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## COVID-19 and Women-Led Businesses around the World

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### ABSTRACT

The impacts of crises are never gender-neutral, and the COVID-19 pandemic is no exception. Using a brand-new dataset covering 24 countries, we document that women-led businesses are subject to a higher likelihood of closure and a longer closure duration than men-led businesses during the pandemic. Women business leaders are also more pessimistic about the future than men business leaders. The disadvantages suffered by women-led businesses widen in high gender inequality economies and developing economies. Our results further indicate that finance and labor factors are likely to be the major contributors to these disadvantages. We suggest that COVID-19's policy response should not be gender-neutral.

“In contrast to previous crises, women’s employment is at greater risk than men’s.”

— International Labor Organization, United Nations, 2020

### 1. Introduction

As of January 26, 2021, the World Health Organization (WHO, 2020) reported that the coronavirus (COVID-19) pandemic has led to 99 million confirmed cases and caused 2.1 million deaths worldwide.<sup>1</sup> The ongoing COVID-19 pandemic and its resulting business closures have inflicted tremendous losses to the global economy (Goodell, 2020). Moreover, the pandemic has wreaked havoc on global businesses in the aspects of corporate finance policy outcomes (Brunnermeier and Krishnamurthy, 2020; Ellul et al., 2020), stock price fluctuations (Baker et al., 2020; Ramelli and Wagner, 2020), environmental and social policy responses (Albuquerque et al., 2020; Broadstock et al., 2020), and small business reactions (Alekseev et al., 2020).

One special concern people have is that the pandemic may have a disproportionate gendered implication in the economy. The impacts of crises are never gender-neutral, and the COVID-19 is no exception. Although every individual is facing unprecedented challenges, women are probably bearing the brunt of the economic and social fallout of the COVID pandemic (Adams-Prassl et al., 2020; Collins et al., 2020; (Cui et al., 2020)).

Social norms among developing economies tend to place a heavier caregiving burden on women. As a result of the pandemic, many countries have mandated stay-at-home orders and closed schools and small businesses. The mandates and closures may further induce gender inequality, given the evidence that women are more burdened with household responsibilities (Power, 2020). Existing studies

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<sup>1</sup> Source: WHO Corona-virus disease dashboard website. [https://covid19.who.int/?gclid=CjwKCAiAqJn9BRB0Ei-wAJ1SztfTqbKTY7auGN8lsfHZpFQj5NLSMFGil\\_mrPddCUv50KOWW\\_RLmOFhoCEBsQAvD\\_BwE](https://covid19.who.int/?gclid=CjwKCAiAqJn9BRB0Ei-wAJ1SztfTqbKTY7auGN8lsfHZpFQj5NLSMFGil_mrPddCUv50KOWW_RLmOFhoCEBsQAvD_BwE)

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have indicated that the COVID-19 pandemic indeed imposes different gender effects on workplaces. For example, women workers' productivity has dropped more than men workers', and women workers are more likely to reduce their working hours than men (Collins et al., 2020, Cui, Ding, and Zhu, 2020).

The studies discussed above have examined how COVID-19 affected women versus men workers differently. However, we have reasons to believe that the gender difference between women and men workers may not be the same between women and men business leaders (Adams and Funk, 2012; Niederle et al., 2013). To the best of our knowledge, this study is the first to examine the differential effects of COVID-19 on women versus men business leaders.

Using a brand-new dataset from the World Bank, the COVID19 follow-up enterprise surveys, we investigate whether and how women-led businesses are affected differently than men-led businesses in 24 countries. We try to answer the following four questions in this study.

First, are women-led businesses more likely to close during the pandemic than men-led businesses? The answer is yes. Specifically, our results provide a quantitative measure of the disadvantage suffered by women-led businesses. Women-led businesses are 2.6% more likely to close.

Second, are women business leaders more pessimistic about the future than men business leaders? We find that women business leaders are pessimistic about the future compared with men business leaders, which is consistent with the findings from Huang and Kisgen (2013) and Faccio et al. (2016). Our results indicate that women leaders are 2.6% more likely to predict that their businesses may go bankrupt in six months. In the discussion below, we simplify the above two findings as the gender-closure and gender-expectation relationships.

Third, how would a country's gender inequality environment or its economic development affect the gender-closure and gender-expectation relationships? Both relationships stated above are weakened (strengthened) in low (high)-gender-inequality countries. Along the same line, the two relationships are also weakened in richer countries and strengthened in poorer countries.

Last but not least, what are the possible mechanisms that help to explain the disproportionate difficulties faced by women-led businesses? Our results find no difference between women and men-led businesses in terms of obtaining government support or using internet technology. However, our results do reveal that women-led businesses are less likely to receive bank loans and are more likely to reduce the number of employees, especially the number of female employees.

We contribute to the literature in several ways. First, to the best of our knowledge, we are the first to examine whether and how women-led businesses suffered more during the pandemic than men-led businesses. Second, the gender environment plays an important role in determining the fate of women-led businesses. Third, we examine the channels through which women-led businesses are disadvantaged. The main disadvantages suffered by women-led businesses mainly come from finance and labor channels, instead of government or technology channels. Last but not least, this study, together with Bartik et al. (2020), extends our understanding of the reactions of small and medium-sized enterprises (SMEs) during the pandemic season.<sup>2</sup>

The rest of the study is arranged as follows. Section 2 describes the data, variables, and relevant summary statistics. Section 3 presents the methodology and discusses empirical results, while Section 4 concludes.

