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Where have all the mothers gone? COVID and mothers leaving the labor force in Egypt

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ABSTRACT

The paper examines the impact of the COVID-19 pandemic on gender gaps in labor market outcomes in Egypt, where the female participation rate has chronically been low. The paper uses the nature of some of the pandemic containment measures, namely the closure of schools and childcare centers to identify the effect of the shock on workers whose is directly affected by these measures: working mothers of school-age children. Using data from the Egypt Labor Force Surveys (2018-2021), we employ a difference-in-differences (DD) approach to identify the differential effect of the pandemic on women in comparison to men. The estimates indicate a significant widening of gender gaps in participation and weekly hours worked following the pandemic. We further decompose this effect using a triple-difference focusing on mothers, using men and childless women as control groups. Both approaches suggest that the overall deterioration in women's labor market outcomes was driven primarily by a reduction in the labor supply of mothers at both the intensive and extensive margins. As school closures become a more common policy in response to large shocks such as wars, energy crises, and environmental shocks, the findings suggest that the labor supply of mother is becoming particularly precarious.

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1 Introduction

Working women are more vulnerable to economic shocks than are men. The effects of COVID-19 on the labor market have been reported to fall disproportionately on the shoulders of women workers globally (Lim and Zabek (2024), Russell and Sun (2020), Corsi and Ilkkaracan (2023)), and the recovery has been slower for women (Konkel et al. (2022)). Following COVID-19, the South West Asia and North Africa (SWANA) region saw the 2nd highest drop in women's employment worldwide (ElBehairy et al. (2022)). The move to online schooling has become a more common and widespread response to shocks and crises, with the education of an estimated 52 million children either disrupted or moved to online modality in March of 2026 as a result of the joint US and Israeli war on Iran (Save the Children (2026)).[1] Similarly, school closure and remote working were also adopted by countries not directly affected by the war. Countries across Asia implemented COVID-19-like measures to ration fuel (Sanicola (2026)). Investigating the effects of shocks that lead to school closures and the move to virtual instruction on the labor market outcomes of women becomes increasingly relevant, particularly in countries where women continue to face significant challenges in the labor market.

In this study, we assess the effect of the pandemic shock on the gender gap in labor market outcomes in Egypt. The Egyptian labor market has historically had persistent gender gaps in most labor market outcomes (Krafft et al. (2019)). We use individual-level data from Egypt's annual labor market surveys from 2018-2021, focusing on three primary labor market outcomes: labor force participation, weekly hours worked, and labor market earnings.

A rich literature has documented the gender gap in Egypt, by age group, sector of activity, and educational attainment (Assaad et al. (2020), Krafft et al. (2019)). Persistently low female labor force participation has also been examined over time, as well as by education and marital status (Sayre and Hendy (2016), Hendy (2015)). Analyses of time-use surveys have shown a disproportionate allocation of women's time to unpaid care work at home, particularly for married women and mothers (Atallah and Hesham (2024)).

Looking at the effect of COVID-19, we find that after controlling for sociodemographic characteristics of the respondent and their household, and using a difference-in-differences (DD) approach, the gender gaps for three main labor market outcomes are wider after the pandemic, confirming the higher incidence of the burden of the pandemic on active women in terms of participation, weekly hours worked, and labor market earnings. The results of our estimation for the gender gap in the participation rate show a drop 2.6 percentage points

[1] Save the Children report closures or a switch to online instruction in each of Bahrain, Iraq, Iran, Israel, Jordan, Kuwait, Lebanon, Oman, Palestine, Qatar, Saudi Arabia, and the United Arab Emirates.

sharper for women. For weekly hours worked, women are more affected by the negative shock of COVID-19, with women's weekly hours worked decreasing by 4.8 percent more than men's, conditional on being employed. The COVID-19 shock is shown to lead more women to both completely leave employment and to simply adjust their working hours downward, compared to men. We also find that women's wage earnings drop more than men's by close to EGP 130/month (close to USD 8/month), in line with the findings on hours and participation. Our findings are consistent with the results of other studies that have looked at gender differences in the susceptibility of labor market outcomes to COVID-19 in Egypt (Rodriguez et al. (2023)).

However, while the literature has only looked at the effect of COVID-19 on labor market outcomes disaggregated by sex, we examine the effect more closely for different groups of workers. Because the nature of the COVID-19 shock and related pandemic containment measures are likely to have affected different segments of the workforce differently, we look at the heterogeneity in the response to the shock for different groups of women. We exploit the fact that COVID-19 increased the cost of childcare due to mandated closures of schools and daycare centers (Fadlalmawla et al. (2022), Russell and Sun (2020), Dutra Carolino et al. (2023)). When we re-run our DD regressions separately for parents and non-parents, we find some heterogeneity: i. at the extensive margin, participation drops for all women, but the drop is larger for mothers, ii. the gap in employment rates shrinks for childless women, but iii. their hours of work drop less than they do for mothers, and iv. the wage gap widens more for mothers. In line with the findings of Atallah and Hesham (2024), we postulate that these pandemic containment measures affect mothers more than they do men and non-mothers. Our approach is similar to the one used by Couch et al. (2022), which analyzes the labor market response to COVID for mothers in the United States.

We leverage the DD results to derive a triple difference-in-differences (DDD) estimator (Gruber (1994)), using women without children as an additional control group. This identification strategy is used to measure the effect of changes in the childcare burden during COVID-19 on the gender gap, after controlling for confounding factors. Comparing our DD and DDD results, our analysis identifies the additional childcare burden as the primary mechanism contributing to a more significant decrease in the employment rate for women compared to men. The COVID-19 shock caused a higher decline of close to 2 percentage points in the participation rate for mothers, compared to women without children and men. Even conditional on employment, mothers reduce their hours of work by more than childless women by about 3.7 percent.

We test the robustness of our findings by verifying that the labor market losses for mothers are not due to other effects, by estimating the effect for households with different age and

generational compositions. We are also able to rule out that the larger shock to mothers' work is due to mothers being concentrated in sectors or types of employment that are more vulnerable to COVID-19.

Our analysis therefore offers a more granular account of the widely reported drop in women's employment in Egypt during the pandemic (ElBehairy et al. (2022), Krafft et al. (2022), Rodriguez et al. (2023)). The comparison of DD and DDD results suggests that much of the effect of COVID-19 on gender gaps is driven by the increase in the childcare burden that pandemic containment measures caused. Our results are also consistent with other studies that have attempted to estimate the impact of COVID-19 on mothers' labor market outcomes in industrialized countries (Couch et al. (2022); Russell and Sun (2020); Heggeness (2020)).

In terms of magnitude, our main finding for the participation rate is of note because it is both larger than the declines found for mothers in industrialized countries, and because the participation rate for women in Egypt was already low (around 21%). The additional decrease for women represents a 10 percent drop in the employment rate.

2 Empirical Methodology

2.1 Data

We use data from four Egypt Labor Force Surveys (HLFS (2018-2021)) covering the period 2018-2021. In every calendar year, data is collected over four rounds. We restrict the sample to individuals between the ages of 15 and 75. The final sample is comprised of 784,492 observations across 304,942 household.

