Policy Research Working Paper 10646

The Effect of COVID-19 on the Gender Employment Gap in Egyptian Manufacturing

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WORLD BANK GROUP
Poverty and Equity Global Practice
December 2023

Policy Research Working Paper 10646

Abstract

This paper examines the evolution of the gender employment gap post COVID-19 in the Egyptian manufacturing sector, using a unique firm-level data set. The findings show that the COVID-19 shock led to a slight improvement in the gender employment gap, both in absolute and relative terms, driven by a larger reduction in male employment compared to that for female employment. The heterogeneity analysis shows that exporting firms and firms in industrial zones on average increased both types of employment post COVID-19. Two types of firms contributed to a worsening of the gender gap, namely firms that adopted technology and those that provided worker training prior to the pandemic, pushing male employment up while not doing the same for female employment. Additionally, the informal sector contributed to a worsening of the gender gap during the pandemic.

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The effect of COVID-19 on the gender employment gap in Egyptian manufacturing*

Amirah El-Haddad* and Phoebe W. Ishak†

1. Introduction

The gender gap in Egypt has changed over time in response to changes in policy, itself driven by changes in the underlying development model of the country. The state-led inward looking development model in Egypt from the 50s to nearly the 80s meant that female employment was disproportionately greater in the government sector, that is in Egyptian bureaucracy and in state owned enterprises (SOE) including in manufacturing. With the gradual liberalization in the 70s and the adoption of the Economic Reform and Structural Adjustment Program (ERSAP) in 1991, the situation has changed. The public sector employment guarantee scheme was suspended and the ERSAP entailed large scale privatization of SOE. Privatization in turn fueled private sector growth especially in textiles and clothing (TC), which has caused this sector to increasingly attract female workers. In fact, the entire increase in private sector employment between 1998 and 2006 was on account of the feminization of just two sectors, these are food processing and TC (Assaad and El-Hamidi 2009).

During the first half of the 2000s the economy was further liberalized. Additionally, competition from countries such as China, India, Bangladesh, Pakistan, Indonesia, and even Turkey had become fierce with the phase-out of the Multi-fibre Agreement (MFA) in 2005. Liberalization had been largely 'hybrid' implying that the transition to a market economy was not preceded by the necessary regulatory framework (El-Haddad 2023). These developments have increasingly transformed Egypt into a rentier economy (El-Haddad 2015) and increasingly informal. Similar to the formal sector, the informal sector became largely male dominated or 'de-feminized' (Assaad 2002). Accordingly, the informal sector has further entrenched the gender employment gap in the country. Whilst policies induced these substantial shifts in the gender gap, the role of social norms and gendered socioeconomic roles is as important.

Apart from these long term trends, the gender gap could also suddenly change. An economic crisis can potentially be a driver of change and so can either decrease or exacerbate the gap. Through imposed lockdown measures to limit the spread of the virus, the breakout of COVID-19 has simultaneously induced a demand and a supply side shock with potential job losses following a demand-pushed recession and a supply-side contraction.

This paper is positioned within the recent literature investigating the effect of the pandemic on the gender gap, but is also more broadly situated within the historical evolution of

* We are thankful for the generous financial support provided by the project 'Stability and Development in the Middle East and North Africa', funded by the German Federal Ministry for Economic Cooperation and Development (BMZ) towards the administration of the 2020/21 Egyptian Industrial Firm Behavior Survey (EIFBS) instrument. The contents of this document are the sole responsibility of the authors and do not reflect the position of the BMZ. We are grateful to Dr. Zakaria Othman for undertaking the sampling. Thanks are also due to Marian Adel for research assistance. The dataset can be downloaded here: Egypt, Arab Rep. - Egyptian Industrial Firm Behavior Survey, EIFBS 2020/21 (erfdataportal.com)

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the gap outlined above. Following the COVID-19-induced recession, women's employment and labour market outcomes have been disproportionately reduced (Titan et al. 2020; Adams-Prassl et al. 2020; Farre et al. 2020; Forsythe 2020; Blundell et al. 2020; Andrew et al. 2020; Benzeval et al. 2020; Collins et al. 2021; Hupkau and Petrongolo 2020; Hipp and Buenning 2021; Alon et al. 2021; Dang and Nguyen 2021). While the impacts of the pandemic on the labour force of developed economies have been widely studied, research on the gender gap in developing countries has been less explored. For the MENA region, the nascent literature provides insights into the employment gap in services and in the care work sectors, where women are disproportionately overrepresented compared to manufacturing (Assaad et al. 2022; Barsoum and Majbouri 2021; Krafft et al. 2022, Marouani et al. 2022; Kraft et al. 2022). It also highlights the lockdown's effect on the increased burden in female unpaid housework activities (ESCWA 2020; Alon et al. 2022; UN Women Jordan 2020; Kraft et al. 2022). Nevertheless, there has been no equivalent work on the evolution of female employment in manufacturing post-COVID. This paper fills this gap.

We proceed in two ways. First, we look at the evolution of the gender employment gap post COVID-19. Then, we examine the heterogeneous effects of firm characteristics and other controls on the ensuing gap. In doing so, we use a unique firm-level dataset, namely the Egyptian Industrial Firm Behavior Survey 2020/21 (EIFBS). The dataset gives detailed information on employment levels pre and post the COVID-19 breakout, and their gender distribution. Two sets of factors may affect the gender gap. We distinguish between 'status variables' or 'innate characteristics', and those which are shaped by the behavior of the industrial firm such as managerial practices, investment in innovation or worker training and the adoption of advanced technology. 'Innate characteristics' cover traits such as being informal, catering to the domestic or export market, firm size or being in the private sector or located in an industrial zone.

We find that, contrary to evidence from other countries around the world, the COVID-19 shock led 'overall' to a slight improvement in the gender employment gap in manufacturing. This gap however stems from a larger 'reduction' in male employment compared to that for females. Men have borne the brunt of the pandemic in Egyptian manufacturing. The relative weaker direct employment impact on women compared to men is primarily due to the very limited number of women in employment in manufacturing to start with. Female employment in manufacturing is just 18% of total employment in the sector (EIFBS data). More generally, with just 7% of total female participation in industry (UNDP 2021), Egypt occupies the bottom position compared to its oil importing counterparts such as Tunisia, Jordan or even agriculture dominated Morocco. Industry encompasses more than just manufacturing, it additionally includes sectors such as construction, mining and quarrying; electricity, gas and water supply, which are inherently even more male-dominated compared to manufacturing.

While the aggregate results show that there had been a slight overall improvement in the employment gap post-COVID, there are nuances based on individual characteristics of the surveyed firms. The heterogeneity analysis shows that exporting firms and firms in industrial zones have on average 'increased' both types of employment post-COVID. Egypt's traditional sectors have been particularly hit by the pandemic (El-Haddad and Zaki 2022, El-Haddad and Zaki 2023a, El-Haddad and Zaki 2023b) which is reflected in their shock exposure. These feminized sectors have contributed to a deterioration of the gender gap.

Whilst providing 'helping hand employment' for men, the informal sector has contributed to a worsening of the gender gap during the pandemic. Further, two more types of firms have contributed to a worsening of the gender gap in manufacturing, namely firms that

have adopted technology and those that have provided worker training prior to the pandemic. Firms associated with these 'behavioral traits' have pushed male employment up while not doing the same for female employment. They hurt women employment twice over. First, through their huge contribution to the gender gap to start with; and second through entrenching the gap further post-COVID.

The remainder of the paper is structured as follows. The next section is devoted to providing a historical background of Egypt's development models since the 50s and what that means for the gender employment gap. Section 3 introduces the EIFBS and the stylized facts associated with the data. Section 4 details the methodology. Section 5 presents the results and 6 provides a discussion of these results and concludes.

2. Evolution of Egypt's Economic Model and Implication on the Gender Gap

The gender gap in Egypt has changed over time in response to changes in policy. The shifts in the adopted economic model have shaped female employment in the country. The state-led inward looking development model from the 50s to the 80s meant that the labour market was characterized by a large public sector including state-owned enterprises (SOEs); a small but growing private sector and a small informal sector. This structure was largely driven by the government public employment drive of the early 60s which constituted a package of policies from government employment guarantee for every secondary and post-secondary graduate, to lifetime job security, to numerous other benefits such as health insurance, pension and maternity leave (Assaad 1997). The implications were that female employment was disproportionately greater in the government sector, i.e. in Egyptian bureaucracy and in SOEs including in manufacturing.

This economic model has become increasingly unsustainable. By the 80s the economy suffered fiscal and external imbalances such as large budget and balance of payment deficits and accumulated foreign debt. As a result the government embarked on the Economic Reform and Structural Adjustment Program (ERSAP) in 1991 which entailed the privatization of SOEs and the removal of various subsidies among other things. Changes in labour market characteristics had already came about starting from the 80s when the government had directly interfered with the market by suspending the public sector employment guarantee scheme for graduates and by introducing direct rationing of enrollment by the Ministry of Education. These two major turns in the economy have resulted in profound changes in female employment in the following years.

Following the ERSAP, state-owned textiles and clothing (TC) enterprises were downsized, thus paving the way for some private sector growth. This growth has caused this sector to increasingly attract female workers. In fact, the entire increase in private sector employment between 1998 and 2006 was on account of the feminization of just two sectors, these are food processing and TC (Assaad and El-Hamidi 2009). Many more women are employed in TC compared to the national average. At the national level in 2007, about 20% of the private sector's labor force were women, this share doubles to about 40% in TC (El-Haddad 2015). This *relative* contribution remains true to date as our data confirm. Female participation in the clothing sector remains at 40%, while it had dropped to just 17% in textiles.[1] Female participation in manufacturing remains also more or less put at about 18% of total employment in the sector (EIFBS data). But these persistent patterns mean that the female Egyptian labor market is also clearly highly segmented.

[1] And to 15% in the food, beverage and tobacco sector.

Two more major events shaped female employment further. First, another set of economic reforms took place through 2000-05 further liberalizing the economy. By the first decade of the 21st century, instead of boosting structural transformation with increased opportunities for productive employment in industry, these reforms combined with a general neglect of education and health have increasingly transformed Egypt into a rentier economy (El-Haddad 2015). Rents from oil and gas exports, remittances and Suez Canal proceeds have skewed the structure of the economy toward non-tradable sectors – such as construction - which are largely male dominated (Assaad 2002) and for a large part also informal. Second, the phase-out of the Multi-fibre Agreement (MFA) in 2005 has gradually subjected the industry to normal (WTO) rules, thus bringing Egypt into direct competition in the international market with countries such as China, India, Bangladesh, Pakistan, Indonesia, and even Turkey; countries that were earlier quota constrained under the former MFA (El-Haddad 2016). This came at the expense of Egypt's traditional export sectors particularly female dominated TC. Thus, the scaling down of TC SOEs was not offset by comparable growth of privately owned companies in the sector or in manufacturing more generally (El-Haddad 2009a). In less than a decade between 1997 and 2006 the TC industry has lost about 16% of its labor force, equal to over 50,000 jobs (El-Haddad 2012) causing an absolute decline in absolute female employment, though not relative employment in the sector (*ibid*.).