## 2. Data and variables

### 2.1. Data

Our novel and rich sample come from several different sources. The first data source is the World Bank COVID-19 follow-up surveys, which are based on the most recently completed World Bank Enterprise Surveys in 24 countries in 2020. The COVID-19 follow-up surveys investigate the impact of the COVID-19 pandemic on global businesses, especially SMEs, in both developed and developing economies. COVID-19 follow-up surveys collect information about the effects and the corresponding adjustments that COVID-19 has brought to the businesses, e.g., changes in sales, production, employment, access to finance, government support, and future expectations as a result of COVID-19. The second dataset is the World Bank Enterprise Survey (WBES), which covers more than 130 countries around the world. WBES dataset uses standardized survey instruments to measure the business climate of each economy and how these conditions might influence business investment and performance.

We then merge the COVID-19 follow-up surveys with WBES at the firm level. COVID-19 related variables come from the COVID-19 follow-up surveys, while other firm-level variables come from WBES. Besides, country-level variables are collected from the World Development Indicators (WDI). Our final sample includes 12,888 firm observations from 24 countries. 46% (11 countries) and 25% (6 countries) of our sampling countries come from Europe & Central Asia and Sub-Saharan Africa, respectively. See Appendix for the country distribution.

### 2.2. Variables

Our variable of interest, *WomanTopManager*, is a dummy variable that takes the value one if the top manager of the firm is female, zero otherwise. The dependent variables are the pandemic-related firm closures and existing firms' expectations. The first firm closure proxy is *CloseDummy*, a dummy variable that equals one if the firm has been permanently or temporarily closed and zero if the firm

<sup>2</sup> 92.64% of the businesses studied in our sample have an employee number lower than 250. These businesses can be defined as SMEs according to the criteria of European Union.

remains open. The second closure proxy is *Ln\_CloseWeeks*, which is the logarithm of 1 plus the firm's answer to "For how many weeks has this establishment been closed (or was closed) due to the COVID-19 outbreak?". The firm expectation is proxied by *ExpectBankrupt* (a dummy variable which equals one if the firm is expected to fall in arrears in any of its outstanding liabilities in the next six months and zero otherwise) and *Ln\_ExpectRemainWeeks*, which is the logarithm of 1 plus the firm's answer to "Keeping the cost structure as it is now, how many weeks would this establishment be able to remain open if its sales stopped as of today?".

We also investigate the mechanisms through which women top managers may affect firm closures and expectations. Government aid, access to finance, technology, and employment may be the potential mechanisms. *GovAid* measures whether the firm has received government support since the outbreak of COVID-19; *BankLoan*, our proxy of access to finance, is a dummy variable that equals one if bank loans are the primary source to deal with cash flow shortages, and zero otherwise; *Online* is a proxy of the firm's usage of internet technology, which measures whether a firm has started or increased online business activities, delivery or carry-out of goods or services, or remote working arrangements in response to the COVID-19 outbreak. *DecreaseLabor* and *DecreaseFemale* are used to evaluate a firm's change of employment in response to the COVID-19 outbreak.

We control for a set of firm characteristics, namely, *Ln\_FirmSize* (the natural logarithm of the number of employees), *Ln\_FirmAge* (the natural logarithm of firm age plus one), *Public* (a dummy variable that takes the value one if the firm is publicly listed, zero otherwise), *Exporter* (a dummy variable that takes the value one if the firm exports, zero otherwise), *Experience* (the top manager's number of years of experience working in this sector). Several ownership variables are included as well, *State* (a dummy variable that takes the value one if the firm is at least partially owned by the government or state, zero otherwise), *Foreign* (a dummy variable that takes the value one if the firm is at least partially owned by foreign individuals, companies or organizations, zero otherwise), *Subsidiary* (a dummy variable that takes the value one if the firm is part of a large firm, zero otherwise), and *Top\_Owner\_Pct* (the percent of the firm owned by its largest shareholder).

To further examine the institution's impact on the gender-closure and gender-expectation relationships, we introduce *Gender\_Inequality* (a country's gender inequality index) into our regressions. Additional country-level macro variables, *Ln\_GDP* (the natural logarithm of a country's GDP), *GDP\_Growth* (the growth rate of GDP), *Ln\_GDPperCapita* (the natural logarithm of a country GDP per capita), and *Inflation* (inflation rate), are also included to account for the macroeconomic heterogeneity across different countries. Among the 24 countries we examine in this study, Slovenia, Italy, and Cyprus have the lowest gender inequality index (high gender equality), while Chad, Niger, and Togo have the highest gender inequality index (low gender equality).