The survey contains detailed information on labor market status and sociodemographic characteristics of individuals and their households. The main outcomes of interest are labor force status, weekly hours worked, and labor market earnings. Weekly hours are measured conditional on being employed, and labor market earnings are reported in Egyptian pounds.[2]

Table 1 presents summary statistics of key demographic variables of the pre- and peri-pandemic periods.The statistics are reported for the full sample and by gender.

Table 2 shows the mean difference in the three labor market outcomes of interest between women and men in the different groups of our study. In the pre-pandemic period, men's participation rate is significantly higher than that of women, with higher weekly hours worked and higher earnings. The dataset allows us to identify relationships within household, most importantly we are able to determine if individuals are parents of children in the house-

[2]The average inflation rate in Egypt during the years covered by our study is approximately 9%.

Table 1: Summary statistics of demographic characteristics

	All	Men	Women
Panel A. Pre-pandemic			
Age	38.6	38.0	39.2
Currently married (%)	61.3	59.2	63.4
Never married (%)	23.5	31.2	15.7
Household size	4.5	4.6	4.4
Years of education	8.1	8.9	7.3
Urban (%)	40.7	40.3	41.2
No. observations	414,551	207,534	207,017
Panel B. Post-pandemic			
Age	37.7	37.5	37.9
Currently married (%)	64.6	62.4	66.7
Never married (%)	21.2	28.5	13.9
Household size	4.4	4.5	4.4
Years of education	8.7	9.3	8.0
Urban (%)	40.7	40.4	41.1
No. observations	369,941	185,026	184,915

hold. Using this information, we construct a parenthood indicator variable.[3] The reported differences by parenthood status show that the gender gaps in labor market outcomes are particularly large among parents.

Comparing the two panels in Table 2, we find a noticeable decline in weekly hours worked after the onset of the pandemic. Earnings improve slightly for both men and women, while the earnings gap increases across all groups.[4] The participation rate declines for women and rises for men. When looking separately at parents and non-parents, we find that the drop in female participation is specific only to mothers.

2.2 Empirical Framework

Women bear a heavier childcare burden than men for a variety of reasons, one of which is that men typically have more bargaining power within the household (García-Mainar et al. (2011)). This gender disparity in childcare responsibilities appears to have worsened

[3]When parents do not live in the same household as their children, our approach incorrectly codes them as non-parents.

[4]The Egyptian government introduced a number of in-kind and in-cash assistance programs during COVID-19, including public health interventions, economic and social support, business relief, etc Baloch et al. (2020); Jrad et al. (2023). The increase in average labor earnings earning after the shock may be reflecting some of this social assistance. This may also be due to selective attrition out of the labor market during the pandemic, with 1) lower earning men and women more likely to drop out of the labor market, and 2) small informal businesses, which pay lower wages, less likely to survive the pandemic.

Table 2: Table of Labor Market Gender Gaps

	Full sample			Parents			Non-parents		
	W (1)	M (2)	Difference M-W (3)	W (4)	M (5)	Difference M-W (6)	W (7)	M (8)	Difference M-W (9)
Panel A. Pre Covid									
Participation rate (%)	16.3	69.6	53.2**	18.0	86.4	68.3**	10.4	52.9	42.5**
Weekly hours worked	34.3	44.9	10.6**	36.2	46.2	10**	37.8	45	7.2**
Employment income	2108	2451	342.9**	2172	2574	402**	2381	2476	95**
Panel B. Post Covid									
Participation rate (%)	15.7	71.9	56.2**	16.7	87.2	70.5**	10.6	55.7	45.1**
Weekly hours worked	31	41	10**	32.3	41.2	9.8**	33.9	40.9	7**
Employment income	2543	3011	467**	2605	3127	522**	2578	2941	239*

Notes: The table shows the average market outcomes for different groups of men and women.
Columns 3, 6, and 9 show the average gender gap for each group before and after the shock (Panels A and B).
+ denotes significance at 10%, * at 5%, and ** at 1%.

during the pandemic. The closures of schools and daycare centers led to an increase in the time children spend at home, increasing demand for childcare in households with children of schooling age (Zamarro and Prados (2021), Fadlalmawla et al. (2022)).

In a first step, we look at the heterogeneity in the effect of COVID-19 on men and women by tracking the effect of the pandemic shock on the gender gap in labor market outcomes while controlling for baseline demographic characteristics.

In a second step, we allow for more heterogeneity in the effect of COVID-19 on different groups of workers of the same sex: we look at mothers and childless women separately. We use a triple difference method to identify the effect of COVID-19 on the gender gap in participation for mothers in comparison to that for non-mothers. We then try to confirm our hypothesis that the differential effect observed for mothers is due to the increase in the childcare burden related to the pandemic containment measures adopted.

2.3 Empirical strategy

We start by using the Difference-in-Differences (DD) method to investigate whether COVID affected the gender gap in the labor market. The DD specification, represented in equation (1), allows us to estimate the effect of the COVID shock on the gender gap in various labor market outcomes.

$$y_{it} = \alpha_0 + \alpha_1 Female_i + \alpha_2 Covid_t + \gamma_{DD} Female_i \times Covid_t + \beta' X_i + \epsilon_{it} \quad (1)$$

where y_i is the labor market outcome of individual i. We focus on three main job market outcomes: employment rate, weekly hours worked, and labor earnings. The employment rate allows us to measure the effect of the shock on women's labor market status on the extensive margin, while weekly hours worked allow us to measure it on the intensive margin. Relative changes in the weekly hours worked are estimated conditional on remaining employed, and

can be considered a less severe labor supply response compared to the employment rate. $Covid_t$ takes the value 1 if the date is after the first quarter of 2020 (beginning from the second quarter), when the government implemented restriction policies, including closing schools, daycare centers, and many other sectors.[5] $Female_i$ is the indicator of whether individual i is male ($Female = 0$) or female ($Female = 1$). X_i is a vector of individual-level characteristics, such as age, years of education, sector of employment (where appropriate), and marital status, and household level characteristics such as household size and age of children. It also includes sets of region-by-quarter and sector-by-quarter fixed effects that account for time-varying regional and sectoral heterogeneity in the job market.

We are interested in the coefficient γ_{DD} in equation 1. A negative γ_{DD} means that the COVID-19 shock has had a stronger negative impact on women than on men, and the gender gap has worsened. The identifying assumption here is that the difference in labor market outcomes between men and women would have remained stable if the COVID-19 shock had not occurred.[6] To test this identifying assumption, we report the results of event studies for the participation rate across different groups in our sample in Figures 1 and A.1. As evident from the figures, the gender gap in participation in the two years prior to the COVID-19 shock is no different from the participation gap during the period of 2020:Q1. In Figure 1, while the gender gap is slightly smaller in 2018 and slightly larger in 2019 than it is in the first quarter of 2020, these differences are far from significant. Starting in the second quarter of 2020 and until the last quarter of 2021, the gender gap in participation is significantly larger than in the pre-shock period. The gender gap in participation therefore seems to satisfy the identification assumption for the difference-in-differences estimator of parallel trends in participation between men and women before the shock.

