure 4: HETEROGENEOUS EFFECT OF SCHOOL CLOSURE ACCORDING TO AGE DIFFERENCES

Source: ENOE, authors' analysis.

Notes: – Each panel shows for the years 2017 till 2021 the marginal effects of interacting the “Treated x School-closure” indicator with the respective categorical variable, i.e. the age differences. Women with school-aged children are split into young (20-29), middle-age (30-39), and old women (40-55). The results are calculated using as the dependent variable a binary variable indicating if women with school-aged children are participating in the labor force and the number of hours worked in the market. The regressions include the full set of control variables and state-by-quarter-by-year-fixed effects.

Tables

Table 1: DESCRIPTIVE STATISTICS: PRE-SCHOOL CLOSURE WOMEN WITH CHILDREN

	All		Treatment before		Control before		T-test
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Δ Mean ^a
Dependent variables							
Labor force participation	0.548	0.498	0.572	0.495	0.475	0.499	0.097***
Employed	0.534	0.499	0.559	0.497	0.458	0.498	0.101***
Total hours worked	19.128	22.057	20.074	22.249	16.172	21.176	3.902***
Domestic Work	34.541	17.174	31.998	16.021	42.691	18.179	-10.693***
Conditional dependent variables							
Conditional hours worked	35.810	17.704	35.935	17.780	35.332	17.399	0.602***
Formal work conditional on working	0.479	0.500	0.463	0.499	0.540	0.498	-0.077***
Paid employment	0.949	0.220	0.948	0.222	0.953	0.211	-0.005***
<i>Sector</i>							
Primary	0.025	0.155	0.026	0.160	0.019	0.135	0.008***
Secondary	0.171	0.376	0.171	0.376	0.170	0.375	0.001
Tertiary	0.805	0.396	0.803	0.398	0.812	0.391	-0.009***
Control variables							
Women with school aged kids 6-14	0.758	0.429	1.000	0.000	0.000	0.000	1.000
School closure	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Age	37.793	8.254	40.096	6.804	30.594	8.247	9.502***
Spouse present	0.765	0.424	0.747	0.435	0.821	0.384	-0.074***
Grandparent present	0.054	0.227	0.052	0.223	0.060	0.237	-0.007***
Number of children	2.506	1.389	2.767	1.403	1.689	0.965	1.078***
<i>Marital Status</i>							
Married/Cohabiting	0.863	0.344	0.846	0.361	0.919	0.273	-0.073***
Separated/Divorced	0.068	0.252	0.080	0.271	0.032	0.175	0.048***
Widowed	0.016	0.126	0.019	0.138	0.006	0.077	0.013***
Single	0.052	0.223	0.055	0.228	0.044	0.204	0.012***
<i>Mother's education level</i>							
No education	0.019	0.138	0.022	0.148	0.010	0.098	0.013***
Primary education	0.175	0.380	0.197	0.398	0.106	0.308	0.090***
Secondary education	0.349	0.477	0.364	0.481	0.302	0.459	0.062***
High-school	0.206	0.404	0.184	0.387	0.274	0.446	-0.090***
Vocational training	0.057	0.231	0.063	0.244	0.036	0.187	0.027***
University degree	0.195	0.396	0.170	0.375	0.272	0.445	-0.102***
<i>Locality size</i>							
More than 100,000 inhabitants	0.577	0.494	0.575	0.494	0.585	0.493	-0.010***
15,000-99,999 inhabitants	0.136	0.342	0.136	0.343	0.134	0.341	0.002
2,500-14,999 inhabitants	0.129	0.335	0.130	0.337	0.123	0.329	0.007***
Less than 2,500 inhabitants	0.158	0.365	0.159	0.365	0.158	0.364	0.001
Observations	382,322		289,647		92,675		

Notes: – The table presents descriptive statistics for pre-program trends of women with children before the COVID-19 pandemic for the years 2017-2021. The treatment group includes women who have school-aged kids (6 to 14 years) and control group includes women who have nursery age children (0 to 5 years). ^a This column represents the difference between treatment and control and the respective t-test.

Table 2: EFFECT OF SCHOOL CLOSURE ON WOMEN: LABOR FORCE PARTICIPATION, EMPLOYMENT, HOURS WORKED, AND CONDITIONAL HOURS WORKED