### 2.3. Descriptive statistics and correlation matrix

As shown in Table 1, Panel A, 18% of our sample firms have a woman top manager, consistent with the prior literature (Allison et al., 2019; An, 2020). In our sample, 15% of the firms are permanently or temporarily closed. Closure lasts for seven to eight weeks on average. 32% of the existing firms expect that they may face bankruptcy in the next six months. And the existing firms expect that they

**Table 1**  
Summary of Descriptive Statistics.

|  | N      | Mean  | Std   | Min   | Median | Max   |
|--|--------|-------|-------|-------|--------|-------|
| <b>A. Gender</b>                       |        |       |       |       |        |       |
| WomanTopManager                        | 12,853 | 0.18  | 0.39  | 0     | 0      | 1     |
| <b>B. Dependent Variables</b>          |        |       |       |       |        |       |
| CloseDummy                             | 9948   | 0.15  | 0.35  | 0     | 0      | 1     |
| Ln_CloseWeeks                          | 4799   | 1.96  | 0.61  | 0     | 2.08   | 4.62  |
| ExpectBankrupt                         | 8645   | 0.32  | 0.47  | 0     | 0      | 1     |
| Ln_ExpectRemainWeeks                   | 7194   | 1.80  | 0.83  | 0     | 1.61   | 5.90  |
| <b>C. Channels</b>                     |        |       |       |       |        |       |
| GovAid                                 | 9407   | 0.32  | 0.47  | 0     | 0      | 1     |
| BankLoan                               | 6641   | 0.16  | 0.37  | 0     | 0      | 1     |
| Online                                 | 9461   | 0.50  | 0.50  | 0     | 1      | 1     |
| DecreaseLabor                          | 6740   | 21.95 | 34.54 | 0     | 0      | 100   |
| DecreaseFemale                         | 3540   | 49.91 | 37.30 | 0     | 50     | 100   |
| <b>D. Firm-level Control Variables</b> |        |       |       |       |        |       |
| Ln_FirmSize                            | 12,781 | 3.25  | 1.35  | 0.69  | 3.00   | 6.90  |
| Ln_FirmAge                             | 12,674 | 2.83  | 0.73  | 0     | 2.89   | 5.31  |
| State                                  | 12,600 | 0.02  | 0.14  | 0     | 0      | 1     |
| Foreign                                | 12,577 | 0.11  | 0.32  | 0     | 0      | 1     |
| Subsidiary                             | 12,872 | 0.16  | 0.37  | 0     | 0      | 1     |
| Public                                 | 12,812 | 0.07  | 0.26  | 0     | 0      | 1     |
| Exporter                               | 12,608 | 0.29  | 0.45  | 0     | 0      | 1     |
| Experience                             | 12,425 | 19.24 | 11.36 | 1     | 18     | 70    |
| Top_Owner_Pct                          | 12,323 | 79.15 | 25.81 | 1     | 100    | 100   |
| <b>E. Macro Control Variables</b>      |        |       |       |       |        |       |
| Ln_GDP                                 | 12,888 | 25.25 | 1.79  | 22.45 | 24.87  | 28.40 |
| GDP_Growth                             | 12,888 | 2.11  | 2.86  | -8.10 | 2.48   | 5.90  |
| Ln_GDPperCapita                        | 12,888 | 8.72  | 1.06  | 6.33  | 8.51   | 10.48 |
| Inflation                              | 12,288 | 2.89  | 2.66  | -2.49 | 2.23   | 9.47  |
| Gender_Inequality                      | 12,738 | 0.29  | 0.17  | 0.06  | 0.23   | 0.71  |

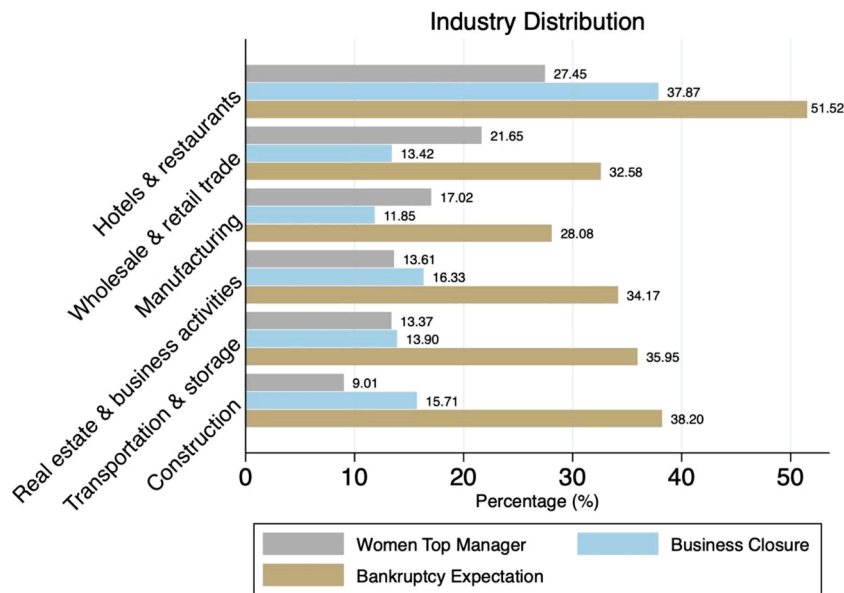


Fig. 1. The distribution of women-led businesses, business closure and bankruptcy expectation by industry.

can survive seven to eight weeks without any further income (Table 1, Panel B).