[5]The government instituted a lockdown from March 5th and it remained in place until the first quarter of 2022, when the Robert Koch Institute (RKI) removed Egypt from the list of international high-risk areas. For more information see https://global-monitoring.com/gm/page/events/epidemic-0001959.eI8QFDmrQAeG.html?lang=en.

[6]It should be noted that any unobservable time-varying variables that affect the gender gap would bias the estimation of the COVID effect as measured by γ_{DD}.

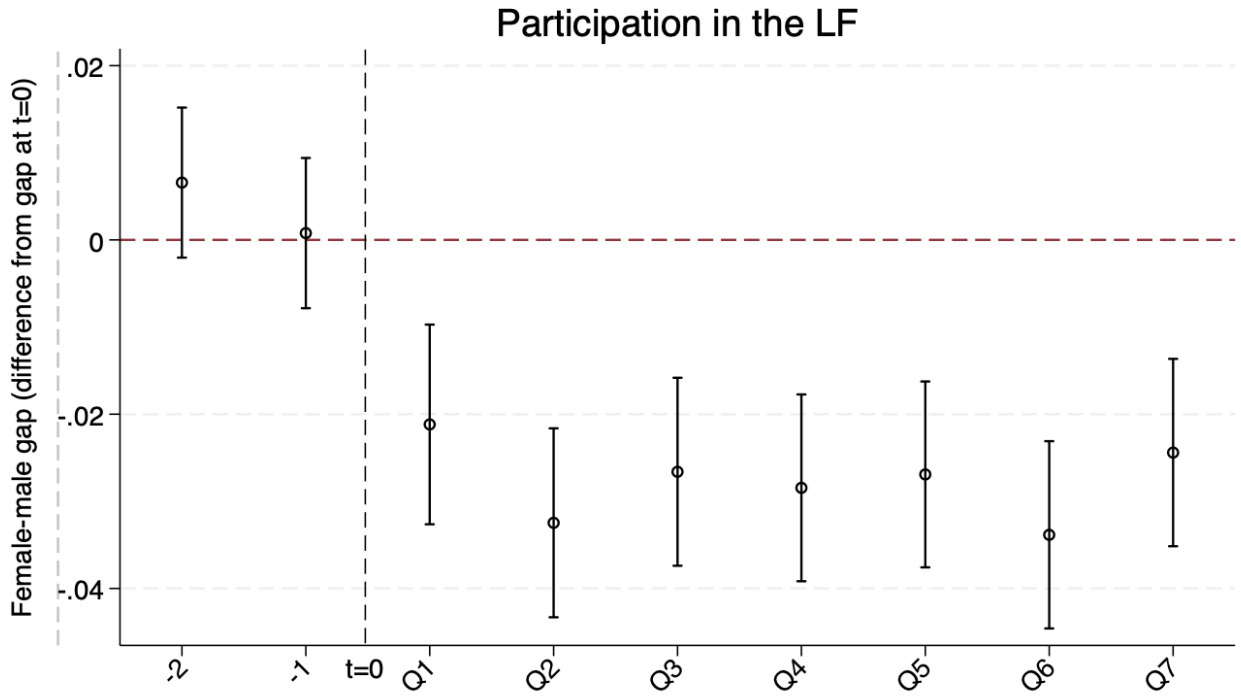


Figure 1: Event study, all sample (women and men)

For other market outcomes, such as weekly working hours and employment income, the corresponding event study graphs are presented in the Appendix.

Our second empirical strategy identifies the effect of the COVID-19 shock on mothers separately using a DDD regression. Our identifying assumption in this step is that the COVID-19 shock's effect on the gender gap in the participation rate is driven primarily by the shock to the childcare burden on mothers. In other words, the effect of COVID-19 on the participation rate of non-mothers who are similar to mothers in all other characteristics (except having children) is similar to its effect on the participation rate of men. This idea comes from comparing the findings in Panels (A) and (B) of Table 2. The table shows that the unadjusted participation rate drops for mothers but remains virtually unchanged for childless women. To further identify the effect of COVID-19 on the labor market outcomes of mothers as compared to men and non-mothers, we use the specification in equation 2:

$$y_{it} = \delta_0 + \delta_1 \text{Female}_i + \delta_2 \text{Covid}_t + \delta_3 \text{Female}_i \times \text{Covid}_t + \delta_4 \text{Kids}_i + \delta_5 \text{Female}_i \times \text{Kids}_i + \delta_6 \text{Covid}_t \times \text{Kids}_i + \gamma_{\text{DDD}} \text{Female}_i \times \text{Kids}_i \times \text{Covid}_t + \beta' X_i + e_{it}. \tag{2}$$

where $Kids_i$ is a dummy variable that shows whether individual i has any children ($Kids =$

1) or not. All other variables are the same as defined in equation (1). The coefficient of γ_{DDD} estimates the specific effect of COVID-19 on mothers.

The next section provides the results of the estimations of equations (1) and (2).

3 Estimation results

3.1 Effect of the COVID-19 shock on the gender gap

This section presents the main empirical results on the effect of the COVID-19 shock on the gender gap in the labor market. We begin with findings from the first step DD estimation of the effect of the shock on the gender gap in labor market outcomes.

Table 3: DD estimates of women relative to men (Participation rate)

	All sample		Non-parents		Parents	
	(1)	(2)	(3)	(4)	(5)	(6)
Female	-0.644**	-0.661**	-0.425**	-0.415**	-0.683**	-0.704**
	(-41.33)	(-43.91)	(-29.18)	(-25.03)	(-45.30)	(-46.69)
post-covid	0.0156**	-0.00140	0.0286**	0.00424	0.00840*	-0.00576+
	(3.64)	(-0.41)	(3.77)	(0.61)	(2.44)	(-2.02)
Female × post-covid	-0.0252**	-0.0258**	-0.0261**	-0.0180**	-0.0221**	-0.0229**
	(-5.26)	(-5.40)	(-4.18)	(-3.65)	(-4.15)	(-4.23)
Individual controls	No	Yes	No	Yes	No	Yes
Region× quarter FE	No	Yes	No	Yes	No	Yes
Observations	543430	542317	88316	87211	455114	455102

t statistics in parentheses

$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$

Notes: Dependent variable in all specifications takes 1 if the person is employed. The omitted group in each subsample is all men, men without kids, and men with kids (fathers), respectively. Control variables include household size, marital status, years of education, age, and region ×quarter fixed effects. Standard errors are clustered at the regional level.

The DD results are shown in Tables 3, 4, 5, and 6, each showing the results for a different labor market outcome. In each of these tables, the first pair of columns shows results for the full sample of 15 to 75 year olds, the next pair of columns shows results for the subsample without children, and the last pair of columns for the subsample with children. In each pair of columns, the first shows the results of our baseline specification with no controls, and the second shows the results of a specification with controls for age, household size, years of education, and quarter x region fixed effects.

