

Impact of the COVID-19 Pandemic on Employment Rates for Women: Insights from a Developing Country

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Abstract

This paper uses quarterly data from the Pakistan Standard of Living Measurement Survey for the years 2018 through 2020 to look at the impact of COVID-19 induced school lockdowns and social distancing measures on the male-female gap in employment rates based on the presence of school-aged children within their household. The analysis makes use of a difference-in-difference model to estimate the gap in male-female employment rates. The results indicate that employment rates declined more sharply for women with no kids compared to men during the months following the introduction of social distancing and lock-down measures in Pakistan. This suggests that these women took on the duty of being a caregiver to school aged children belonging to their relatives while the shutdown policies were in place. The finding reflects different care-giving expectations in developing countries which traditionally place the childcare burdens on women present in the household who have no children of their own as opposed to the case in developed countries such as the United States where mothers provided care to their children during COVID-19.

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1. Introduction

The economic impact of COVID-19 through social distancing, lockdowns, and reduced demand affected the global population in various ways. However, these effects raise the question of whether they were uniform across gender and a country's development levels. The possibility that the emergence and spread of COVID-19 affected men and women differently in the labor market is an important concern to study in the context of developing countries where women tend to be more disadvantaged than men in terms of their labor market prospects.

In their survey paper Miguel and Mobarak (2022) noted that female-headed households in poorer countries faced greater food insecurity, with pre-existing economic gaps worsened by COVID-19. This contrasts with the work by Couch, Fairlie, and Xu (2022) regarding women relative to men in the U.S., where they observed that increased gaps in labor market activity for mothers of young children were aggravated by COVID-19. Agüero, Marks, and Raykar (2020) also examined labor market disparities between men and women, with and without children, across 21 middle- and low-income countries. Unlike the U.S., they found that the motherhood penalty did not similarly increase labor market gaps in these countries. With this context, this analysis focuses on the impact of COVID-19 on gender labor market gaps in Pakistan, a developing country with a majority Muslim population.

In Pakistan, women are culturally seen as caregivers, and younger women are expected to help with childcare. Although education has improved prospects for younger women, strict societal rules, including limitations on movement without a male guardian, often confine them to domestic roles. The COVID-19 school closures increased caregiving responsibilities, but it is unclear which women in the household were most impacted. This paper investigates whether the likelihood of women's employment was disproportionately affected by COVID-19 due to increased childcare responsibilities and the distribution of this work within families.

This research provides evidence on the effects of the COVID-19 pandemic recession on the likelihood of being employed among prime-aged men and women spanning the first three quarters since the nationwide adoption of social distancing and lockdown measures in March of 2020 across Pakistan's provinces. The period spanning these first three quarters is crucial because it captures the initial shock and adjustment to lockdown measures, covering the time when schools were closed, businesses began to reopen, and children returned to hybrid or in-person learning.

The question of the evolution of the gender gap in likelihood of being employed in Pakistan since the introduction of COVID-19 lockdown measures is important to study since the country has historically struggled with gender inequality across several economic outcomes ranging from access to education to

wage inequality. According to the Global Gender Gap Report 2021, Pakistan ranks 153rd out of 156 countries on the gender gap index (an index between 0 and 1 and values close to zero being undesirable and reflecting severe gender gaps across various economic measures). Pakistan has consistently been a low-ranking country on this index. Not only does Pakistan globally fare poorly on the Gender gap index, it also does not do better within its own continent. It is the second lowest scoring country on the gender index in South Asia in terms of education and labor force outcomes (WEF 2021). The research of Couch, Fairlie and Xu (2022) demonstrated that women with school-aged children had to reduce employment in a developed country such as the United States. Here, I examine women in Pakistan to see if labor market prospects for women, specifically the likelihood of a female being employed is worsened due to COVID-19. This research is important because poor labor force prospects can prompt women to withdraw from the labor market and withdrawals of women from the labor force particularly at young ages is often associated with total lifetime work activity.

I. Female Labor Markets in Pakistan

Research based on Becker (2010), Blinder (1973), Oaxaca (1973), and Bergmann (1971) has explored gender gaps in labor markets in developing countries, including Pakistan. However, recent studies are limited due to political instability and disrupted data collection in the country. Historically, studies on Pakistan used male/female wage comparisons to examine gender gaps, with findings indicating that larger families and the presence of male siblings lowered girls' educational opportunities, contributing to low female labor force participation (Nasir and Nazli 2010). This research underscores the importance of determining whether education differentials or other factors influenced female employment during COVID-19 lockdowns, which this paper investigates.

The aforementioned research hints at a longstanding tradition in Pakistan.

Historically, girls in the country have been deprived of opportunities to accumulate human capital due to notions of protecting their honor and keeping them safe. The preference for investing in sons' education to improve their labor market prospects further perpetuates gender inequality and adds to the prejudice against women with them being considered more useful as caregivers at home. In the 1990s, despite increased female labor force participation, women faced higher unemployment rates and were concentrated in low-paying occupations such as stitching (Siddiqui, Siddiqui, and Soomro 2006). Although women worked more days and longer hours on average, this did not translate to higher earnings, reinforcing the notion that sending women to work was not economically viable for many families. The aforementioned studies motivated this paper to test for whether this trend persisted during COVID-19, with women staying home while men maintained higher employment levels.

While women in the formal working sector in Pakistan have been seen to be concentrated in low-paying occupations, it has also been shown that females often tend to be in the informal labor market due to limited human capital accumulation. The perception of women as less competent than men, exacerbated by limited education and skill acquisition opportunities, contributes to this disparity (Siddiqui et al. 2006). Further research shows that while productivity differences explain part of the gender wage gap, labor market discrimination against women worsens it (Siddiqui, Siddiqui, and Akhtar 1998). A lot of the previous work done in Pakistan focused on the male-female earnings gap found substantially higher earnings for males as compared to females in Pakistan's labor force with most often cited causes for this being human capital differences and discrimination against women (Ashraf, Ashraf, and Ahmed 1993). These findings with respect to wages highlight the importance of similar examinations of gender gaps in employment and whether differences are based on human capital attainment, or some discriminatory mechanism is at play. The research contained here contributes to this literature by employing a difference-in-differences research design to look at the influence of COVID-19 on the gender gap in likelihood of being employed in Pakistan.