But liberalization in Egypt was *partial* or *hybrid*. The hybrid liberalization model adopted in Egypt from the 70s through to the early 2000s implied that the transition to a market economy was not preceded by the necessary regulatory framework such as the enactment of a competition law, the establishment of competition and consumer protection authorities, or the establishment of modern dispute resolution mechanisms (El-Haddad 2023).[2] These took place only decades later around 2005. This hybrid liberalization model supported the growth of crony capitalism in Egypt which further restricted decent employment opportunities for the masses (El-Haddad 2020). As a result, the informal sector emerged as a 'survival sector' in the country (Tansel and Ozdemir 2019; El-Haddad and Gadallah 2021). But with its growth as a survival sector, the dominance of the male figure as a bread earner (Hoodfar 1997; El-Feki et al. 2017), traditional stereotyping and the constraints women face in joining this sector (Assaad 2005), the informal sector has also been gradually 'de-feminized' (Assaad 2002). Similar to its formal sector counterpart, the sector has been overemploying men. In fact, the formal sector has been employing 10 times as many women on average compared to its informal counterpart.[3] This is true in absolute terms, in relative terms, however, men are on average four times more likely to be informally employed as women (EIFBS). As a result the informal sector has further entrenched the gender employment gap in the country.[4]

3. EIFBS Survey Instrument and Stylized Facts

EIFBS Survey Instrument and Sampling Design

We use unique and recently collected data from the self-designed 2020/21 Egyptian Industrial Firm Behavior Survey (EIFBS) of 2,383 Egyptian manufacturing firms. The data

[2] See El-Haddad (2008) on dispute resolution in TC in Egypt

[3] Calculated from EIFBS data.

[4] Most recently there has been a very slight trend in increased female self-employment including in the household enterprise, especially in fashion and catering – also considered informal activities - triggered by increased access to digitization and online platforms. Data on these trends remain largely unaccounted for in establishment surveys but have resurfaced in results based on the Egyptian Household Income, Expenditure and Consumption Survey.

were collected at the beginning of the second wave of COVID-19 extending to the height of it.[5] EIFBS firms comprise a multistage stratified sample drawn from the 2017 economic census sample of 33,331 establishments, which is itself drawn from a sample of 117,149 establishments. The EIFBS sample design is based on three parameters to ensure that the sample produces representative and precise estimates at the national level. These parameters are number of employees, region (urban governorates, lower and upper Egypt) and economic activity level (2 digits). The sample frame, however, excludes firms with less than 5 employees and thus is only representative of small, medium (SMEs) and large manufacturing enterprises. This also implies that informal firms – albeit present – are underrepresented in our sample. We expect that the results pertaining to informality would be stronger with the inclusion of more informal firms. More detailed information on sampling can be found in Annex 1.

Two questionnaires were administered, one for firms that are still in operation, and another, very similar one[6], for firms that have exited the market or have temporarily shut down operations. The response rate is 75%, meaning that we successfully interviewed 2,383 establishments of which 2,338 are in operation and 45 firms that have either exited the market or are temporarily closed. Of the 766 firms we could not interview, an unknown number, and presumably a much higher proportion, have also exited the market. The issue of representativeness is one of sample selection bias, which arises if firms that refuse to respond have different characteristics to those that did respond. In principle, the presence of such bias can be checked for by comparing characteristics of firms in the sample with those not taking part in the interview. But since data are, by definition, not collected from firms that refuse/didn't take part, it is not possible to compare the characteristics of firms who responded with those who did not. But what we can do is compare some of the broad characteristics of the drawn sample to the actual sample of firms we used. Comparisons for governorate, size, export status and many other characteristics are pretty similar. Actual sample characteristic are quite close to the drawn sample.[7]

The questionnaire includes 14 modules: basic firm identification data, firm size and employment, firm expectations on recovery and potential exit, changes in firm performance, pandemic transmission channels, ownership and management characteristics, innovation, management practices and use of information technology (IT), production costs, obstacles to operation, exports and global value chains, obstacles to exports, worker training and government support.

The survey includes information on the distribution of female and male employees pre- and post- COVID, which we use to construct our measure for the gender employment gap. Specifically, we are able to infer the change in employment and other indicators pre- and post-COVID-19 based on a number of retrospective questions in the EIFBS questionnaire. For instance, we ask about the total number of employees in the last financial year prior to COVID-19, and the total number of employees recorded at the month of the survey. This allows us to work out changes in total employment post-COVID. Similarly for male and female employment.

Stylized Facts

[5] Precisely between November 19th 2020 and the 5th of February 2021. Precisely between November 19th 2020 and the 5th of February 2021.

[6] Only four modules are slightly different. The main difference is that for temporarily closed or closed firms there are no values for current variables such as production, exports, employment or revenues.

[7] Available from authors upon request.

Women in much of the Arab World are very lightly concentrated in industry.[8] In oil exporting countries (OECs) of the Gulf, they are mostly concentrated in services[9] and in oil importing countries (OICs), such as in Morocco and Egypt, they are additionally concentrated in agriculture (UNDP 2021). Female participation in industry is generally below 15% throughout the region with the exception of Tunisia (33%) and Algeria (25%). With just 7% of total female participation in industry, Egypt occupies the bottom position compared to its OICs counterparts. In fact, quite comparable to the average for the group of OECs.

With such limited participation in industry and in turn manufacturing in Egypt, it is expected that the effect of COVID-19 on women employment be limited. Our firm-level representative sample data show that overall, there has been a decrease in manufacturing employment in response to COVID-19 for both men and women. The reported decline has been however quite small and accounts for less than 5% of original weighted employment prior to COVID (Table 1; column 3). This decline is equivalent to just 10353 jobs in our sample when we use weights.[10] In terms of percentage change this decline hit men harder (-5% compared to -3.6% for women; columns 6 and 9). Female participation within manufacturing is just 18.2% and has slightly increased to 18.4% post COVID, indicating that women are heavily underrepresented in manufacturing and that's probably the reason why men are hit harder in this male dominated sector of the economy.

Table 1: Employment pre and post-COVID and labor market participation by gender

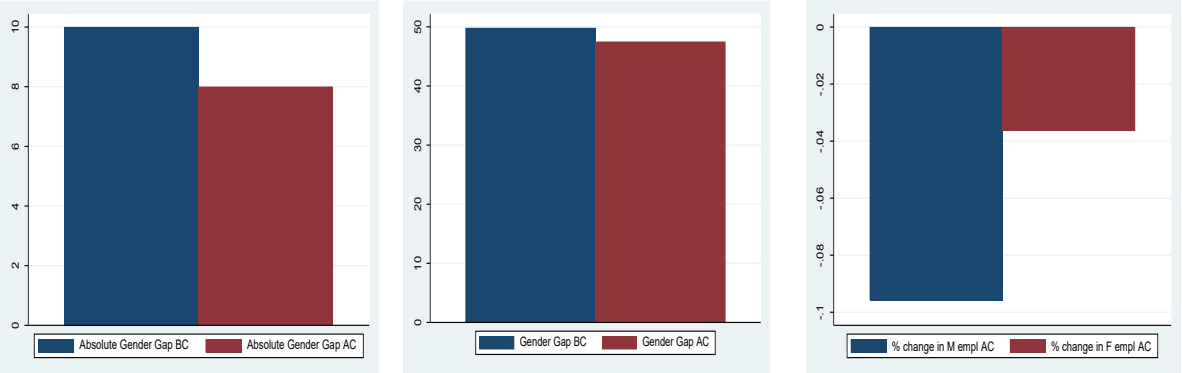
Total empl. BC	Total empl. AC	% change	Male empl. BC	Male empl. AC	% change in male empl. AC	Female empl. BC	Female empl. AC	% change in female empl.AC	F share in total empl. BC	F share in total empl. AC
212796	202443	-4.87%	162455	154300	-5.02%	38727	37326	-3.62%	18.20%	18.44%

Source: Authors' calculations using the EIFBS. Total/Male/Female empl. BC refers to Total/Male/Female sample manufacturing employment before COVID using sampling weights. Without weights Total empl. BC=594978 and AC=574692 (so nearly 20 thousand jobs are lost in absolute terms post-COVID). Similarly, AC refers to the respective values after COVID. Female share in total employment BC (AC) = column 7 (8)/column 1.

We would expect these facts to be mirrored in the ensuing 'Gender Gap'. Figure 1 shows that the 'Gender Gap', calculated as the difference between male and female employment, has declined post COVID in terms of the median, the mean and in terms of the percentage change in employment by gender (Figure 1).

Figure 1: Gender Gap (M-F) and percentage change in employment pre- and post-COVID-19

a. Gender Gap median b. Gender Gap mean c. % change in M/F employment AC



Source: Authors' own elaboration using the EIFBS. Weights are used. The gender gap equals the difference between the number of male and female employees after COVID (AC) and before COVID (BC). Panel c gives the

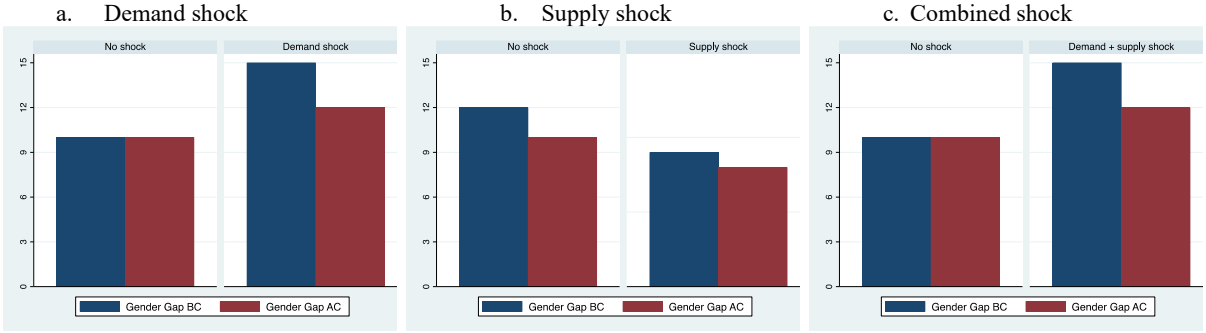
[8] Which is also similar around the world but a lot more pronounced in the Arab region.
[9] Ranging between 73% in Algeria to 97% in Kuwait of all employment women.
[10] Around 20 thousand when weights are not used.

percentage change in male and female employment AC. That is for males = (M empl. AC- M empl.)/M empl. BC; for females = (F empl. AC- F empl.)/FempBC. This value differs from the % change given in columns 3 and 6 of Table 1.

While low levels of female participation in manufacturing persist, the focus of this paper is on the moderate changes that COVID-19 has brought about in terms of the employment gap and the underlying explanatory factors in Egyptian manufacturing. On account of the vast use of lockdown measures, COVID-19 has induced both a demand and a supply side shock. In this paper, we look at these separately as well as the effect of the combined demand and supply shock on the gender gap. The demand shock is inferred from reported declines in domestic and foreign quantities demanded, and the supply shock from reported declines in production and in capacity utilization. The combined shock combines the two. Figure 2 shows that the demand shock (Figure 2a. as opposed to the supply one has hit men harder resulting in relatively larger improvements in the gender employment gap. The overall effect of the combined shock is also to improve the gap (Figure 2c).

Figure 2: The Gender Gap (median) pre- and post-COVID-19 by type of shock

a. Demand shock b. Supply shock c. Combined shock

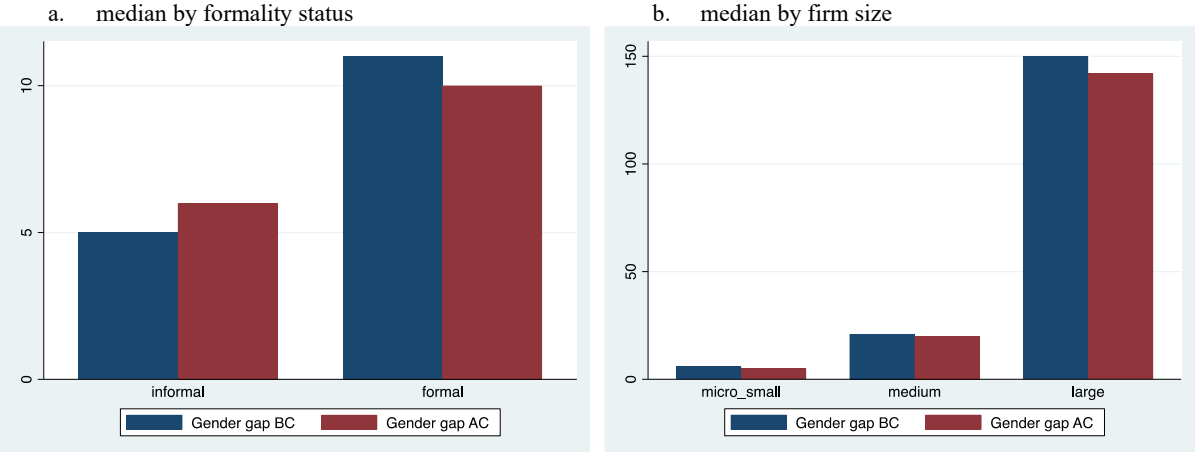


Source: Authors' own elaboration using the EIFBS. Weights are used. Gender gap is the difference of the number of male and female employees before COVID (BC) and after COVID (AC).