Fig. 1 shows the industry breakdown of women-led business, business closure, and expected bankruptcy. We can observe that 27.45% of the top managers in the hotels and restaurants industry are female (which is the highest percentage across all industries). This unevenness reflects the fact that women are more likely to work in service industries that require interaction with people. Correspondingly, the hotels and restaurants industry is associated with the highest level of business closure and expected bankruptcy. From Fig. 1, we can clearly see the industrial heterogeneity of gender distribution and potential economic outcomes. Therefore, it is essential to control for the industry fixed effects throughout our empirical analysis.

Table 2 presents the Pearson correlation matrix of all our variables. *WomanTopManager* does strongly and positively correlate with business closure and expected bankruptcy, which is consistent with our expectations. Country-level variables generally have a high correlation among each other. Especially, *Ln\_GDPperCapita* is highly correlated with *Gender\_Inequality*. This high correlation is intuitive since less developed countries generally have a greater level of gender inequality. We have performed different tests in this study to reduce the potential multicollinearity issue within our independent variables.

### 3. Results and discussions

#### 3.1. The effect of gender on business closure and expected bankruptcy

We first try to answer the following two questions. Are women-led businesses more likely to close during the pandemic than men-led businesses? Are women business leaders more pessimistic about the future than men business leaders?

The main regression model is:

$$Closure / Expectation = \alpha + \beta_1 WomanTopManager + \beta_2 Controls + Country \times Industry dummies + e \tag{1}$$

To capture the unobserved country-industry level heterogeneity, we include the country-industry fixed effects in our regressions. To mitigate the heteroscedasticity issue, we cluster standard errors at the country-industry level.

Columns (1) and (2) of Table 3 report the results of gender-closure tests. *CloseDummy* and *Ln\_CloseWeeks* are both positively and significantly related to *WomanTopManager*, suggesting that women-led firms are subject to a higher probability of closure and a longer closure duration than men-led firms during the pandemic environment. Columns (3) and (4) report the regression results of the gender-expectation tests. *ExpectBankrupt* and *Ln\_ExpectRemainWeeks* are positively and negatively correlated with *WomanTopManager*, indicating that women business leaders are more pessimistic about the future than men business leaders.

We understand that our regression may suffer from the endogeneity issue. The possible causes of endogeneity include reverse causality, simultaneity, and omitted variables. Reverse causality and simultaneity are unlikely to affect the regression results in our study for two reasons. First, the COVID-19 pandemic was an utterly unanticipated shock, and the dependent variables (firm closure and expectations) are the results of this exogenous event. Second, the dependent variables are collected from the COVID-19 follow-up surveys done in 2020, while *WomanTopManager* and other control variables are collected from the most recent round of WBES done in 2018 or 2019. Omitted variables might affect our results, and we try our best to lower its impact. Besides our key variable *WomanTopManager*, we include nine firm-level control variables and country-industry fixed effects in our regressions. As a result, we hope that

**Table 2**  
Pearson Correlation Matrix.

|                       | 1        | 2        | 3        | 4        | 5        | 6        | 7        | 8        | 9        | 10       | 11       | 12       | 13       | 14       | 15       | 16      |
|-----------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|---------|
| 1. CloseDummy         |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |         |
| 2. ExpectBankrupt     | 0.17***  |          |          |          |          |          |          |          |          |          |          |          |          |          |          |         |
| 3. WomanTopManager    | 0.04***  | 0.03***  |          |          |          |          |          |          |          |          |          |          |          |          |          |         |
| 4. Ln_FirmSize        | -0.15*** | -0.13*** | -0.11*** |          |          |          |          |          |          |          |          |          |          |          |          |         |
| 5. Ln_FirmAge         | -0.08*** | -0.03*** | -0.06*** | 0.24***  |          |          |          |          |          |          |          |          |          |          |          |         |
| 6. State              | -0.03*** | -0.03*** | 0.00     | 0.14***  | 0.09***  |          |          |          |          |          |          |          |          |          |          |         |
| 7. Foreign            | 0.01     | -0.05*** | -0.05*** | 0.25***  | 0.01     | 0.06***  |          |          |          |          |          |          |          |          |          |         |
| 8. Subsidiary         | -0.04*** | -0.04*** | -0.04*** | 0.16***  | 0.09***  | 0.05***  | 0.18***  |          |          |          |          |          |          |          |          |         |
| 9. Public             | -0.03*** | -0.03*** | -0.01    | 0.20***  | 0.11***  | 0.32***  | 0.12***  | 0.09***  |          |          |          |          |          |          |          |         |
| 10. Exporter          | -0.05*** | -0.07*** | -0.05*** | 0.35***  | 0.13***  | 0.06***  | 0.21***  | 0.04***  | 0.07***  |          |          |          |          |          |          |         |
| 11. Experience        | -0.05*** | 0.01     | -0.08*** | 0.12***  | 0.49***  | -0.04*** | -0.04*** | 0.03***  | 0.01     | 0.09***  |          |          |          |          |          |         |
| 12. Top_Owner_Pct     | 0.04***  | 0.03***  | 0.06***  | -0.18*** | -0.14*** | -0.03*** | -0.13*** | -0.12*** | -0.09*** | -0.11*** | -0.10*** |          |          |          |          |         |
| 13. Ln_GDP            | -0.11*** | -0.20*** | 0.01     | 0.09***  | 0.02**   | -0.02**  | -0.12*** | -0.13*** | -0.06*** | 0.03***  | 0.02**   | 0.00     |          |          |          |         |
| 14. GDP_Growth        | 0.04***  | 0.01     | 0.04***  | 0.00     | -0.09*** | -0.05*** | -0.07*** | -0.20*** | -0.03*** | 0.05***  | 0.00     | 0.10***  | 0.04***  |          |          |         |
| 15. Ln_GDPperCapita   | -0.16*** | -0.17*** | 0.04***  | 0.07***  | 0.09***  | -0.02**  | -0.15*** | -0.14*** | -0.10*** | 0.11***  | 0.12***  | -0.04*** | 0.74***  | 0.23***  |          |         |
| 16. Inflation         | -0.01    | 0.03**   | 0.09***  | 0.01     | -0.12*** | 0.05***  | 0.04***  | -0.07*** | 0.05***  | -0.11*** | -0.13*** | 0.07***  | -0.17*** | -0.05*** | -0.25*** |         |
| 17. Gender_Inequality | 0.18***  | 0.15***  | -0.08*** | -0.07*** | -0.06*** | -0.04*** | 0.15***  | 0.12***  | 0.04***  | -0.11*** | -0.10*** | 0.03***  | -0.57*** | -0.24*** | -0.92*** | 0.08*** |

