

STOCKHOLM SCHOOL OF ECONOMICS
Department of Economics
5350 Master's thesis in economics
Academic year 2021–2022

Childcare, Social Norms and COVID-19: Does Internet Access Help Women Cope with the Increase in Childcare during COVID-19?

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Abstract: This paper investigates the changes in women's employment due to the outbreak of COVID-19 and the school closure policies in response to the pandemic, by employing a Difference in Difference method. The data is mainly retrieved from the World Bank Enterprise Surveys and COVID-19 Follow-up Surveys across 38 countries. It is found that women working in firms with internet access were less likely to be laid off or quit their jobs during the pandemic, especially when the childcare needs multiplied because of the closedown of schools. Additional evidence suggests that women residing in countries characterized by more conservative social norms with regard to working mothers were more likely to benefit from workplace flexibility. One possible interpretation of this is that they faced a more severe work-family conflict, and the ability to work remotely allowed them to cope with the unexpected increase in childcare. Finally, I find a weaker effect of school closures on women's employment in low-income countries.

Keywords: COVID-19, Gender Gap, Employment Loss, Childcare, Internet Access

JEL: J13, J16, J21

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Date submitted:	May 16, 2022
Date examined:	May 25, 2022
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Acknowledgement

I would like to express my very great appreciation to my supervisor, Céline Zipfel, for her valuable and patient suggestions and guidance during the thesis writing process. I would also like to thank my parents and friends for their support and help.

Table of Contents

1 Introduction	6
2 Literature Review	8
2.1 The Gender Gap in Employment Loss due to COVID-19	8
2.2 Women Employment, Childcare and Social Norms.....	9
2.3 Employment Loss, Childcare and Telecommuting.....	11
3 Data and Variables	11
3.1 Data Description	11
3.2 Dependent Variable	12
3.3 Main Explanatory Variables and Control Variables.....	15
4 Methodology	19
4.1 Hypotheses	19
4.1.1 Gender Impact of Internet Access under COVID-19 and School Closures	19
4.1.2 Heterogenous Gender Impact of Internet Access under COVID-19 and School Closures differ by Social Norms	20
4.1.3 Heterogenous Gender Impact of Internet Access under COVID-19 and School Closures in Low-income Countries and High-income Countries	21
4.2 Identification Strategy	22
4.2.1 Gender Impact of Internet Access under COVID-19 and School Closures	23
4.2.2 Heterogenous Gender Impact of Internet Access under COVID-19 and School Closures differ by Social Norms	24
4.2.3 Heterogenous Gender Impact of Internet Access under COVID-19 and School Closures in Low-income Countries and High-income Countries	25
5 Results	26
5.1 The Job Resilience of Female Employees under COVID-19 and School Closures.....	26
5.2 The Heterogenous Effect of Internet Access differ by Social Norms	27
5.3 Does Internet Access differentially affect the Female Ratio of Employees under the Shocks in Low-income Countries and High-income Countries?	31
6 Discussion and Limitation	32

6.1 Discussion.....	32
6.2 Limitations.....	33
7 Conclusions.....	34
Reference	36
Appendix A	39
Appendix B.....	39
Appendix C	42
Appendix D.....	42

List of Tables

Table 1 Variable Description.....	17
Table 2 Descriptive Statistics.....	18
Table 3 Summary Statistics of Female Ratio Pre- and Post-COVID-19.....	19
Table 4 The Impact of Internet Access on Female Ratio of Employees under COVID-19 and School Closures	27
Table 5 The Impact of Internet Access on Female Ratio of Employees under COVID-19 and School Closures differ by Social Norm1	29
Table 6 The Impact of Internet Access on Female Ratio of Employees under COVID-19 and School Closures differ by Social Norm2	30
Table 7 The Impact of Internet Access on Female Ratio of Employees under COVID-19 and School Closures in Low-income Countries.....	31
Table A 1 Country Distribution.....	40

List of Figures

Figure 1 The Impact of COVID-19 on Gender Ratio of Employments.....	14
Figure B 1 The COVID-19 Follow-up Enterprise Surveys by Country and Round.....	41
Figure C 1 The Impact of Social Norm1 on Gender Ratio of Employees before COVID-19.....	43
Figure C 2 The Impact of Social Norm1 on Gender Ratio of Employees after COVID-19	43
Figure C 3 The Impact of Social Norm2 on Gender Ratio of Employees before COVID-19.....	44
Figure C 4 The Impact of Social Norm2 on Gender Ratio of Employees after COVID-19	44
Figure D 1 The Impact of COVID-19 on Gender Ratio of Employees.....	45

1 Introduction

The COVID-19 Crisis is more than a health and well-being crisis, the pandemic aggravates gender disparities in many social-economic aspects, of which the impact on formal and informal employment is the most noticeable and protracted one (Flor et al., 2022). There was a larger drop in women's employment (4.2%) than that of men (3%) during the year after the pandemic outbreak (ILO, 2021). Women take up a higher proportion in occupations with less resilience to shocks, such as, low-income and part-time jobs, compared to men (ILO, 2017), which makes them suffer a lot when the pandemic almost causes the whole economic world to stop running. The overrepresentation of women in the service industry (OECD, 2017) exacerbates their vulnerability since the social distancing and related measures implemented by government restrict the normal operation of those businesses requiring face-to-face interaction, including retail, hotel, catering, etc. (De Paz et al., 2020).

Previous studies have shown that women were hurt disproportionately compared to men with regard to employment loss during the spread of the pandemic (Alon et al., 2020; Albanesi and Kim, 2021; Bluedorn et al., 2021), and some of them also shed light on how the increase in childcare resulted by school closures worsened the situation of working women under the pandemic (Fabrizio et al., 2021; Collins et al., 2021; Alon et al., 2021; Alon et al., 2022). Women undertake around seventy-six percent of unpaid care work, including childcare and other household chores, which is more than triple the figure of men (Addati et al., 2018), though the time devoted to unpaid care work of men has been increasing, the narrowing process of the gender gap is slow. However, the unexpected pandemic leads to a considerable rise in childcare, forcing women with children to short their working hours and even make the only choice between work and family. A study of the UK family presents a higher job loss for mothers than fathers, and the lockdown led to more mothers being laid off because of the rise in childcare needs (Andrew et al., 2020). The ability to work remotely is found to alleviate the gender gap in labor market participation during the pandemic, since it allows women to manage work and childcare flexibly when schools are closing (Alon et al., 2021; Hou et al., 2022). Following this, this paper estimates how internet access affects the employment loss of white-collar women in formal enterprises during the pandemic, compensating for previous studies with an enterprise perspective. The impact of recommended and mandatory school closure policies on working women is also examined in this paper since they raise the demand for additional childcare. To trace the changes in female employment due to the pandemic, I use data retrieved from the World Bank Enterprise Surveys (ES) and Enterprise

Follow-up Surveys on the impact of COVID-19 across 38 countries. A country-level index measuring the stringency of school closure policies since the outbreak of the pandemic is also employed in this paper. I regard whether a firm has its own website as a proxy for internet access to test its effect on the job resilience of female employees under the pandemic and the school closure policies by using a Difference in Difference (DID) model. To avoid the collinearity problem, I first run the regression considering COVID-19 as an external shock and find that the female ratio of employees in firms with internet access is less affected by the pandemic than those without internet access. I get a similar result when I regard the school closures as a shock, which supports previous research findings.

Then I investigate the heterogeneous gender impact of internet access on the labor market participation by employing country-level indicators representing social norms toward gender roles collected from the World Value Survey. Social norms could shape the cognition and behaviors of people, which inevitably infects people to some extent. The traditional social norms deeming that women should undertake most domestic chores impose constraints on women's access to the job market, and those norms believing that men and women are suitable for different occupations exacerbate the gender segregation in employment (Marcus, 2018). Few studies focusing on the gender impact of COVID-19 have addressed this problem, except for Goldstein et al. (2022), which demonstrates how social beliefs regarding gender equality affected the business and time spent on unpaid care work of female entrepreneurs. As a supplement to prior studies, I introduce a triple difference term of the shock, internet access and social norms to my baseline DID model. And I find that women in conservative societies might benefit more from workplace flexibility under school closures than women in more egalitarian societies. Most of the population in an economy considering that working outside is men's domain and women should take responsibility for children care may hinder women from staying in workplaces and cause working women to be more trapped in the work-family conflict, especially under unexpected shocks. The school closure policy is also found to affect working women in high-income and low-income countries differently, which might be attributed to the fact that school closures induced students from low-income households to drop out of school and join the workforce (Alon et al., 2022), thereby reducing the childcare needs of working mothers in these countries, or that the lack of social insurance schemes might lead to lower coverage of benefits or subsidies in low-income countries under the pandemic (Lastunen et al., 2021), and women might have no choice but to keep working to ensure their own survivals.

This paper consists of the following parts: section 2 makes a brief introduction about previous studies that may be related to this paper; section 3 demonstrates the data and variables; section 4 presents the hypotheses and identification strategy; section 5 displays the results; section 6 includes discussions and limitations, and section 7 makes conclusions.

2 Literature Review

2.1 The Gender Gap in Employment Loss due to COVID-19

Previous studies have demonstrated the gender gap in employment loss. In most countries, female workers experience higher unemployment rates than male workers, and the females in countries with higher unemployment rates are even more likely to drop out of the labor market, suffering disproportionately in employment loss (Ortiz-Ospina et al., 2018). The gender gap has long been existing on the employment side, working women face inequalities when looking for jobs and promotions, and at the same time, they are more vulnerable or less fortunate than men workers under the unexpected crisis, COVID-19. Female workers had a higher probability of losing their jobs (approximately 26%) than males (approximately 20.4%) when hit by COVID-19, from March 2020 to September 2021 (Flor et al., 2022). Two leading causes have been proposed by researchers to explain why this worldwide pandemic has disproportionately disrupted female employment more than male employment. First, unlike the financial crisis in 2008, the impact of COVID-19 on employment is more likely to be indirect and focus on service industries (Shibata, 2020). The coronavirus, as an infectious disease, has forced many countries and regions to take measures such as closing public places, restricting people from gathering, or even lockdowns to reduce its spread, and those sectors that require face-to-face services, such as retail, catering, hospitality, and other service sectors, have suffered more from the impact of these policies. These sectors mentioned above tend to have a higher share of female employees than males, which caused women to be affected a lot during the outbreak of the pandemic, especially when cities were locked down. Many studies investigating the initial impacts of COVID-19 on the labor market have proved the significant employment loss and weekly working hours decline in service industries and low-income groups due to the pandemic, where female workers were likely to be affected more than males (Lemieux et al., 2020; Dang and Nguyen, 2021).

Second, since schools and childcare centers were closed due to the restrictions of the pandemic in some countries and regions, children had to stay at home, which caused the working women with kids to sacrifice their working hours and even quit jobs to take care of their kids during the

pandemic. Alon et al. (2020) pointed out the potential gender differences in employment loss resulted from the increase in childcare needs, as mothers were expected to take on more childcare responsibilities, and indeed, even for couples both working full-time, mothers were more likely to spend more time on looking after their children than fathers (Pew Research Center, 2015), and the restriction measures such as school closures would impose an extra burden on working women.