Dependent variable:	Labor Force Participation I	Hours worked II	Extensive margin III	Intensive margin IV
Women with school aged kids 6-14 x School closure	-0.017*** (0.005)	-0.471** (0.209)	-0.019*** (0.005)	0.460** (0.213)
Women with school aged kids 6-14	0.055*** (0.003)	2.165*** (0.137)	0.055*** (0.003)	0.387*** (0.144)
Age	0.041*** (0.001)	1.606*** (0.037)	0.041*** (0.001)	0.289*** (0.048)
Age-squared	-0.001*** (0.000)	-0.020*** (0.000)	-0.001*** (0.000)	-0.004*** (0.001)
Spouse present	-0.122*** (0.004)	-5.116*** (0.145)	-0.115*** (0.004)	-1.825*** (0.137)
Grandparent present	0.030*** (0.004)	1.649*** (0.184)	0.030*** (0.004)	0.893*** (0.180)
Number of children	-0.002** (0.001)	-0.233*** (0.041)	-0.003*** (0.001)	-0.278*** (0.052)
Household size	-0.007*** (0.001)	-0.171*** (0.037)	-0.006*** (0.001)	0.097** (0.044)
<i>Marital Status: Ref.: Married/Cohabiting</i>				
Separated/Divorced	0.193*** (0.005)	8.268*** (0.247)	0.184*** (0.005)	1.789*** (0.184)
Widowed	0.159*** (0.007)	6.758*** (0.357)	0.155*** (0.007)	1.615*** (0.292)
Single	0.215*** (0.005)	9.720*** (0.234)	0.206*** (0.005)	2.462*** (0.177)
<i>Women's education level: Ref.: None</i>				
Primary education	0.013 (0.008)	0.659** (0.319)	0.012 (0.008)	0.752* (0.392)
Secondary education	0.033*** (0.008)	1.425*** (0.325)	0.030*** (0.008)	1.068*** (0.382)
High-school	0.072*** (0.008)	3.234*** (0.320)	0.068*** (0.008)	1.932*** (0.412)
Vocational training	0.099*** (0.009)	3.869*** (0.376)	0.095*** (0.009)	1.317*** (0.436)
University degree	0.233*** (0.009)	7.146*** (0.349)	0.227*** (0.008)	-0.769* (0.410)
<i>Locality size: Ref.: > 100,000 inhabitants</i>				
15,000-99,999 inhabitants	-0.012*** (0.003)	-0.362** (0.168)	-0.010*** (0.003)	-0.041 (0.180)
2,500-14,999 inhabitants	-0.040*** (0.004)	-2.076*** (0.182)	-0.036*** (0.004)	-1.527*** (0.194)
Less than 2,500 inhabitants	-0.130*** (0.006)	-5.752*** (0.209)	-0.122*** (0.005)	-3.534*** (0.246)
Constant	-0.250*** (0.018)	-10.227*** (0.677)	-0.283*** (0.018)	34.127*** (0.876)
Controls all	yes	yes	yes	yes
State-by-quarter-by-year FE	yes	yes	yes	yes
Observations	526,706	526,706	526,706	281,532
R ²	0.130	0.099	0.122	0.026

*Notes: – Results are obtained from DiD models. The data is taken from the ENOE for the years 2017 till 2021. – Standard errors in parentheses (clustered at the state-survey year level). The regressions includes the full set of controls and state-by-quarter-by-year fixed effects. – *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.*

Table 3: EFFECT OF SCHOOL CLOSURE ON WOMEN: LABOR OUTCOMES: INDIVIDUAL FIXED EFFECTS APPROACH

Dependent variable:	Labor Force Participation I	Hours worked II	Extensive margin III	Intensive margin IV
Women with school aged kids 6-14 x School closure	-0.092*** (0.034)	-3.439** (1.530)	-0.087** (0.034)	-2.234 (2.391)
Women with school aged kids 6-14	0.047* (0.026)	2.124* (1.168)	0.030 (0.026)	2.017 (1.823)
Individual FE	all	all	all	all
State-by-quarter-by-year FE	yes	yes	yes	yes
Observations	9,783	9,783	9,783	5,358
R ²	0.107	0.104	0.105	0.323

*Notes: – Results are obtained from DiD models. The data is taken from the ENOE for the years 2017 till 2021. – Standard errors in parentheses (clustered at the state-survey year level). The regressions includes the controls such as age and age squared, state-by-quarter-by-year-fixed effects. – *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.*

Table 4: EFFECT OF SCHOOL CLOSURE ON DOMESTIC WORK, HOURS CARING FOR HH MEMBERS, OR ON HH CHORES

	Domestic work	Hours caring	Hours HH chores
	I	II	III
Women with school aged kids 6-14 x School closure	1.021*** (0.272)	0.545** (0.271)	-0.110 (0.112)
Women with school aged kids 6-14	-7.276*** (0.167)	-6.085*** (0.146)	0.788*** (0.055)
Controls	all	all	all
State-by-quarter-by-year FE	yes	yes	yes
Observations	508,236	267,704	500,762
R ²	0.161	0.147	0.115

*Notes: – Results are obtained from DiD analysis. Treatment are women with school-aged children 6 to 14 years old. Control are women with nursery-aged children 0 to 5 years. The data is taken from the ENOE for the years 2017 till 2021. The sample differs here because of the missing values reported for those variables. The regressions include the full set of controls and state-by-quarter-by-year fixed effects. – Standard errors in parentheses (clustered at the state-survey year level). – *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.*

Table 5: HETEROGENEOUS EFFECTS OF SCHOOL CLOSURE ON WOMEN: FORMAL, PAID EMPLOYMENT, AND SECTOR

Dependent variable:	Formal	Informal	Paid	Unpaid	Primary	Secondary	Tertiary
	I	II	III	IV	V	VI	VII
Women with school aged kids 6-14 x School closure	0.001 (0.005)	-0.033*** (0.005)	-0.019*** (0.005)	-0.006* (0.003)	-0.002 (0.003)	-0.005 (0.005)	-0.018*** (0.005)
Women with school aged kids 6-14	0.033*** (0.003)	0.065*** (0.003)	0.054*** (0.003)	0.013*** (0.002)	0.008*** (0.001)	0.023*** (0.003)	0.053*** (0.003)
Mean	.484	.516	.522	.054	.027	.166	.478
Observations	381,434	390,446	513,072	259,044	252,106	293,949	469,880
R ²	0.251	0.085	0.135	0.022	0.069	0.096	0.148

*Notes: – Results are obtained from DiD models. The data is taken from the ENOE for the years 2017 till 2021. The regressions includes the full set of controls and state-by-quarter-by-year fixed effects. – Standard errors in parentheses (clustered at the state-survey year level). – *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.*

Table 6: HETEROGENEOUS EFFECT OF SCHOOL CLOSURE ON WOMEN: LABOR FORCE PARTICIPATION, EMPLOYMENT, HOURS WORKED, AND CONDITIONAL HOURS WORKED