Despite the overall improvement in the gender gap, it is possible to find heterogenous effects of firm characteristics. 'Status variables' such as formality or export status, size and sector could have varying effects on the gap. For example, while the gap is considerably larger in the formal sector (Figure 3a) it has improved in the sector post-COVID compared to a worsening of the gap in the informal sector. Similarly, while large firms account for a much larger employment gap, the gap has disproportionately improved for larger firms compared to their SME counterparts (Figure 3b).

Figure 3: The Gender Gap (median) pre- and post-COVID-19 by informality and size

a. median by formality status b. median by firm size

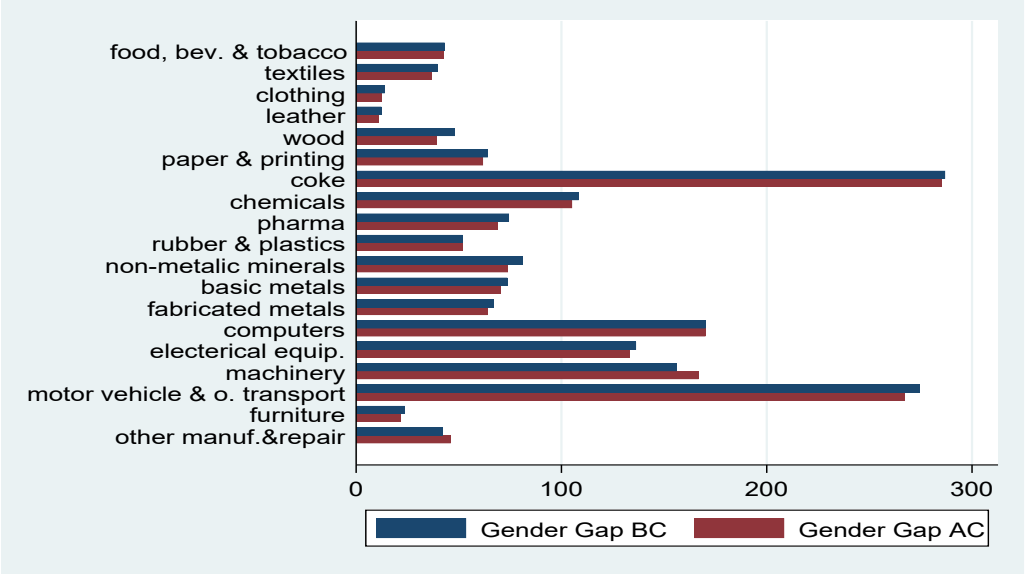


Source: Authors' own elaboration using the EIFBS. Weights are used. Gender gap is the difference of the number of male and female employees before COVID (BC) and after COVID (AC).

Figure 4a shows that the largest gender employment gap in manufacturing is in the manufacture of coke and refined petroleum products and in the manufacture of motor vehicle, trailers, semi-trailers and other transport equipment.[11] On the other hand the smallest employment gap is in leather and clothing. About 40 percent of clothing sector employees are women, twice the overall female participation share. Since the late 1990s women's share has increased following privatization, liquidation and long-term leasing of SOEs subsequent to the Economic Reform and Structural Adjustment Program of 1991 (ERSAP). Indeed, the entire increase in private sector employment between 1998 and 2006 was on account of the feminization of just two sectors, namely food and TC (Assaad and El-Hamidi 2009). As our data clearly show the food sector has also a relatively small gender gap. But since the COVID-19 crisis has hit the clothing sector hard, the largest percentage change in female employment has been in that sector (Figure 4b).

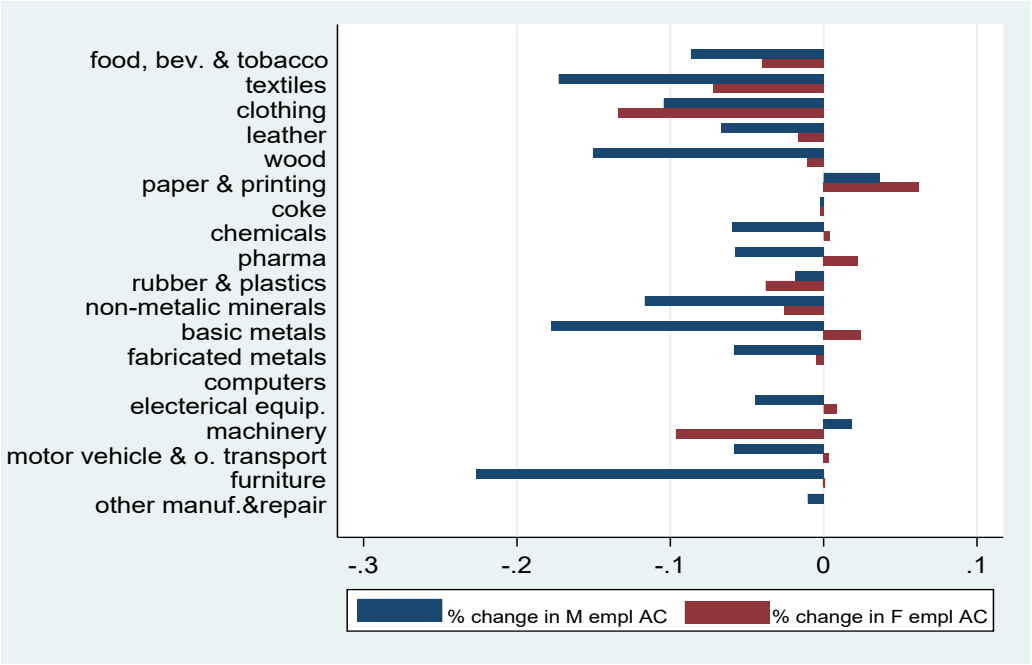
Figure 4. The Gender Gap and percentage change in employment pre- and post-COVID-19 by sector

a. Gender Gap (mean) by sector



b. Percentage change in employment by gender and sector

[11] Note that we combined these two sectors on account of just one observation in the sector other transport equipment in our sample.



Source: Authors' own elaboration using the EIFBS. Weights are used. Gender gap is the difference of the number of male and female employees before COVID (BC) and after COVID (AC).

Other heterogenous effects pertain to firm behavior which captures the extent to which good managerial practices, innovation, the adoption of advanced technologies and worker training have weighed in various ways on the gender gap. These behavioral traits have provided an opportunity for firms to adapt their business models and show greater resilience in coping with the COVID-19 crisis in Egypt (El-Haddad and Zaki 2023a). But do they also positively reflect on the gender gap post-COVID?

Table 2: Distribution of employment by firm technology adoption and worker training

	Total male empl. BC	Total female empl. BC	Total empl. BC	Total male empl. AC	Total female empl. AC	Total empl. AC	Gender Gap BC	Gender Gap AC	% change in gender gap (AC)
Technology									
No	30418	7146	37565	26524	6340	32864	23272	20184	-13.3%
	80.98%	19.02%		80.71%	19.29%				
Yes	157568	36180	193748	153547	35374	188921	121388	118173	-2.6%
	81.3%	18.7%		81.3%	18.7%				
Training									
No	11258	2205	13462	9352	1914	11266	9053	7438	-17.8%
	84%	16%		83%	17%				
Yes	143241	34032	177274	138023	32745	170767	109209	105278	-3.6%
	80.8%	19.2%		80.8%	19.2%				

Source: Authors' calculations using the EIFBS. Weights are used. Gender gap is the difference of the number of male and female employees before COVID (BC) and after COVID (AC).

In terms of firms' behavioural traits, the employment gap is about five times and twelve times greater in firms that adopted technology and those that provided worker training prior to COVID respectively compared to their counterparts (Table 2). This is not surprising as women tend to be concentrated in low-tech, traditional sectors such as clothing. In the sample, on average female employment accounts for just 3% and 7% of total employment in the relatively high-tech automotive and computer sectors. In terms of changes, the employment gap has considerably declined in non-tech and no-training oriented firms. It declined just over 5 times

more (13.3%) for non-technologically oriented firms and just under 5 times more for firms not providing worker training (17.8%) for their employees.

Despite the very modest changes in female employment post-COVID reported by our survey, looking at these stylized facts of the sector, there seem to be some interesting heterogenous effects at play that require further rigorous investigation.

4. Methodology

Our aim is to assess the heterogeneous impact of COVID-19 on the gender employment gap in Egyptian manufacturing using unique firm-level data. We control for sector, location and firm level characteristics to disentangle the effect of the shock on the employment gap.

The Model

To measure the impact of COVID-19 on the gender employment gap, we run the following two OLS fixed effects specifications:

$$Emp.\ Gap_{ikg} = \alpha_0 + Shock_{ikg} + \alpha_1 X_{ikg} + \alpha_2 Z_{ikg} + \mu k + \delta g + \eta_{ikg} \quad (1)$$

$$Percentage\ change\ in\ F/M\ empl_{ikg} = \alpha_0 + Shock_{ikg} + \alpha_1 X_{ikg} + \alpha_2 Z_{ikg} + \mu k + \delta g + \eta_{ikg} \quad (2)$$

where the dependent variable $Emp.\ Gap_{ikg}$ is the change in the difference of the number of male and female employees after COVID (*Δ in male-female employment AC*) in firm *i* in sector *k* and governorate *g* with separate equations estimated for (i) the change in the number of male employees; and (ii) the change in the number of female employees post-COVID. δ_g and μk are governorate and sector dummies respectively, to control for governorate and sector unobversables, and η_{ikg} is the error term. The sectors are classified according to the ISIC Rev. 4 at the 2-digit level. The dependent variable in equation (2) is the percentage change in male and female employment, and the difference thereof. The vectors of the independent variables are identical in equations (1) and (2).

Two sets of factors could affect the gender gap. We distinguish between 'status variables' or 'innate characteristics' and those which are shaped by the behavior of the industrial firm such as good managerial practices or investment in innovation. X_{ikg} and Z_{ikg} are vectors of firm's innate characteristics and behavior, respectively. 'Innate characteristics' cover traits such as being informal, solely catering to the domestic market, firm size or being in the private sector. Thus, the former includes controls for firm age, indicators for private ownership, formality, export status, industrial zone and firm size prior to COVID. The latter set of variables control for degree of technology adoption, worker training, innovation, i.e., spending on R&D and good managerial practices prior to COVID-19.

$Shock_{ikg}$ is a composite index for firms' exposure to COVID shocks. We distinguish three types of shocks: *demand shock*, *supply shock* and the *combined shock*. The *demand shock* is calculated as the sum of two indicators, namely the self-reported decline in the value of the quantity demanded both domestically and in export markets. The *supply shock* is given as the sum of the self-reported decline in production value and in capacity utilization. The combined shock aggregates the demand and supply shocks. We cluster the standard errors at the sector and governorate level. The OLS fixed effects model allows us to control for a wide range of

firms' characteristics and to account for all time-invariant unobservable characteristics at the sector and governorate level. The shock variable is exogenous by definition and so no endogeneity concerns occur. Finally, descriptive statistics for all variables are in Annex 2.