2.2 Women Employment, Childcare and Social Norms

Childcare is one of the factors that negatively affect the employment rate of females, and previous studies have proved the relationship between childcare and women's labor supply by leveraging quantitative methods. Lefebvre and Merrigan (2008) examined the impact of a childcare subsidy policy in the Canadian province of Québec on women's labor participation, and they found that a 5-dollar subsidy of daycare facilities for children aged four considerably increased the participation rate and working hours of women with preschool children. Similarly, the Dutch government's reform in the Law of Childcare in 2005 led to substantial higher spending on subsidizing childcare, as a result, women with young children were more likely to participate in the job market (Bettendorf et al., 2015). Bauernschuster and Schlotter (2015) confirmed above findings regarding the causal relationship between childcare and women's labor participation by employing a Difference in Difference method, which demonstrated that a public childcare reform implemented at the end of the last century in Germany had a positive effect on the employment of women with children in kindergarten.

As mentioned before, the pandemic response measures regarding school and childcare centers have widened the gender gap in employment loss. Fabrizio et al. (2021) found that the pandemic most disrupted the employment of women with no college degree and children under 12 years old by employing the American monthly Current Population Survey (CPS), which could be attributed to the impact of school closures. Collins et al. (2021) also used the CPS data but compared three different teaching models in primary schools (remote, hybrid and in-person). It discovered that the probability of women participating in the job market decreased significantly in the area where primary schools reopened with online teaching and learning model by comparing the job participation in the fall semesters of 2019 and 2020. Alon et al. (2021) examined the gender gaps in employment across six developed countries, respondents were classified into three groups with regard to the children's age, and it was found that women with school-age children contributed most to the gender gap both in employment loss and working hours decrease. Not only in developed countries, but a similar phenomenon also existed in the less developed world. A study

using COVID-19 National Longitudinal Phone Survey demonstrated the adverse effect of school closures in September 2020 on the employment status of females with school-age children in Nigeria, while the negative impact did not persist into February 2021 (Alon et al. 2022). However, few studies have been carried out to compare the different effects of the pandemic in the developed and developing world.

A major channel leading to differences in sharing childcare tasks between parents is the relevant social norms. Social norms not only constrain women's access to the job market but could also shape working women's choice between work and family under some extreme situations, such as, the COVID-19 pandemic. It includes but is not limited to whether family members agree with women's participation in the workforce, and the discrimination in family concerning housework and care responsibilities (International Labour Organization, 2017). Female members are forced to take the major responsibility for the unpaid care and domestic work assigned by social norms, and even the quality of the housework they undertake would be judged and criticized. Meanwhile, men who perform housework are more likely to be regarded as lacking masculinity, worsening the unequal distribution of housework between men and women in family (Boudet et al., 2013; Marcus, 2018). Also, working mothers tend to feel more time pressure with regard to childcare compared to men, leading to a more time flexible work choice for women with children (Rose, 2017).

Social norms might make working women bear more when school closures policies were implicated during the spread of COVID-19, since they are usually expected to take more housework and spend more time on children caring, which negatively affects women's working hours and job participation. One recent empirical study examined how social norms affected the gender gap in women under the pandemic, while it concentrated on female business leaders. Goldstein et al. (2022) showed that a majority of men agreeing that "men and women should have equality in opportunities" decreased the probability of business closing for married women when schools were required to close due to the pandemic. And the proportion of women agreeing with the above sentence was inversely related to the time spent on care and domestic work of married women. Though this statement does not directly reflect the norms regarding the sharing of housework and childcare, it presents how social norms shaped women's decisions under the pandemic.

2.3 Employment Loss, Childcare and Telecommuting

Among the studies focusing on the gender gap caused by the pandemic, some found that the ability to work from home, or telecommuting positions might help narrow the gender gap in job losses. Lyttelton et al. (2020) collected the panel data before and after the outbreak of the pandemic in the US and demonstrated that working from home would decrease the gender gap in time spent on childcare prior to the pandemic, while their study on the impact of COVID-19 only included the well-being perspective. Previous research regarding this topic mainly investigated developed countries. For example, Alon et al. (2021) examined the gender gap in employment with regard to telecommuting jobs in the US, the UK and Netherlands. By classifying workers into three categories according to whether they had children and whether the children were at the school-age, they found that the gender gap in parents with school-age children shrank by around ten percentage points in the telecommuter group compared to the non-telecommuter group in the US, which shows that the ability to work remotely might increase the job resilience of working women with kids. Similarly, Hou et al. (2022) also presented that women in telecommuting jobs experienced less probability of unemployment during the pandemic by using data from the US Current Population Survey. The ability for women in jobs to work remotely enabled them to allocate their time more flexibly when quarantined at home with their kids. Moreover, the telecommuting work was found to facilitate improvement in the traditional distribution of housework in family under lockdowns, helping transfer housework from mothers to fathers (Arntz et al., 2020).

3 Data and Variables

3.1 Data Description

This paper employs the World Bank Enterprise Surveys (ES) and three waves of Enterprise Follow-up Surveys on the impact of COVID-19. The World Bank Enterprise Surveys target private firms selected based on location, industry, and size of the firms. Until now, ES has interviewed top managers of 177000 companies from 153 economics and comprises firm characteristics and market environment topics in a wide variety, which would allow me to identify the primary independent variable and potential control variables in regressions. The Enterprise Follow-up Surveys on COVID-19 is part of the Enterprise Surveys, which focuses on the impact of the pandemic and its response measures on firms in the private sector. The Follow-up Surveys have been conducted for up to four waves in 46 countries and are still ongoing. The topics cover

different aspects of firm performance, such as sales, workforce and cash flow, as well as the questions regarding government measures in response to the pandemic. I chose the Enterprise Surveys data from 2016 to 2019 before the outbreak of the pandemic as the baseline, and merged it with the Follow-up Surveys according to the unique firm ID. I included the first three rounds of COVID-19 Follow-up Surveys, since only one country has participated in the fourth round. The dataset used in this essay contains 14836 firms across 38 countries after dropping the missing data, and each firm has participated in the baseline surveys and at least one wave of the follow-up surveys. The number of firms selected in each country and the conducted time of different rounds of the follow-up surveys are shown in table A1 and figure B1 in the Appendix.

Another data source of this paper is Oxford COVID-19 Government Response Tracker (OxCGRT), which includes daily updated country-level indicators and indices regarding government measures against the pandemic, for example, school closures, workplace closures, restrictions on gathering, vaccination policy, etc. I also retrieved data from World Value Survey (Wave 6 and Wave 7) to construct the factors representing social norms.

3.2 Dependent Variable

In the baseline and follow-up survey, there are questions about the number of total permanent full-time employees and how many of them were female in the last completed month, which allows me to calculate the female ratio of employees in each firm. Though the questionnaires were conducted at different times, all firms that participated in the follow-up survey were asked about the number of total employees and female employees in December 2019 before the pandemic, and I set it as “round 0”. I dropped those data about the outcome in the baseline survey before the last quarter of 2018 and set remained data as “round -1”¹. Therefore, the sample set used in this paper includes five different rounds, two rounds before the pandemic and three rounds after the pandemic. Each firm at least has data available in December 2019 (round 0) before the pandemic and in one round after the pandemic.

Figure 1 displays changes in the average share of female employees before and after the outbreak of COVID-19 in each country, and 26 of 38 countries suffered from a decrease in the ratio. Among them, five countries are from Sub-Saharan Africa (AFR), two countries are from Middle East and

¹ The outcome variable will have a large variation in time if I keep all female ratio of employees from the baseline survey as “round -1”, because there are no duplicated firms in the baseline survey from 2016 to 2019.

North Africa (MNA), three are from Latin America and the Caribbean (LAC), fifteen are from Europe and Central Asia (ECA), one is from East Asia and Pacific (EAP). In the sample, there are seven countries from AFR, three countries from MNA, four countries from LAC, one country from EAP, and twenty-three countries from ECA. Given that, the female employment ratios in most countries in Sub-Saharan Africa, Middle East & North Africa, and Latin America & the Caribbean have declined under the shock, female employees in these regions might have weaker job resilience compared to those in Europe & Central Asia.

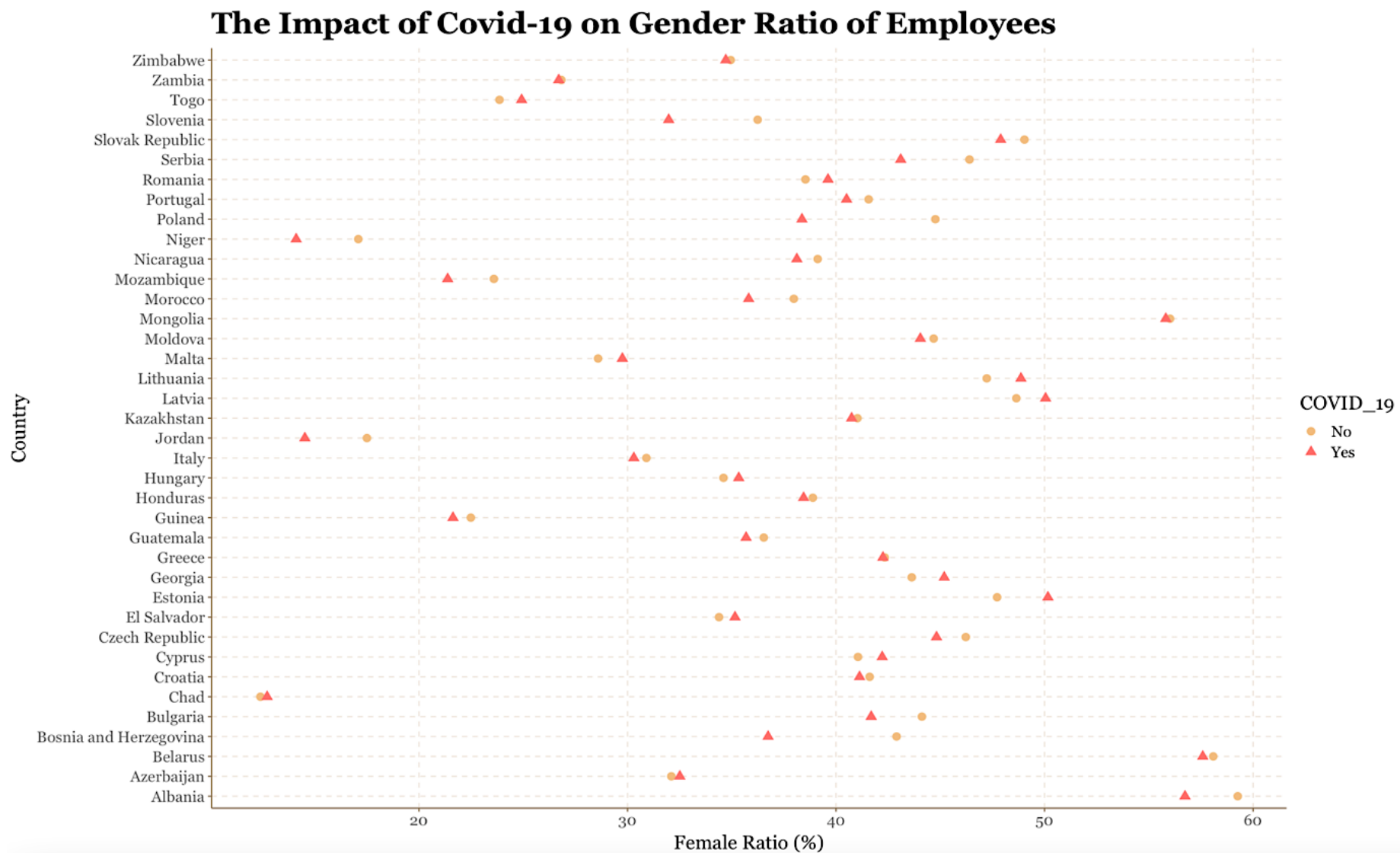


Figure 1 The Impact of COVID-19 on Gender Ratio of Employments

3.3 Main Explanatory Variables and Control Variables

As an unexpected shock, *COVID*, is employed as a binary variable measuring the impact of COVID-19, *COVID* equals one if the time is after the outbreak of the pandemic (January 2020), otherwise zero.