**Table 3**

Gender, Closure, and Expectations.

Table 3 reports the regression results of firm closures and expectations on women top managers. *t*-statistics based on standard errors clustered at the country-industry level are shown in parentheses beneath each estimate. The superscripts \*, \*\*, and \*\*\* refer to significance at the 10%, 5%, and 1% levels, respectively.

|                            | CloseDummy (1)       | Ln_CloseWeeks (2)    | ExpectBankrupt (3)   | Ln_ExpectRemainWeeks (4) |
|----------------------------|----------------------|----------------------|----------------------|--------------------------|
| WomanTopManager            | 0.026***<br>(2.74)   | 0.079***<br>(3.34)   | 0.026**<br>(2.18)    | -0.146***<br>(-5.76)     |
| Ln_FirmSize                | -0.029***<br>(-7.82) | -0.047***<br>(-6.57) | -0.028***<br>(-3.99) | 0.053***<br>(4.16)       |
| Ln_FirmAge                 | -0.010*<br>(-1.79)   | -0.026**<br>(-2.07)  | -0.016<br>(-1.51)    | 0.034<br>(1.52)          |
| State                      | 0.019<br>(0.78)      | 0.120<br>(1.65)      | 0.036<br>(1.03)      | -0.077<br>(-0.89)        |
| Foreign                    | 0.018<br>(1.56)      | 0.109***<br>(3.44)   | -0.060***<br>(-4.23) | 0.070**<br>(2.01)        |
| Subsidiary                 | -0.022*<br>(-1.97)   | -0.008<br>(-0.28)    | -0.043**<br>(-2.09)  | 0.023<br>(0.86)          |
| Public                     | -0.003<br>(-0.20)    | -0.088**<br>(-2.32)  | 0.019<br>(0.88)      | -0.001<br>(-0.03)        |
| Exporter                   | 0.009<br>(1.15)      | -0.013<br>(-0.62)    | -0.031**<br>(-2.29)  | 0.064**<br>(2.10)        |
| Experience                 | -0.000<br>(-1.34)    | 0.001<br>(1.61)      | 0.000<br>(0.72)      | -0.000<br>(-0.04)        |
| Top_Owner_Pct              | 0.000<br>(0.31)      | 0.001*<br>(1.77)     | 0.000<br>(0.21)      | -0.000<br>(-1.35)        |
| Country × Industry dummies | Yes                  | Yes                  | Yes                  | Yes                      |
| Observations               | 8976                 | 4320                 | 7799                 | 6586                     |
| Adj. R-squared             | 0.14                 | 0.23                 | 0.13                 | 0.14                     |

the omitted-variable issue is no longer a major concern in our context.

### 3.2. The moderating effect of gender environment

We are also curious about how a country's gender equity environment would affect the gender-closure and gender-expectation relationships found above. We first collect the country-level gender inequality index from the United Nation Development Programme. *Gender\_Inequality* is a country's gender inequality index. A higher value of the index indicates a greater degree of inequality. We then introduce *Gender\_Inequality* and the interaction term *WomanTopManager* × *Gender\_Inequality* into Eq. (1). Since only one year's observation is available in our dataset, including *Gender\_Inequality* means that we cannot simultaneously include country fixed effects in order to avoid the multicollinearity issue. To make sure that the macroeconomic heterogeneity across different countries is taken care of, we further include *Ln\_GDP*, *GDP\_Growth*, *Ln\_GDPperCapita*, and *Inflation* into the regressions.

In Table 4A, we evaluate the effects of *WomanTopManager* × *Gender\_Inequality* on firm closures and expectations. The coefficients of the interaction term are statistically significant in all columns. For example, in the most gender-equal country (*Gender\_Inequality*=0.06), women-led businesses are nearly the same as men-led businesses regarding their closure probability and bankruptcy expectation. However, in the least gender-equal countries (*Gender\_Inequality*=0.71), women-led businesses are 10.93% (13.58%) more likely to close (expect a bankrupt) than men-led businesses. In sum, the results in Table 4A suggest that the pandemic's disproportional impact on women-led businesses are especially prominent in gender unequal countries.