Extensions

This baseline regression is extended in three ways: *First*, the lockdown by restricting worldwide demand for clothing and by disrupting clothing global value chains has hit the clothing sector the most. Since the sector is female-dominated, we divide our sectors into two categories: 1) female dominated; and 2) other sectors. The female dominated sector dummy variable takes the value of 1 if the sector is among the top 2% of sectors whose average gender difference in employment (M-F employment) is the lowest of all manufacturing sectors of the sample. This applies to just two sectors, namely clothing and leather. Other sectors have a substantially wider gap than these two. Thus, in our first extension we interact the female dominated sectors with the three types of shocks.

The second extension pertains to informality. The dataset contains two measures of informality. One is the informality of the firm itself, for which we employ a strict definition. A firm is formal if it has a commercial registry, an operating license and a tax record. The second informality variable is the number of informally employed individuals within a firm- be it formal or informal. Hence, we add the number of informal workers and interact it with our exogenous shocks.

Thirdly, to further control for firm's unobservable characteristics and control for potential endogeneity we additionally estimate a *Propensity Score Matching (PSM)* model. The PSM technique allows us to predict the probability of being negatively affected by the COVID shock subject to a set of observable characteristics (X_{ikg} *and* Z_{ikg}) and then match treated firms – those who witnessed the shock - with their untreated counterparts based on similar propensity scores. The model runs in 2 stages. In the 1st stage, we use a logistic regression, to estimate the propensity score of experiencing the shock, and in the 2nd stage, we run the OLS fixed effects models on the matched sample. We rely on the nearest neighbor matching technique to predict the propensity score and a matching technique without replacement, meaning that an untreated unit can only be used once as a match. This is a well-adapted technique given the large sample size of untreated units relative to treated ones (Abadie and Imbens, 2006). We also include matched pair dummies to allow for a within-comparison between treated and untreated firms.

5. Results

We will proceed by presenting the results from our three baseline regressions given in Tables 3 and Tables 1-2 in Annex 3, followed by the three extensions from the heterogeneity analysis which are given in Table 4 and Tables 3-4 in Annex 3 for the feminized sectoral examination and Tables 5-7 in Annex 3 for introducing other forms of informality. Table 5 gives the propensity score matching results. Tables 8-9 in Annex 3 give further details on the propensity score matching results.

Baseline Results

Tables 3 and Tables 1-2 in Annex 3 give our baseline results. All three shocks produce quite uniform results: a) they decrease both male and female employment, both in absolute

terms (regressions 1 and 2) and in percentage terms (regressions 4 and 5); b) they do so more for men than women and so on balance they improve the absolute and percentage change in the gender employment gap (regressions 3 and 6); and 3) the demand shock produces slightly stronger results in terms of magnitude and significance of the improvement in the gender gap. Given the limited female participation in manufacturing in Egypt –as shown in the previous section - it is expected that the effect of COVID-19 on women employment be limited. And so, it is not surprising that males bear the brunt of the crisis in this male dominated sector. But it is not only that, gender wage discrimination (El-Haddad 2016) is potentially another factor that explains these results. Men are high cost employment compared to women, so it is economically viable to shed male employment in order to cope with the crisis rather than the low cost factor of production.

In terms of firm *'innate characteristics'* formal firms have significantly reduced male employment compared to their informal counterparts (regression 2, Tables 3 and Tables 1-2 in Annex 3), in some cases reducing the absolute and percentage gender gaps (regressions 3 and 6). Indeed, over a quarter (26%) of informal firms have *increased* their employment (El-Haddad and Zaki, 2022). The latter seems puzzling but has a number of possible explanations. A more likely one is that the informal sector is a survival sector. The informal sector in Egypt is labour intensive and the productivity of its participants is too low to allow them to operate in the formal sector with the additional costs of formalization (La Porta and Shleifer, 2014). Tansel and Ozdemir (2019) and El-Haddad and Gadallah (2021) demonstrate this relation for the Egyptian case. The Egyptian labour market is segmented along formal-informal lines, workers participate in informal work to escape unemployment as they are forced out of formal employment which supports the traditional dualistic view of the economy (*ibid*.). The counter cyclicality of the relation implies that contraction of the formal sector expands the informal as the only alternative way to earn a living. This counter-cyclicality argument was introduced in earlier literature on informality (cf. Fields 1975, Dickens and Lang's 1985). As a 'survival sector', the informal sector has thus provided 'helping hand employment' for 'males', the predominately hit group by the crisis in manufacturing. This result echoes the trends in the stylized facts section above (Figure 3) where the formal sector contributed to reducing the gender gap whereas the informal sector has basically been doing the opposite.

Second, exporting firms have generally increased employment, but this is more apparent in terms of percentage change in employment post-COVID (regressions 4 and 5). Shocks have improved female employment (in percentage terms) in exporting firms more than they have done so for male employees with the exception of the demand shock which very slightly improved the $\%\Delta$ in male employment post-COVID more. This could be due to the fact that the demand shock hit female dominated sectors the most, a matter that is explored further below. Also, firms located in industrial zones have increased both male and female employment but have done more so for the former. Men employment has increased by double the value female employment has increased by (Tables 3 and Tables 1-2 in Annex 3). Both these changes have not reflected in overall improvements in the gender gaps (i.e., in regressions 3 and 6).

Third, consistent with the stylized facts presented above, more generally speaking medium and larger firms have improved the gender gap in absolute and relative terms more so than did smaller firms. The declines in male employment have been in some instances four times larger than the corresponding declines for women (cf. large size coefficients in regressions 1 and 2).

Finally, in terms of firm *'behavioral traits'* more high-tech firms and to a lesser extent firms that provided worker training pre-COVID have clearly worsened the gender gap. These

firms have mostly increased their demand on *male* employment, while slightly declining that on females. So, in addition to these types of firms' enormous contribution to the gender gap (see stylized facts above), their effect post-COVID is to further entrench this gap. Again, this is not surprising as women tend to be concentrated in low-tech, traditional sectors such as clothing.

A note on the dependent variable is warranted. Ideally one would use the change in female employment share in total employment post COVID as dependent variable. This would take into account relative changes in female employment compared to those of men given a particular firm size. Nevertheless, using this dependent variable turns all results insignificant.

Heterogeneity Analysis Results

Table 4 and Tables 3-4 in Annex 3 give our first set of heterogeneous effects of other firm characteristics. The interaction of the *female dominated sectors* with the various types of shocks produced the expected results in terms of increasing the gender gaps (regressions 3 and 6, Table 4 and Tables 3-4 in Annex 3). It did so through either reducing female employment (e.g., regression 1 Table 3) or increasing male percentage change in employment (regressions 4 and 5, Table 4 and Tables 3-4 in Annex 3) without a corresponding increase for females. Demand, supply and the combined shock increased the gender gap in the two female dominated sectors of clothing and leather compared to the other non-female dominated sectors. When interacting the shocks with the female dominated sector variable it becomes clear that the worsening of the gender gap is driven by firms in female dominated sectors that are hit by the supply and combined COVID-19 shock. As a robustness check we ran the same regressions for the top 5% female dominated sectors.[12] Results remain robust if slightly weaker.

When additionally controlling for the number of informal workers we find that the higher the number of informal employees in a firm pre-COVID, the greater the increase in the number of 'male' workers compared to females post-COVID (Tables 5-7 in Annex 3, regression 2), leading to a very slight deterioration of the gender gap (Tables 6-7 in Annex 3, regression 3). Nevertheless, for firms with informal workers that have additionally experienced a shock (i.e. the interaction term) this effect more or less cancels this employment effect out, even though that the overall estimated effects of informality are not substantially large. There is no contradiction here with the fact that the informal sector, which is made up strictly of informal firms, is a 'survival sector' that has provided 'helping hand employment' to the type of employment harder hit by the pandemic.

Propensity Score Matching

The propensity score matching results (Table 5) basically confirm the baseline results in tables.[13] The COVID shock, be it a demand one, a supply one, or combined has led to a decline in overall employment and in the percentage change of employment. This is true of both sexes. Nevertheless, the reduction in 'male' employment has been on average over three times greater than that for women. This relative weaker direct employment impact on women is primarily due to the very limited number of women in employment in manufacturing to start

[12] In the EIFBS data these are leather, clothing, furniture and wood products, textiles, other manufacturing and food.

[13] The balance tests for the covariates are provided in Tables 8-9 in Annex 3. In all cases, the standardized mean differences (i.e., median bias) are less than the recommended threshold of 5%.

with. These results are consistent with results from other Arab Countries (cf. UN Women 2020, ILO 2020)

6. Discussion and Conclusion

The pandemic has chiefly hurt women's employment. This evidence is coming predominantly from developed high-income countries (Collins et al. 2021; Hupkau and Petrongolo 2020; Hipp and Buenning 2021; Alon et al. 2021). Equally, the available evidence from low- and middle-income countries suggests that women have tended to exit paid employment in response to the pandemic (Miguel and Mobarak 2021; Viollaz et al. 2022).

In contrast, in Egypt the COVID-19 demand and supply shocks have led to an improvement in the gender employment gap in manufacturing. That is, there had been a small decrease in both male and female employment post COVID, but this decline has been more pronounced for men. This relative weaker direct employment impact on women is primarily due to the very limited number of women in manufacturing to start with. Female participation in industry is generally below 15% throughout the Arab region. Egypt, however, lies even way below this poor regional average. With just 7% of total female participation in industry, Egypt occupies the bottom position compared to its oil importing counterparts such as Tunisia, Joran or even agriculture dominated Morocco. In fact, Egypt's position is quite comparable to the average for the group of oil exporting countries. Within manufacturing, women participation represents just 18.2% of total employment in the sector. The COVID-19 pandemic has only slightly increased this rate to 18.44%, thereby also very slightly improving the gender gap.

There is a substantial literature showing that female labor force participation is lowest in the Arab region (cf. Assaad 2009; Assaad and Kraft 2015; El-Haddad 2011 and 2016). For years, women were either forced out of the labor market, or have already selected themselves out on account of the difficulties of reconciling private sector employment with care work (Kraft et al. 2022). So, whilst the results reported in this paper show improvements in the gender employment gap, this result is potentially basically driven by the underlying history of poor female-participation in the labor market, especially in manufacturing in the first place. This poor participation is potentially a direct outcome of two factors.

First are factors at home, including stereotyping, social norms and discrimination. Stereotyping extend from social norms of men being the main bread earner in the family (Hoodfar 1997; El-Feki et al. 2017) to types of 'socially suitable' jobs for women as such (El-Haddad 2009b; Barsoum and Abdalla 2022), but also for married women or women with children (Ehab 2022). Outright discrimination in offering job opportunities for women is also well documented in the literature (see most recently Osman et al. 2021) with implications on returns to education relative to those to marriage. Equally, gender wage discrimination (El-Haddad 2016) is potentially another factor that explains the overall result of improvements in the gender gap in Egyptian manufacturing. Men are high cost employment compared to women, so it is economically viable to shed male employment in order to cope with the crisis rather than the female low cost factor of production.

Second are external factors. Women are mostly concentrated in the textiles and clothing sectors. The phase-out of the Multi-fibre Agreement (MFA) in 2005 has subjected the sector to fierce competition from countries such as China, India, Bangladesh, Pakistan, Indonesia that were earlier quota constrained under the former MFA (El-Haddad 2016). This development has

reduced both male and female employment in the sector; as well as female wages (El-Haddad 2016). The financial crisis of 2008 exacerbated this trend.

There are, however, some nuances in the results driven by our heterogeneity analysis. In terms of firm 'innate characteristics', exporting firms and firms in industrial zones have on average increased both types of employment post-COVID. But these changes were not as pronounced as to affect the ensuing gender gap.