Previous studies have suggested that working remotely could mitigate the negative impact of the pandemic on female workers' employment by allowing females to have more time flexibility, especially when schools were shut down and the needs for childcare increased. Most of the earlier studies employed survey data at an individual level, and the Enterprise Survey used in this paper could be regarded as a supplement from a firm perspective. Unlike the data at an individual level, there is no information provided in the ES dataset regarding each employee's position, department or gender, therefore, I tended to find a variable measuring the ability of a firm to conduct its business online and provide its workforce opportunity to work remotely. In the pre-pandemic baseline ES questionnaire, firms were asked if they have their own websites or not, in this case, the answer to this question could be recognized as a proxy for the ability of a firm could allow its employees to start teleworking under the pandemic. Hence, *Website* is a dummy variable equaling one if a firm has its own website, otherwise zero.

School closure policies were implemented in many countries and regions to control the spread of the virus, generating an increase in childcare workload in family. Working mothers are more likely to be affected than fathers, since women are expected to undertake more childcare responsibilities in family. I retrieved the data concerning school closure policies from the Oxford COVID-19 Government Response Tracker (OxCGRT), covering policy response information in more than 180 countries since January 2020. In OxCGRT, the school closure measures are categorized into four types: no measures, recommend closing, require closing at some levels and require closing at all levels. To capture the impact of school closures on women's job loss, I converted the index from the database into a binary variable, *School Closures*, which equals zero if no measures were implemented in the economy, otherwise one. I also introduced the index from OxCGRT about workplace closure policies to exclude the effect of workplace shutdown on the employment of females. *Workplace Closures*, equals one if workplaces were recommended or required closing at any levels, otherwise zero. The indicators from OxCGRT are updated on a daily basis, while the firm-level data from the enterprise surveys are only precise to month, so I merged the school closure and workplace closure indicators with the firm data by the first day of the month.

Social norms impose constraints on the choices and behaviors of both genders in social life, while such limitations are often invisible and imperceptible (Marcus, 2018). It is hard to find an index that precisely reflects the social norms in an economy with regard to gender roles, since norms could vary over time, and not everyone follows norms to live. Following Goldstein et al. (2022), I collected two country-level indicators related to social norms or beliefs on gender equality from the World Value Survey (Wave 6 and Wave 7). The first one is *Social Norm1*, which is how many percent of the respondents agree or strongly agree that “when a mother works for pay, the children suffer”, measuring the gender discriminatory attitudes in family. The second one, *Social Norm2*, represents the aggregated level norms with regard to women in workplaces, which refers to the proportion of respondents agreeing that “when jobs are scarce, men should have more right to a job than women”. Because the wave 7 of the World Value Survey in some countries were conducted after COVID-19, for example, Portugal, Guatemala, Nicaragua, Morocco and Zimbabwe, I replaced these data with the survey result from the wave 6². The 24 of 38 countries in my sample have available indicators regarding social norms before the pandemic. See Appendix C for the relationships between these social norms and the female ratio of employees before and after the outbreak of COVID-19, respectively, which shows that both social norms are negatively correlated to the average female ratio of employees.

I retrieved firm-level data from the baseline ES before the pandemic and follow-up surveys to control the firm characteristics that may be related to the outcome, i.e., the gender job resilience to the COVID-19 shock. Table 1 below presents the variables description and data source, and table 2 shows the descriptive statistics of total selected variables. The Dependent variable, *Female Ratio*, has a mean of 38.02% and a standard deviation of 28.94%.

² However, Portugal, Guatemala and Nicaragua didn't participate in the wave 6 of World Value Survey.

Table 1 Variable Description

Variable	Description	Data source
A. Dependent variable		
Female Ratio (%)	the number of full-time permanent female employees divided by the total number of full-time permanent employees	World Bank Enterprises Survey (WBES), World Bank Enterprise Follow-up Survey on COVID-19 (WBES on COVID)
B. Main explanatory variables		
COVID	dummy variable, COVID = 1 if the time is after the outbreak of COVID-19, otherwise 0	WBES
Website	dummy variable, Website = 1 if the firm has its own website, otherwise 0	
School Closures	dummy variable, School Closures = 1 if schools are at least recommended closing, required closing at some levels or required closing at all levels, School Closures = 0 if no measures are implemented	
Social Norm1	continuous variable, Social Norm1 equals to the proportion of respondents agreeing or strongly agreeing that “when a mother works for pay, the children suffer”, a country-level variable ranges from 0 to 1	World Values Survey Wave 7, Wave 6
Social Norm2	continuous variable, Social Norm2 equals to the proportion of respondents agreeing that “when jobs are scarce, men should have more right to a job than women”, a country-level variable ranges from 0 to 1	World Values Survey Wave 7, Wave 6
C. Control variables		
Workplace Closures	dummy variable, Workplace Closures = 1 if workplaces are recommended closing, required closing at some levels, required closing at all levels but essential ones (e.g. grocery stores, doctors), Workplace Closures = 0 if no measures are implemented	Oxford COVID-19 Government Response Tracker
Employees	the number of full-time permanent employees of the firm before the outbreak of COVID-19	WBES, WBES on COVID
Female Employees	the number of full-time permanent female employees of the firm before the outbreak of COVID-19	WBES, WBES on COVID
Firm Year	the firm’s age, 2022 minus the year that firm began operations	WBES
Listed	dummy variable, Listed = 1 if it is a shareholding company with shares in the stock market, otherwise 0	WBES
Female Manager	dummy variable, Female Manager = 1 if the top manager is female, otherwise 0	WBES, WBES on COVID

Table 1 Variable Description, Continued

Variable	Description	Data source
Sector	Sector = 1, Manufacturing; Sector = 2, Services	WBES
Export	dummy variable, Export = 1 if there is direct export in the firm's total sale, otherwise 0	WBES
Foreign	dummy variable, Foreign = 1 if the firm is owned by private foreign individuals, companies, or organizations, otherwise 0	WBES
Largest Owner (%)	the percentage of the firm owned by its largest owner	WBES
Finance Access	dummy variable, Finance Access = 1 if the access to finance is regarded as an obstacle to the operations of the firm, otherwise 0	WBES

Table 2 Descriptive Statistics

Variable	Observations	Mean	Std. Dev.	Min	Max
A. Dependent variable					
Female Ratio (%)	56112	38.024	28.941	0	100
B. Main explanatory variables					
COVID	56112	.559	.497	0	1
Website	56112	.665	.472	0	1
School Closures	56112	.536	.499	0	1
Social Norm1	42579	.463	.165	.214	.843
Social Norm2	42579	.354	.169	.097	.815
C. Control variables					
Workplace Closures	56112	.508	.5	0	1
Employees ³	56112	75.568	233.343	1	14000
Female Employees	56112	31.956	147.029	0	11000
Firm Year	55536	25.087	16.626	3	208
Listed	56112	.066	.249	0	1
Female Manager	56029	.18	.384	0	1
Sector	56112	1.49	.5	1	2
Export	56112	.274	.446	0	1
Foreign	56112	.112	.316	0	1
Largest Owner (%)	54379	79.164	26.095	1	100
Finance Access	54917	.57	.495	0	1

³ I will take the logarithms of the variables *Employees*, *Female Employees* and *Firm Year* when running the regressions because of their large variations.

Table 3 Summary Statistics of Female Ratio Pre- and Post-COVID-19

Disaggregated by whether the firm has its own website or not					
		No Website		With Website	
		Pre-COVID-19	Post-COVID-19	Pre-COVID-19	Post-COVID-19
Female Ratio (%)	Mean	41.659	39.174	37.719	36.237
	Std. Dev.	32.233	30.958	28.254	26.806
	Min	0	0	0	0
	Max	100	100	100	100
	Observations	8356	10433	16409	20914

Table 3 presents the pre- and post-pandemic summary statistics of the outcome variable disaggregated by whether the firm has its own website. It shows that the average female ratio of employees in firms without websites decreased by around 2.485% due to the pandemic outbreak, while the average value in firms with websites experienced a slightly smaller decline, approximately 1.482%. While table 3 displays the differential changes in the average value of the outcome variable due to internet access, more tests will be conducted to validate these initial results in the following parts of this paper.

4 Methodology

4.1 Hypotheses

4.1.1 Gender Impact of Internet Access under COVID-19 and School Closures

Women working in a firm with internet access might have higher job resilience when facing unanticipated shocks. Female workers are more likely to experience unemployment than their male counterparts due to the impact of the pandemic on service sectors and its associated response measures, such as, school closing. Women spend more time on unpaid housework, including caring for their children, than men in family even without the outbreak of COVID-19. Schools and daycare centers help working women share their burdens, allowing them to work without worries. However, the implementation of school closure policies by the government to cope with the spread of the pandemic may exacerbate the adverse impact of the pandemic on working women. Children are hereby forced to stay at home and take online classes, which multiples the need for childcare in the household, women have to sacrifice their working time or even quit jobs

to take care of children. The ability to work remotely gives working women more flexibility in their schedules, so they no longer have to choose between jobs and children. Due to the data limitation, I use website as a proxy for whether a firm could allow their employees to work from home during the pandemic, and therefore, I suppose that a firm with its own website would reduce the shock of the pandemic on their female workers when schools are recommended or required close. My first two hypotheses are shown as follows:

H1a: Women working in firms with internet access would have higher job resilience than women in firms without internet access under the shock of COVID-19.