### 3.3. The moderating effect of economic development

Given the high correlation between gender inequality and GDP per capita, it is necessary to separately investigate the moderating effect of economic development proxied by GDP per capita. Specifically, we interact *WomanTopManager* with the logarithm of GDP per capita and introduce it into Eq. (1). We find that the coefficients of the interaction terms are consistently significant across all models (Table 4B). The results in Table 4B suggest that the pandemic's disproportional impact on women-led businesses is much stronger in poor countries.<sup>3</sup>

To further investigate the economic environment's effect on the gender-closure and gender-expectation relationships, we split the sample into two groups, developed and developing countries, according to the World Bank's income classification. We then re-implement the analysis presented in Table 2 in each subsample. In the subsample of developed countries, the closure probability and bankruptcy expectation are not significantly different between women-led and men-led businesses. However, in the subsample of developing countries, the closure probability and bankruptcy expectation are significantly higher in women-led than in men-led

<sup>3</sup> To further relieve the concern of multicollinearity, we drop GDP-per-capita (gender inequality) in Table 4A (4B) and rerun the regressions, the main interaction results remain the same. To save space, the results are presented in the Online Appendix, Panels A and B.

businesses. If we compare the results in Table 4C, Panel B, and the results in Table 2, we will see that, e.g., women-led businesses are 2.6% more likely to close at the world level, and 3.3% more likely to close in developing countries, compared to men-led businesses.<sup>4</sup>

### 3.4. Potential channels

What are the possible channels through which women and men top managers may affect COVID-19 related firm closures and expectations differently? Four possible channels (government, finance, technology, and labor) are examined below. (1) The government channel: Would women-led businesses receive less government support than men-led businesses? *GovAid* (a dummy variable that equals one if the firm has received any government support since the outbreak of COVID-19, and zero otherwise) is used to proxy a firm's access to government support. (2) The finance channel: Would women-led businesses receive less financial support than men-led businesses? Since the major financing channel for SMEs is bank finance (Beck et al., 2008), *BankLoan* (a dummy variable that equals one if a firm's main source to deal with cash flow shortages is commercial loans, and zero otherwise) is used to proxy a firm's access to finance. (3) The technology channel: Would women leaders less likely to make operating adjustments using internet technology during the pandemic? *Online* (a dummy variable that equals one if the firm has started or increased: online business activities, delivery of goods/services, or remote work arrangements, in response to the COVID-19 outbreak, and zero otherwise) is used to proxy a firm's technology adoption. (4) The labor channel: Would the number of employees/women employees decrease more in women-led businesses than the number of employees/women employees in men-led businesses? We understand that women employees' working opportunities are disproportionately affected by the COVID-19 pandemic (Adams-Prassl et al., 2020; Cui, Ding, and Zhu, 2020), while we have no idea how this effect varies between women versus men-led businesses. *DecreaseLabor* and *DecreaseFemale* are used to evaluate a firm's change of employment in response to the COVID-19 outbreak.

In sum, the channel variables we are interested in are *GovAid*, *BankLoan*, *Online*, *DecreaseLabor*, and *DecreaseFemale*. The key independent variable is still *WomanTopManager*. The same set of firm-level control variables, country-industry fixed effects, and standard errors' clustering, as described in Eq. (1), are included in the regressions.

Table 5 reports the results of the channels through which women top managers may affect firm closures and expectations. Columns (1) and (3) indicate that there is no significant relationship between *WomanTopManager* and *GovAid* (*Online*). Column (2) shows *WomanTopManager* loads negatively on *BankLoan*, suggesting that women-led businesses are less likely to receive financial support from the banks than men-led businesses. This finding is consistent with Allison et al. (2019), which demonstrates a similar bank financing gap between women and men-led businesses. Columns (4) and (5) report the results of the labor channel. Compared to men-led firms, women-led firms are more likely to decrease their number of employees, especially women employees.<sup>5</sup> Note that the decrease of (women) employees could be the result of quitting, being laid off, or being furloughed.

Taken together, we find no support from the government and technology channels, and some support from the finance and labor channels, to explain the gender-closure and gender-expectation gaps during the pandemic. We advise the government to pay more attention to the tougher finance and labor obstacles faced by women-led businesses.

## 4. Conclusion

In this paper, we examine whether and how the COVID-19 pandemic affects women-led and men-led businesses differently. We find that women-led businesses are more likely to close and close longer during the COVID-19 pandemic than men-led businesses. Women business leaders are also more pessimistic about the future than men business leaders. Moreover, the gender-closure and gender-expectation relationships found above are more prominent in gender unequal economies and poorer economies. Finally, women-led firms are less likely to get bank loans and more likely to reduce their number of employees, especially women employees.

Not all businesses are created equal. The COVID-19 policy response should not ignore the disproportionate difficulties faced by women-led businesses. Countries with a high gender inequality index or a low GDP-per-capita should establish corresponding policies to mitigate the gender gap during the pandemic, and to protect the benefit of women and their businesses. The effective policy may include but should not be limited to: providing access to finance for women business owners, and re-balancing the newly added household responsibilities, which tend to affect women more than men.