Unlike prior research which has studied gender gaps in Pakistan at a point in time using mean wages, the temporal, dynamic behavior of gender gaps in the labor market has not been a subject of much research. One of the only studies in this area of research is by Sabir and Aftab (2007). They explored the change in the gender gap in labor force participation over time using Pakistan's Labor Force Survey data from 1999 – 2006. They employ the Blinder-Oaxaca decomposition method and quantile regression methods in their analysis and find that even though over time female labor force participation increased, it only resulted in a widening gender gap in male-female wages. In light of both the research context and the prior literature, it is important to be mindful of the observation that women in Pakistan are traditionally considered the primary caretakers of children around them, and this can impact their labor force participation decisions not just on a daily basis but in times of crisis as well. Additional caregiving burdens traditionally extend beyond the mother in a Pakistani family, and this may be important in the case of COVID-19 as well. Hence, looking at different groups of women and their respective employment rates compared to their male counterparts is an important aspect of this analysis.

II. Pakistan and COVID-19

In their research on Pakistan pertaining to COVID-19, Naeem, Muhammad and Niazi (2021) discuss the impact of the COVID-19 pandemic in terms of a negative growth rate and declining exports using data from Asian development bank. Also, to look at the impact of COVID-19 on small and medium enterprises (SMEs) a study collected primary data using a survey instrument adapted from the US Bureau of Labor Statistics public documents to find that SMEs encountered unfavorable circumstances amid the

COVID-19 pandemic in the form of a shortage of goods, blockages in transportation, a decrease in the demand of product and services, a decline in profits and sales, limited operations as well as forced employee layoffs due to the aforementioned problems (Aftab and Hanif 2021). The shut-down of SMEs can increase the chances of the owners themselves trying to get employed by others and might result in increased employment rates for men as they would tend to be owners. This may have provided remaining employers with an increased availability of men to work during the pandemic.

Additionally, Akmal et al. (2020) examined the impact of COVID-19 on education, economic and health related outcomes, in relation to the availability of learning aids for children. Their research indicates that richer households have access to more learning aids for their children in the form of technology which led to better learning outcomes in richer households as opposed to poorer households during COVID-19. Because of large regional differences in affluence, this points to the importance of geographic differences in driving employment likelihood-based gaps between men and women. Hence, the research design in this paper accounts for regional fixed-effects in the analysis section.

III. Caregiving and Family Dynamic

Historically, it has been argued that the motherhood penalty is likely to become worse as a woman has more children (Grimshaw and Rubery 2015), but in the context of a developing country, having more siblings in a family introduces the possibility that the mothers may end up relaying the care-giving duties to the elder siblings for the very reason that they may be old enough to be able to take care of their younger siblings. This conjecture can further be supported by the prevalence of the joint family system in Pakistan. While Pakistan does have nuclear families where a single-family unit lives in a household, a lot of families still have the joint family system where multiple families live within the same household. In rural areas this is even more common than urban areas as less people can afford separate dwellings. This family structure allows not only a woman's older child but also other women without children present in the household, to serve as substitute caretakers. For example, this might be a grandmother, unmarried sister-in-law, or adolescent daughter. All can help as substitute caretakers for children for parents who need to work or who are busy with other children. In the context of this research, it seems more plausible that adolescent daughters might have to be substitute caretakers because of the social norm present within the country of daughters taking care of younger siblings.

An interesting factor in determining childcare burdens is whether or not they have costs associated with them. Historically, the precedent in a developed country such as United States is that access to and affordability of childcare is an important factor in reducing labor market participation and advancement of women in the labor market (Blau and Kahn 2013a, Goldin and Mitchell 2017, Juhn and McCue 2017,

Waldfogel 1998). In the context of developing countries, it is safe to expect that the burden of caretaking ends up being put on younger unmarried women in the household rather than by purchasing outside provided care. The idea is that these women have to take care of either their siblings or other children in the house which disturbs their labor prospects instead of severely affecting the labor market prospects of their mothers. This is why in previous work it has been shown that motherhood penalty is not as severe in less developed countries as in developed countries. As the development of a country increases, so does its motherhood penalty (Agüero, Marks and Raykar 2020). In the case of Pakistan, there is a reasonable expectation that adolescent women in the household provide mothers with substitute caregivers while they work or are otherwise occupied.

A major aspect of the Pakistani family structure that makes it natural to expect women to take care of their siblings is discussed by Cicirelli (1994); the nature of sibling relationships is also different in Pakistan. It is considered obligatory for older children to take care of their younger siblings as opposed to the more discretionary role that is observed in developed countries such as the United States.

Understanding what gender is preferred when it comes to older children taking care of younger siblings needs to be premised on how Pakistan's labor force participation has varied by gender historically. In Pakistan, female labor force participation has always been low in comparison to men in part due to their lower human capital accumulation, which makes the opportunity cost of a daughter foregoing work lower than for a son due to the lower pay of women and their reduced labor market opportunities (Barigozzi, Cremer and Roeder 2020). Furthermore, the social norms in Pakistan dictate that women are primarily supposed to take care of affairs of the household while the men go out and work. This norm is further reinforced by the unfortunate fact that in Pakistan the number of spaces considered safe for women are scarce. These factors work in tandem to support the normative idea that if substitute care for children needs to be provided by any individual within the household, it should be a woman instead of a man. This suggests that in developing countries such as Pakistan, sisters are more likely to incur losses in labor force participation due to increased caregiving demands related to COVID-19 rather than mothers.

This analysis examines how different childcare burdens and family structure impacts the gender gaps in likelihood of being employed in Pakistan due to the COVID-19 pandemic. The analysis considers women and men with children of different ages to account for expected and unexpected childcare burdens introduced due to the onset of the pandemic as well as individuals with no children of their own. The empirical results of the paper indicate that the likelihood of being employed fell more for women with no kids, children ages 0-5, and school aged children as compared to males. The estimates indicate that the greatest disproportionate reduction in likelihood of being employed occurred among women that did not

have kids of their own. This is consistent with the conclusion of prior research by Agüero, Marks and Raykar (2020) that such women in developing countries were likely the caregivers of their younger siblings or other relatives. The gender gap in likelihood of being employed for these single women relative to men is found to widen by 5.8 and 9.5 percentage points in the Spring and Summer of 2020 after the lockdown measures were introduced. In comparison to results from developed countries (Couch, Fairlie and Xu 2022), the difference between the role of siblings in the household based on the level of development in a country can be seen. In that research on the U.S., the employment gap for women with no kids relative to men did not vary during the pandemic.