H1b: Women working in firms with internet access would have higher job resilience than women in firms without internet access under the shock of school closures due to COVID-19.

4.1.2 Heterogenous Gender Impact of Internet Access under COVID-19 and School Closures differ by Social Norms

Women are expected to undertake more responsibilities for household and childcare than men, so when schools close due to the pandemic, women are more likely to struggle with the work-family conflict, leading to more women quitting their jobs or being laid off. The influence of social norms may explain the mechanism behind this. In a more conservative society, more people would have a negative attitude toward women's participation in the labor market compared to that of men and hold the opinion that women should perform domestic work, including childcare. On the one hand, it hinders women from entering workplaces, and on the other hand, it makes working women more vulnerable when facing unpredictable shocks. These traditional beliefs are reflected by a much lower labor force participation rate of women (47%) than that of men (72%) around the world (ILOSTAT, 2017) and more time spent by women on unpaid caregiving than men (OECD, 2019). Women may even get penalties when they don't comply with gender stereotypes derived from social norms, reinforcing the social norms themselves again (Marcus, 2018). When a majority of the country's population holds negative perceptions with regard to working women in family or workplaces, women might face a much more severe work-family conflict and demand more workplace flexibility to cope with the surge in childcare needs due to school closures. Therefore, I suppose that:

H2a: Women residing in a society characterized by more conservative social norms would benefit more from working in firms with internet access regarding employment loss than their counterparts in a society characterized by more egalitarian social norms under the shock of COVID-19.

H2b: Women residing in a society characterized by more conservative social norms would benefit more from working in firms with internet access regarding employment loss than their counterparts in a society characterized by more egalitarian social norms under the shock of school closures due to COVID-19.

4.1.3 Heterogenous Gender Impact of Internet Access under COVID-19 and School Closures in Low-income Countries and High-income Countries

Alon et al. (2022) investigated how the pandemic affected women's employment in a developing country, Nigeria, and surprisingly found that women's participation rate increased in the late stage of the pandemic, which is quite different from the prior findings in developed countries. And it mentioned that one of the possible explanations is that families in low-income countries received much fewer government subsidies than those in high-income countries, and the large decline in income might force women in low-income countries to make efforts to retain their jobs or find new jobs when the pandemic was eased if they were laid off. Another probable explanation is the higher school dropout rate of children in low-income countries. Children dropping out of school is closely connected to the child labor problem (Kechagia and Metaxas, 2021), and students in secondary schools were more likely to be pulled out of school and find a job due to the pandemic (Alon et al., 2022), which might decrease the childcare burden on working mothers. I will compensate for their findings by testing if having the ability to work remotely under the pandemic and the school closure policies would differentially affect working women in low-income countries. I retrieved the country income level classification data from the World Bank database, and there are twelve countries in my sample that belong to the lower middle-income group and low-income group⁴. This roughly broke down the sample into the top 70% and bottom 30% groups according

⁴ According to the World Bank country income level classification in 2019, countries with GNI per capita between \$1026 and \$3995 are lower middle-income countries, those with GNI per capita lower than \$1026 are low-income countries. There are twelve countries in the sample with GNI per capita lower than \$3995, which are Chad, El Salvador, Guinea, Honduras, Mongolia, Morocco, Mozambique, Nicaragua, Niger, Togo, Zambia, and Zimbabwe.

to their GNI (Gross National Income) per capita in 2019⁵. For simplicity, the bottom 30% group is hereinafter referred to as the low-income country group. Then I set a dummy variable, *Low-income Country*, which equals one if the firm is located in the country from the bottom 30% group, otherwise zero. Finally, I introduced the variable *Low-income Country* to the baseline DID regression to identify the heterogeneity between low-income and high-income countries, and I suppose that:

H3a: Internet access may have differential effects on the female ratio of firms in low-income countries and high-income countries under the shock of COVID-19.

H3b: Internet access may have differential effects on the female ratio of firms in low-income countries and high-income countries under the shock of school closures due to COVID-19.

4.2 Identification Strategy

The baseline OLS pooled regression in this study used a DID (Difference-in-Difference) method by regarding the COVID-19 as an external shock to examine the impact of the pandemic on the gender ratio of employees in firms with and without websites. The treatment group includes all firms with websites, and the comparison group includes firms without websites. I have five time periods in total, two periods before the shock and three periods after the shock. Also, I estimated how internet access of firms would affect the gender ratio by considering COVID-19 and school closure policies due to the pandemic as external shocks separately. Next, based on the first model, I introduced the variables representing social norms and leveraged a triple difference estimator to examine if the ability to work remotely would have a heterogeneous effect in societies with different attitudes toward working women. Finally, I tested whether internet access affected the shock of the pandemic and its school closure policies on women's employment differ by the income level of countries. The OLS pooled specifications with country/region and time fixed effects are shown as follows.

⁵ I tried to divide the countries in my sample into different groups according to GDP per capita in 2019, and the countries which are in the bottom 30% group of the GDP per capita are the same as those in the bottom 30% group of GNI per capita, which might support the robustness of the classification of different income groups. The GNI per capita and GDP per capita of countries in 2019 can be found in Appendix A.

4.2.1 Gender Impact of Internet Access under COVID-19 and School Closures

I first tried to estimate how internet access of a firm affected the job resilience of its female employees under the shock of COVID-19, by using the equation below:

$$Y_{ijt} = \beta_0 + \beta_1 COVID_t + \beta_2 Website_{ij} + \beta_3 COVID_t \times Website_{ij} + \delta Controls_{ijt} + \alpha_j + \gamma_t + \epsilon_{ijt} \quad (1),$$

where Y_{ijt} refers to the female ratio of employees for firm i in country j at time t . $COVID_t$ is a dummy variable, denoting whether the time is after the outbreak of COVID-19 (January 2020) or not. $Website_{ij}$ is also a dummy variable, which equals 1 if the firm i has its own website, otherwise 0. And $Website_{ij}$ is collected from the baseline Enterprise Surveys before the pandemic, which is a time-invariant variable. $Controls_{ijt}$ denotes a set of control variables representing the firm characteristics, α_j refers to the country fixed effect and γ_t refers to the time fixed effect, which is denoted by the round of surveys. ϵ_{ijt} refers to the error term, which is clustered at the firm level.

Since there were no school closure policies before the outbreak of the COVID-19, the variables *School Closures* and *COVID* have a high correlation. To avoid the collinearity problem, I chose not to include the *COVID* variable in equation 2 to test how school closures affected the gender ratio of different firms:

$$Y_{ijt} = \beta_0 + \beta_1 SchoolClosures_{jt} + \beta_2 Website_{ij} + \beta_3 SchoolClosures_{jt} \times Website_{ij} + \delta Controls_{ijt} + \alpha_j + \gamma_t + \epsilon_{ijt} \quad (2),$$

where Y_{ijt} refers to the female ratio of employees for firm i in country j at time t . $SchoolClosures_{jt}$ is a dummy variable, which equals 1 if the school closing policy is implemented in country j at time t , otherwise 0. $Website_{ij}$ indicates whether the firm i has its own website or not. $Controls_{ijt}$ includes workplace closure policies and a set of control variables representing the firm characteristics, α_j refers to the country fixed effect and γ_t refers to the time fixed effect. ϵ_{ijt} refers to the error term, which is clustered at the firm level. In equations 1 and 2, β_3 denotes the coefficient of the interaction term, which estimates differences in the effects of the external shock on female share of employees in the treatment and control groups.

A convincing result of the DID approach should be based on the assumption that the share of female employees in the treatment group (firms with internet access) and the comparison group (firms without internet access) have parallel moving trends without the occurrence of the unexpected disaster. I tried to test the parallel time assumption by visualizing the average female ratios by country. The changes in the average female ratio of employees under the pandemic shock disaggregated by whether the firm has its own website or not are shown in Appendix D. Not all countries in figure D1 display a parallel trend in the treatment and comparison groups before the pandemic. That might be because I only collected two periods before the shock, and some countries in my sample do not have the round before December 2019 (round 0) due to a lack of data.

4.2.2 Heterogenous Gender Impact of Internet Access under COVID-19 and School Closures differ by Social Norms

To test the hypothesis that internet access would alleviate the employment loss of women in societies with gender discrimination norms. I introduced variables reflecting social norms and proposed the following equations:

$$\begin{aligned}
Y_{ijt} = & \beta_0 + \beta_1 COVID_t + \beta_2 Website_{ij} + \beta_3 SocialNorm_j \\
& + \beta_4 COVID_t \times Website_{ij} + \beta_5 COVID_t \times SocialNorm_j \\
& + \beta_6 Website_{ij} \times SocialNorm_j + \beta_7 COVID_t \times Website_{ij} \times SocialNorm_j \\
& + \delta Controls_{ijt} + \alpha_j + \gamma_t + \epsilon_{ijt}
\end{aligned} \tag{3}$$

where Y_{ijt} refers to outcome (i.e., gender ratio) for firm i in country j at time t . $COVID_t$ is a dummy variable, which equals 1 if the time is after the outbreak of COVID-19 (January 2020), otherwise 0. $SocialNorm_j$ is a continuous variable at the country level, which refers to the attitudes in a country toward gender inequality. I collected two proxies for social norms from the World Value Survey and would run the regression with them separately. $SocialNorm1$, which equals the proportion of respondents in a country agreeing or strongly agreeing that “when a mother works for pay, the children suffer”, indicating the gender discrimination in family. $SocialNorm2$ measures how people think about women in workplaces, which equals the proportion of the respondents agreeing that “when jobs are scarce, men should have more right to a job than women”. The indicators are retrieved from surveys prior to the outbreak to avoid the potential variation in gender norms caused by the pandemic. $Controls_{ijt}$ denotes a set of control variables

representing the firm characteristics, α_j refers to the region fixed effect⁶ and γ_t refers to the time fixed effect. ϵ_{ijt} refers to the error term, which is clustered at the firm level. β_7 is the parameter of interest, estimating whether social norms differentially affect women's employment in firms with internet access under external shocks.

Equation 4 examines the impact of social norms on the share of female employees in firms with websites under the shock of school closures:

$$\begin{aligned}
Y_{ijt} = & \beta_0 + \beta_1 SchoolClosures_{jt} + \beta_2 Website_{ij} + \beta_3 SocialNorm_j \\
& + \beta_4 SchoolClosures_{jt} \times Website_{ij} + \beta_5 SchoolClosures_{jt} \times SocialNorm_j \\
& + \beta_6 Website_{ij} \times SocialNorm_j \\
& + \beta_7 SchoolClosures_{jt} \times Website_{ij} \times SocialNorm_j + \delta Controls_{ijt} + \alpha_j \\
& + \gamma_t + \epsilon_{ijt}
\end{aligned} \tag{4}$$

where the $Controls_{ijt}$ consists of variables referring to workplaces closure policies and firm characteristics, other variables in equation 4 have been defined in equations 2 and 3.