### CRedit authorship contribution statement

**Yu Liu:** Conceptualization, Methodology, Formal analysis, Writing – original draft. **Siqi Wei:** Conceptualization, Methodology, Formal analysis, Writing – original draft. **Jian Xu:** Conceptualization, Methodology, Formal analysis, Writing – original draft.

<sup>4</sup> Our results presented in Table 4C are not sensitive to the selection of threshold of high income countries. If we simply split the whole sample by the sample median of GDP per capita, our main conclusions remain robust. To save space, the alternative subsample results are presented in the Online Appendix, Panel C.

<sup>5</sup> We also find that in women-led businesses, women employees are both more likely to be laid off involuntarily and more likely to quit voluntarily. Results are available upon request.



## Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.frl.2021.102012](https://doi.org/10.1016/j.frl.2021.102012).

## Appendix. Country Distribution

| Country     | Number of Obs. | Region                     | GDP     | GDPperCapita | GDPGrowth | Inflation | Gender_Inequality |
|-------------|----------------|----------------------------|---------|--------------|-----------|-----------|-------------------|
| Albania     | 377            | Europe & Central Asia      | 14.87   | 5210.69      | 2.24      | 1.41      | 0.18              |
| Belarus     | 600            | Europe & Central Asia      | 63.22   | 6678.51      | 1.22      | 5.60      | 0.12              |
| Bulgaria    | 772            | Europe & Central Asia      | 63.19   | 9058.74      | 3.69      | 3.10      | 0.21              |
| Chad        | 153            | Sub-Saharan Africa         | 12.98   | 813.72       | 3.25      | -0.97     | 0.71              |
| Cyprus      | 226            | Europe & Central Asia      | 28.68   | 32,093.03    | 3.08      | 0.25      | 0.09              |
| El Salvador | 719            | Latin America & Caribbean  | 23.05   | 3572.36      | 2.38      | 0.08      | 0.38              |
| Georgia     | 578            | Europe & Central Asia      | 18.52   | 4978.50      | 4.98      | 4.85      | 0.33              |
| Greece      | 600            | Europe & Central Asia      | 257.45  | 24,024.23    | 1.87      | 0.25      | 0.12              |
| Guatemala   | 345            | Latin America & Caribbean  | 56.67   | 3413.23      | 3.84      | 3.70      | 0.48              |
| Guinea      | 150            | Sub-Saharan Africa         | 11.76   | 920.88       | 5.60      | 9.47      | .                 |
| Honduras    | 332            | Latin America & Caribbean  | 21.84   | 2241.24      | 2.65      | 4.37      | 0.42              |
| Italy       | 760            | Europe & Central Asia      | 2151.42 | 35,680.16    | 0.34      | 0.61      | 0.07              |
| Jordan      | 524            | Middle East & North Africa | 33.60   | 3325.81      | 1.96      | 0.76      | 0.45              |
| Moldova     | 360            | Europe & Central Asia      | 9.89    | 3720.23      | 3.58      | 4.84      | 0.20              |
| Mongolia    | 360            | East Asia & Pacific        | 14.04   | 4352.64      | 5.16      | 7.30      | 0.32              |
| Morocco     | 1096           | Middle East & North Africa | 126.27  | 3396.06      | 2.48      | 0.20      | 0.45              |
| Nicaragua   | 333            | Latin America & Caribbean  | 11.54   | 1763.20      | -3.88     | 5.38      | 0.43              |
| Niger       | 151            | Sub-Saharan Africa         | 13.13   | 563.15       | 5.90      | -2.49     | 0.64              |
| Poland      | 1369           | Europe & Central Asia      | 660.94  | 17,406.55    | 4.54      | 2.23      | 0.12              |
| Russia      | 1323           | Europe & Central Asia      | 1762.46 | 12,011.53    | 1.34      | 4.47      | 0.23              |
| Slovenia    | 409            | Europe & Central Asia      | 57.27   | 27,426.79    | 3.18      | 1.63      | 0.06              |
| Togo        | 150            | Sub-Saharan Africa         | 5.63    | 696.08       | 5.34      | 0.67      | 0.57              |
| Zambia      | 601            | Sub-Saharan Africa         | 29.54   | 1653.83      | 1.44      | 9.15      | 0.54              |
| Zimbabwe    | 600            | Sub-Saharan Africa         | 17.33   | 1183.10      | -8.10     | .         | 0.53              |

**Table 4A**

Gender Inequality's Moderating Effect.

Table 4A reports the regression results of firm closures and expectations on women top managers, gender inequality, and the interaction term of these two. *t*-statistics based on standard errors clustered at the country-industry level are shown in parentheses beneath each estimate. The superscripts \*, \*\*, and \*\*\* refer to significance at the 10%, 5%, and 1% levels, respectively.

|                                   | CloseDummy (1)    | Ln_CloseWeeks (2) | ExpectBankrupt (3) | Ln_ExpectRemainWeeks (4) |
|-----------------------------------|-------------------|-------------------|--------------------|--------------------------|
| WomanTopManager                   | -0.010<br>(-0.48) | 0.016<br>(0.38)   | -0.014<br>(-0.51)  | -0.060<br>(-1.28)        |
| Gender_Inequality                 | 0.277**<br>(2.18) | 0.707*<br>(1.80)  | 0.298<br>(1.25)    | 1.007**<br>(2.01)        |
| WomanTopManager*Gender_Inequality | 0.168*<br>(1.90)  | 0.253*<br>(1.72)  | 0.211*<br>(1.90)   | -0.410**<br>(-2.37)      |
| Firms controls                    | Yes               | Yes               | Yes                | Yes                      |
| Macro-economic controls           | Yes               | Yes               | Yes                | Yes                      |
| Industry dummies                  | Yes               | Yes               | Yes                | Yes                      |
| Observations                      | 8406              | 3904              | 7278               | 6145                     |
| Adj. R-squared                    | 0.09              | 0.16              | 0.07               | 0.07                     |

**Table 4B**

Economic Development's Moderating Effect.