The findings from this paper contribute to the existing sparse literature on the impacts of COVID-19 on the labor market outcomes of women in a developing country such as Pakistan. It extends the analysis of the gender gap in employment likelihood in Pakistan before and after COVID-19 restrictions were put into place. Also, it analyses how a unique shock can impact existing gender gaps in the labor force in Pakistan using the Pakistan Standard of Living Measurement micro-data from July of 2018 through December 2020 collected by the Bureau of Statistics in Pakistan. The paper adds to the literature regarding how differential family structures and norms in developing countries can result in disparities in labor market outcomes for women.

2. Context and Analytical Approach

Pakistan's first case of COVID-19 was diagnosed in the province of Sindh on 26 February 2020 and less than a month later, the country was unable to contain the spread of the disease across all provinces. It was a natural expectation by March of 2020 that schools and businesses had to shut down following the example of other countries such as the United States that had its states implement shutdowns by March 15 2020. Hence on March 23, 2020, Pakistan's Prime Minister Imran Khan introduced a two-week long lockdown for businesses and schools. Only two weeks of lockdown were initially introduced because Pakistani citizens underestimated the severity of the consequences of contracting the Coronavirus. This was echoed in studies as well, with seventy eight percent of respondents of a phone-survey of 1,211 households exhibiting opinions that showed they underestimated the impact of COVID-19 on their health as compared to the effects of the slower spreading and more prevalent Tuberculosis strain present in the country (Akmal et. al 2020).

It was soon that the country realized that the rapid spread of COVID-19 could not be underestimated and on April 6 2020, the lockdown measures were extended for another week until mid-April. Regardless, Sindh province being the first to finish the imposition of lockdown on 5 April 2020. By the end of April most provinces started lifting lockdown restrictions on their businesses while keeping schools closed.

However, the schools remained closed from April up until September of 2020 when the federal government of Pakistan decided to introduce hybrid learning and reopened in person learning for grades above middle school.

While the arrival and presence of children in the household is associated with gender gaps in the labor market in part due to reduction in human capital formation for women during the formative years of children and possible female absence from the labor market (Juhn and McCue 2017), in the case of Pakistan it is interesting to theorize that the presence of older female siblings in the house might moderate the negative consequences seen in more developed countries with respect to female labor force participation and employment for women with children during COVID-19 as found by Agüero, Marks and Raykar (2020).

Accordingly, we focus on the likelihood of a woman being employed as an important indicator of their labor market activity and the premise of this study is that under normal circumstances families have childcare behaviors that change as the child grows older; pre-school children require different care compared to school-age children and the demanding nature of providing childcare and supervision typically declines with their age. Furthermore, labor market interruptions are often associated with childbirth when it comes to women. Therefore, the focus of this paper is to contrast women and men in families with no children of their own, any children, young children, or school age children as we expect that school closures should have differential impacts on each of these groups (Juhn and McCue 2017, Collins et al. 2020).

Data

The data used in the analysis are taken from the Pakistan Standards of Living Measurement (PSLM) survey. The data are a monthly dated repeated cross-section of all urban and rural areas of the four provinces of Pakistan excluding military restricted areas in the country. In the analysis we use the monthly PSLM data from July of 2018 through December of 2020. The total number of observations in the overall sample for the analysis in this paper are 174,381 individuals.

Given the aim of this paper is in estimating the impact of COVID-19 pandemic on the labor market activity of men and women, it is relevant to note that the social distancing measures including local closures of businesses and schools started right before the collection of the March PSLM data. However, all provinces in Pakistan had some form of social distancing and lockdown measures in place before the collection of the April PSLM data. Thus, the March data is viewed as a month partially impacted by the pandemic and April as the first month in which labor market activity was disrupted throughout Pakistan.

The focus in the paper is on changes in likelihood of being employed experienced beginning with April 2020 given the timing of the adoption of national social distancing policies in Pakistan. The data are pooled across months in portions of the analysis referring to post-COVID seasons such as Spring, Summer and Fall (April and May 2020 are included in the Spring, June to August 2020 included in the Summer and September to December 2020 in the Fall). February 2020 is used as the reference pre-pandemic month. The division of months into seasons roughly approximates the timing of (1) the unanticipated disruptions to school (Spring), (2) disruptions to summer vacation plans (Summer) and (3) additional unanticipated disruptions to school (Fall). Specifically, for the COVID-19 analysis the focus will be on individuals with children aged 0 to 5 years old, school-age children and individuals with no children to look at the effects of care-giving responsibilities being increased during COVID-19 on the gender gap in employment.

The family structure variables within the PSLM are used to identify working-age adults ages 25 to 55 with and without children at home from ages 0 to 5 and 10 to 16 years old. Additional survey questions are used to determine families with children of different ages at home.

Table 1: Percentage Distribution of Provinces in the Sample

Province	Percentage of Sample
Khyberpakhtunkhwa	16.63
Punjab	54.56
Sindh	23.24
Balochistan	5.58

Table 2: Median Age of Women with no Kids Based on Marital Status

Marital Status	Median Age of Women with no Kids
Unmarried	15
Currently Married	31
Widow	61
Divorced	50
Separated	49

Table 3: Percentage Distribution of Women with no Kids Based on Marital Status

Marital Status	Percentage of Women with no Kids
unmarried / never married	82.46
currently married	16.78
widow / widower	0.71
divorced	0.03
separated	0.01
Total	100

In terms of the regional breakdown of the data in the timeframe of the study, table 1, 2, 3 and table 4 contain descriptive statistics for the study. Table 1 shows that about 55 percent of the data is from the province of Punjab alone, followed by 23 percent from Sindh, 17 percent from Khyber Pakhtunkhwa (KPK) province and the remaining five percent from Baluchistan province. The male-to-female ratio of the sample used in the analysis suggests proportion of females in the sample to be 52 percent, married individuals being 88 percent of the sample of analysis and 53 percent of the sample being employed. Additionally, 62 percent of the data is from rural regions while the rest is from urban locations. (Table 4).