4.2.3 Heterogenous Gender Impact of Internet Access under COVID-19 and School Closures in Low-income Countries and High-income Countries

As mentioned before, I constructed equations 5 and 6 to examine whether the pandemic and its response measure regarding schools differentially affected the firms' female employees with internet access in low-income countries and high-income countries, which is shown by:

$$\begin{aligned}
Y_{ijt} = & \beta_0 + \beta_1 COVID_t + \beta_2 Website_{ij} + \beta_3 Low - incomeCountry_j \\
& + \beta_4 COVID_t \times Website_{ij} + \beta_5 COVID_t \times Low - incomeCountry_j \\
& + \beta_6 Website_{ij} \times Low - incomeCountry_j \\
& + \beta_7 COVID_t \times Website_{ij} \times Low - incomeCountry_j + \delta Controls_{ijt} + \alpha_j \\
& + \gamma_t + \epsilon_{ijt}
\end{aligned} \tag{5}$$

⁶ I controlled region fixed effect instead of country fixed effect in equations 3 and 4 since the social norms are time-invariant and only vary across countries, leading to a high correlation between social norms and countries.

$$\begin{aligned}
Y_{ijt} = & \beta_0 + \beta_1 SchoolClosures_{jt} + \beta_2 Website_{ij} + \beta_3 Low - incomeCountry_j \\
& + \beta_4 SchoolClosures_{jt} \times Website_{ij} \\
& + \beta_5 SchoolClosures_{jt} \times Low - incomeCountry_j \\
& + \beta_6 Website_{ij} \times Low - incomeCountry_j \\
& + \beta_7 SchoolClosures_{jt} \times Website_{ij} \times Low - incomeCountry_j \\
& + \delta Controls_{ijt} + \alpha_j + \gamma_t + \epsilon_{ijt}
\end{aligned} \tag{6},$$

where Y_{ijt} refers to the female ratio of employees for firm i in country j at time t . $Low - incomeCountry_j$ is a dummy variable, which equals 1 if the firm is from a country in the lower middle-income and low-income country group according to the World Bank classification in 2019, otherwise 0. Other variables in equations 5 and 6 have been defined in equations 2 and 3. In equations 5 and 6, β_7 would test if women working in firms with internet access in low-income and high-income countries would be differentially affected by the shock of COVID-19 and school closure policies.

5 Results

5.1 The Job Resilience of Female Employees under COVID-19 and School Closures

Following section 4, I will estimate how the COVID-19 disaster and school closing affect female employees in firms with and without internet access differently. Table 4 represents the results of pooled regression with the DID model, including all observations across 38 countries. Column 1 in table 4 demonstrates the impact of the COVID-19 on the gender share of employees, the outbreak of the pandemic in 2020 decreased the female employee proportion in firms by around 2.038%. The interaction term of *COVID* and *Website* in column 2 shows that the firm with its own website might experience less employment loss (0.544%) in its female employees' share during COVID-19 than that without a website. However, the absolute value of the coefficient of the interaction term (0.544%) is smaller than that of the COVID-19 (2.413%), which shows that working in firms that have the ability to provide telework opportunities could not mitigate all the negative impact of the pandemic on female employees.

Columns 3 and 4 in table 4 display the effect of school closure policies. In columns 3 and 4, it seems that schools closing led more female employees to quit their work or to be laid off, where the gender ratio of female employees reduced by around 1.348 and 1.706 percent, respectively, but

the female share of employees experienced a smaller decline (0.584%) in firms with internet access than in firms without internet access when schools were recommended or required to close, which is in line with the hypothesis H1b in section 4. The ability to work remotely might alleviate the burden of childcare for women to some extent since it allows them to have more flexible time. The dummy variable of COVID-19 is not included in columns 3 and 4 because of the collinearity of *COVID* and *School Closures* variables since there were no school closure policies before the pandemic.

Table 4 The Impact of Internet Access on Female Ratio of Employees under COVID-19 and School Closures

	(1)	(2)	(3)	(4)
	Female Ratio (%)	Female Ratio (%)	Female Ratio (%)	Female Ratio (%)
COVID	-2.038*** (.244)	-2.413*** (.317)		
Website	-1.962*** (.258)	-2.264*** (.247)	-1.963*** (.258)	-2.272*** (.249)
COVID × Website		.544** (.259)		
School Closures			-1.348** (.566)	-1.706*** (.601)
Website × School Closures				.584** (.272)
Sample Mean	37.92	37.92	37.92	37.92
R-squared	.7018	.7018	.7018	.7018
Country Fixed Effect	Yes	Yes	Yes	Yes
Time Fixed Effect	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Observations	52946	52946	52946	52946

Note: Standard errors are in parentheses, and clustered at the firm level.

*** significant at 10% level, ** significant at 5% level, * significant at 1% level

Control variables consist of sector, the firm operating years, the total number of permanent full-time employees before COVID-19, the total number of female permanent full-time employees before COVID-19, access to finance, whether the top manager is female, whether the firm is publicly listed, whether the firm has direct export in its total sales, whether the firm is owned by any private foreign individuals, firms or organizations, and the percentage of the firm owned by its largest owner. I also controlled the variable referring to workplace closure policies in columns 3 and 4.

5.2 The Heterogenous Effect of Internet Access differ by Social Norms

As mentioned before, social norms lead an essential role when women participate in economic activities and the result in the last section shows that women were more likely to be laid off or quit

jobs under the outbreak of COVID-19 and the closedown of schools. This section will investigate whether women in a society with a majority of people holding gender discriminatory attitudes in the workplace or family would benefit more from internet access. The first social norm measures the aggregated perception with regard to working women with children, which shows how many percent of the respondents agree or strongly agree that “when a mother works for pay, the children suffer”. The second one focuses on the discrimination gender norms in workplaces, which presents the proportion of respondents agreeing that “when jobs are scarce, men should have more right to a job than women”. Due to the data limitation, I only collected the indicator of *Social Norm1* and *Social Norm 2* from twenty-four countries. Appendix C displays the negative correlations between these two social norms and the average female ratio of employees before and after the outbreak of COVID-19.

Table 5 reflects the heterogeneous impact of internet access on women’s job resilience by the family’s discrimination against working women with children. The coefficient of the triple interaction term in column 1 shows no statistically significant difference between the impacts of internet access on working women in conservative and egalitarian societies under the shock of COVID-19. The interaction terms of *Social Norm1* and shocks are negative, while they are not significant. However, the coefficient of the interaction term (4.032%) in column 2 is positive and significant at a 10% level, which demonstrates that the ability to work flexibly might be more conducive for working women in a society where gender discriminatory attitudes in family were more pervasive, especially when schools were closed down. Women in a more conservative society tended to suffer more from the pressure of childcare needs caused by school closure policies, and therefore workplace flexibility would be of greater help for them to handle the work-family conflict.

No significant increase or decrease in female ratio of employees was found in table 6 when I used the norm indicator regarding gender discrimination in workplaces to construct the triple different estimator. The insignificant results in table 6 might support the findings in table 5, which shows that the discrimination gender norms in family might be the primary factor causing working mothers to struggle between work and children, since women are usually regarded as the major caregivers in less egalitarian societies. The belief that men should have priority with regard to jobs over women may be one of the possible explanations for the underrepresentation of women in formal enterprises. Women might not be provided with an equal opportunity when entering the labour market compared to men, and it might be harder for them to obtain a full-time permanent and decent job.

Table 5 The Impact of Internet Access on Female Ratio of Employees under COVID-19 and School Closures differ by Social Norm1

	(1)	(2)
	Female Ratio (%)	Female Ratio (%)
COVID × Website	-.114 (.946)	
COVID × When a mother works for pay, the children suffer.	-1.387 (1.654)	
COVID × Website × When a mother works for pay, the children suffer.	2.319 (1.994)	
School Closures × Website		-.801 (1.043)
School Closures × When a mother works for pay, the children suffer.		-2.197 (1.759)
School Closures × Website × When a mother works for pay, the children suffer.		4.032* (2.159)
Sample Mean	39.03	39.03
R-squared	.7099	.7102
Region Fixed Effect	Yes	Yes
Time Fixed Effect	Yes	Yes
Controls	Yes	Yes
Observations	40170	40170

Note: Standard errors are in parentheses, and clustered at the firm level.

*** significant at 10% level, ** significant at 5% level, * significant at 1% level.

Control variables consist of sector, the firm operating years, the total number of permanent full-time employees before COVID-19, the total number of female permanent full-time employees before COVID-19, access to finance, whether the top manager is female, whether the firm is publicly listed, whether the firm has direct export in its total sales, whether the firm is owned by any private foreign individuals, firms or organizations, and the percentage of the firm owned by its largest owner. I also controlled the variable referring to workplace closure policies in column 2. *Social Norm1* refers to the proportion of respondents agreeing or strongly agreeing that “when a mother works for pay, the children suffer”. The number of observations above is less than that in table 4 due to missing data in *Social Norm1*. For the sake of brevity, I didn’t report the coefficients and standard errors of *COVID*, *Website*, *Social Norm1*, *Website * Social Norm1*, *School Closures*.

Table 6 The Impact of Internet Access on Female Ratio of Employees under COVID-19 and School Closures differ by Social Norm2

	(1)	(2)
	Female Ratio (%)	Female Ratio (%)
COVID × Website	.359 (.766)	
COVID × When jobs are scarce, men should have more right to a job than women.	-.453 (1.705)	
COVID × Website × When jobs are scarce, men should have more right to a job than women.	1.937 (2.042)	
School Closures × Website		.358 (.795)
School Closures × When jobs are scarce, men should have more right to a job than women.		-.846 (1.737)
School Closures × Website × When jobs are scarce, men should have more right to a job than women.		2.245 (2.089)
Sample Mean	39.03	39.03
R-squared	.7104	.7101
Region Fixed Effect	Yes	Yes
Time Fixed Effect	Yes	Yes
Controls	Yes	Yes
Observations	40170	40170

Note: Standard errors are in parentheses, and clustered at the firm level.

*** significant at 10% level, ** significant at 5% level, * significant at 1% level.

Control variables are the same as table 5. *Social Norm2* refers to the proportion of respondents agreeing that “when jobs are scarce, men should have more right to a job than women”. The number of observations above is less than that in table 4 due to missing data in *Social Norm2*. For the sake of brevity, I didn’t report the coefficients and standard errors of *COVID*, *Website*, *Social Norm2*, *Website* × *Social Norm2*, *School Closures*.

5.3 Does Internet Access differentially affect the Female Ratio of Employees under the Shocks in Low-income Countries and High-income Countries?

Table 7 The Impact of Internet Access on Female Ratio of Employees under COVID-19 and School Closures in Low-income Countries

	(1)	(2)
	Female Ratio (%)	Female Ratio (%)
COVID × Website	.701** (.304)	
COVID × Low-income Countries	.703 (.464)	
COVID × Website × Low-income Countries	-.564 (.639)	
School Closures × Website		.802** (.317)
School Closures × Low-income Countries		.918* (.492)
School Closures × Website × Low-income Countries		-.61 (.674)
Sample Mean	37.92	37.92
R-squared	.7019	.7020
Country Fixed Effect	Yes	Yes
Time Fixed Effect	Yes	Yes
Controls	Yes	Yes
Observations	52946	52946

Note: Standard errors are in parentheses, and clustered at the firm level.