Dependent variable:	Labor force participation	Hours worked	Extensive margin	Intensive margin
	I	II	III	IV
A. Grandparent in HH				
Women with school aged kids 6-14 x School closure	-0.017*** (0.005)	-0.466** (0.207)	-0.019*** (0.005)	0.482** (0.222)
Grandparent lives in HH	0.039*** (0.008)	2.328*** (0.381)	0.040*** (0.008)	1.691*** (0.379)
Women with school aged kids 6-14 x School closure x Grandparent	0.001 (0.014)	-0.263 (0.685)	-0.000 (0.014)	-0.599 (0.957)
Observations	526,706	526,706	526,706	281,532
B. Adult Women in HH				
Women with school aged kids 6-14 x School closure	-0.017*** (0.006)	-0.413* (0.226)	-0.018*** (0.006)	0.547** (0.230)
Adult women living in HH	0.057*** (0.007)	3.030*** (0.302)	0.056*** (0.007)	2.035*** (0.274)
Women with school aged kids 6-14 x School closure x Adultwomen	0.011 (0.012)	0.403 (0.515)	0.009 (0.012)	0.067 (0.479)
Observations	498,774	498,774	498,774	264,883
C. Single Mother				
Women with school aged kids 6-14 x School closure	-0.018*** (0.005)	-0.491** (0.212)	-0.020*** (0.005)	0.524** (0.220)
Single mother	0.059*** (0.009)	1.157** (0.525)	0.047*** (0.010)	-0.678 (0.447)
Women with school aged kids 6-14 x School closure x Single mother	0.021* (0.011)	1.003* (0.580)	0.022* (0.012)	0.061 (0.530)
Observations	526,706	526,706	526,706	281,532

Notes: – Results are obtained from DiD models. The data is taken from the ENOE for the years 2017 till 2021. – Standard errors in parentheses (clustered at the state-survey year level). The regressions includes the full set of controls and state-by-quarter-by-year fixed effects.– *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

Table 7: ROBUSTNESS: PLACEBO FOR THE EFFECT OF SCHOOL CLOSURE ON LABOR OUTCOMES

Dependent variable:	Labor force participation	Hours worked	Extensive margin	Intensive margin
	I	II	III	IV
A. Placebo year 2018				
Women with school aged kids 6-14 x Placebo school-closure in 2018	0.000 (0.005)	-0.009 (0.228)	-0.001 (0.005)	0.027 (0.233)
Observations	352,356	352,356	352,356	187,627
B. Men with nursery-aged children				
Men with school aged kids 6-14 x School closure	-0.002 (0.002)	-0.223 (0.171)	-0.004 (0.002)	-0.067 (0.157)
Observations	438,919	438,919	438,919	414,884
C. Women with no children				
Women with nursery kids 0-5 x School closure	-0.007 (0.008)	-0.005 (0.008)	0.053 (0.366)	0.257 (0.286)
Observations	208,921	208,921	208,921	116,660

Notes: – Results are obtained from DiD models. In panel A, school closure is now introduced in the second quarter of year 2018 as a placebo year and the data is taken from the ENOE for the years 2017 till 2019. In panel B, the treatment group is now defined as men with school-aged children (6 to 14) and control group men with nursery-aged children (0 to 5). In Panel C, the treatment is defined as women with nursery-aged children (0 to 5) and the control group is defined as women with no children. For both panels B and C the data is taken from the ENOE for the years 2017 to 2021. – Standard errors in parentheses (clustered at the state-survey year level). The regressions includes the full set of controls and state-by-quarter-by-year fixed effects.– *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

Table 8: ROBUSTNESS: ALTERNATIVE CONTROL GROUPS

Dependent variable:	Labor force participation	Hours worked	Extensive margin	Intensive margin
	I	II	III	IV
A. Control-women with children 0 to 3				
Women with school aged kids 6-14 x School closure	-0.014** (0.006)	-0.339 (0.272)	-0.017*** (0.006)	0.587** (0.275)
Observations	467,157	467,157	467,157	253,639
B. Control-women without children				
Women with school aged kids 6-14 x School Closure	-0.026*** (0.008)	-0.699* (0.387)	-0.026*** (0.008)	0.424 (0.274)
Observations	482,834	482,834	482,834	279,187
C. Control-men with school-aged children				
Women with school aged kids 6-14 x School closure	-0.037*** (0.007)	-1.650*** (0.326)	-0.040*** (0.007)	-0.398 (0.295)
Observations	712,041	712,041	712,041	516,669

Notes: – Results are obtained from DiD models. The data is taken from the ENOE for the years 2017 to 2021. Treatment group is defined as women with school-aged children (6 to 14). Control groups are defined as women with children aged 0 to 3 (panel A), as women without children (panel B), and men with school-aged children 6 to 14 years old (panel C) – Standard errors in parentheses (clustered at the state-survey year level). The regressions includes the full set of controls and state-by-quarter-by-year fixed effects.– *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

Table 9: ROBUSTNESS: EFFECT OF SCHOOL CLOSURE ON WOMEN ON LABOR OUTCOME - GROUP TRENDS AND DIFFERENT AGE GROUP

Dependent variable:	Labor force participation	Hours worked	Extensive margin	Intensive margin
	I	II	III	IV
A. Group specific time trend				
Women with school aged kids 6-14 x School closure	-0.034*** (0.004)	-1.557*** (0.188)	-0.038*** (0.004)	-0.392** (0.177)
Observations	526,706	526,706	526,706	281,532
B. Women in the age 18 to 55				
Women with school aged kids 6-14 x School closure	-0.017*** (0.005)	-0.441** (0.208)	-0.019*** (0.005)	0.494** (0.213)
Observations	526,706	526,706	526,706	281,532
C. Year 2018-2021				
Women with school aged kids 6-14 x School closure	-0.016*** (0.005)	-0.413* (0.218)	-0.018*** (0.005)	0.510** (0.226)
Observations	407,952	407,952	407,952	219,597