Table 4: Descriptive Statistics

Variable	Obs	Mean/Percent of Sample	Std. dev.	Min	Max
employed	352669	53%	-	-	-
female	352669	52%	-	-	-
Men and Women with no children	268,245	14%			
Men and Women with children age 0-5	352,669	35%			
Men and Women with Children age 10-16	352,669	40%			
Education: Grade_2	174381	1%	-	-	-
Education: Grade_3	174381	2%	-	-	-
Education: Grade_4	174381	2%	-	-	-
Education: Grade_5	174381	19%	-	-	-
Education: Grade_6	174381	2%	-	-	-
Education: Grade_7	174381	2%	-	-	-
Education: Grade_8	174381	16%	-	-	-
Education: Grade_9	174381	2%	-	-	-
Education: Grade_10	174381	25%	-	-	-
Education: Pre-Undergrad(2 years)	174381	11%	-	-	-
Education: B.A/B.Com/B.Sc	174381	7%	-	-	-

Education: B.Ed	174381	1%	-	-	-
Education: B.A/B.E	174381	1%	-	-	-
Education: M.A/M.Sc	174381	5%	-	-	-
Never Married	352669	8%	-	-	-
Married	352669	88%	-	-	-
Widow/Widower	352669	3%	-	-	-
age	352669	37.69326	8.862141	25	55

Divorced, separated, no education, education: grade 1, diploma, medschool, agriculture science, law school, engineering, accountancy, Mphil, PhD, M.S, Pre-school, Nursery and Kindergarten represented less than 0.5% of the sample, Additionally, 62 percent of the data is from rural regions while the rest is from urban locations.

Additionally, table 4 also shows 14 percent of the sample has no children, 35 percent of the sample has children aged 0 to 5 years and 40 percent of the sample has children aged 10 to 16.

In terms of education, 25 percent of the sample has individuals that have education till grade 10, followed by 19 percent individuals having education till grade 5, 16 percent individuals with education till grade 8, 11 percent individuals with two years of undergraduate education and 7 percent of individuals having done Bachelor of Science. Lastly, the average age of individuals in the sample is approximately 37 years old.

3. Descriptive Patterns of Male and Female Employment

Table 5: Mean Comparison of Employment by Gender and Child Presence

The descriptive patterns of male and female employment rates are presented in table 5.

Quarter	Average Employment for people with no kids			Average Employment for people with kids age 0 to 5			Average Employment for people with kids age 10 to 16		
	Female	Male	Gap	Female	Male	Gap	Female	Male	Gap
2018-Q3	0.251	0.957	0.706	0.254	0.974	0.720	0.285	0.970	0.685
2018-Q4	0.266	0.953	0.687	0.241	0.969	0.729	0.285	0.961	0.676
2019-Q1	0.242	0.956	0.714	0.230	0.976	0.746	0.286	0.964	0.679
2019-Q2	0.199	0.960	0.761	0.238	0.968	0.730	0.264	0.949	0.685
2019-Q3	0.107	0.984	0.877	0.231	0.993	0.762	0.236	0.987	0.751
2019-Q4	0.159	0.952	0.793	0.154	0.968	0.814	0.170	0.954	0.785
2020-Q1	0.136	0.963	0.827	0.155	0.971	0.816	0.169	0.956	0.788
2020-Q2	0.049	0.990	0.942	0.064	0.960	0.896	0.060	0.953	0.893
2020-Q3	0.068	0.997	0.929	0.131	0.994	0.864	0.094	0.990	0.896
2020-Q4	0.280	0.975	0.696	0.253	0.954	0.701	0.312	0.959	0.647

Table 5 shows that the likelihood of being employed for women with no kids as compared to men with no kids is relatively low. The employment rate for these women peaks at 26.6 percent in the fourth quarter of 2018 and is at its lowest in the second quarter of 2020 at 4.9 percent. If we look at men with no kids on the other hand, their highest employment rate occurred in the third quarter of 2019 at 98.4 percent. Their employment rate only grew to 99 percent in the second quarter of 2020, which lead to the highest male-female employment rate gap observed in the sample period of 93 percentage points. Once we start to look at men and women with younger children aged 0 to 5, we see a similar pattern as was observed with women without kids. The peak female employment rate for that group was 25.2 percent in the third quarter of 2018 and the lowest observed rate was 6.8 percent in the second quarter of 2020. Just as the case was for individuals with no kids, the individuals with children ages 0 to 5 had the widest employment rate gap in the second quarter of 2022 at 89.6 percentage points.

An interesting observation that can be drawn from the data is that women with school going children had employment rates that were slightly higher as compared to the women with no kids or kids aged 0 to 5 years. However, this did not change the fact that women still had peak employment rates in the third quarter in 2018 and had the worst employment rates as compared to their male counterparts in 2020 quarter 2 and afterwards. The male-female employment rate gap for women with no children was at 93 percentage points, for those with school aged children was 88.3 percentage points in the second quarter of 2020 and at 88.5 in the third quarter. This male-female employment rate gap was found to be lowered for women with no kids, women with children aged 0 to 5 and women with school aged children to 66.4 percentage points, 69.3 percentage points, and 64.4 percentage points respectively by the Fall of 2020.

In terms of the difference in average employment of males and females, the descriptive statistics in table 5 suggest similar patterns in Pakistan to those reported by Agüero, Marks and Raykar (2020) with the employment gap between men and women being most pronounced for those without any kids of their own. This pattern is consistent with women who are either sisters or daughters in a household with younger kids, with no kids of their own taking care of younger children. This can be supported by table 2 and table 3 where we see that the median age for women with no kids is at 15 and unmarried women are representing approximately 83% of the women with no kids. Lastly, if we turn our attention towards women and men with children of their own, women with school going children are not performing as poorly in employment rates as those without kids. This is further corroborating the theory that it is possible that older married women with young children ask younger women in their household such as their daughters or younger siblings to take care of their children while they work.