*** significant at 10% level, ** significant at 5% level, * significant at 1% level

Control variables are the same as table 5. For the sake of brevity, I didn't report the coefficients and standard errors of *COVID*, *Website*, *Low-income Country*, *Website * Low-income Country*, *School Closures*.

This section will test the possible heterogeneous effects of internet access under the pandemic and school closure policies in high-income and low-income countries. The coefficients of both triple difference terms in table 7 are not statistically significant, showing that having the ability to work remotely may not have differential impacts on the female share of firms under shocks in high-income and low-income countries. It is worth noting that the interaction term of *Low-income Countries* and *School Closures* in column 2 has a positive coefficient (0.918%) and is significant at a

10% level, which may demonstrate that the female ratio of employees in low-income countries was less affected by the shutdown of schools than that in other countries. This unexpected result might be attributed to the high school dropout rate in low-income countries due to school closure policies (Moscoviz and Evans, 2022), which was closely correlated with the rise in child labor (Kechagia and Metaxas, 2021). Older children in secondary schools from low-income families were even more likely to forgo classes and join the workforce (Alon et al., 2022), which might decrease the childcare demands within the household. It is also possible that the weaker impact of school closures on women's employment in low-income countries was due to the lack of social safety net protection and much lower government transfers (Lastunen et al., 2021; Alon et al., 2022).

6 Discussion and Limitation

6.1 Discussion

The findings of this paper might provide some possible evidence and explanations for the employment loss of white-collar women workers due to the COVID-19 pandemic from an enterprise aspect. First, I found that women workers were more likely to be laid off or quit the labor market under the pandemic and when schools closed. The increase in childcare caused by school closures could be one of the major drivers for the decline in the female ratio of employees, since women tend to spend more time in domestic care work than men globally. However, the ability to work remotely allows women to have more time flexibility to handle the family-work conflict, and they may not need to make the only choice between children care and work, which supports the previous findings of Alon et al. (2021) and Hou et al. (2022) by including more observations from the developing world.

Second, I tried to estimate the possible heterogeneous effect of internet access on women's employment loss by introducing country-level indicators with regard to discrimination gender norms in family and workplace. And I found that women in societies with more proportion of the population holding negative perceptions toward working mothers would benefit more from the ability to work remotely under the shock of school closures. In contrast, the gender norm in workplaces may not be the primary factor driving the exacerbating of the pressure on working mothers when childcare needs dramatically increased. The invisible constraints on working women imposed by conservative social norms in family may lead to a disproportionated distribution of childcare work within the household, forcing women to sacrifice their working time and even jobs to take care of children. Goldstein et al. (2022) demonstrated how discriminatory social norms

negatively affected female business leaders and raised their time spent on domestic work under unexpected childcare shocks. My results may contribute to their findings by taking internet access into consideration. The prevalence of gender stereotypes in family aggravated the situation of working mothers in conservative societies since they were more likely to be constrained by the caregiving burden compared to women in more egalitarian societies. Therefore, these women in less gender egalitarian societies might have a higher demand for the workplace flexibility, which enabled them to handle the dramatic increase in childcare during the pandemic.

Finally, I examined if the ability to work flexibly differentially affected working women from low-income and high-income countries under the COVID-19 and school closure shocks, but the coefficients of the triple interaction terms were not significant. Surprisingly, I found that the employment status of women in low-income countries was less likely to be influenced by school closure policies compared to that in high-income countries. However, this does not mean that women in low-income countries had a higher job resilience, instead, it might be resulted from its high children out-of-school rate due to school closures (Moscoviz and Evans, 2022) and the limited coverage of social insurance systems (Lastunen et al., 2021). Children from low-income households were forced to find a job rather than continue studying when schools were closed (Alon et al., 2022), leading to a decline in childcare needs. In addition, working women were less likely to quit their jobs since maintaining livelihoods was a much more urgent and essential problem in low-income households.

6.2 Limitations

While the findings of this paper show how internet access may help working women handle the work-family conflict, the results should be treated cautiously because of the limitations. The first limitation of this study is caused by the lack of data. There were limited questions regarding employees in the baseline and follow-up surveys. I only used a single outcome variable, female ratio of employees, to measure women's job resilience, though it straightforwardly reflected the employment loss of women, it could not display the changes in women's working hours or temporary leaves due to the pandemic and school closures. Another data limitation problem lies in the indicators of social norms, only 24 countries in my sample had data available in the World Value Survey, accounting for around 76% of the total observations. In addition, I only collected two time periods before the pandemic since there were no duplicated firms in the baseline surveys. And some countries in my sample only have one round (December 2019) before the shock, so it

might be hard to tell the parallel time trend for the treatment and comparison groups through data visualization with limited pre-shock periods. The placebo test by setting a fake shock before the real COVID-19 shock is also hard to implement, since there would be some firms in the sample that do not have any periods before the shock if I regard December 2019 as a fake shock. Given that, future research could consider performing a Difference in Difference (DID) method combined with propensity score matching (PSM). By calculating propensity scores, the treatment group and control group could be matched based on country- and firm-level characteristics, and then a DID method could be conducted using the matched firms to estimate how internet access affects women's employment loss under shocks.

7 Conclusions

This paper suggests that working in firms with internet access improved women's job resilience by allowing them to have more flexible time to cope with the increase in childcare needs during the pandemic, and women residing in societies characterized by less gender egalitarian social norms might benefit more from the workplace flexibility. Despite the findings being based on limited data, this paper may contribute to studies concerning how childcare and conservative gender norms exacerbated women's employment loss under an unexpected shock, COVID-19, and emphasizes the significance of allowing flexible work schedules for women employees. However, the implementation of workplace flexibility should not be limited to women employees, since arranging flexible work schedules for all employees could not only alleviate the childcare burden on mothers but also encourage fathers to make utilization of their work flexibility to spend more time in childcare and other domestic chores, which might narrow the gender gap in unpaid care work and challenge the traditional social norms (Arntz et al., 2020; Alon et al., 2020). Policies about workplace flexibility targeting working women exclusively may also raise the cost of recruiting women employees for firms, adversely preventing women from participating in the job market. Therefore, firms should be encouraged to provide flexible work arrangements for both female and male employees, which would be conducive to mitigating the unequal distribution of care work and other domestic chores within the household.

By covering countries from different income levels, this paper may supplement previous studies focusing on the gender impact of the pandemic and the response policies implemented by the government only in developed countries. However, I found that the less negative impact of school closures on working women in low-income countries in comparison with high-income countries could probably be attributed to the high school dropout rate of children and lack of social

insurance systems. The COVID-19 Follow-up Enterprise Surveys Project is still ongoing and continually collecting data with regard to the effects of the pandemic on enterprises across the world. Given that, further detailed research containing the long-term gender impact of the pandemic in developed and developing countries could be done if more comprehensive information about the employees' characteristics, such as position, children's status, are available. Last but not least, it might be possible for future studies to leverage a more reliable proxy for workplace flexibility of employees if more detailed information about firms' online business shares or their choices among remote, hybrid or return-to-office work models are accessible.

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Appendix A

Table A1 displays the number of firms in the sample by country, the baseline survey year, GNI per capita, and GDP per capita in 2019.

Appendix B

The COVID-19 Follow-up Enterprises Surveys in different countries were conducted at different times, which is shown in figure B1. Most enterprises completed the first round of the follow-up survey by October 2020, and most of the second round of follow-up surveys were conducted between November 2020 and March 2021. The third round of the follow-up surveys started from April 2021. However, not all countries participated in three rounds of the surveys.

Table A 1 Country Distribution

Country	Region	Number of Firms	Baseline Survey Year	GDP Per Capita (\$)	Income Per Capita (\$)
Albania	Europe & Central Asia	331	2019	5220	5396
Azerbaijan	Europe & Central Asia	81	2019	4490	4806
Belarus	Europe & Central Asia	520	2018	6370	6838
Bosnia and Herzegovina	Europe & Central Asia	194	2019	6180	6120
Bulgaria	Europe & Central Asia	625	2019	9570	9879
Chad	Sub-Saharan Africa	93	2018	700	710
Croatia	Europe & Central Asia	369	2019	14990	15312
Cyprus	Europe & Central Asia	211	2019	27930	29206
Czech Republic	Europe & Central Asia	473	2019	21930	23660
El Salvador	Latin America & Caribbean	453	2016	3990	4168
Estonia	Europe & Central Asia	301	2019	23250	23398
Georgia	Europe & Central Asia	476	2019	4690	4698
Greece	Europe & Central Asia	578	2019	19710	19134
Guatemala	Latin America & Caribbean	218	2017	4610	4639
Guinea	Sub-Saharan Africa	84	2016	950	1058
Honduras	Latin America & Caribbean	189	2016	2390	2556
Hungary	Europe & Central Asia	729	2019	16530	16736
Italy	Europe & Central Asia	492	2019	34860	33642
Jordan	Middle East & North Africa	480	2019	4410	4405
Kazakhstan	Europe & Central Asia	633	2019	8820	9813
Latvia	Europe & Central Asia	276	2019	17740	17927
Lithuania	Europe & Central Asia	216	2019	19020	19576
Malta	Middle East & North Africa	225	2019	28340	30186
Moldova	Europe & Central Asia	273	2019	4580	4492
Mongolia	East Asia & Pacific	281	2019	3790	4405
Morocco	Middle East & North Africa	912	2019	3200	3235
Mozambique	Sub-Saharan Africa	351	2018	490	507
Nicaragua	Latin America & Caribbean	217	2016	1900	1927
Niger	Sub-Saharan Africa	49	2017	600	554
Poland	Europe & Central Asia	915	2019	15350	15732
Portugal	Europe & Central Asia	883	2019	23170	23331
Romania	Europe & Central Asia	628	2019	12610	12899
Serbia	Europe & Central Asia	278	2019	7030	7417
Slovak Republic	Europe & Central Asia	349	2019	19220	19304
Slovenia	Europe & Central Asia	335	2019	25940	25943
Togo	Sub-Saharan Africa	44	2016	920	893
Zambia	Sub-Saharan Africa	534	2019	1430	1305
Zimbabwe	Sub-Saharan Africa	540	2016	1200	1317
Total		14836			