Inconsistent with the global evidence, the informal sector has provided 'helping hand employment' but solely for men – the group hardest hit in the manufacturing sector. Being a 'survival' sector, the counter cyclicality of the relation meant that contraction of the formal sector expands the informal as the only alternative way to earn a living. The sector has thus contributed to a worsening of the gender gap during the pandemic. This is consistent with the fact that the informal sector in Egypt has been gradually 'de-feminized' since the country's structural reforms in the 70s (Assaad 2002), that together with the aforementioned external factors have increasingly transformed Egypt into a rentier economy.

Two more types of firms have worsened the gender gap in manufacturing, namely firms that have adopted technology and those that have provided worker training prior to the pandemic. These 'behavioral traits' have pushed male employment up while not doing the same for female employment. One could say that these traits harm women employment twice over. First, through their huge contribution to the gender gap to start with[14]; and second through entrenching the gap further post-COVID. Again, this result is also driven by the fact that women are concentrated in low-tech traditional sectors such as clothing and leather. Firms experiencing demand, supply and the combined shocks in these two sectors have as expected also contributed to a worsening of the gender gap.

These results bring us back to the underlying female employment structure in Egypt. This structure is characterized by poor female labor market participation, concentration in the public sector and in care sectors such as health and education, retail and other services but not in industry or manufacturing. Within manufacturing female employment is concentrated in low-tech, traditional and formal[15] firms. Reversing these trends can only be a very gradual process through changes in perception, social norms and regulation to support women employment in those sectors. But these results also bring us back to generally weak industrial structure in Egypt and the dominance of the non-tradable sector and the rentier state thriving on crony capitalism and slim decent employment opportunities outside these sectors.

There is a caveat to this analysis. The data used to undertake this analysis captures the gender gap of those firms still in operation. Employment loss in firms that have exited the market already cannot be accounted for. Evidence exists that in the care sectors these exits have disproportionately hit women the most. Nevertheless, this evidence is not conclusive (Assaad et al. 2022; Barsoum and Majbouri 2021; Krafft et al. 2022, Marouani et al 2022). But given the poor female participation in manufacturing in Egypt one would expect the results to remain robust and fairly similar to those reported in this paper.

[14] More so to the 'absolute' gender gap as large firms may actually

[15] Obviously it is better if employment is predominately formal, but women have also been sort of discriminated against even in that poorly and increasingly security apparatus regulated sector (cf. El-Haddad, 2020; Assaad and Arntz, 2005).

Table 3: Baseline: COVID-19 demand shock effect on gender employment gap

	(1)	(2)	(3)	(4)	(5)	(6)
	Δ female emp. AC	Δ male emp. AC	gender emp. Δ AC	%Δ male emp AC	%Δ female emp. AC	gender difference in % Δ in emp. AC (M-F)
Demand shock	-0.674*	-2.95***	-2.276***	-0.235***	-0.106***	-0.123**
	(0.348)	(0.755)	(0.802)	(0.0510)	(0.0404)	(0.0484)
Formal	-0.0295	-3.328*	-3.298	-0.169	0.0384	-0.207
	(0.363)	(2.001)	(2.020)	(0.131)	(0.0475)	(0.134)
Export status BC	0.968	-3.011	-3.978	0.139***	0.115***	0.0209
	(1.280)	(2.964)	(3.083)	(0.0472)	(0.0344)	(0.0465)
Medium size	-0.635**	-3.43***	-2.794***	-0.0638	-0.126***	0.0603
	(0.256)	(0.954)	(0.968)	(0.0599)	(0.0476)	(0.0608)
Large size	-2.75***	-10.95***	-8.194***	-0.164**	-0.123***	-0.0484
	(0.593)	(1.894)	(1.847)	(0.0663)	(0.0465)	(0.0611)
Private	1.227	-1.105	-2.332	-0.0262	0.0202	-0.0550
	(1.015)	(2.008)	(1.824)	(0.0677)	(0.0496)	(0.0584)
Ln(age)	0.0206	-0.213	-0.234	-0.0132	-0.0222	0.0105
	(0.140)	(0.571)	(0.566)	(0.0306)	(0.0190)	(0.0278)
Indus. Zone	0.709*	1.464*	0.756	0.0277	0.0442	-0.0103
	(0.368)	(0.884)	(0.916)	(0.0544)	(0.0429)	(0.0552)
Female manager	-0.645	-1.274	-0.629	0.0379	0.00325	0.0309
	(0.656)	(1.348)	(1.370)	(0.666)	(0.0378)	(1.332)
Technology	-0.436	2.560**	2.996**	0.145**	0.0428	0.110**
	(0.404)	(1.236)	(1.225)	(0.0584)	(0.0385)	(0.0545)
R & D	0.803	1.729	0.926	0.0266	-0.0557	0.0809
	(0.653)	(1.459)	(1.496)	(0.0651)	(0.0443)	(0.0624)
Good manag. practices	0.186	-0.478	-0.664	-0.0119	0.0105	-0.0241
	(0.354)	(0.791)	(0.837)	(0.0579)	(0.0645)	(0.0616)
Training	-0.0394	1.266	1.306	0.199***	0.00408	0.201***
	(0.278)	(0.882)	(0.915)	(0.0580)	(0.0521)	(0.0626)
Constant	-1.083	5.129	6.212*	1.935***	2.045***	-0.122
	(0.989)	(3.387)	(3.326)	(0.176)	(0.0891)	(0.171)
Gov. dummies	Yes	Yes	Yes	Yes	Yes	Yes
Sector dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,143	2,143	2,143	2,142	2,130	2,129
R-squared	0.049	0.067	0.052	0.214	0.199	0.173

*Demand shock is the sum of indicators of reported decline in quantity demanded and in export demand value. Gender gap is the change in the difference of the number of male and female employees after COVID (Δ Male employment - Δ Female employment). Weights are used. The method of estimation is ordinary least squares with Huber-robust standard errors (reported in parentheses). Significantly different from zero at *10% significance, **5% significance level, ***1% significance level.

Table 4: Heterogeneity: COVID-19 demand shock effect on gender employment gap by sector – top 2%

	(1)	(2)	(3)	(4)	(5)	(6)
	Δ female emp. AC	Δ male emp. AC	gender emp. Δ AC	%Δ male emp AC	%Δ female emp. AC	gender difference in % Δ in emp. AC (M-F)
Demand shock	-0.457*	-3.768***	-3.311***	-0.270***	-0.0789**	-0.183***
	(0.254)	(0.914)	(0.923)	(0.0595)	(0.0388)	(0.0537)
Female sector (top 2%)	-1.737	-0.568	1.169	-0.200**	-0.125*	-0.0486
	(2.075)	(2.506)	(3.204)	(0.0909)	(0.0667)	(0.0769)
Demand shock x female sector	-0.228	0.104	0.332	0.255**	-0.00331	0.230**
	(2.120)	(2.705)	(3.403)	(0.103)	(0.0808)	(0.111)
Formal	0.0694	-1.976	-2.045	-0.193	0.0387	-0.232
	(0.333)	(1.272)	(1.294)	(0.163)	(0.0438)	(0.163)
Export status BC	0.924	-2.319	-3.242	0.0990**	0.0877***	0.00759
	(1.252)	(2.899)	(3.010)	(0.0463)	(0.0297)	(0.0465)
Medium size	-0.823***	-4.187***	-3.364**	-0.0136	-0.133**	0.119*
	(0.290)	(1.307)	(1.332)	(0.0657)	(0.0525)	(0.0662)
Large size	-2.717***	-12.14***	-9.425***	-0.110	-0.120**	0.00194
	(0.584)	(1.822)	(1.774)	(0.0680)	(0.0484)	(0.0624)
Private	1.450	-1.481	-2.932	0.0261	0.0533	-0.0350
	(1.006)	(2.018)	(1.827)	(0.0703)	(0.0521)	(0.0571)
Ln(age)	-0.00572	-0.113	-0.107	-0.0161	-0.0269	0.0122
	(0.171)	(0.636)	(0.634)	(0.0339)	(0.0233)	(0.0290)
Indus. Zone	0.821**	2.041*	1.220	0.0144	0.0572	-0.0359
	(0.357)	(1.127)	(1.158)	(0.0582)	(0.0481)	(0.0638)
Female manager	-0.784	-0.857	-0.0724	0.0305	-0.0151	0.0423
	(0.648)	(1.317)	(1.339)	(0.0546)	(0.0355)	(0.0610)
Technology	-0.163	2.551**	2.714***	0.179**	0.0789	0.107**
	(0.398)	(1.037)	(1.038)	(0.0716)	(0.0516)	(0.0527)
R & D	1.158*	2.346*	1.188	0.0374	-0.0359	0.0721
	(0.649)	(1.379)	(1.429)	(0.0734)	(0.0526)	(0.0629)
Good manag. practices	-0.161	-0.555	-0.394	-0.0167	-0.0191	0.00161
	(0.372)	(0.793)	(0.864)	(0.0700)	(0.0707)	(0.0689)
Training	0.00914	1.343	1.334	0.201***	0.0146	0.191***
	(0.306)	(0.995)	(1.040)	(0.0623)	(0.0560)	(0.0666)
Constant	-0.806	3.911	4.717	1.979***	2.096***	-0.131
	(0.983)	(3.239)	(3.213)	(0.208)	(0.108)	(0.192)
Gov. dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,143	2,143	2,143	2,142	2,130	2,129
R-squared	0.038	0.054	0.038	0.175	0.159	0.143

*Demand shock is the sum of indicators of reported decline in quantity demanded and in export demand value. Gender gap is the change in the difference of the number of male and female employees after COVID (Δ Male employment - Δ Female employment). Weights are used. The method of estimation is ordinary least squares with Huber-robust standard errors (reported in parentheses). Significantly different from zero at *10% significance, **5% significance level, ***1% significance level.

Table 5: effect of COVID-19 shock on gender employment gab – propensity score matching with matched pair dummies

	(1)	(2)	(3)	(4)	(5)	(6)
	Δ female emp.	Δ male emp.	Gender gab	% Δ male emp	% Δ female emp.	gender difference in % Δ in emp. (M-F)
Demand shock	-2.588***	-9.002***	-6.414***	-0.217***	-0.0790***	-0.0994***
	(0.670)	(1.450)	(1.536)	(0.0188)	(0.0129)	(0.0192)
Gov. dummies	Yes	Yes	Yes	Yes	Yes	Yes
Sectors dummies	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Matched pair dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,894	2,894	2,894	2,894	2,876	2,876

*Demand shock is the sum of indicators of reported decline in quantity demanded and in export demand value. Gender gap is the change in the difference of the number of male and female employees after COVID (Δ Male employment - Δ Female employment). *Ordinary least squares with Huber-robust standard errors (reported in parentheses). Significantly different from zero at *10% significance, **5% significance level, ***1% significance level.

	(1)	(2)	(3)	(4)	(5)	(6)
	Δ female emp.	Δ male emp.	Gender gab	% Δ male emp	% Δ female emp.	gender difference in % Δ in emp. (M-F)
Supply shock	-2.352***	-7.724***	-5.372***	-0.196***	-0.0667***	-0.127***
	(0.601)	(1.490)	(1.558)	(0.0190)	(0.0131)	(0.0197)
Gov. dummies	Yes	Yes	Yes	Yes	Yes	Yes
Sectors dummies	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Matched pair dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,986	2,986	2,986	2,986	2,964	2,964

*Supply shock is the sum of indicators of reported decline in production value and capacity utilization. Gender gap is the change in the difference of the number of male and female employees after COVID (Δ Male employment - Δ Female employment). *Ordinary least squares with Huber-robust standard errors (reported in parentheses). Significantly different from zero at *10% significance, **5% significance level, ***1% significance level.