4. Methodology

Difference-in-difference regressions will be estimated for the impact of COVID-19 on the gender employment gap for all women relative to men and for sub-groups of those with no children and children of different ages (age group 1 consists of children ages 0 to 5 years old and age group 2 is children aged 10 to 16) as well as individuals with no children of their own. The identifying assumption of the model is that in the absence of the pandemic, trends across the two groups (men and women) would have been equal. While this condition cannot be directly checked, an event-history model will be estimated to check whether any significant pre-trends are found prior to the arrival of the pandemic. This is done for men and women from ages 25 to 55.

The difference-in-difference regression can be written as follows:

$$(5.1) Y_{it} = \alpha + \gamma Female_i + \sum_{q=1}^3 \pi_q COVID_q + \sum_{\{q=1\}}^{\{3\}} \delta_q Female_i * COVID_q + \beta' X_{it} + \lambda_t + \theta_t + \tau + Female * \tau + \epsilon_{it}$$

Similar estimation approaches can be found in the prior literature (e.g. Couch, Fairlie and Xu 2022). Here Y is the outcome being examined, i.e., an individual i in month t being employed or not. Female is the indicator coded with a value of 1 for the women in the sample. COVID_q is a dummy variable for each post-COVID quarter beginning with Spring (April to May) through Summer (June to August) and Fall (September to December) of 2020. X includes categorical variables for education level and marital status for each individual in month t. The model also includes seasonal fixed-effects λ_t, year fixed effects ϑ_t, and a time trend τ as well as a female specific time trend. ε_{it} is the error term. In calculating the regressions, standard errors are clustered by province. Equation 5.1 is estimated for all men and women, women and men with young children (ages 0 - 5), women and men with school-age children (ages 6 - 17) and women and men with no kids of their own.

For the event-study estimation, annual pre-COVID dummies are also included in equation (5.1). In addition, the event-study model interacts these year dummies with the female indicator variable. If the model is correctly specified, we would not expect any of the estimates of the interaction of female with the year dummies prior to 2020 to be statistically different than zero. If this condition is violated, the identification strategy's validity would not support the interpretation that the pandemic caused the changes in the gender employment gap. Lastly, February 2020 is also used as the omitted pre-COVID reference point in the event-study model.

5. Difference-in-Difference Estimates Relative to Men

There are two tables containing results from the difference-in-difference models comparing men and women before and after COVID-19 lockdown measures were introduced. Table 6 divides the post-COVID period into quarters to show the change in the employment gap between men and women while table 7 looks at the change in the employment gap between men and women dividing the pre- and post-COVID-19 era into two cumulative periods.

Table 6: Difference-in-Difference for Likelihood of Being Employed for post periods in terms of quarters.

VARIABLES	(1) All Men and Women	(2) Men & Women with Children Under Five	(3) Men and Women with Kids Ten to Sixteen	(4) Men and Women with No Kids
female	-0.749*** (0.00897)	-0.801*** (0.00721)	-0.736*** (0.0204)	-0.710*** (0.0278)
covid_spring	0.0278 (0.0127)	0.00452 (0.0102)	0.0122 (0.00766)	0.0377** (0.0103)
covid_spring_fe	-0.0503 (0.0321)	-0.00950 (0.0378)	-0.0360 (0.0338)	-0.0580** (0.0176)
covid_summer	0.0521** (0.0124)	0.0372 (0.0161)	0.0394 (0.0181)	0.0259 (0.0112)
covid_summer_fe	-0.0646* (0.0260)	-0.0321 (0.0429)	-0.0801 (0.0378)	-0.0952** (0.0238)
covid_fall	0.0232 (0.0343)	-0.0150 (0.0175)	0.0405* (0.0154)	0.0416 (0.0265)
covid_fall_fe	-0.0158 (0.0381)	0.0493 (0.0861)	-0.0283 (0.0762)	-0.00460 (0.0792)
no_education	-0.847*** (0.0150)	0 (3.62e-09)	0 (2.20e-08)	0 (0)
grade_1	0.0360 (0.0156)	0.0567** (0.0171)	0.00532 (0.0132)	0.0732 (0.0549)
grade_2	0.0602** (0.0119)	0.0554** (0.0160)	0.0552** (0.0162)	0.0733 (0.0433)
grade_3	0.0407 (0.0180)	0.0431 (0.0237)	0.0462 (0.0198)	0.0408 (0.0213)
grade_4	0.0287* (0.0106)	0.0385* (0.0133)	0.0169 (0.0122)	0.00925 (0.0188)
grade_5	0.0235** (0.00553)	0.0278** (0.00789)	0.0162* (0.00675)	0.0189** (0.00507)
grade_6	0.0100 (0.00981)	0.00328 (0.0142)	-0.00194 (0.0103)	0.00419 (0.00987)
grade_7	0.0138 (0.00677)	0.0116 (0.00838)	-0.00936 (0.0117)	0.00775 (0.0142)
grade_8	0.00439 (0.00275)	0.00563 (0.00486)	-0.000238 (0.00249)	0.00749 (0.00374)