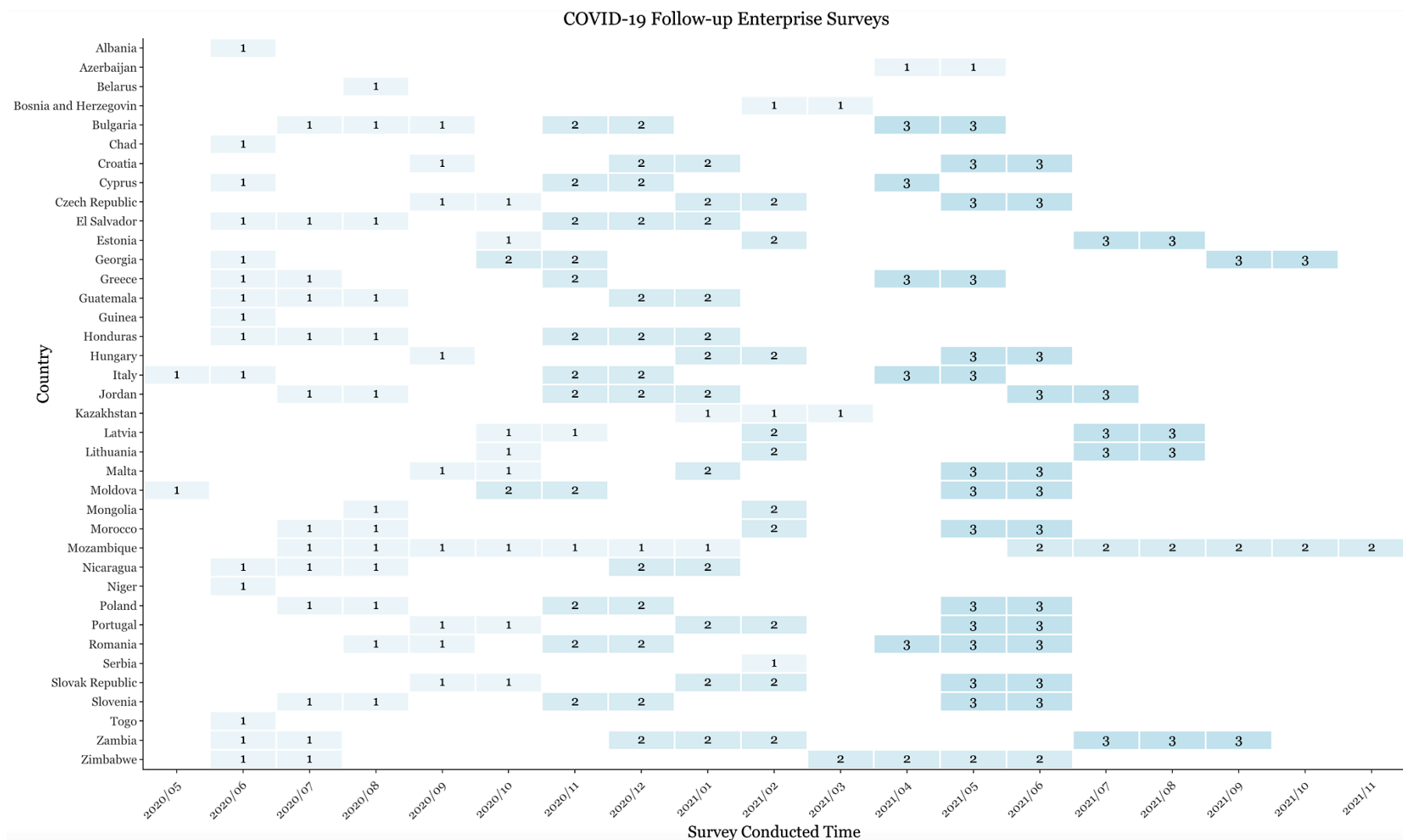


Figure B 1 The COVID-19 Follow-up Enterprise Surveys by Country and Round

Appendix C

Figures C1 to C4 display the negative correlations between social norms and the female ratio of employees before and after the pandemic, respectively, and the blue dashed lines denote the fitted lines using a simple OLS regression.

Social Norm1 in figures C1 and C2 approximately measures how representative respondents think of gender equality with regard to childcare. Jordan has the highest proportion of respondents (84.3%) agreeing or strongly agreeing that “when a mother works for pay, the children suffer”, the lowest ratio goes to Estonia, which is 21.4%. Figures C3 and C4 display the changes in countries with different attitudes toward gender equality in workplaces, with 81.5% of respondents in Jordan holding a negative opinion, which is the largest. And Estonia has the lowest share, which is 9.7%.

After the outbreak of the pandemic, the average female ratios of employees in Albania, Belarus, Bosnia and Herzegovina, Bulgaria, Greece, Italy, Jordan, Kazakhstan, Mongolia, Morocco, Poland, Serbia, Slovak Republic, Slovenia, and Zimbabwe decreased.

Appendix D

Figure D1 demonstrates how the outbreak of COVID-19 affects the female ratio of employees in firms from different countries, disaggregated by whether the firm has its own website or not. In most countries, the blue lines referring to the gender ratio of firms with websites seem to have less volatility under the impact of COVID-19 compared to the red lines. Rounds 1, 2 and 3 refer to different rounds of the COVID-19 Follow-up Enterprises Surveys, round 0 refers to the time of December 2019, right before the global outbreak of the pandemic. Round -1 refers to the time from the last quarter of 2018 to the time before round 0, and the data in round -1 is collected from the baseline enterprise surveys, which contains no duplicated firms.

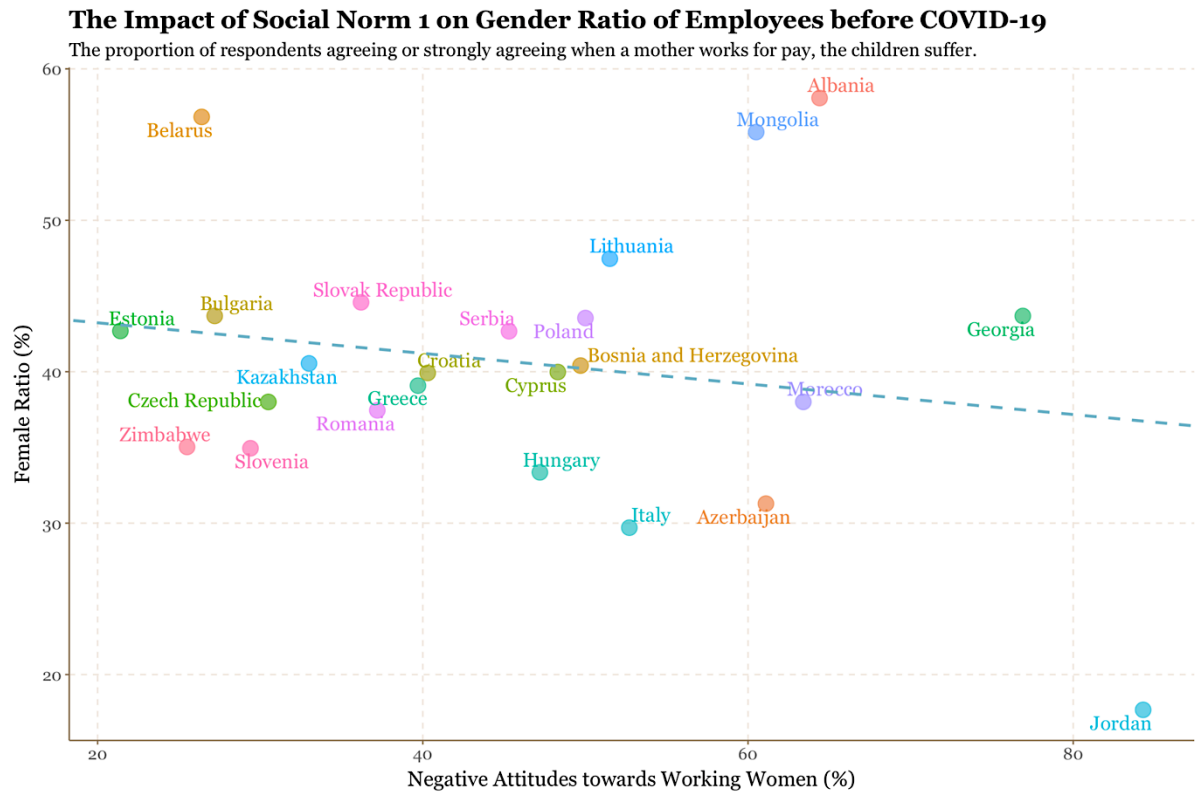


Figure C 1 The Impact of Social Norm1 on Gender Ratio of Employees before COVID-19

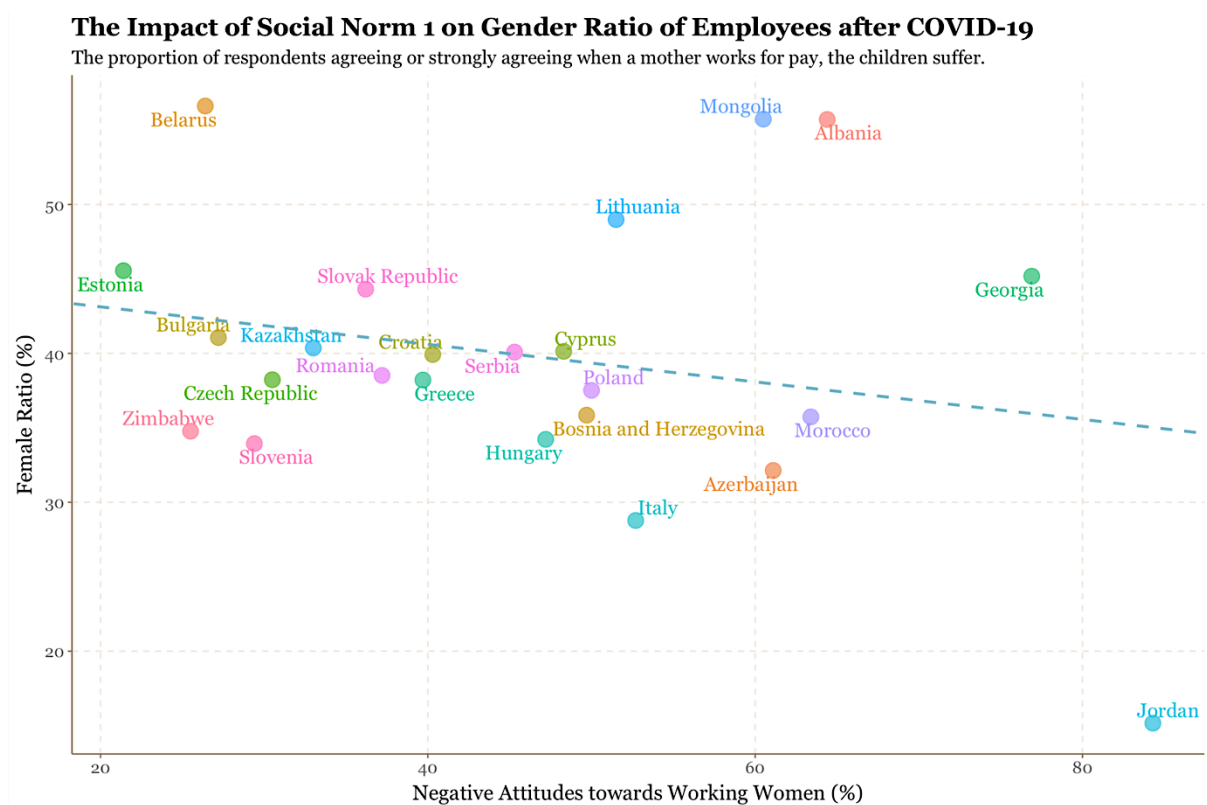


Figure C 2 The Impact of Social Norm1 on Gender Ratio of Employees after COVID-19

The Impact of Social Norm 2 and Gender Ratio of Employees before COVID-19

The proportion of respondents agreeing when jobs are scarce, men should have more right to a job than women.