Table 3 shows a larger gender gap in the participation rate following COVID-19. For the entire sample (first two columns), the DD estimation shows a 2.52-2.58 percentage points larger reduction in the participation rate of women compared to men. The results show a smaller (1.8 percentage points) effect on the gender gap in the participation rate for women without children, when compared to men without children while controlling for demographics (column 4). Among parents, the gender gap in the participation rate for mothers is 2.2-2.3 percentage points larger than that for fathers during the pandemic. In other words, a larger part of the shock's impact on the increase in the participation gender gap (column 2) seems to be accounted for by the reduction in the participation rate of mothers (column 6) than by non-mothers (column 4).

Mothers lost or left employment during the COVID-19 shock. This result is consistent with the findings of Aksoy et al. (2022) on the possibility of working from home during the pandemic. Using cross-country data, they find that employment in Egypt was below the world average in the average number of days in which employees could work from home. With the lower possibility of telecommuting, mothers may have been compelled to leave the workforce altogether.

Table 4: DD estimates of women relative to men (Employment rate)

	All sample		Non-parents		Parents	
	(1)	(2)	(3)	(4)	(5)	(6)
Female	-0.0795**	-0.0788**	-0.0428**	-0.0545**	-0.0840**	-0.0819**
	(-6.94)	(-7.15)	(-4.86)	(-5.86)	(-6.86)	(-6.97)
post-covid	-0.0136**	-0.00907**	-0.0132**	-0.00887*	-0.0138**	-0.00920**
	(-6.11)	(-3.86)	(-3.24)	(-2.22)	(-6.26)	(-3.93)
Female × post-covid	0.0114	0.0126	0.0202*	0.0202*	0.0104	0.0117
	(0.91)	(1.07)	(2.20)	(2.35)	(0.79)	(0.94)
Individual controls	No	Yes	No	Yes	No	Yes
Region× quarter FE	No	Yes	No	Yes	No	Yes
Observations	249070	248935	25772	25637	223298	223295

t statistics in parentheses

$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$

Notes: Dependent variable in all specifications takes 1 if the person is employed. The omitted group in each subsample is all men, men without kids, and men with kids (fathers), respectively. Control variables include household size, marital status, years of education, age, and region ×quarter fixed effects. Standard errors are clustered at the regional level.

In Table 4, the gender gap in the employment rate (conditional on being in the labor force) is unchanged. Looking at the effect separately by parental status, we find a 2-percentage

point decrease in the gender gap in the employment rate among non-parents, and no change in the gender gap among parents.

The results in Table 5 show a significant reduction in the log of weekly hours worked for everyone following the pandemic. The gender gap in log hours ($\gamma_{DD} < 0$) also worsens for all women. Women decrease their weekly hours worked, and both mothers and non-mothers are similarly affected by the shock in terms of magnitude. Columns 1-6 of Table 5 show a reduction in women's working hours by 4.7-5.6 percentage points more than men.

Table 5: DD estimates of women relative to men (Log weekly hours worked)

	All sample		Non-parents		Parents	
	(1)	(2)	(3)	(4)	(5)	(6)
Female	-0.152**	-0.158**	-0.128**	-0.121**	-0.155**	-0.163**
	(-10.90)	(-11.19)	(-7.26)	(-7.05)	(-11.09)	(-11.54)
post-covid	-0.0883**	-0.0932**	-0.0932**	-0.0981**	-0.0879**	-0.0927**
	(-5.20)	(-5.61)	(-3.90)	(-4.20)	(-5.34)	(-5.75)
Female × post-covid	-0.0494**	-0.0478**	-0.0533*	-0.0559*	-0.0486**	-0.0467**
	(-2.82)	(-2.83)	(-2.09)	(-2.42)	(-2.84)	(-2.80)
Individual controls	No	Yes	No	Yes	No	Yes
Region× quarter FE	No	Yes	No	Yes	No	Yes
Observations	238308	238189	24528	24409	213780	213777

t statistics in parentheses

$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$

Notes: Dependent variable in all specifications is log of weekly working hours. The omitted group in each subsample is all men, men without kids, and men with kids (fathers), respectively. Control variables include household size, marital status, years of education, age, and region×quarter fixed effects. Standard errors are clustered at the regional level.

Table 6 shows the DD estimation of the COVID-19 shock on the gender gap in labor market earnings. While the pandemic raises earnings for all, the gender gap in earnings increases significantly for women, by around 123-130 EGP. When disaggregated by parental status, this widening of the earnings gap is only significant for mothers. However, the results should be interpreted with caution due to a large number of missing observations in the earnings variable, and because of potential measurement error and selection bias in respondents' willingness to answer the question. We lose around 47% of the observations of the employed when we run the regressions for labor earnings.

Table 6: DD estimates of women relative to men (Total wage)

	All sample		Non-parents		Parents	
	(1)	(2)	(3)	(4)	(5)	(6)
Female	-372.7**	-493.5**	-94.33+	-321.9**	-402.0**	-511.4**
	(-13.26)	(-15.37)	(-1.97)	(-7.33)	(-14.54)	(-15.89)
post-covid	551.7**	581.6**	540.2**	559.1**	552.9**	583.9**
	(6.82)	(6.46)	(6.06)	(6.00)	(6.84)	(6.47)
Female × post-covid	-122.6*	-129.7*	-144.8	-106.6	-120.0+	-130.2*
	(-2.12)	(-2.17)	(-1.49)	(-1.08)	(-1.98)	(-2.10)
Individual controls	No	Yes	No	Yes	No	Yes
Region× quarter FE	No	Yes	No	Yes	No	Yes
Observations	126363	126309	11157	11104	115206	115204

t statistics in parentheses

$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$

Notes: Dependent variable in all specifications is log of employment income. The omitted group in each subsample is all men, men without kids, and men with kids (fathers), respectively. Control variables include household size, marital status, years of education, age, and region×quarter fixed effects. Standard errors are clustered at the regional level.

3.2 Estimation of the motherhood burden (DDD estimates)

To further identify the channel through which the shock affects mothers' employment, we follow the method of Couch et al. (2022) of using a triple-difference estimation approach. This method estimates the effect of the shock on mothers' employment outcomes compared to two control groups: non-mothers and men.

Results are shown in Table 7 for the three main labor market outcomes. Our estimates of the distinct effect on the participation rate of mothers are shown in columns 1 and 2, indicating a 1.6-2.2 percentage point larger decrease than for non-mothers. In other words, mothers are significantly likelier to have left the workforce than are non-mothers. For non-mothers, the change in participation related to COVID-19 is not significantly different from that for men.

Unlike the findings in Table 4, columns 3 and 4 of Table 7 show that the gender gap in employment increased during COVID-19, but only for non-mothers, while motherhood does not come with any further employment penalty.