Table 4B reports the regression results of firm closures and expectations on women top managers, economic development, and the interaction term of these two. *t*-statistics based on standard errors clustered at the country-industry level are shown in parentheses beneath each estimate. The superscripts \*, \*\*, and \*\*\* refer to significance at the 10%, 5%, and 1% levels, respectively.

|                                 | CloseDummy (1)       | Ln_CloseWeeks (2)  | ExpectBankrupt (3)  | Ln_ExpectRemainWeeks (4) |
|---------------------------------|----------------------|--------------------|---------------------|--------------------------|
| WomanTopManager                 | 0.338***<br>(2.77)   | 0.503**<br>(2.26)  | 0.364**<br>(2.23)   | -0.683***<br>(-2.68)     |
| Ln_GDPperCapita                 | -0.025<br>(-1.02)    | 0.046<br>(0.63)    | 0.024<br>(0.50)     | 0.045<br>(0.48)          |
| WomanTopManager*Ln_GDPperCapita | -0.034***<br>(-2.61) | -0.047*<br>(-1.93) | -0.036**<br>(-2.06) | 0.058**<br>(2.11)        |
| Firms controls                  | Yes                  | Yes                | Yes                 | Yes                      |
| Macro-economic controls         | Yes                  | Yes                | Yes                 | Yes                      |
| Industry dummies                | Yes                  | Yes                | Yes                 | Yes                      |
| Observations                    | 8406                 | 3904               | 7278                | 6145                     |
| Adj. R-squared                  | 0.09                 | 0.16               | 0.07                | 0.07                     |

**Table 4C**

Gender, Closure, and Expectations: Subsample Analysis by Economic Development.

Table 4C reports the regression results of firm closures and expectations on women top managers after the whole sample is split by economic development. Panel A shows the results of developed countries; Panel B shows the results of developing countries. *t*-statistics based on standard errors clustered at the country-industry level are shown in parentheses beneath each estimate. The superscripts \*, \*\*, and \*\*\* refer to significance at the 10%, 5%, and 1% levels, respectively.

|                               | CloseDummy         | Ln_CloseWeeks      | ExpectBankrupt   | Ln_ExpectRemainWeeks |
|-------------------------------|--------------------|--------------------|------------------|----------------------|
|                               | 1                  | 2                  | 3                | 4                    |
| Panel A: Developed Countries  |                    |                    |                  |                      |
| WomanTopManager               | 0.004<br>(0.22)    | 0.034<br>(1.08)    | 0.023<br>(1.26)  | -0.091**<br>(-2.06)  |
| Observations                  | 2128               | 710                | 1845             | 1562                 |
| Adj. R-squared                | 0.12               | 0.12               | 0.07             | 0.08                 |
| Panel B: Developing Countries |                    |                    |                  |                      |
| WomanTopManager               | 0.033***<br>(2.78) | 0.087***<br>(3.07) | 0.026*<br>(1.80) | -0.166***<br>(-5.61) |
| Observations                  | 6848               | 3610               | 5954             | 5024                 |
| Adj. R-squared                | 0.14               | 0.24               | 0.14             | 0.15                 |
| Firms controls                | Yes                | Yes                | Yes              | Yes                  |
| Macro-economic controls       | Yes                | Yes                | Yes              | Yes                  |
| Industry dummies              | Yes                | Yes                | Yes              | Yes                  |

**Table 5**

Gender, Closure, and Expectations: Channel Analysis.

Table 5 reports the possible channels through which women top managers may affect firm closures and expectations differently than men top managers. *t*-statistics based on standard errors clustered at the country-industry level are shown in parentheses beneath each estimate. The superscripts \*, \*\*, and \*\*\* refer to significance at the 10%, 5%, and 1% levels, respectively.

|                            | GovAid (1)        | BankLoan (2)         | Online (3)        | DecreaseLabor (4)  | DecreaseFemale (5)  |
|----------------------------|-------------------|----------------------|-------------------|--------------------|---------------------|
| WomanTopManager            | -0.003<br>(-0.30) | -0.026***<br>(-2.68) | -0.004<br>(-0.25) | 3.402***<br>(2.73) | 10.295***<br>(5.82) |
| Firms controls             | Yes               | Yes                  | Yes               | Yes                | Yes                 |
| Country × Industry dummies | Yes               | Yes                  | Yes               | Yes                | Yes                 |
| Observations               | 8487              | 6057                 | 8537              | 6065               | 3241                |
| Adj. R-squared             | 0.27              | 0.07                 | 0.13              | 0.11               | 0.20                |

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