	(1)	(2)	(3)	(4)	(5)	(6)
	Δ female emp.	Δ male emp.	Gender gab	% Δ male emp	% Δ female emp.	gender difference in % Δ in emp. (M-F)
Demand + supply shock	-2.004***	-8.310***	-6.306***	-0.207***	-0.0819***	-0.0896***
	(0.482)	(1.272)	(1.300)	(0.0179)	(0.0121)	(0.0180)
Gov. dummies	Yes	Yes	Yes	Yes	Yes	Yes
Sectors dummies	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Matched pair dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,143	2,143	2,143	2,130	2,142	2,130

Gender gap is the change in the difference of the number of male and female employees after COVID (Δ Male employment - Δ Female employment). *Ordinary least squares with Huber-robust standard errors (reported in parentheses). Significantly different from zero at *10% significance, **5% significance level, ***1% significance level.

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Annex 1

More on Sampling:

We oversampled by selecting a sample of 3,149 establishments in order to be sure to obtain the target number of 2,200. First, the sample was allocated proportionally among the three regions (urban governorates, lower Egypt, and upper Egypt), which cover 99.2% of industrial establishments in Egypt. A systematic random sample was drawn to select three governorates from each region using Probability Proportional to Size (PPS). The industrial establishments in each region were allocated among governorates proportional to their size (measured by employment). Next, a systematic random sample was used to select the establishments in each governorate after sorting the establishments according to the number of employees and economic activity at the 4 digits level.

Annex 2

Table 1: summary statistics

	N	Mean	SD	Min	Max
Independent Variables					
Female employment BC	2193	14.83	70.37	0	2973
Female employment AC	2168	14.14	69.82	0	2937
$\underline{\Delta}$ female employment AC	2167	-0.80	7.51	-300	340
Male employment BC	2193	65	238	0	12500
Male employment AC	2168	62	235	0	12500
$\underline{\Delta}$ male employment AC	2167	-3.41	19.07	-810	400
Gender absolute employment $\underline{\Delta}$ AC	2167	-2.61	19	-810	400
% change in female empl. AC (cont.)	1453	-0.04	0.22	-1	4
% change in male empl. AC (continuous)	2158	-0.09	0.24	-0.98	1.5
% $\underline{\Delta}$ in male employment AC (cat)	2166	1.78	0.56	1	3
% $\underline{\Delta}$ in female employment AC (cat)	2154	1.91	0.37	1	3
Gender percentage employment $\underline{\Delta}$ AC	2153	-0.12	0.58	-2	2

	N	Mean	SD	Min	Max
Demand shock	2182	1	0	0	2
Quantity demanded shock	2197	0.72	0.45	0	1
Export value shock	2182	0	0	0	1
Supply shock	2197	1.19	0.84	0	2
Production value shock	2197	0.54	0.5	0	1
Capacity utilization shock	2197	0.65	0.48	0	1
Combined demand and supply shock	2182	1.92	1.17	0	4
Formal Firm	2196	0.91	0.28	0	1
Exporting Firm BC	2190	0.03	0.16	0	1
Small firms	2193	0.51	0.5	0	1
Medium firms	2193	0.33	0.47	0	1
Large firms	2193	0.17	0.37	0	1
Sector ownership	2198	0.96	0.19	0	1
Age of firm (log)	2189	2.72	0.85	0	5.30
Industrial zone	2197	0.31	0.46	0	1
Female in top managment	2196	0.1	0.3	0	1
Behavioural Traits					
Use of technology	2195	0.28	0.45	0	1
R & D (innovation)	2196	0.12	0.32	0	1
Management good practices	2196	0.42	0.49	0	1
Providing worker training	2194	0.6	0.49	0	1
Governorates					
Cairo	2198	0.18	0.39	0	1
Alexandria	2198	0.09	0.28	0	1
Port Said	2198	0	0.01	0	1
Suez	2198	0.01	0.09	0	1
Dakahlia	2198	0	0.03	0	1
Sharqia	2198	0.11	0.31	0	1
Qalyubia	2198	0.24	0.43	0	1
Kafr El Sheikh	2198	0	0.02	0	1
Gharbia	2198	0.14	0.35	0	1
Behira	2198	0	0.02	0	1
Ismailia	2198	0	0.03	0	1
Giza	2198	0.18	0.38	0	1
Bani Sweif	2198	0.01	0.12	0	1
Minya	2198	0.04	0.2	0	1

Source: author's calculation based on EIFBS.

Annex 3: Further Results

Table 1: Baseline: COVID-19 supply shock effect on gender employment gap

	(1)	(2)	(3)	(4)	(5)	(6)
	Δ female emp. AC	Δ male emp. AC	gender emp. Δ AC	%Δ male emp AC	%Δ female emp. AC	gender difference in % Δ in emp. AC (M-F)
Supply shock	-0.681***	-2.287***	-1.607***	-0.107***	-0.0620**	-0.0391
	(0.169)	(0.528)	(0.541)	(0.0322)	(0.0291)	(0.0337)
Formal	-0.115	-3.715*	-3.599*	-0.202	0.0239	-0.225*
	(0.363)	(2.034)	(2.042)	(0.129)	(0.0478)	(0.134)
Export status BC	0.589	-4.312	-4.901	0.0241	0.0597**	-0.0379
	(1.220)	(2.889)	(2.998)	(0.0388)	(0.0259)	(0.0413)
Medium size	-0.724***	-3.756***	-3.032***	-0.0842	-0.136***	0.0512
	(0.256)	(0.964)	(0.976)	(0.0615)	(0.0480)	(0.0605)
Large size	-2.955***	-11.59***	-8.632***	-0.192***	-0.140***	-0.0574
	(0.607)	(1.856)	(1.827)	(0.0668)	(0.0459)	(0.0600)
Private	1.392	-0.687	-2.079	-0.0284	0.0251	-0.0650
	(0.999)	(2.039)	(1.834)	(0.0714)	(0.0488)	(0.0606)
Ln(age)	0.0474	-0.102	-0.149	-0.00502	-0.0185	0.0146
	(0.147)	(0.561)	(0.553)	(0.0318)	(0.0198)	(0.0281)
Indus. Zone	0.738**	1.488*	0.751	0.0256	0.0444	-0.0129
	(0.355)	(0.883)	(0.918)	(0.0560)	(0.0431)	(0.0556)
Female manager	-0.553	-1.018	-0.466	0.0490	0.0102	0.0342
	(0.646)	(1.356)	(1.383)	(0.0565)	(0.0388)	(0.0629)
Technology	-0.518	2.367**	2.885**	0.144**	0.0394	0.112**
	(0.417)	(1.206)	(1.205)	(0.0618)	(0.0430)	(0.0533)
R & D	0.688	1.455	0.766	0.0284	-0.0589	0.0875
	(0.624)	(1.444)	(1.473)	(0.0654)	(0.0429)	(0.0628)
Good manag. practices	0.314	-0.0193	-0.333	0.0109	0.0234	-0.0147
	(0.332)	(0.815)	(0.858)	(0.0571)	(0.0593)	(0.0615)
Training	-0.0274	1.330	1.358	0.212***	0.00859	0.208***
	(0.266)	(0.875)	(0.911)	(0.0586)	(0.0510)	(0.0636)
Constant	-0.783	6.008*	6.791**	1.959***	2.064***	-0.119
	(1.005)	(3.489)	(3.419)	(0.179)	(0.0903)	(0.173)
Gov. dummies	Yes	Yes	Yes	Yes	Yes	Yes
Sector dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,156	2,156	2,156	2,155	2,143	2,142
R-squared	0.052	0.070	0.053	0.205	0.201	0.169

*Supply shock is the sum of indicators of reported decline in production value and capacity utilization. Gender gap is the change in the difference of the number of male and female employees after COVID (Δ Male employment - Δ Female employment). Weights are used. The method of estimation is ordinary least squares with Huber-robust standard errors (reported in parentheses). *Significantly different from zero at *10% significance, **5% significance level, ***1% significance level.

Table 2: Baseline: COVID-19 combined shock effect on gender employment gap

	(1)	(2)	(3)	(4)	(5)	(6)
	Δ female emp. AC	**Δ male emp. AC**	**gender emp. Δ AC**	**%Δ male emp AC**	**%Δ female emp. AC**	**gender difference in % Δ in emp. AC (M-F)**
Demand + supply shock	-0.443***	-1.594***	-1.151***	-0.0898***	-0.0472**	-0.0385*
	(0.117)	(0.350)	(0.358)	(0.0214)	(0.0190)	(0.0230)
Formal	-0.0547	-3.497*	-3.442*	-0.189	0.0306	-0.219
	(0.363)	(2.024)	(2.033)	(0.130)	(0.0469)	(0.134)
Export status BC	0.905	-3.525	-4.430	0.0729*	0.0891***	-0.0201
	(1.257)	(2.945)	(3.063)	(0.0409)	(0.0279)	(0.0433)
Medium size	-0.683***	-3.629***	-2.945***	-0.0786	-0.133***	0.0529
	(0.258)	(0.955)	(0.968)	(0.0610)	(0.0483)	(0.0604)
Large size	-2.882***	-11.40***	-8.515***	-0.188***	-0.136***	-0.0582
	(0.597)	(1.869)	(1.832)	(0.0672)	(0.0466)	(0.0602)
Private	1.389	-0.643	-2.032	-0.0157	0.0294	-0.0560
	(1.005)	(2.041)	(1.840)	(0.0704)	(0.0485)	(0.0600)
Ln(age)	0.0327	-0.154	-0.187	-0.00778	-0.0200	0.0135
	(0.145)	(0.567)	(0.559)	(0.0315)	(0.0196)	(0.0280)
Indus. Zone	0.729**	1.517*	0.788	0.0280	0.0451	-0.0111
	(0.359)	(0.883)	(0.919)	(0.0553)	(0.0430)	(0.0558)
Female manager	-0.580	-1.051	-0.472	0.0488	0.00933	0.0350
	(0.654)	(1.352)	(1.380)	(0.0564)	(0.0384)	(0.0627)
Technology	-0.504	2.361*	2.865**	0.140**	0.0382	0.109**
	(0.413)	(1.214)	(1.210)	(0.0602)	(0.0409)	(0.0536)
R & D	0.690	1.408	0.718	0.0194	-0.0621	0.0816
	(0.636)	(1.448)	(1.481)	(0.0662)	(0.0437)	(0.0631)
Good manag. practices	0.264	-0.186	-0.449	0.00584	0.0199	-0.0158
	(0.339)	(0.810)	(0.854)	(0.0573)	(0.0610)	(0.0618)
Training	-0.0571	1.253	1.310	0.205***	0.00508	0.205***
	(0.267)	(0.877)	(0.912)	(0.0576)	(0.0505)	(0.0632)
Constant	-0.858	5.846*	6.704**	1.963***	2.063***	-0.113
	(0.998)	(3.468)	(3.401)	(0.176)	(0.0899)	(0.171)
Gov. dummies	Yes	Yes	Yes	Yes	Yes	Yes
Sector dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,143	2,143	2,143	2,142	2,130	2,129
R-squared	0.051	0.070	0.053	0.213	0.203	0.171

Gender gap is the change in the difference of the number of male and female employees after COVID (Δ Male employment - Δ Female employment). Weights are used. The method of estimation is ordinary least squares with Huber-robust standard errors (reported in parentheses). Significantly different from zero at *10% significance, **5% significance level, ***1% significance level.