Table 7: DDD estimates for mothers relative to men and other women

	Participation rate		Employment rate		Log of weekly hours worked	
	(1)	(2)	(3)	(4)	(5)	(6)
Female	-0.386**	-0.401**	-0.343**	-0.343**	-0.0906**	-0.0969**
	(-28.21)	(-25.45)	(-8769.39)	(-7765.52)	(-4.73)	(-7.16)
post-covid	0.00845	-0.0178**	-0.00453**	-0.00451**	-0.102**	-0.101**
	(1.68)	(-3.63)	(-17.89)	(-18.37)	(-4.96)	(-5.30)
Parent	0.342**	0.283**	0.0000633**	0.000148+	0.00182	0.0293**
	(27.81)	(25.31)	(4.00)	(1.88)	(0.25)	(4.97)
Female × post-covid	-0.00628	-0.00496	-0.00150**	-0.00156**	-0.00513	-0.0106
	(-1.31)	(-0.93)	(-9.42)	(-9.62)	(-0.33)	(-0.68)
Female × parent	-0.298**	-0.295**	-0.00000705	0.0000806*	-0.0648**	-0.0657**
	(-25.40)	(-19.61)	(-0.24)	(2.41)	(-4.52)	(-6.65)
post-covid × parent	-0.0000533	0.0149**	-0.000141	-0.000330**	0.0143*	0.00922
	(-0.01)	(3.40)	(-1.49)	(-4.06)	(2.24)	(1.65)
Female × post-covid × parent	-0.0158*	-0.0181*	-0.0000165	0.0000501	-0.0435**	-0.0370*
	(-2.30)	(-2.61)	(-0.19)	(0.64)	(-3.02)	(-2.74)
Individual controls	No	Yes	No	Yes	No	Yes
Region× quarter FE	No	Yes	No	Yes	No	Yes
Observations	784505	732657	784505	732657	315154	310377

t statistics in parentheses

$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$

Notes: Control variables include household size, marital status, years of education, age, an indicator for urban/rural, region×quarter fixed effects. Standard errors are clustered at the regional level.

For those who remain employed on the other hand, women's weekly hours worked decreased significantly more than men's, and this reduction is significantly larger for mothers than for non-mothers. While we do not report the results here, DDD coefficients for the log of labor earnings do not turn out to be significantly different for mothers after COVID-19.

This result is consistent with the findings from the literature based on time-use data from Egypt. Atallah and Hesham (2024) use the time-use module of the Egypt Labor Market Panel Survey from 2023. They distinguish between direct unpaid care work, which includes caring and looking after other household members, and indirect unpaid care work, which includes domestic chores and work around the house that don't involve direct care. They find that while over 84 percent of working-age women and only 33 percent of working-age men are involved in any unpaid care work, the disparities are even starker for direct unpaid care work: working-age women are 5 times more likely to be engaged in direct unpaid care work than working age men. Similarly, Hendy (2010) uses an earlier wave of the labor market panel survey to show that among working women in Egypt in 2006, marriage does not reduce the time a working woman spends doing market work, but significantly increases the time she spends on domestic work and unpaid care work as compared to single women. This effect is stable across all different levels of education.

To confirm the mechanism at work in the DDD results, we rerun the regressions reported in Table 7 separately for mothers who have a child aged 6 years or younger (in Table 8) and those whose youngest child is at least 15 years old (in Table 9).

The patterns of the motherhood-COVID-19 penalty found in the full sample persist for a mother of a young child in Table 8 where the increase in the gender gap in participation rates and hours worked is significantly larger for mothers. Only the reduction in hours worked for mothers is larger than for other women when all children are 15 or older, as seen in Table 9. The results for participation are thus consistent with a loss of employment at the extensive margin for mothers around the pandemic because of the increase in the childcare burden associated with the COVID-19 control measures which included the closure of schools and daycare centers. Given how low the participation rate of women is at baseline, and how unlikely labor force re-entry is in Egypt Taki et al. (2024), this mother-specific attrition from the workforce around the pandemic is economically meaningful, and warrants the attention of policy makers.

Table 8: DDD estimates conditional on the presence of at least one young child (<6 years old)

	Participation rate		Employment rate		Log of weekly hours worked	
	(1)	(2)	(3)	(4)	(5)	(6)
Female	-0.386**	-0.399**	-0.343**	-0.343**	-0.0906**	-0.0927**
	(-28.21)	(-24.81)	(-8769.38)	(-7916.62)	(-4.73)	(-7.21)
post-covid	0.00845	-0.0186**	-0.00453**	-0.00453**	-0.102**	-0.100**
	(1.68)	(-3.87)	(-17.89)	(-18.58)	(-4.96)	(-5.30)
parent	0.342**	0.275**	0.0000633**	0.000172+	0.00182	0.0236**
	(27.81)	(25.98)	(4.00)	(1.98)	(0.25)	(3.96)
Female × post-covid	-0.00628	-0.00577	-0.00150**	-0.00156**	-0.00513	-0.0107
	(-1.31)	(-1.07)	(-9.42)	(-9.62)	(-0.33)	(-0.70)
Female × parent	-0.312**	-0.407**	-0.0000626	0.000101*	-0.0801**	-0.0960**
	(-24.72)	(-21.38)	(-1.59)	(2.33)	(-4.90)	(-8.89)
post-covid × parent	-0.0000533	0.0118*	-0.000141	-0.000338**	0.0143*	0.00892
	(-0.01)	(2.69)	(-1.49)	(-4.26)	(2.24)	(1.59)
Female × post-covid × parent	-0.0225**	-0.0156+	0.0000160	0.0000465	-0.0390*	-0.0319+
	(-2.92)	(-1.91)	(0.19)	(0.63)	(-2.20)	(-1.95)
Individual controls	No	Yes	No	Yes	No	Yes
Region× quarter FE	No	Yes	No	Yes	No	Yes
Observations	650821	598975	650821	598975	291285	286508

t statistics in parentheses

$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$

Notes: Control variables include household size, marital status, years of education, age, an indicator for urban/rural, and region×quarter fixed effects. Standard errors are clustered at the regional level.