grade_9	0.00917 (0.0119)	0.00282 (0.0100)	0.00129 (0.0118)	0.0264* (0.0110)
diploma	-0.0387 (0.0290)	0.00457 (0.0200)	0.0238 (0.0248)	-0.0284 (0.0497)
pre-undergrad (2 years)	-0.00153 (0.00269)	-0.00190 (0.00325)	0.00239 (0.00904)	0.0141** (0.00321)
B.A/B.Com/B.Sc	0.0238** (0.00657)	0.00953 (0.00778)	0.0288* (0.0121)	0.0244* (0.00901)
B.Ed/M.Ed	0.112*** (0.00981)	0.0702** (0.0181)	0.111*** (0.0163)	0.0913** (0.0210)
B.A/B.E	0.00768 (0.0143)	-0.00849 (0.0248)	0.0230 (0.0134)	0.0570* (0.0220)
M.A/M.Sc	0.117** (0.0227)	0.0857** (0.0219)	0.121** (0.0269)	0.107** (0.0272)
med_school	0.241*** (0.0286)	0.199** (0.0395)	0.154** (0.0297)	0.230** (0.0412)
agricultural_sciences	0.0171 (0.0838)	-0.00680 (0.0659)	0.160 (0.134)	0.0710** (0.0146)
law_School	0.0585* (0.0204)	0.0552* (0.0178)	0.0272 (0.0190)	0.0918* (0.0375)
engineering_degrees	-0.0581 (0.0347)	-0.0254 (0.0442)	0.0206 (0.0189)	0.0205 (0.0411)
accountancy	0.0388 (0.0412)	-0.00674 (0.0339)	0.0905 (0.0501)	0.0238 (0.0802)
M.Phil	0.210*** (0.0232)	0.149** (0.0336)	0.174* (0.0611)	0.196** (0.0594)
PhD	0.106* (0.0437)	0.0734 (0.0631)	0.142 (0.0794)	0.214 (0.111)
M.S	0.0497 (0.0732)	0.00112 (0.0461)	0.0163 (0.0576)	0.0590 (0.0397)
playgroup	0.0182 (0.0379)	-0.00929 (0.0312)	0.0513** (0.0116)	0 (0)
nursery	-0.0760 (0.107)	0.0113 (0.0521)	-0.185*** (0.0110)	0.0612*** (0.00610)
prep/kindergarten	-0.0966 (0.0793)	-0.256 (0.205)	0 (8.90e-09)	0.0888*** (0.0123)
other	0.0409 (0.0242)	0.0326 (0.0340)	0.0438 (0.0223)	0.119* (0.0464)
never_married	-0.0782** (0.0173)	0.0751 (0.0677)	-0.328** (0.0975)	-0.0347 (0.0151)
widow/widower	0.0404** (0.00992)	0.159** (0.0435)	0.113*** (0.0141)	-0.0136 (0.0470)
divorced	0.0584 (0.0277)	0.127 (0.0669)	0.292* (0.118)	0.00912 (0.0201)
separated	0.0734**	0.325**	0.139	0.0284

	(0.0164)	(0.0779)	(0.142)	(0.0455)
nikkah_only	-0.0294	0	0	-0.0906
	(0.0564)	(0)	(1.20e-10)	(0.0982)
Constant	0.969***	0.988***	0.977***	0.941***
	(0.0113)	(0.0112)	(0.0177)	(0.00990)
Province Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
Seasonality	Yes	Yes	Yes	Yes
Observations	174,381	64,029	59,814	19,214
R-squared	0.647	0.753	0.692	0.704

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

In table 6 column (4), the employment gap for young women with no kids averaged 5.8 percentage points wider in the Spring after the introduction of COVID-19 lockdown measures. The gap is observed to have widened by 9.5 percentage points during the summer after the COVID-19 restrictions were put into place. This is consistent with young women who are siblings or related to school going children taking care of them while the mothers work to ensure that they financially contribute to the household. It is also consistent with women with no kids of their own such as adolescent daughters or sisters foregoing work and human capital accumulation, to take care of children around them. For a more general representation of how the labor market prospects of women changed following the arrival of COVID-19, the results in table 6, column (1) show that the overall gap in employment of women ages 25 to 55 relative to men widened by 6.5 percentage points. They became less likely to be employed during the summer after COVID-19 than comparable males although this result is only significant at the 10 percent level.

It is also evident in column (2) of table 6 that there were no measurable statistically significant changes in the employment gap for men and women with children under five after the COVID-19 lockdown measures occurred in Pakistan. This can likely be attributed to the fact that school closures should have very little impact on the presence of children 0 to 5 changing in the household since kids in that age group do not go to school. In column (3) of table 6 to see impact of COVID-19 lockdowns on people with school-going children, the sample consists of parents of school aged children only. While the coefficients are negative for women with children during the post COVID-19 period consistent with a widening gender gap, they are not statistically significant at conventional levels.

The results in table 6 also reveal patterns of employment independent of the pandemic. For example, in column (1) women are 75 percentage points less likely to be employed in Pakistan as compared to men and in column (2) this gender gap is 80.1 percentage points for women with children aged 0 to 5. In column (3) and (4) of table 6 we can see that women with school aged children and women with no kids are on average 73.6 and 71 percentage points less likely to be employed than comparable men.

In terms of human capital accumulation, the coefficients for different education levels in table 6 show that for both men and women having a Bachelor of Education, going to medical school or having a Master of Philosophy leads to an increased likelihood of being employed. Alternatively for labor market behaviors based on marital status, it can be seen in table 6 that people who are separated or are widowed/widowers are more likely to be employed if they have kids with the coefficients being significant at the 5 percent significance level.

The results of the difference-in-difference estimations condensing the time periods into pre- and post-COVID periods are presented in table 7.

Table 7: Difference-in-Difference for Likelihood of Being Employed with division of time into two (pre-COVID period and post COVID-period)

VARIABLES	(1) All Men and Women	(2) Men & Women with Children Under Five	(3) Men and Women with Kids Ten to Sixteen	(4) Men and Women with No Kids
female	-0.805*** (0.0132)	-0.859*** (0.00856)	-0.817*** (0.0156)	-0.829*** (0.0262)
post_covid	0.0204* (0.00713)	-0.000402 (0.00820)	0.0132 (0.00646)	0.0393** (0.00957)
female_post_covid	-0.0733* (0.0277)	-0.0325 (0.0433)	-0.0745 (0.0384)	-0.100** (0.0202)
No education	-0.886*** (0.0300)	0 (1.91e-07)	0 (3.78e-08)	0 (6.32e-08)
Grade_1	-0.00254 (0.0249)	0.0254 (0.0392)	-0.0356 (0.0206)	-0.0427 (0.0385)
Grade_2	0.0207 (0.0203)	0.0221 (0.0344)	0.0144 (0.0138)	-0.0465 (0.0776)
Grade_3	0.00160 (0.0143)	0.0114 (0.0205)	0.00478 (0.0124)	-0.0758 (0.0454)
Grade_4	-0.0107 (0.0152)	0.00566 (0.0222)	-0.0242* (0.00903)	-0.106* (0.0382)
Grade_5	-0.0166 (0.0192)	-0.00549 (0.0258)	-0.0262* (0.0104)	-0.0979* (0.0363)