Notes: – Results are obtained from DiD models. – Standard errors in parentheses (clustered at the state-survey year level). The regressions includes the full set of controls, state fixed effects and group specific time trend for panel A. The regressions includes the full set of controls and state-by-quarter-by-year fixed effects for panels B and C.– *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

Appendix

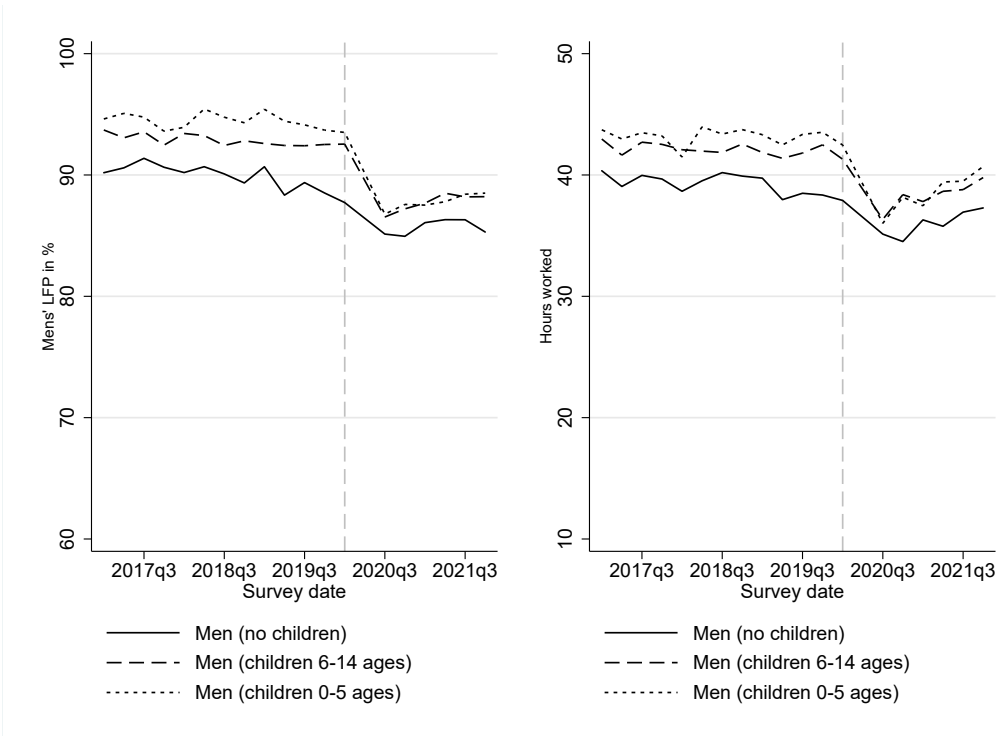


Figure A1: LABOR FORCE PARTICIPATION OF MEN BY SURVEY YEAR

Source: ENOE, authors' analysis.

Notes: – The figure illustrates labor force participation of men with no children versus men with children in the age range from 0 to 14.

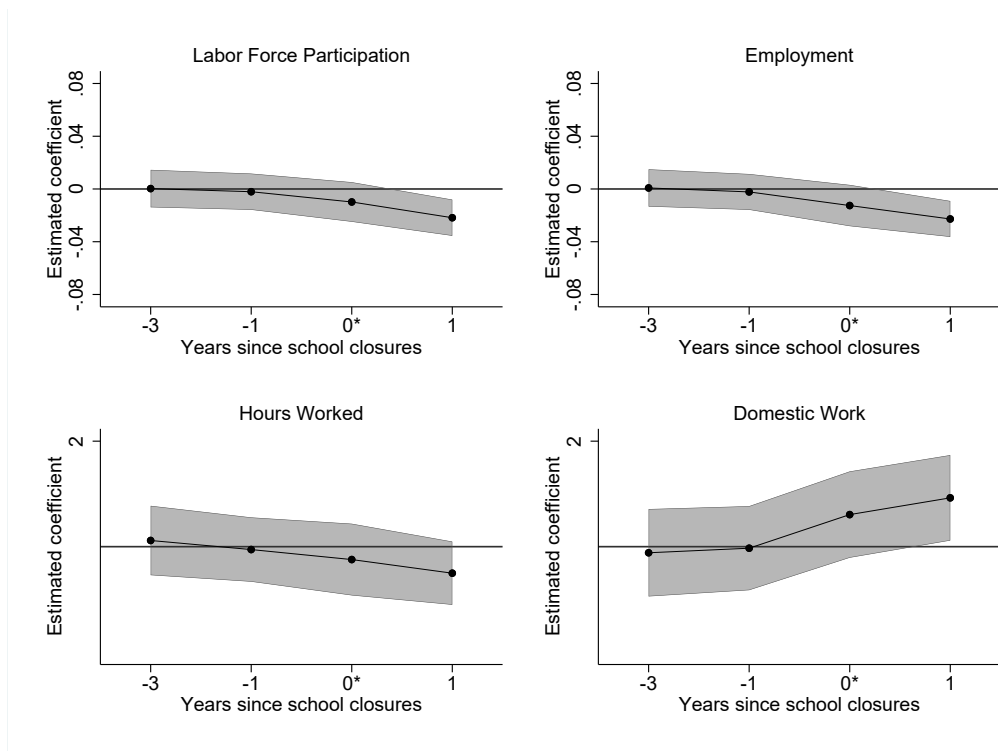


Figure A2: EVENT STUDY: IMPACT OF SCHOOL CLOSURE BY SURVEY YEAR

Source: ENOE, authors' analysis.