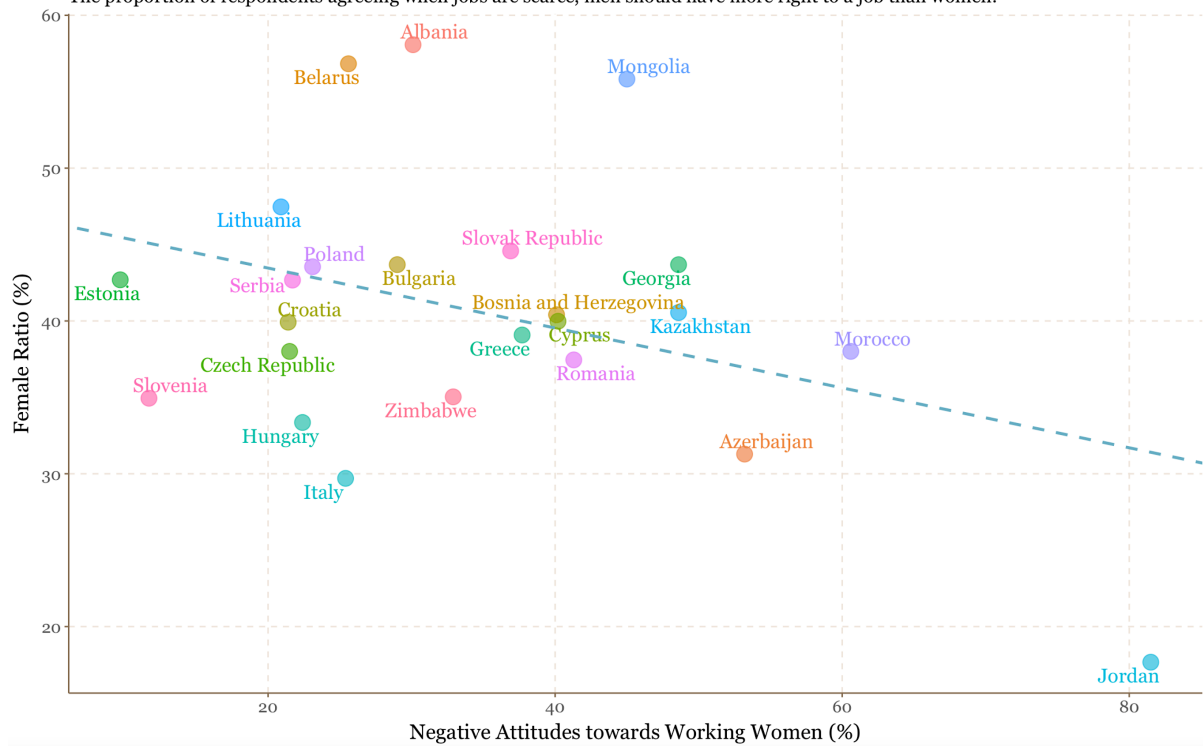


Figure C 3 The Impact of Social Norm2 on Gender Ratio of Employees before COVID-19

The Impact of Social Norm 2 and Gender Ratio of Employees after COVID-19

The proportion of respondents agreeing when jobs are scarce, men should have more right to a job than women.

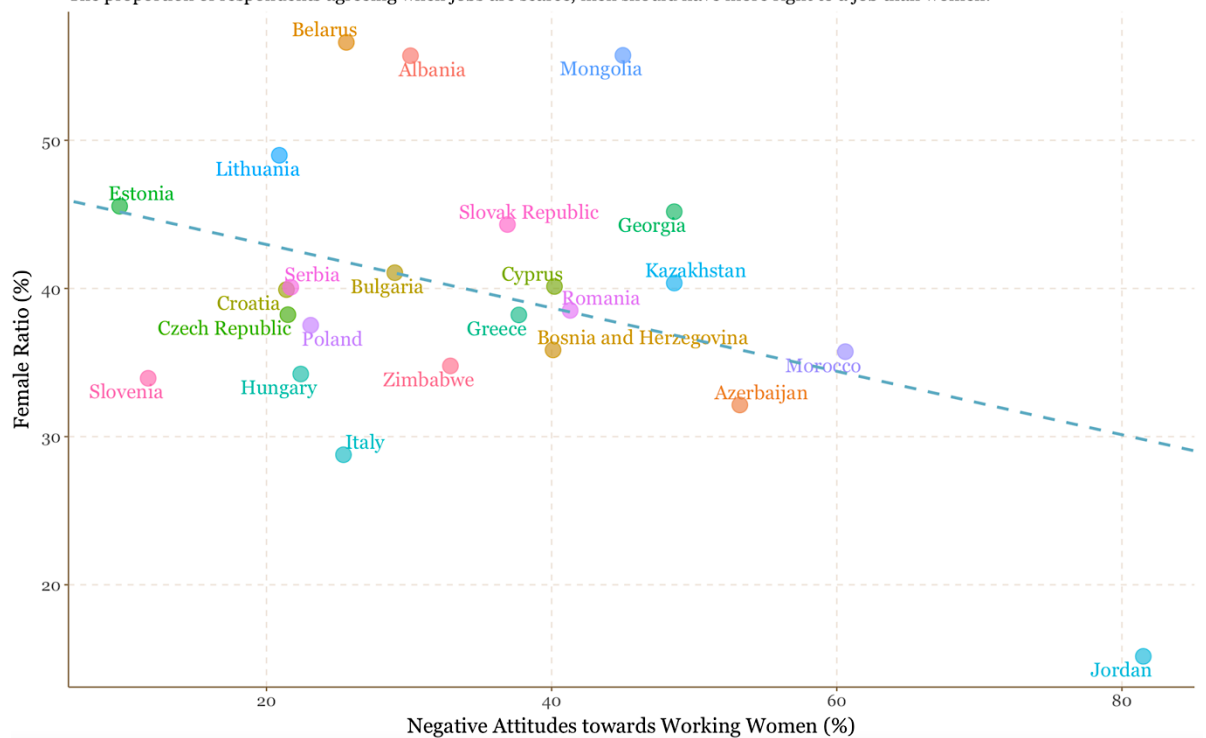


Figure C 4 The Impact of Social Norm2 on Gender Ratio of Employees after COVID-19

The Impact of COVID-19 on Gender Ratio of Employees

Disaggregated by whether the firm has its own website before COVID-19

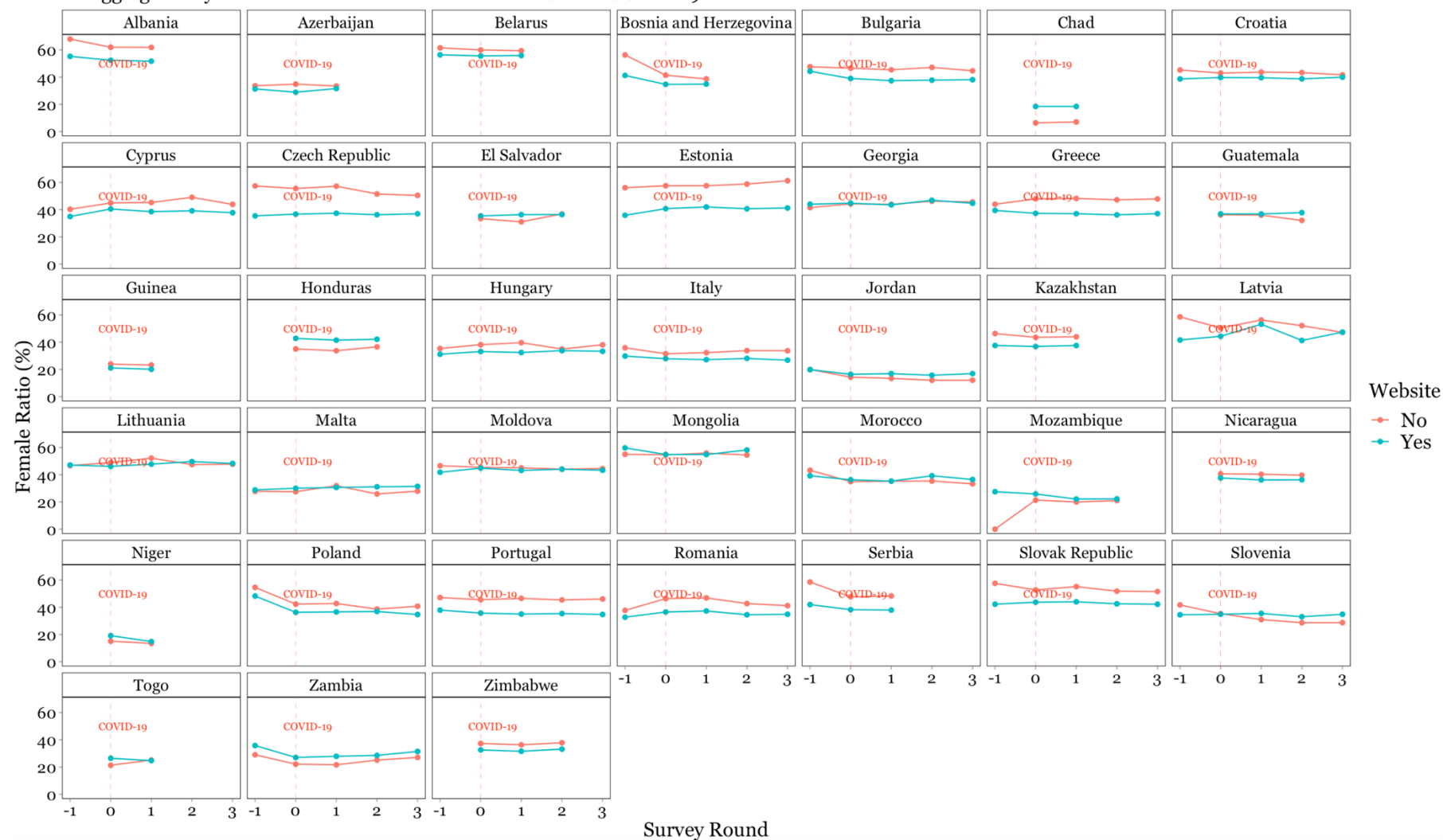


Figure D 1 The Impact of COVID-19 on Gender Ratio of Employees