Grade_6	-0.0298 (0.0171)	-0.0300 (0.0229)	-0.0438*** (0.00642)	-0.114* (0.0422)
Grade_7	-0.0262 (0.0184)	-0.0220 (0.0244)	-0.0520** (0.0117)	-0.109* (0.0358)
Grade_8	-0.0364 (0.0205)	-0.0282 (0.0272)	-0.0435** (0.0121)	-0.110* (0.0398)
Grade_9	-0.0306 (0.0171)	-0.0302 (0.0248)	-0.0405** (0.0113)	-0.0913* (0.0369)
Grade_10	-0.0407 (0.0227)	-0.0338 (0.0312)	-0.0431** (0.0127)	-0.118* (0.0406)
Diploma	-0.0788 (0.0484)	-0.0287 (0.0461)	-0.0198 (0.0442)	-0.144 (0.0708)
Pre-Undergrad (2 years)	-0.0421 (0.0244)	-0.0356 (0.0341)	-0.0408 (0.0211)	-0.103* (0.0392)
B.A/B.Com/B.Sc	-0.0178 (0.0208)	-0.0249 (0.0305)	-0.0150 (0.0204)	-0.0934* (0.0378)
B.Ed	0.0759** (0.0226)	0.0390 (0.0512)	0.0716** (0.0192)	-0.0236 (0.0553)
B.A/B.e	-0.0310 (0.0150)	-0.0404 (0.0172)	-0.0180 (0.0271)	-0.0569 (0.0334)
M.A/ M.Sc	0.0767** (0.0163)	0.0516 (0.0245)	0.0778* (0.0267)	-0.00877 (0.0228)
Medschool	0.200*** (0.0242)	0.166** (0.0325)	0.111** (0.0331)	0.112 (0.0596)
Agriculture_Sciences	-0.0188 (0.0760)	-0.0380 (0.0743)	0.118 (0.128)	-0.0483 (0.0348)
Law_School	0.0176 (0.0347)	0.0216 (0.0423)	-0.0153 (0.0233)	-0.0277 (0.0617)
Engineering	-0.0990* (0.0329)	-0.0587 (0.0636)	-0.0231 (0.0262)	-0.0971* (0.0358)
Accountancy	-0.00160 (0.0409)	-0.0407 (0.0295)	0.0481 (0.0359)	-0.0945 (0.0695)
M.Phil	0.169*** (0.0206)	0.114** (0.0247)	0.128* (0.0528)	0.0804 (0.0618)
PhD	0.0639 (0.0286)	0.0384 (0.0464)	0.0972 (0.0822)	0.0931 (0.0935)
M.S	0.00560 (0.0872)	-0.0358 (0.0600)	-0.0323 (0.0590)	-0.0637 (0.0554)
Pre-school	-0.0126 (0.0413)	-0.0338 (0.0388)	0.0116 (0.0106)	0 (6.16e-08)
Nursery	-0.0996 (0.109)	-0.00815 (0.0592)	-0.172*** (0.0175)	-0.0567 (0.0308)
Kindergarten	-0.113 (0.0860)	-0.272 (0.430)	0 (1.39e-09)	-0.0346 (0.0319)
Never_Married	-0.0509 (0.0387)	-0.220* (0.0875)	-0.464* (0.150)	0.0564 (0.0620)
Married	0.0266	-0.329***	-0.133	0.0915

	(0.0458)	(0.0256)	(0.106)	(0.0733)
Widow/Widower	0.0679	-0.162**	-0.0184	0.0782
	(0.0486)	(0.0344)	(0.110)	(0.0671)
Divorced	0.0873	-0.200	0.159	0.100
	(0.0576)	(0.104)	(0.171)	(0.0696)
Separated	0.0983			0.119**
	(0.0523)			(0.0341)
Constant	0.934***	1.313***	1.117***	0.963***
	(0.0623)	(0.00224)	(0.114)	(0.0865)
Province Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
Seasonality	Yes	Yes	Yes	Yes
Observations	174,381	64,029	59,814	19,214
R-squared	0.647	0.752	0.691	0.703

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

In table 7, the coefficient for the interaction of female and post-COVID dummies in column (4) reflects that the gender gap in employment for women with no kids is approximately 7 percentage points larger than for comparable men post-COVID at the 5 percent significance level. In table 7 column (1), the key study coefficient on the interaction between the female dummy and the post-COVID-19 variable shows that women ages 25 to 55 are 6 percentage points less likely to be employed after the pandemic began compared to men at the .10 level. Thus, these results which consider the post-COVID months as a combined period are consistent with the disaggregated estimates.

Again, the results in table 7 provide estimates of the gender gaps prior to the arrival of COVID-19. Table 7 column (1) shows that for the overall sample, women on average are approximately 75 percentage points less likely to be employed compared to men. This difference for women with children under five, in column (2) of table 7 is 80 percentage points. Columns (3) and (4) for women with school aged children or no children at all show that women are about 73 percentage points less likely to be employed than comparable men and these results coming from the coefficient on female in each of these columns are significant at the 1 percent significance level. Additionally, as would be expected, higher levels of education are associated with greater employment and those individuals likely to be lone parents such as divorced and widowed individuals are more likely to work.

These results from Pakistan stand in stark contrast to the findings from developed economies such as the U.S. (Couch, Fairlie and Xu 2022). First, the overall negative impacts of COVID-19 on women's employment in the U.S. were far smaller in magnitude compared to their male counterparts when it comes

to the gender gap between men and women. For the overall sample in the U.S., women in Spring and Summer were about 1 percentage point less likely to be employed after the introduction of COVID-19 lockdown measures as compared to men. In Pakistan on the other hand, the male-female gender gaps in likelihood of being employed were far wider with women being about 5 percentage points less likely to be employed in Spring and roughly 6.5 percentage points less likely to be employed in summer post-COVID as compared to men in the overall sample . Hence, the response of the gender-gap in employment was larger in Pakistan compared to U.S.