Notes: – The set up of the event study design sets the time at zero since survey year 2020 when schools closed. The regression includes the full set of controls and state-by-quarter-by-year fixed effects. The grey area represents the confidence interval at a 95% level. Standard errors are clustered at the state-year level and the year of reference is the 2018.

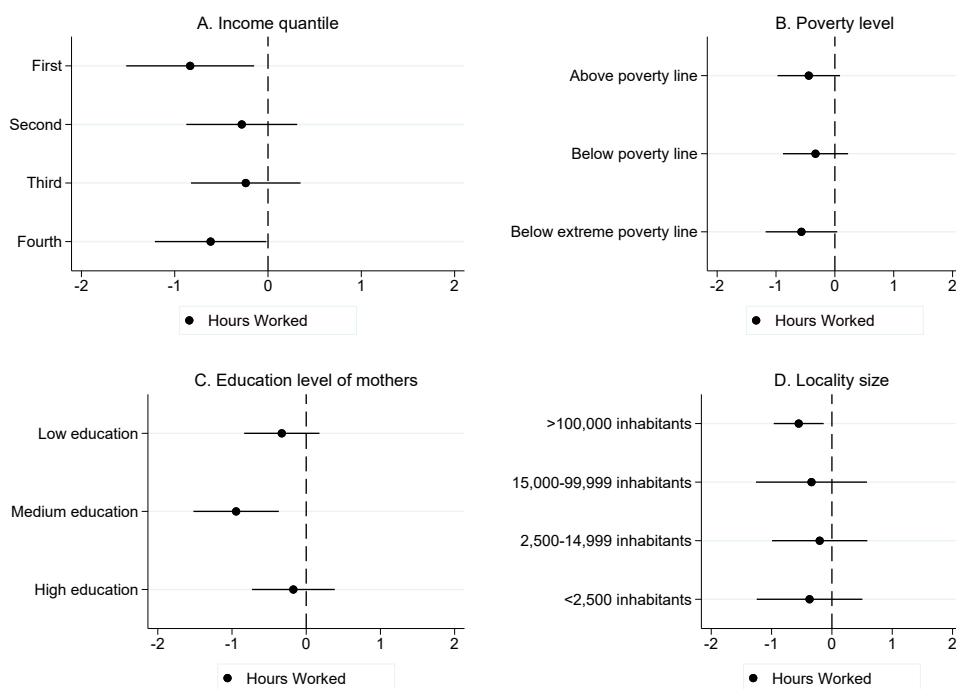


Figure A3: HETEROGENEOUS EFFECT OF SCHOOL CLOSURE - HOURS WORKED

Source: ENOE, authors' analysis.

Notes: – Each panel shows for the years 2017 till 2021 the marginal effects of interacting the “Treated x School-closure” indicator with the respective categorical variable i.e., poverty level, income quantile, education level, and locality size. The results are calculated using as the dependent variable the number of hours worked. The regressions include the full set of control variables and state-by-quarter-by-year-fixed effects. .

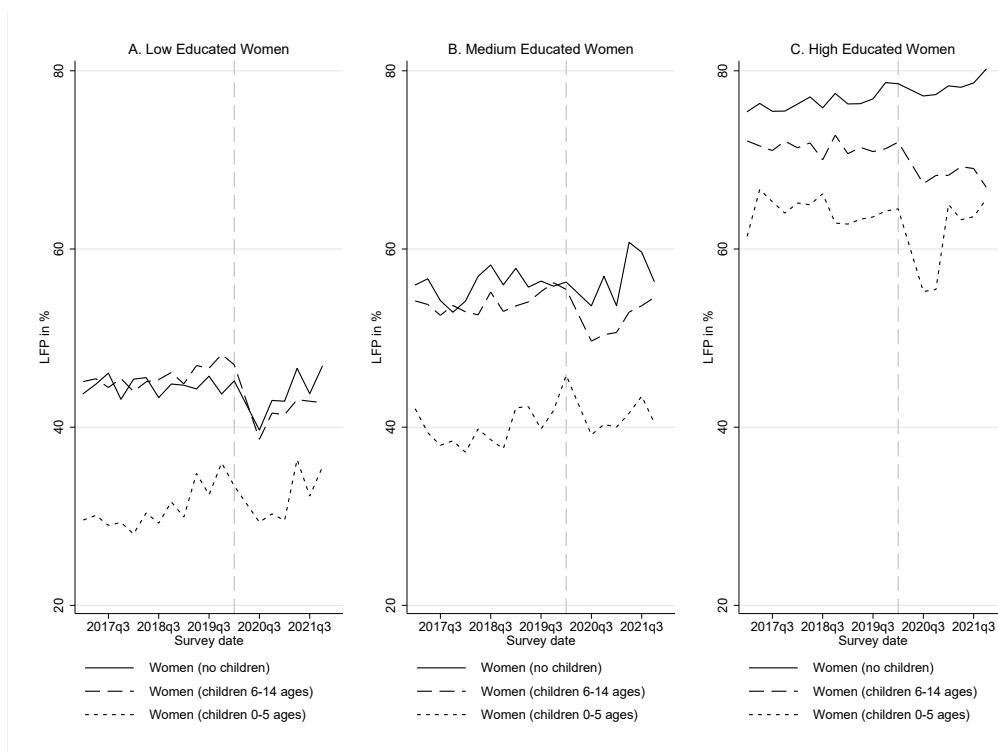


Figure A4: LABOR FORCE PARTICIPATION OF WOMEN ACCORDING TO EDUCATION LEVEL

Source: ENOE, authors' analysis.