Table 9: DDD estimates conditional on all children being 15 or older

	Participation rate		Employment rate		Log of weekly hours worked	
	(1)	(2)	(3)	(4)	(5)	(6)
Female	-0.386**	-0.398**	-0.343**	-0.343**	-0.0906**	-0.0934**
	(-28.21)	(-25.51)	(-8769.38)	(-7926.50)	(-4.73)	(-7.25)
post-covid	0.00845	-0.0212**	-0.00453**	-0.00454**	-0.102**	-0.100**
	(1.68)	(-4.32)	(-17.89)	(-18.46)	(-4.96)	(-5.31)
parent	0.342**	0.283**	0.0000633**	0.000160+	0.00182	0.0275**
	(27.81)	(29.66)	(4.00)	(1.93)	(0.25)	(4.52)
Female × post-covid	-0.00628	-0.00570	-0.00150**	-0.00155**	-0.00513	-0.0105
	(-1.31)	(-1.06)	(-9.42)	(-9.52)	(-0.33)	(-0.68)
Female × parent	-0.312**	-0.189**	0.0000747*	0.0000433	-0.0577**	-0.0444**
	(-31.63)	(-15.23)	(2.30)	(0.85)	(-4.46)	(-3.94)
post-covid × parent	-0.0000533	0.0102*	-0.000141	-0.000349**	0.0143*	0.00885
	(-0.01)	(2.32)	(-1.49)	(-4.44)	(2.24)	(1.58)
Female × post-covid × parent	-0.00874	0.00975	-0.0000678	0.0000453	-0.0431*	-0.0331*
	(-1.16)	(1.21)	(-0.56)	(0.45)	(-2.74)	(-2.13)
Individual controls	No	Yes	No	Yes	No	Yes
Region× quarter FE	No	Yes	No	Yes	No	Yes
Observations	607891	556052	607891	556052	288243	283466

t statistics in parentheses

$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$

Notes: Control variables include household size, marital status, years of education, age, an indicator for urban/rural, and region×quarter fixed effects. Standard errors are clustered at the regional level.

3.3 Robustness checks

In sections 3.1 and 3.2, we provided evidence suggesting that the decline in women's labor force participation and the widening gender gap in weekly hours worked during the pandemic are driven primarily by larger losses to mothers and not to childless women. We further suggested that the effect is larger on mothers because the COVID-19 shock affects households' demand for childcare services following the COVID-19 containment measures, with mothers of younger children shouldering the greater share of this additional burden.

In this section, we seek to further understand this effect, and to try to confirm that it was driven by the exogenous increase in the demand for childcare at home that accompanied the COVID-19 containment measures, and not by other sources of underlying heterogeneity. In particular, we seek, in turn, to i. investigate any dose response effect of the number of kids on mothers' employment, ii. verify the heterogeneity of the effect by household age composition, and finally, iii. investigate the sectoral distribution of mothers' employment as well as its distribution across types of jobs to rule out the hypothesis that the widening gender gap for mothers is the result of a COVID-19-specific shock to labor demand in any sectors or job types that mothers tended to be concentrated in.

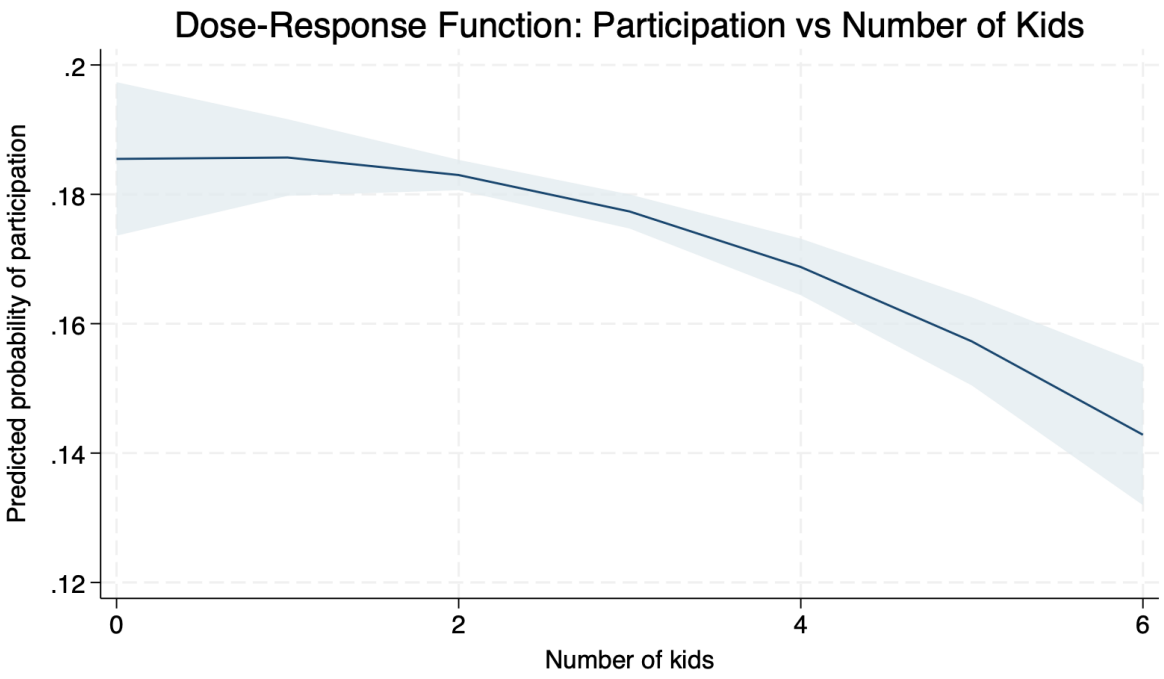
3.3.1 Dose-response effect of children on mother's labor supply

We first investigate the existence of any dose-response effect of the number of children, as it could provide evidence consistent with the hypothesis that COVID-19 widened labor gender gaps primarily through an exogenous increase in the demand for childcare services.

In Figure 2, we plot the fitted value (and 95% confidence interval) of mothers' participation from a quadratic regression of participation on the number of children while controlling for age, marital status, educational level, an indicator of urban/rural, as well as time-varying regional fixed effects. As seen in the figure, having children inversely affects women's likelihood of being active. This negative relationship remains negative even for a higher number of children.

If the effect of the COVID-19 shock on the labor market outcomes for mothers is working primarily through its increase in the household's need for childcare services at home, we would expect this effect to be larger for mothers of school-age children. As already seen from comparing Tables 8 and 9, when we separate out mothers of children 15 years old or older, the motherhood participation penalty is less pronounced.

Figure 2: Dose-response of mothers' participation to number of kids



3.3.2 Age composition of the household

The results from sections 3.1 and 3.2 may be driven by an exogenous increase in the demand for care work for older household members, and not just children, as caring for the elderly also tends to fall more heavily on women than on men (Dwyer and Seccombe (1991)). On the other hand, older adults in the household can also shoulder some of the childcare burdens and relieve mothers. To try to identify the cause of the measured motherhood penalty, we repeat the analysis in Table 7 on several sub-samples of our data, based on the age composition of the household. We first limit our analysis to households with no elderly members (70 or older), and report the results in Appendix Table A.1. The findings are qualitatively unchanged from our main findings, suggesting that COVID-19 came with a significant drop in mothers' labor supply at both the extensive and intensive margins, even when no one in the household was 70 or above. Regardless of whether older household members contribute to the care burden or shoulder some of it, female labor force participation declined more significantly for mothers during COVID-19.

We then repeat the DDD regressions for households with at least one member 70 years old or older (Appendix Table A.2). Interestingly, the COVID-19-associated motherhood penalty is no longer significant, suggesting that the presence of older adults in the household might be reducing the childcare burden on mothers. This is also the case when we limit our

attention to households with young children (6 or younger) and one elderly member. On average, older adults seem to contribute to childcare rather than adding to the overall care duties on mothers.