Table 3: Heterogeneity: COVID-19 supply shock effect on gender employment gap by sector – top 2%

	(1)	(2)	(3)	(4)	(5)	(6)
	Δ female emp. AC	Δ male emp. AC	gender emp. Δ AC	%Δ male emp AC	%Δ female emp. AC	gender difference in % Δ in emp. AC (M-F)
Supply shock	-0.455***	-2.774***	-2.319***	-0.130***	-0.0414	-0.0799**
	(0.145)	(0.698)	(0.705)	(0.0399)	(0.0288)	(0.0372)
Female sector (top 2%)	-0.263	-2.411	-2.148	-0.187*	-0.0519	-0.118
	(0.553)	(1.490)	(1.492)	(0.113)	(0.0509)	(0.133)
Supply shock x female sector	-1.416***	1.065	2.481*	0.136*	-0.0715	0.196**
	(0.541)	(1.337)	(1.394)	(0.0801)	(0.0600)	(0.0992)
Formal	-0.226	-2.603**	-2.377*	-0.220	0.0152	-0.236
	(0.357)	(1.324)	(1.313)	(0.162)	(0.0461)	(0.161)
Export status BC	0.574	-3.951	-4.525	-0.00664	0.0437*	-0.0543
	(1.204)	(2.840)	(2.944)	(0.0373)	(0.0246)	(0.0402)
Medium size	-0.772***	-4.356***	-3.584***	-0.0369	-0.134**	0.0976
	(0.294)	(1.307)	(1.328)	(0.0677)	(0.0540)	(0.0629)
Large size	-2.829***	-12.71***	-9.885***	-0.147**	-0.130***	-0.0215
	(0.604)	(1.795)	(1.764)	(0.0697)	(0.0480)	(0.0598)
Private	1.693*	-1.108	-2.802	0.0113	0.0598	-0.0588
	(1.007)	(2.018)	(1.809)	(0.0672)	(0.0504)	(0.0577)
Ln(age)	0.115	-0.103	-0.218	-0.0170	-0.0186	0.00340
	(0.181)	(0.657)	(0.659)	(0.0323)	(0.0230)	(0.0276)
Indus. Zone	0.942***	2.120*	1.179	0.00486	0.0619	-0.0501
	(0.341)	(1.100)	(1.142)	(0.0589)	(0.0486)	(0.0630)
Female manager	-0.699	-0.499	0.200	0.0483	-0.00862	0.0527
	(0.637)	(1.337)	(1.359)	(0.0555)	(0.0366)	(0.0624)
Technology	-0.217	2.392**	2.609**	0.181**	0.0774	0.111**
	(0.383)	(1.014)	(1.019)	(0.0821)	(0.0590)	(0.0526)
R & D	0.939	1.980	1.041	0.0397	-0.0454	0.0849
	(0.624)	(1.345)	(1.386)	(0.0743)	(0.0486)	(0.0630)
Good manag. practices	-0.0116	0.120	0.132	0.0127	-0.00492	0.0162
	(0.335)	(0.844)	(0.913)	(0.0695)	(0.0658)	(0.0675)
Training	0.0467	1.421	1.374	0.211***	0.0194	0.196***
	(0.292)	(0.968)	(1.015)	(0.0604)	(0.0547)	(0.0638)
Constant	-0.768	5.609	6.376*	2.034***	2.097***	-0.0807
	(1.021)	(3.598)	(3.582)	(0.198)	(0.103)	(0.187)
Gov. dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,156	2,156	2,156	2,155	2,143	2,142
R-squared	0.045	0.059	0.040	0.165	0.166	0.142

Supply shock is the sum of indicators of reported decline in production value and capacity utilization. Gender gap is the change in the difference of the number of male and female employees after COVID (Δ Male employment - Δ Female employment). Weights are used. The method of estimation is ordinary least squares with Huber-robust standard errors (reported in parentheses). Significantly different from zero at *10% significance, **5% significance level, ***1% significance level.

Table 4: Heterogeneity: COVID-19 combined shock effect on gender empl. gap by sector – top 2%

	(1)	(2)	(3)	(4)	(5)	(6)

	Δ female emp. AC	Δ male emp. AC	gender emp. Δ AC	%Δ male emp AC	%Δ female emp. AC	gender difference in % Δ in emp. AC (M-F)
Demand + supply shock	-0.283***	-1.906***	-1.623***	-0.104***	-0.0317*	-0.0669***
	(0.1000)	(0.459)	(0.462)	(0.0245)	(0.0163)	(0.0251)
Female sector (top 2%)	0.413	-1.475	-1.888	-0.239*	-0.0124	-0.202
	(0.879)	(2.221)	(2.292)	(0.131)	(0.0703)	(0.160)
Shock x female sector	-1.118**	0.331	1.449	0.112**	-0.0576	0.159**
	(0.437)	(1.160)	(1.204)	(0.0570)	(0.0466)	(0.0744)
Formal	-0.128	-2.383*	-2.255*	-0.209	0.0220	-0.232
	(0.350)	(1.307)	(1.296)	(0.164)	(0.0450)	(0.162)
Export status BC	0.899	-3.099	-3.998	0.0367	0.0685***	-0.0370
	(1.239)	(2.892)	(3.006)	(0.0399)	(0.0254)	(0.0432)
Medium size	-0.784***	-4.219***	-3.434***	-0.0271	-0.133**	0.106*
	(0.290)	(1.290)	(1.310)	(0.0666)	(0.0538)	(0.0632)
Large size	-2.815***	-12.50***	-9.685***	-0.136*	-0.129***	-0.0126
	(0.606)	(1.808)	(1.769)	(0.0694)	(0.0492)	(0.0599)
Private	1.674*	-0.972	-2.645	0.0282	0.0634	-0.0448
	(1.008)	(2.028)	(1.819)	(0.0679)	(0.0504)	(0.0577)
Ln(age)	0.0872	-0.108	-0.195	-0.0196	-0.0207	0.00302
	(0.179)	(0.655)	(0.655)	(0.0325)	(0.0232)	(0.0276)
Indus. Zone	0.901**	2.181*	1.280	0.0109	0.0615	-0.0437
	(0.353)	(1.116)	(1.159)	(0.0581)	(0.0485)	(0.0632)
Female manager	-0.723	-0.580	0.144	0.0448	-0.00965	0.0506
	(0.646)	(1.330)	(1.354)	(0.0549)	(0.0361)	(0.0619)
Technology	-0.202	2.370**	2.571**	0.176**	0.0768	0.106**
	(0.390)	(1.010)	(1.017)	(0.0782)	(0.0563)	(0.0524)
R & D	0.977	1.940	0.963	0.0323	-0.0461	0.0779
	(0.644)	(1.354)	(1.406)	(0.0751)	(0.0503)	(0.0632)
Good manag. practices	-0.0871	-0.129	-0.0421	0.00474	-0.00993	0.0139
	(0.349)	(0.830)	(0.905)	(0.0700)	(0.0681)	(0.0682)
Training	0.0136	1.347	1.333	0.204***	0.0165	0.193***
	(0.293)	(0.973)	(1.018)	(0.0599)	(0.0545)	(0.0640)
Constant	-0.824	5.248	6.072*	2.043***	2.099***	-0.0739
	(1.013)	(3.513)	(3.490)	(0.199)	(0.106)	(0.185)
Gov. dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,143	2,143	2,143	2,142	2,130	2,129
R-squared	0.043	0.059	0.040	0.174	0.167	0.146

Gender gap is the change in the difference of the number of male and female employees after COVID (Δ Male employment - Δ Female employment). Weights are used. The method of estimation is ordinary least squares with Huber-robust standard errors (reported in parentheses). Significantly different from zero at *10% significance, **5% significance level, ***1% significance level.

Table 5: Heterogeneity: COVID-19 demand shock effect on gender employment gap by informality

	(1)	(2)	(3)	(4)	(5)	(6)

	Δ female emp.	Δ male emp.	Gender gab	% Δ male emp.	% Δ female emp.	gender difference in % Δ in emp. (M-F)
Demand shock	-0.593*	-2.479***	-1.886**	-0.239***	-0.107**	-0.126**
	(0.347)	(0.768)	(0.809)	(0.0520)	(0.0420)	(0.0491)
No. of informal workers	0.00493	0.0115*	0.00656	-0.000330	-2.81e-05	-0.000306
	(0.00374)	(0.00637)	(0.00655)	(0.000235)	(0.000130)	(0.000243)
Demand shock x informal workers	-0.00752	-0.0401*	-0.0325	0.000390	5.99e-05	0.000309
	(0.00512)	(0.0205)	(0.0204)	(0.000278)	(0.000190)	(0.000278)
Formal	-0.0214	-3.222	-3.201	-0.170	0.0383	-0.207
	(0.366)	(2.016)	(2.033)	(0.131)	(0.0475)	(0.134)
Export status BC	0.965	-3.036	-4.001	0.139***	0.115***	0.0210
	(1.281)	(2.969)	(3.087)	(0.0472)	(0.0345)	(0.0465)
Medium size	-0.626**	-3.360***	-2.734***	-0.0642	-0.126***	0.0601
	(0.256)	(0.962)	(0.975)	(0.0600)	(0.0477)	(0.0608)
Large size	-2.742***	-10.43***	-7.692***	-0.162**	-0.124***	-0.0458
	(0.612)	(1.862)	(1.809)	(0.0667)	(0.0468)	(0.0615)
Private	1.204	-1.051	-2.255	-0.0241	0.0202	-0.0528
	(1.017)	(2.002)	(1.817)	(0.0678)	(0.0496)	(0.0584)
Ln(age)	0.0145	-0.290	-0.305	-0.0131	-0.0222	0.0105
	(0.141)	(0.573)	(0.569)	(0.0306)	(0.0190)	(0.0279)
Indus. Zone	0.694*	1.434	0.740	0.0287	0.0443	-0.00936
	(0.369)	(0.882)	(0.915)	(0.0544)	(0.0430)	(0.0554)
Female manager	-0.643	-1.277	-0.634	0.0377	0.00325	0.0307
	(0.656)	(1.349)	(1.369)	(0.0569)	(0.0378)	(0.0625)
Technology	-0.446	2.542**	2.987**	0.146**	0.0429	0.110**
	(0.405)	(1.232)	(1.222)	(0.0585)	(0.0387)	(0.0545)
R & D	0.755	1.495	0.740	0.0292	-0.0554	0.0830
	(0.654)	(1.445)	(1.484)	(0.0648)	(0.0440)	(0.0625)
Good manag. practices	0.196	-0.434	-0.630	-0.0125	0.0104	-0.0247
	(0.356)	(0.780)	(0.827)	(0.0579)	(0.0647)	(0.0617)
Training	-0.0373	1.318	1.356	0.200***	0.00403	0.201***
	(0.280)	(0.887)	(0.920)	(0.0579)	(0.0521)	(0.0626)
Constant	-1.094	4.914	6.008*	1.935***	2.045***	-0.122
	(0.987)	(3.394)	(3.328)	(0.176)	(0.0893)	(0.172)
Gov. dummies	Yes	Yes	Yes	Yes	Yes	Yes
Sector dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,143	2,143	2,143	2,142	2,130	2,129
R-squared	0.049	0.071	0.055	0.214	0.199	0.173

*Demand shock is the sum of indicators of reported decline in quantity demanded and in export demand value. Gender gap is the change in the difference of the number of male and female employees after COVID (Δ Male employment - Δ Female employment). Weights are used. *Ordinary least squares with Huber-robust standard errors (reported in parentheses). Significantly different from zero at *10% significance, **5% significance level, ***1% significance level.