Notes: – The figure illustrates labor force participation of women according to the level of education. Low educated women have either no, primary education, or secondary education. Medium educated women have high-school or vocational training. High educated women have University degree.

Table A1: SUMMARY OF TREATMENT AND CONTROL GROUPS

Estimates	Treatment	Control
Baseline Results:	Women with school-aged children 6 to 14	Women with nursery-aged children 0 to 5
Robustness Checks:	Women with school-aged children 6 to 14 Women with school-aged children 6 to 14 Women with school-aged children 6 to 14 Women with children aged 6 to 17 Women with nursery-aged children 0 to 5 Women with children aged children 0 to 3 Men with school-aged children 6 to 14	Women with no children Men with school-aged children 6 to 14 Women with children 0 to 3 Women with nursery-aged children 0 to 5 Women with no children Women with no children Men with nursery-aged children 0 to 5

Notes: – The table presents a summary of all the definitions used for treatment and control groups throughout the baseline, heterogeneous, and robustness estimations.

Table A2: DESCRIPTIVE STATISTICS: POST-SCHOOL CLOSURE WOMEN WITH CHILDREN

	All		Treatment before		Control before		T-test
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Δ Mean ^a
Dependent variables							
Labor force participation	0.552	0.497	0.567	0.496	0.500	0.500	0.067***
Employed	0.535	0.499	0.550	0.497	0.483	0.500	0.068***
Total hours worked	19.096	22.415	19.736	22.613	16.819	21.540	2.917***
Domestic Work	32.343	18.172	30.504	17.215	39.202	19.919	-8.697***
Conditional dependent variables							
Conditional hours worked	35.663	18.640	35.865	18.730	34.844	18.252	1.021***
Formal work conditional on working	0.498	0.500	0.490	0.500	0.530	0.499	-0.040***
Paid employment	0.955	0.207	0.954	0.209	0.960	0.197	-0.005***
<i>Sector</i>							
Primary	0.025	0.156	0.026	0.161	0.019	0.135	0.008***
Secondary	0.183	0.386	0.184	0.387	0.179	0.383	0.005
Tertiary	0.793	0.406	0.790	0.407	0.803	0.398	-0.013***
Control variables							
Women with school aged kids 6-14	0.781	0.414	1.000	0.000	0.000	0.000	1.000
School closure	1.000	0.000	1.000	0.000	1.000	0.000	0.000
Age	39.258	8.395	40.886	7.163	33.467	9.785	7.419***
Spouse present	0.731	0.444	0.719	0.450	0.775	0.418	-0.056***
Grandparent present	0.050	0.217	0.049	0.216	0.052	0.222	-0.003***
Number of children	2.496	1.316	2.685	1.315	1.823	1.081	0.862***
<i>Marital Status</i>							
Married/Cohabiting	0.842	0.365	0.829	0.377	0.887	0.316	-0.059***
Separated/Divorced	0.079	0.269	0.087	0.282	0.050	0.218	0.037***
Widowed	0.020	0.139	0.022	0.147	0.012	0.109	0.010***
Single	0.060	0.237	0.062	0.241	0.051	0.219	0.011***
<i>Mother's education level</i>							
No education	0.018	0.134	0.020	0.140	0.012	0.109	0.008***
Primary education	0.160	0.367	0.174	0.379	0.110	0.312	0.064***
Secondary education	0.346	0.476	0.361	0.480	0.294	0.456	0.067***
High-school	0.215	0.411	0.203	0.402	0.261	0.439	-0.058***
Vocational training	0.048	0.213	0.051	0.221	0.036	0.186	0.016***
University degree	0.212	0.409	0.191	0.393	0.287	0.453	-0.096***
<i>Locality size</i>							
More than 100,000 inhabitants	0.600	0.490	0.594	0.491	0.621	0.485	-0.027***
15,000-99,999 inhabitants	0.131	0.337	0.132	0.338	0.128	0.334	0.004*
2,500-14,999 inhabitants	0.123	0.328	0.125	0.331	0.113	0.317	0.012***
Less than 2,500 inhabitants	0.147	0.354	0.149	0.357	0.138	0.345	0.011***
Observations	144,384		112,709		31,675		

Notes: – The table presents descriptive statistics for post-school closure trends of women with children before the COVID-19 pandemic for the years 2017-2021. Treatment group is defined as women who have school-aged children (6 to 14 years) and control group as women who have nursery age children (0 to 5 years). ^a This column represents the difference between treatment and control and the respective t-test.