Overall, the results provide further confirmation that the exogenous increase in the need for childcare along with women's weaker bargaining position in the household are the main mechanisms explaining the decline in women's participation and hours worked following the shock.

3.3.3 Sectoral distribution of working mothers

To rule out the hypothesis that the measured penalty is higher for mothers because they happened to be more concentrated (than men and than other working women) in sectors that were more severely hit by the pandemic, we compare the sectoral distribution of mothers vs non-mothers in the workforce and look at the coefficients of interaction terms between industry dummies and the indicator for post-COVID-19. The results are represented in (Table 10).

Column (1) reports the coefficients on the interaction terms for a regression of mothers vs others (men and working women who are not mothers). Column (2) looks only at women and shows the coefficient on the interaction terms associated with being a mother. While we find that working mothers are heavily concentrated in a handful of sectors before the pandemic, there is no significant change in working mothers' distribution across sectors after the pandemic when compared to all other workers. The only marginally statistically significant (but economically insignificant) interaction is the negative coefficient for the "Wholesale and Retail Trade" sector in column (2), in which mothers are 0.64 percentage points less likely to be employed than non-mothers after the pandemic. Overall, Table 10 suggests that labor force attrition hits mothers uniformly across all the sectors in which they work, rather than hitting everyone working in these sectors, regardless of their parental status.

Table 10: Sectoral distribution pre- and post-COVID-19

	(1) Non-mothers (=0 for mothers 1 for others)	(2) Mothers (females only)
Mining	-0.0207	0
	(-1.03)	(.)
Manuf	0.00301	-0.00478
	(0.22)	(-0.49)
Electricity & Water	0.00646	-0.00652
	(0.48)	(-0.27)
Construction	0.000507	-0.0113
	(0.04)	(-0.37)
Trade	0.00123	-0.00637^{+}
	(0.10)	(-1.77)
Transportation	0.0000913	-0.00867
	(0.01)	(-0.34)
Hospitality	-0.00501	0.0173
	(-0.32)	(0.76)
Telecomm	0.0277	-0.0166
	(1.65)	(-0.75)
Finance & Insurance	-0.0145	-0.0231
	(-0.62)	(-1.66)
Real Estate	-0.0121	-0.000419
	(-0.78)	(-0.03)
Public Admin	-0.0139	-0.000831
	(-0.95)	(-0.16)
Education	-0.0200	-0.00464
	(-1.47)	(-1.19)
Health & Social Work	-0.0182	-0.00520
	(-1.16)	(-1.09)
Observations	292585	41515

t statistics in parentheses

$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$

Notes: Omitted industry is "Agriculture". Coefficients shown for industry×post-covid interaction terms only. Control variables include household size, marital status, years of education, age, and region×quarter fixed effects. Standard errors are clustered at the regional level.

4 Conclusion

Persistent gender gaps in labor market outcomes have been documented in both developed and developing countries. We exploit the disruption generated by the COVID-19 pandemic to estimate the effect of the shock on the gender disparities in labor market outcomes in Egypt. Our results show that the pandemic widened gender gaps across several key outcomes, most notably it increased the gender differential in labor supply at both the extensive and intensive margins.

The effects, however, differ substantially by motherhood status. Mothers, especially those with young children, experienced a relatively larger decrease in labor supply, especially in weekly hours worked. This heterogeneity suggests that the widening of gender disparities was driven, at least in part, by the increased burden of unpaid care work resulting from pandemic-related containment measures, most notably the closure of schools and childcare facilities.

These findings point to the importance of incorporating care responsibilities into the design of labor-market and crisis-response policies. Measures that preserve access to childcare and schooling during periods of disruption, expand flexible work arrangements, and provide targeted support to workers with caregiving responsibilities may help limit the disproportionate effects of shocks on women's employment. Given the limited re-entry of women into the Egyptian labor market following employment interruptions, policy interventions should also extend beyond job retention to include active measures that facilitate women's return to work. More broadly, the results suggest that policies aimed at strengthening women's labor market participation should be accompanied by investment in the care infrastructure and a push towards a more equitable distribution of unpaid care responsibilities.

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APPENDIX

A Additional Tables and Graphs

Table A.1: DDD estimates for mothers relative to men and other women in households with no elderly member

	(1) Participation	(2) Participation	(3) Employment Rate	(4) Employment rate	(5) Log weekly hours worked	(6) Log weekly hours worked
Female	-0.383**	-0.407**	-0.343**	-0.343**	-0.0861**	-0.0957**
	(-28.13)	(-25.41)	(-7860.76)	(-6702.21)	(-4.56)	(-7.09)
post-covid	0.0107*	-0.0166**	-0.00452**	-0.00450**	-0.102**	-0.100**
	(2.10)	(-3.42)	(-18.30)	(-18.82)	(-4.96)	(-5.30)
Female × post-covid	-0.00791	-0.00909+	-0.00150**	-0.00156**	-0.00318	-0.00710
	(-1.66)	(-1.75)	(-9.46)	(-9.48)	(-0.20)	(-0.45)
parent	0.359**	0.288**	0.0000665**	0.000151+	0.00251	0.0311**
	(32.24)	(24.30)	(4.17)	(1.83)	(0.35)	(4.71)
Female × parent	-0.311**	-0.296**	-0.0000127	0.0000879*	-0.0701**	-0.0679**
	(-24.50)	(-18.35)	(-0.41)	(2.32)	(-4.95)	(-6.87)
post-covid × parent	-0.00431	0.0141**	-0.000130	-0.000326**	0.0144*	0.00974+
	(-0.92)	(3.09)	(-1.42)	(-4.07)	(2.29)	(1.77)
Female × post-covid × parent	-0.0134+	-0.0130+	0.00000626	0.0000633	-0.0443**	-0.0395**
	(-1.81)	(-1.77)	(0.07)	(0.74)	(-3.03)	(-2.94)
Age		-0.00391**		0.00000411**		-0.00218**
		(-10.33)		(3.77)		(-7.18)
Observations	720812	671261	720812	671261	298095	293559

t statistics in parentheses

$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$

Notes: Control variables include household size, marital status, years of education, age, an indicator for urban/rural, and region× quarter fixed effects. Standard errors are clustered at the regional level.