Table 6: Heterogeneity: COVID-19 supply shock effect on gender employment gap by informality

	(1)	(2)	(3)	(4)	(5)	(6)
	Δ female emp.	Δ male emp.	Gender gab	% Δ male emp.	% Δ female emp.	gender difference in % Δ in emp. (M-F)
Supply shock	-0.560***	-1.521***	-0.961*	-0.105***	-0.0601*	-0.0380
	(0.179)	(0.536)	(0.547)	(0.0333)	(0.0310)	(0.0349)
No. of informal workers	0.00765*	0.0341**	0.0264*	3.15e-05	0.000109	-6.41e-05
	(0.00427)	(0.0156)	(0.0155)	(0.000239)	(0.000170)	(0.000258)
Supply shock x informal workers	-0.0115**	-0.0729**	-0.0615*	-0.000236	-0.000179	-0.000101
	(0.00505)	(0.0329)	(0.0332)	(0.000303)	(0.000248)	(0.000307)
Formal	-0.0555	-3.266	-3.210	-0.200	0.0249	-0.224*
	(0.366)	(2.098)	(2.097)	(0.130)	(0.0485)	(0.134)
Export status BC	0.568	-4.434	-5.002*	0.0238	0.0594**	-0.0379
	(1.221)	(2.898)	(3.007)	(0.0389)	(0.0259)	(0.0414)
Medium size	-0.650**	-3.264***	-2.614**	-0.0825	-0.135***	0.0521
	(0.255)	(1.026)	(1.037)	(0.0617)	(0.0481)	(0.0609)
Large size	-2.773***	-9.988***	-7.215***	-0.184***	-0.137***	-0.0518
	(0.628)	(1.808)	(1.769)	(0.0677)	(0.0466)	(0.0611)
Private	1.381	-0.570	-1.951	-0.0271	0.0251	-0.0634
	(0.999)	(2.027)	(1.818)	(0.0715)	(0.0488)	(0.0606)
Ln(age)	0.00446	-0.420	-0.424	-0.00630	-0.0192	0.0138
	(0.142)	(0.573)	(0.568)	(0.0317)	(0.0197)	(0.0281)
Indus. Zone	0.676*	1.143	0.467	0.0248	0.0434	-0.0130
	(0.352)	(0.906)	(0.939)	(0.0563)	(0.0440)	(0.0560)
Female manager	-0.559	-1.073	-0.513	0.0487	0.0100	0.0340
	(0.645)	(1.361)	(1.384)	(0.0567)	(0.0389)	(0.0630)
Technology	-0.579	2.009	2.588**	0.143**	0.0385	0.112**
	(0.418)	(1.255)	(1.261)	(0.0619)	(0.0432)	(0.0535)
R & D	0.601	0.911	0.310	0.0268	-0.0603	0.0869
	(0.620)	(1.398)	(1.425)	(0.0653)	(0.0428)	(0.0626)
Good manag. practices	0.301	-0.109	-0.410	0.0105	0.0231	-0.0150
	(0.334)	(0.801)	(0.844)	(0.0571)	(0.0593)	(0.0615)
Training	-0.0191	1.419	1.438	0.213***	0.00876	0.209***
	(0.270)	(0.863)	(0.899)	(0.0586)	(0.0511)	(0.0635)
Constant	-0.836	5.525	6.361*	1.956***	2.063***	-0.121
	(1.003)	(3.528)	(3.451)	(0.179)	(0.0906)	(0.173)
Gov. dummies	Yes	Yes	Yes	Yes	Yes	Yes
Sector dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,156	2,156	2,156	2,155	2,143	2,142
R-squared	0.054	0.085	0.064	0.206	0.201	0.169

*Supply shock is the sum of indicators of reported decline in production value and capacity utilization. Gender gap is the change in the difference of the number of male and female employees after COVID (Δ Male employment - Δ Female employment). Weights are used. The method of estimation is ordinary least squares estimation with Huber-robust standard errors (reported in parentheses). Significantly different from zero at *10% significance, **5% significance level, ***1% significance level.

Table 7: Heterogeneity: COVID-19 combined shock effect on gender employment gap by informality

	(1)	(2)	(3)	(4)	(5)	(6)
	Δ female emp. AC	Δ male emp. AC	gender emp. Δ AC	%Δ male emp AC	%Δ female emp. AC	gender difference in % Δ in emp. AC (M-F)
Demand + supply shock	-0.375***	-1.172***	-0.797**	-0.0899***	-0.0467**	-0.0389
	(0.121)	(0.355)	(0.358)	(0.0219)	(0.0201)	(0.0237)
No. of informal workers	0.00827*	0.0356**	0.0273*	-0.000131	6.26e-05	-0.000179
	(0.00456)	(0.0148)	(0.0143)	(0.000256)	(0.000177)	(0.000272)
Shock x informal workers	-0.00627**	-0.0382**	-0.0319*	1.53e-05	-4.95e-05	4.12e-05
	(0.00299)	(0.0182)	(0.0180)	(0.000168)	(0.000135)	(0.000169)
Formal	-0.0153	-3.189	-3.174	-0.189	0.0309	-0.219
	(0.365)	(2.064)	(2.067)	(0.130)	(0.0473)	(0.134)
Export status BC	0.889	-3.613	-4.502	0.0730*	0.0889***	-0.0199
	(1.259)	(2.952)	(3.070)	(0.0410)	(0.0280)	(0.0433)
Medium size	-0.635**	-3.313***	-2.678***	-0.0785	-0.132***	0.0528
	(0.257)	(0.991)	(1.004)	(0.0612)	(0.0483)	(0.0605)
Large size	-2.770***	-10.27***	-7.497***	-0.185***	-0.135***	-0.0551
	(0.616)	(1.832)	(1.783)	(0.0680)	(0.0472)	(0.0609)
Private	1.363	-0.620	-1.982	-0.0143	0.0292	-0.0543
	(1.007)	(2.035)	(1.830)	(0.0705)	(0.0486)	(0.0601)
Ln(age)	0.00408	-0.375	-0.379	-0.00805	-0.0202	0.0133
	(0.143)	(0.574)	(0.569)	(0.0315)	(0.0195)	(0.0281)
Indus. Zone	0.683*	1.286	0.602	0.0285	0.0448	-0.0104
	(0.358)	(0.896)	(0.932)	(0.0555)	(0.0435)	(0.0561)
Female manager	-0.581	-1.077	-0.495	0.0487	0.00932	0.0349
	(0.653)	(1.360)	(1.383)	(0.0565)	(0.0384)	(0.0627)
Technology	-0.545	2.143*	2.688**	0.140**	0.0378	0.110**
	(0.415)	(1.237)	(1.237)	(0.0604)	(0.0412)	(0.0537)
R & D	0.603	0.894	0.291	0.0198	-0.0628	0.0823
	(0.634)	(1.412)	(1.445)	(0.0659)	(0.0434)	(0.0630)
Good manag. practices	0.265	-0.189	-0.454	0.00574	0.0199	-0.0160
	(0.341)	(0.790)	(0.835)	(0.0573)	(0.0611)	(0.0618)
Training	-0.0504	1.332	1.382	0.206***	0.00515	0.205***
	(0.270)	(0.871)	(0.906)	(0.0576)	(0.0505)	(0.0633)
Constant	-0.899	5.448	6.346*	1.962***	2.062***	-0.114
Formal	(0.995)	(3.492)	(3.419)	(0.177)	(0.0902)	(0.172)
Gov. dummies	Yes	Yes	Yes	Yes	Yes	Yes
Sector dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,143	2,143	2,143	2,142	2,130	2,129
R-squared	0.053	0.081	0.061	0.213	0.203	0.171

The method of estimation is ordinary least squares with Huber-robust standard errors (reported in parentheses). Significantly different from zero at *10% significance, **5% significance level, ***1% significance level.

Table 8: Balance tests for PSM regressions table – first table

Sample	Ps R2	LR chi2	p>chi2	MeanBias	MedBias	B	R	%Var
Unmatched	0.194	524.22	0	16.2	11.5	114.4*	1	0
Matched	0.033	130.58	0	5.9	3.8	42.4*	0.69	0

Sample	Ps R2	LR chi2	p>chi2	MeanBias	MedBias	B	R	%Var
Unmatched	0.194	524.22	0	16.2	11.5	114.4*	1	0
Matched	0.033	130.58	0	5.9	3.8	42.4*	0.69	0

Sample	Ps R2	LR chi2	p>chi2	MeanBias	MedBias	B	R	%Var
Unmatched	0.194	524.22	0	16.2	11.5	114.4*	1	0
Matched	0.033	130.58	0	5.9	3.8	42.4*	0.69	0

Sample	Ps R2	LR chi2	p>chi2	MeanBias	MedBias	B	R	%Var
Unmatched	0.194	522.97	0	16.2	11.5	114.3*	1	0
Matched	0.044	177.29	0	6.9	5.9	49.9*	0.96	0

Sample	Ps R2	LR chi2	p>chi2	MeanBias	MedBias	B	R	%Var
Unmatched	0.196	525.92	0	16.3	11.6	114.9*	0.99	0
Matched	0.042	169.2	0	6.7	4.8	49.1*	0.94	0

Sample	Ps R2	LR chi2	p>chi2	MeanBias	MedBias	B	R	%Var
Unmatched	0.195	524.65	0	16.3	11.6	114.8*	0.99	0
Matched	0.036	143.96	0	6	4.8	45.1*	0.92	0

Table 9: Balance tests for PSM regressions table – second table

Sample	Ps R2	LR chi2	p>chi2	MeanBias	MedBias	B	R	%Var
Unmatched	0.167	445.66	0	15.3	10	104.8*	0.98	0
Matched	0.034	140.44	0	5.9	5	43.9*	1.06	0

Sample	Ps R2	LR chi2	p>chi2	MeanBias	MedBias	B	R	%Var
Unmatched	0.167	445.66	0	15.3	10	104.8*	0.98	0
Matched	0.034	140.44	0	5.9	5	43.9*	1.06	0

Sample	Ps R2	LR chi2	p>chi2	MeanBias	MedBias	B	R	%Var
Unmatched	0.167	445.66	0	15.3	10	104.8*	0.98	0
Matched	0.034	140.44	0	5.9	5	43.9*	1.06	0

Sample	Ps R2	LR chi2	p>chi2	MeanBias	MedBias	B	R	%Var
Unmatched	0.168	445.83	0	15.4	10	104.8*	0.97	0
Matched	0.032	133.99	0	5.6	4.1	42.8*	0.95	100

Sample	Ps R2	LR chi2	p>chi2	MeanBias	MedBias	B	R	%Var
Unmatched	0.169	446.56	0	15.3	10	105.2*	0.98	0
Matched	0.03	123.49	0	4.5	4.2	41.3*	1.08	0

Sample	Ps R2	LR chi2	p>chi2	MeanBias	MedBias	B	R	%Var
Unmatched	0.169	446.66	0	15.4	10	105.2*	0.97	0
Matched	0.03	124.45	0	5.2	3.7	41.2*	0.93	0

Balance tests for PSM regressions table – third table

Sample	Ps R2	LR chi2	p>chi2	MeanBias	MedBias	B	R	%Var
Unmatched	0.177	414.33	0	15.7	11	111.3*	1.03	0
Matched	0.038	172.84	0	5.4	4.5	46.4*	1.28	0

Sample	Ps R2	LR chi2	p>chi2	MeanBias	MedBias	B	R	%Var
Unmatched	0.177	414.33	0	15.7	11	111.3*	1.03	0
Matched	0.038	172.84	0	5.4	4.5	46.4*	1.28	0

Sample	Ps R2	LR chi2	p>chi2	MeanBias	MedBias	B	R	%Var
Unmatched	0.177	414.33	0	15.7	11	111.3*	1.03	0
Matched	0.038	172.84	0	5.4	4.5	46.4*	1.28	0

Sample	Ps R2	LR chi2	p>chi2	MeanBias	MedBias	B	R	%Var
Unmatched	0.177	413.54	0	15.7	10.9	111.2*	1.02	0
Matched	0.041	186.9	0	5.6	4.4	48.3*	1.45	100

Sample	Ps R2	LR chi2	p>chi2	MeanBias	MedBias	B	R	%Var
Unmatched	0.179	416.15	0	15.7	11.2	111.8*	1.03	0
Matched	0.027	120.14	0	4.2	3.3	38.8*	1.54	100

Sample	Ps R2	LR chi2	p>chi2	MeanBias	MedBias	B	R	%Var
Unmatched	0.179	415.31	0	15.7	11.1	111.8*	1.02	0
Matched	0.031	140.58	0	5.2	4.5	42.0*	1.51	100