Secondly, for women with no kids in the U.S, the negative effect of the pandemic on employment was insignificant compared to men with no kids. This effect was significant for women with no kids in Pakistan. Women with no kids in Pakistan were roughly 6 percentage points less likely to be employed in Spring and about 10 percentage points less likely to be employed in summer post-COVID as compared to their male counterparts with the results being significant at 5 percent significance level. This hints at mechanisms being at play in Pakistan in secondary care-giving that are not present within the U.S, particularly the norm of co-resident female relatives and siblings taking care of younger children.

Additionally, for those with school going children in the U.S., the effect of COVID-19 was to reduce the likelihood of being employed for women by 2.4 percentage points and 2.7 percentage points respectively for Spring and Summer of 2020 relative to their male counterparts. In contrast to this, in Pakistan the only significant result for changes in likelihood of being employed for women in Pakistan was for the fall of 2020 when women were about 4 percentage points less likely to be employed with the result being significant at the 10 percent significance level.

It is evident from the aforementioned comparisons that the results from this paper show something different from what is observed in developed countries such as the U.S. From this paper we see that in a developing context for a country such as Pakistan with much less integration of women into the labor force; the most significant and negative results occurred for women with no kids since as compared to men as those women appear to provide home care for children.

6. Event Study Regressions

A necessary condition for difference-in-difference models to have a causal interpretation is that the two groups being studied have equal trends prior to the event being studied. Thus, it is important to check for the possibility of a difference of pre-trends in the employment of men and women prior to the arrival of COVID-19. For this purpose, estimates of event history models shown in table 8 are presented below. They include annual dummies prior to the arrival of the pandemic interacted with the female variable that

were included in the models from table 6. The absence of statistically significant interactions prior to the arrival of COVID-19 would be consistent with equal pre-trends.

Table 8: Event-Study Regressions to check for pre-trends

VARIABLES	(1) All Men & Women	(2) Men & Women with Children Under Five	(3) Men and Women with Kids Ten to Sixteen	(4) Men and Women with No Kids
female	-0.730*** (0.00712)	-0.784*** (0.0289)	-0.699*** (0.00690)	-0.769*** (0.0409)
pre_period1(t-1)	0.00511 (0.00486)	-0.00184 (0.00428)	0.00651 (0.0102)	-0.0108 (0.00859)
pre_period2 (t-2)	-0.00509 (0.00599)	-0.000348 (0.00395)	-0.00105 (0.00628)	-0.0104 (0.0105)
post_period1 (t+1)	0.0176 (0.0125)	-0.00174 (0.0116)	0.00771 (0.00921)	0.0350* (0.0115)
post_period2 (t+2)	0.0335* (0.0131)	0.0245 (0.0155)	0.0286 (0.0203)	0.0225 (0.0125)
post_period3 (t+3)	-0.00369 (0.0364)	-0.0342 (0.0163)	0.0239 (0.0140)	0.0375 (0.0229)
pre_period1*female	-0.0264* (0.0107)	-0.0204 (0.0259)	-0.0438 (0.0215)	0.0362 (0.0346)
pre_period2*female	0.00230 (0.00741)	-0.00585 (0.0135)	-0.0147 (0.00911)	0.0203 (0.0118)
post_period1*female	-0.0367 (0.0329)	-0.00310 (0.0414)	-0.0278 (0.0407)	-0.0527 (0.0255)
post_period2*female	-0.0529 (0.0270)	-0.0283 (0.0431)	-0.0740 (0.0403)	-0.103** (0.0281)
post_period3*female	0.00652 (0.0401)	0.0619 (0.0877)	-0.00783 (0.0802)	-0.0127 (0.0765)
Constant	0.934*** (0.0605)	1.310*** (0.0132)	1.123*** (0.118)	0.971*** (0.0851)
Province Fixed Effects	Yes	Yes	Yes	Yes
Seasonality	Yes	Yes	Yes	Yes
Observations	174,381	64,029	59,814	19,214
R-squared	0.647	0.753	0.692	0.704

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

The table only displays the coefficients for the pre- and post-period variables as well as their interactions with the female dummy variable. The estimates are presented for the overall differences between men and women ages 25 to 55, those with children ages 0 to 5, those with school aged children

and lastly, those with no children of their own. In table 8, it can be seen that in comparison to the omitted period of February of 2020, the effects on employment status for women in the two years prior to the arrival of the pandemic are not significantly different from those of men at the 5 percent level for virtually all of the estimated parameters prior to the arrival of the pandemic. Perhaps most importantly, there is no evidence in column (4) for the estimates for women with no children of any differences in trends relative to males prior to the arrival of the pandemic. The only exception is for the estimated interaction coefficient on the first pre-period in column (1) for all women which is statistically significant at the 10% level. This raises some concern about the validity of causal interpretation in column (1). It is worth mentioning that this result can be due to random error.

7. Conclusion

When COVID-19 spread across the world, the economy was disturbed by the pandemic due to the closure of businesses and schools and reduced demand by customers that were afraid of contracting the virus. The shutdown of schools introduced an additional burden on women who had to take care of younger children at home and figure out how to make a living simultaneously. This paper empirically examined whether women in Pakistan incurred more losses in their employment compared to men due to COVID-19 mandated social distancing and lockdown measures.

Using PSLM data, the fixed-effect estimation results indicate that employment declined more sharply and significantly for women compared to men during the months after the arrival of COVID-19 and the associated social distancing and lock-down measures for women did not have any kids of their own. While women did incur losses on average, these losses were most evident for women with no children of their own. These losses ranged from a 5.8 percentage points fall in likelihood of being employed at the beginning of the post-lockdown era to 9.5 percentage points during the lockdown and summers. This is consistent with the functioning of families in Pakistan and many other developing countries where women with no kids such as adolescent daughters or older sisters take care of their siblings to ensure their mothers can work.

The paper contributes to the expanding literature on the impact of COVID-19 on different economic outcomes and the disparity in economic returns across gender. Pakistan's gender gap in employment keeps increasing rather than falling largely due to an advancing denial of opportunities to women to participate in social and economic life (WEF 2021). The additional human capital losses for women due to the pandemic and childcare responsibilities traditionally assigned to adolescent women would be likely to exacerbate these trends.

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