Table A.2: DDD estimates for mothers relative to men and other women in households with at least one elderly member

	(1) Participation	(2) Participation	(3) Employment rate	(4) Employment rate	(5) Log weekly hours worked	(6) Log weekly hours worked
Female	-0.405**	-0.347**	-0.343**	-0.343**	-0.110**	-0.102**
	(-25.25)	(-23.49)	(-4729.90)	(-5265.44)	(-4.75)	(-5.69)
post-covid	-0.0110	-0.0200*	-0.00458**	-0.00460**	-0.107**	-0.102**
	(-1.10)	(-2.22)	(-12.34)	(-12.93)	(-4.45)	(-4.78)
Female × post-covid	0.00865	0.0173+	-0.00142**	-0.00149**	-0.0174	-0.0291
	(0.79)	(1.76)	(-5.30)	(-5.61)	(-0.66)	(-1.21)
parent	0.00281	0.0644**	0.0000709	0.000252*	-0.0276*	0.0149
	(0.07)	(3.93)	(1.28)	(2.54)	(-2.10)	(1.32)
Female × parent	-0.0252	-0.0877**	0.000288*	0.000275**	-0.0165	-0.0390+
	(-0.96)	(-4.51)	(2.28)	(2.84)	(-0.80)	(-1.83)
post-covid × parent	-0.0193	-0.00401	-0.000565*	-0.000740**	-0.0242	-0.0247
	(-0.99)	(-0.27)	(-2.77)	(-4.08)	(-1.33)	(-1.53)
Female × post-covid × parent	0.0105	0.0000307	-0.000151	-0.0000260	-0.0481	-0.0308
	(0.55)	(0.00)	(-0.70)	(-0.16)	(-1.28)	(-0.90)
Age		-0.00898**		0.00000195		-0.00321**
		(-23.73)		(0.59)		(-6.60)
Observations	63693	61396	63693	61396	17059	16817

t statistics in parentheses

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$

Notes: Control variables include household size, marital status, years of education, age, an indicator for urban/rural, and region× quarter fixed effects. Standard errors are clustered at the regional level.

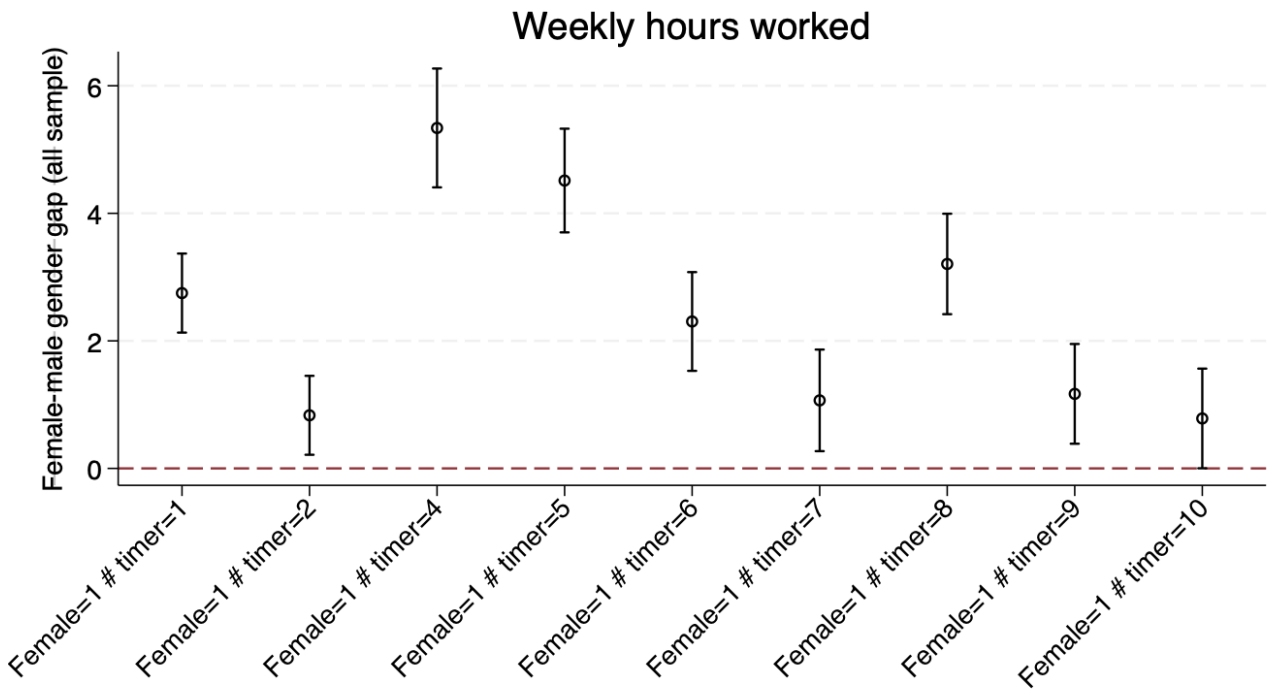


Figure A.1: Event study, all sample (women and men)

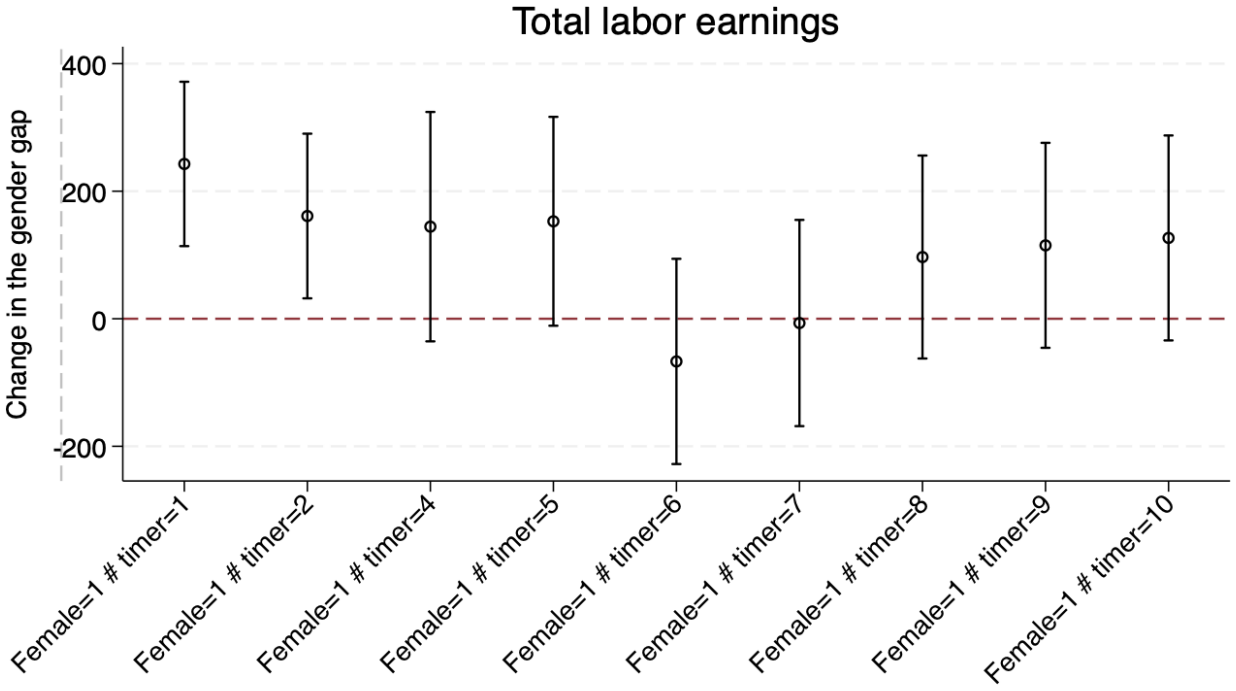


Figure A.2: Event study, all sample (women and men)