Table A3: DESCRIPTIVE STATISTICS: PRE-SCHOOL CLOSURE FOR WOMEN WITH CHILDREN VS. WOMEN WITH NO CHILDREN

	All		Treatment before		Control before		T-test
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Δ Mean ^a
Dependent variables							
Labor force participation	0.732	0.443	0.538	0.499	0.706	0.456	-0.167***
Employed	0.706	0.456	0.526	0.499	0.681	0.466	-0.156***
Total hours worked	29.921	24.367	18.921	22.203	26.576	22.666	-7.655***
Domestic Work	17.835	18.194	33.231	17.412	18.855	13.072	14.376***
Conditional dependent variables							
Conditional hours worked	42.412	17.659	36.007	17.971	39.025	16.389	-3.018***
Formal work conditional on working	0.524	0.499	0.466	0.499	0.659	0.474	-0.193***
Paid employment	0.963	0.188	0.947	0.224	0.970	0.170	-0.023***
<i>Sector</i>							
Primary	0.070	0.254	0.024	0.154	0.012	0.109	0.012***
Secondary	0.269	0.443	0.166	0.372	0.162	0.368	0.004**
Tertiary	0.662	0.473	0.810	0.392	0.826	0.379	-0.016***
Women with children	0.925	0.263	1.000	0.000	0.000	0.000	1.000
School closure	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Age	36.275	10.335	40.342	9.036	34.012	9.742	6.330***
Spouse present	0.719	0.450	0.744	0.436	0.560	0.496	0.184***
Grand parent present	0.053	0.224	0.050	0.219	0.062	0.242	-0.012***
Number of children	1.937	1.599	2.698	1.380	0.000	0.000	2.698***
<i>Marital Status</i>							
Married/Cohabiting	0.637	0.481	0.843	0.364	0.666	0.472	0.178***
Separated/Divorced	0.063	0.243	0.078	0.268	0.012	0.110	0.066***
Widowed	0.012	0.110	0.024	0.154	0.005	0.069	0.019***
Single	0.287	0.453	0.055	0.227	0.317	0.465	-0.263***
<i>Mother's education level</i>							
No education	0.043	0.204	0.025	0.155	0.013	0.112	0.012***
Primary education	0.253	0.435	0.206	0.404	0.085	0.279	0.121***
Secondary education	0.310	0.462	0.349	0.477	0.176	0.381	0.173***
High-school	0.161	0.368	0.188	0.391	0.196	0.397	-0.008***
Vocational training	0.071	0.256	0.064	0.244	0.046	0.211	0.017***
University degree	0.162	0.369	0.169	0.374	0.484	0.500	-0.315***
<i>Locality size</i>							
More than 100,000 inhabitants	0.604	0.489	0.579	0.494	0.709	0.454	-0.130***
15,000-99,999 inhabitants	0.133	0.340	0.136	0.342	0.116	0.320	0.020***
2,500-14,999 inhabitants	0.123	0.328	0.129	0.335	0.088	0.283	0.041***
Less than 2,500 inhabitants	0.140	0.347	0.156	0.363	0.087	0.282	0.069***
Observations	2,538,763		818,769		66,353		

Notes: – The table presents descriptive statistics for post-school closure trends of women with children before the COVID-19 pandemic for the years 2017-2021. Treatment are women with children vs. women with no children. ^a This column represents the difference between treatment and control and the respective t-test.

Table A4: EFFECT OF SCHOOL CLOSURE ON LABOR FORCE PARTICIPATION OF WOMEN WITH CHILDREN

	I	II	III
Women with school aged kids 6-14 x School closure	-0.016** (0.008)	-0.017*** (0.005)	-0.017*** (0.005)
Women with school aged kids 6-14	0.055*** (0.003)	0.055*** (0.003)	0.055*** (0.003)
Age	0.041*** (0.001)	0.041*** (0.001)	0.041*** (0.001)
Age-squared	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)
Spouse present	-0.124*** (0.004)	-0.122*** (0.004)	-0.122*** (0.004)
Grandparent present	0.028*** (0.004)	0.030*** (0.004)	0.030*** (0.004)
Number of children	-0.001 (0.001)	-0.002** (0.001)	-0.002** (0.001)
Household size	-0.008*** (0.001)	-0.007*** (0.001)	-0.007*** (0.001)
<i>Marital Status: Ref.: Married/Cohabiting</i>			
Separated/Divorced	0.193*** (0.005)	0.193*** (0.005)	0.193*** (0.005)
Widowed	0.158*** (0.007)	0.159*** (0.007)	0.159*** (0.007)
Single	0.215*** (0.005)	0.215*** (0.005)	0.215*** (0.005)
<i>Women's education level: Ref.: None</i>			
Primary education	0.018* (0.010)	0.013 (0.008)	0.013 (0.008)
Secondary education	0.042*** (0.011)	0.033*** (0.008)	0.033*** (0.008)
High-school	0.084*** (0.010)	0.072*** (0.008)	0.072*** (0.008)
Vocational training	0.109*** (0.012)	0.099*** (0.009)	0.099*** (0.009)
University degree	0.247*** (0.011)	0.233*** (0.009)	0.233*** (0.009)
<i>Locality size: Ref.: > 100,000 inhabitants</i>			
15,000-99,999 inhabitants	-0.011*** (0.004)	-0.012*** (0.003)	-0.012*** (0.003)
2,500-14,999 inhabitants	-0.042*** (0.005)	-0.040*** (0.004)	-0.040*** (0.004)
Less than 2,500 inhabitants	-0.134*** (0.006)	-0.130*** (0.006)	-0.130*** (0.006)
Constant	-0.219*** (0.020)	-0.245*** (0.018)	-0.243*** (0.018)
Controls	yes	yes	yes
Time fixed effects	no	yes	no
State specific trend	no	no	yes
Observations	526,706	526,706	526,706
R ²	0.121	0.129	0.129

*Notes: – Results are obtained from DiD analysis. Treatment group are women with children aged 6 to 14 years old. Control group are women with children aged 0 to 5 years. – Standard errors in parentheses (clustered at the state-survey year level). – *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.*

Table A5: EFFECT OF SCHOOL CLOSURE ON DOMESTIC WORK CONDITIONAL ON WORKING OR NOT WORKING

	Domestic work	Hours caring	Hours HH chores
	I	II	III
A. Conditional on not working			
Women with school aged kids 6-14 x School closure	1.192*** (0.316)	0.954*** (0.302)	-0.194 (0.166)
Women with school aged kids 6-14	-7.442*** (0.205)	-6.672*** (0.188)	1.526*** (0.087)
Observations	234,729	136,188	232,283
B. Conditional on working			
Women with school aged kids 6-14 x School closure	0.451 (0.298)	-0.098 (0.299)	-0.275** (0.119)
Women with school aged kids 6-14	-6.123*** (0.176)	-5.124*** (0.142)	0.778*** (0.058)
Observations	273,507	131,516	268,479

*Notes: – Results are obtained from DiD analysis. Treatment are women with school-aged children 6 to 14 years old. Control are women with nursery-aged children 0 to 5 years. The data is taken from the ENOE for the years 2017 till 2021. The sample differs here because of the missing values reported for those variables. The regressions include the full set of controls and state-by-quarter-by-year fixed effects. – Standard errors in parentheses (clustered at the state-survey year level). – *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.*

Table A6: INDIVIDUAL F.E.: EFFECT OF SCHOOL CLOSURE ON WOMEN ACCORDING TO SECTOR

Dependent variable:	Formal	Informal	Paid	Unpaid	Primary	Secondary	Tertiary
	I	II	III	IV	V	VI	VII
Women with school aged kids 6-14 x School closure	-0.031 (0.044)	-0.137*** (0.047)	-0.071** (0.035)	-0.082** (0.036)	-0.016 (0.025)	-0.031 (0.050)	-0.112*** (0.038)
Women with school aged kids 6-14	-0.088*** (0.034)	0.121*** (0.036)	0.018 (0.027)	0.058** (0.028)	0.004 (0.019)	0.020 (0.038)	0.031 (0.030)
Individual FE	all	all	all	all	all	all	all
State-by-quarter-by-year FE	yes	yes	yes	yes	yes	yes	yes
Observations	7,213	6,995	9,546	4,665	4,528	5,421	8,664
R ²	0.192	0.209	0.110	0.363	0.338	0.292	0.132

*Notes: – Results are obtained from DiD models. The data is taken from the ENOE for the years 2017 till 2021. The regressions includes age and age squared as controls as well individual fixed effects. – Standard errors in parentheses (clustered at the state-survey year level). – *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.*

Table A7: ROBUSTNESS: PLACEBO FOR EFFECT OF SCHOOL CLOSURE ON WOMEN

Dependent variable:	Labor force participation	Hours worked	Extensive margin	Intensive margin
	I	II	III	IV
A. Placebo year 2019				
Women with school aged kids 6-14 x Placebo school-closure in 2019	-0.007 (0.006)	-0.101 (0.231)	-0.007 (0.006)	0.336 (0.275)
Women with school aged kids 6-14	0.054*** (0.004)	2.023*** (0.189)	0.053*** (0.004)	0.201 (0.219)
Observations	234,202	234,202	234,202	127,130
B. Women with children 0 to 3				
Women with children 0-3 x School closure	-0.012 (0.008)	-0.009 (0.008)	-0.325 (0.390)	-0.084 (0.315)
Women with children 0-3	-0.109*** (0.007)	-0.102*** (0.007)	-5.864*** (0.318)	-3.444*** (0.281)
Observations	159,413	159,413	159,413	94,962

*Notes: – Results are obtained from DiD models. For panel A the data is taken from the ENOE for the years starting the second quarter of 2018 until the first quarter of 2020. School closure is now introduced in the second quarter of year 2019 as a placebo year. For Panel B the data is taken from the ENOE for the years 2017 till 2021. The age range of treatment and control is now changed from 20 to 55 years old women. For panel B the treatment are defined as women with 0 to 3 aged children. Control group is defined as women with no children. – Standard errors in parentheses (clustered at the state-survey year level). The regressions includes the full set of controls and state-by-quarter-by-year fixed effects. – *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.*

Table A8: ROBUSTNESS: EFFECT OF SCHOOL CLOSURE ON LABOR OUTCOMES OF WOMEN WITH DIFFERENT AGE RANGE AND SURVEY YEARS

Dependent variable:	Labor force participation	Hours worked	Extensive margin	Intensive margin
	I	II	III	IV
A. Women age range 20 to 60				
Women with school aged kids 6-14 x School closure	-0.017*** (0.005)	-0.471** (0.209)	-0.019*** (0.005)	0.460** (0.213)
Women with school aged kids 6-14	0.055*** (0.003)	2.165*** (0.137)	0.055*** (0.003)	0.387*** (0.144)
Observations	526,706	526,706	526,706	281,532
B. Year 2019-2021				
Women with school aged kids 6-14 x School closure	-0.015*** (0.006)	-0.409* (0.238)	-0.017*** (0.006)	0.396 (0.258)
Women with school aged kids 6-14	0.055*** (0.004)	2.154*** (0.175)	0.054*** (0.004)	0.422** (0.193)
Observations	291,747	291,747	291,747	158,311

*Notes: – Results are obtained from DiD models. For Panel A the data is taken from the ENOE for the years 2017 until 2021. The age range of women is changed to women aged 20 to 60 years. For Panel B the time frame of the analysis is limited for the years 2019 until 2021. – Standard errors in parentheses (clustered at the state-survey year level). The regressions includes the full set of controls and state-by-quarter-by-year fixed effects. – *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.*