Gender Differences in Informal Labor Market Resilience[*]

Morgan Hardy ⓡ Erin Litzow ⓡ Jamie McCasland ⓡ Gisella Kagy

September 2022

Abstract

This paper reports on the universe of garment-making firm owners in a Ghanaian district capital during the COVID-19 crisis. By July 2020, 80% of both male- and female-owned firms were operational. Using pre-pandemic data, we document that selection into persistent closure differs by gender. Consistent with a "cleansing effect" of recessions and highlighting the presence of marginal female entrepreneurs, female-owned firms that remain closed past the spring lockdown are negatively selected on pre-pandemic sales. The pre-pandemic sales distributions of female survivors and non-survivors are significantly different from each other. Female owners of non-operational firms exit to non-employment and experience large decreases in overall earnings. Persistently-closed male-owned firms are not selected on pre-pandemic firm characteristics. Instead, their owners are 36 percentage points more likely to have another income generating activity prior to the crisis and fully compensate for revenue losses in their core businesses with these alternative income generating activities.

JEL Classifications: D22, J16, J46, L26, O12
Keywords: Informality, Firms, Gender, COVID-19

1 Introduction

Economists have long appreciated the importance of volatility in labor markets, a topic of increasing relevance as public health crises and climate change continue to exacerbate exposure to economic shocks around the world. Labor markets in low- and middle-income countries are arguably more volatile than those in high-income countries; economic crises due to periods of rapid inflation, cycles of election violence, energy shortages, disease outbreaks, and extreme weather events are shockingly common. Underpinning this volatility is widespread acknowledgment and documentation of gender gaps in labor markets. These gender gaps have been well documented and explored in high-income countries (Blau and Kahn, 2017), and there is a more nascent literature providing evidence for similar gaps in low- and middle-income countries (Nix et al., 2016; Hardy and Kagy, 2018; World Bank Group, 2019). Understanding the gender dimensions of resiliency to economic shocks is critical to supporting women's economic empowerment.

Labor market outcomes in low- and middle-income countries are inextricably tied to small firm performance, as the vast majority of workers are self-employed and the vast majority of households depend on self-employment income (Gindling and Newhouse, 2014; McKenzie, 2017; McCaig and Pavcnik, 2021). Small firm outcomes are also of independent importance to understanding economic volatility and resiliency because small firms are the modal firm in low- and middle-income countries (Hsieh and Olken, 2014). Understanding firm exit and selection patterns into exit during volatile periods thus has implications both for aggregate productivity via reallocation and individual and household welfare via effects on the incomes of self-employed individuals.

In this paper, we document gender differences in informal labor market resilience that stem from differential selection into firm survival during an economic crisis. We analyze panel data from February 2020 through to July 2020. The early COVID-19 crisis experience in Ghana mirrored that of many other countries in Sub-Saharan Africa, including a short lockdown that began in late March and ended in mid-April. Our six-month retrospective panel thus includes one pre-pandemic observation and five crisis months, where about 80% of both male- and female-owned firms are operational by the end of the panel.

Our data overcomes several key challenges in understanding differential informal labor market resiliency by gender. In almost all labor markets there is some degree of gender segmentation; in Sub-Saharan Africa in particular, Bardasi et al. (2011) show that small firm ownership within an industry is nearly always heavily dominated by one gender. Prior influential work on gender differences in response to economic shocks from the United States has shown that while men experienced more job loss during the Great Recession, this difference is largely explained by variation in industry-occupation (Hoynes et al., 2012). Garment-making is one of very few industries in Ghana where large shares of both men and women can be found in self-employment, allowing us to isolate differences by gender of the firm owner from industry-occupation shocks. Secondly, we observe the universe of firms in a single labor market (a district capital and its outlying suburbs) pre-crisis, allowing us to track changes in the overall distribution of surviving firms and study survival selection by pre-crisis characteristics. Importantly, firm owners in our context exhibit the same gender earnings gap documented pre-pandemic that has been documented more broadly in the literature (Hardy and Kagy, 2018; Nix et al., 2016). Finally, small firms in low-income countries are both firms and individual workers in a labor market; our data includes earnings from all sources, providing a rich understanding of livelihood vulnerability and occupational choice under duress.

We begin by characterizing the nature of the COVID-19 economic shock to the firms in our sample. In our six-month retrospective panel, firm owners of both genders experience large level drops in revenues across the five crisis months we observe, relative to February 2020. This level

shift in sales is nearly identical on average for male- and female-owned firms and not detectably different in the full sample, conditional on being operational in a given month, or conditional on the measure of survivorship we use in this paper (positive sales in at least two of five crisis months). In contrast, we define *persistently-closed* firms as the converse, those firms with zero revenues for at least four of the five crisis months we observe. While female-owned firms are more likely than male-owned firms to close at the peak of the formal lockdown in April 2020, we observe no statistically significant difference in the probability of persistent closure at 16% of male-owned firms and 19% of female-owned firms.

Our first main finding documents gender differences in selection into persistent closure, leveraging the unique strengths of our data. Female-owned firms exiting the market come from the left-tail of the pre-crisis sales distribution. The same trend does not hold true for male-owned firms that are persistently closed, which are not selected on firm characteristics. Instead, male owners with alternative sources of pre-crisis income are those that are most likely to close their garment-making businesses for at least four of the five crisis months we observe.

Consistent with these sources of selection, we show that 53% of female owners of persistently-closed firms exit to non-employment (having zero market hours of work in July 2020), 26 percentage points more than male owners of persistently-closed firms. These women experience large drops in total income, earning 64% less market income than women whose businesses remained operational. Men who close their firms appear to be directing their labor to other income-generating activities, fully offsetting garment-making sales losses with other sources of income.

Our evidence is most consistent with male- and female-owned firms experiencing a similarly-sized negative economic shock, but responding quite differently, due to underlying static differences in occupational opportunities in this context. We argue that the pre-pandemic presence of marginal female-owned firms near the zero revenue viability threshold is likely due to underlying occupational choice constraints (relative to men) and that female-owned firm closures appear to be driven by proximity to the zero revenue viability threshold. In contrast, there are relatively few male-owned firms near zero revenues pre-pandemic. Instead, men with lucrative outside options are more likely to persistently close, consistent with differential underlying occupational choice fundamentals for men and women.

Our work complements a recent literature on firm exit in low- and middle-income countries. McCaig and Pavcnik (2021) show that informal firms at the margin of viability are those that are both more likely to exit and more likely to enter, implying that churn has no net effect on aggregate (revenue) productivity in Vietnam. McKenzie and Paffhausen (2019) show across 12 low- and middle-income countries that female-owned firms are slightly more likely to close than male-owned firms and that female owners are more likely to report viability as a cause of firm death. This paper provides evidence of a within-industry setting in which female-owned firm closures come from the left-tail of the revenue distribution and male-owned firm closures are most consistent with an occupational choice model, in the presence of a major negative shock. Our findings also echo a theoretical and empirical literature in high-income countries on the "cleansing effect" of recessions,[1] put a gender lens on intersecting stylized facts around productivity and firm size distributions in low-income countries,[2] and highlight the economic vulnerability of women who run businesses at the margin of viability.

---

[1]See for example Caballero and Hammour (1994) for a seminal theoretical model, Foster et al. (2016) for evidence from the Great Recession, and Morikawa (2021) for evidence that relief policies muted any cleansing effect during COVID among Japanese firms.

[2]Hsieh and Klenow (2009) documented larger productivity dispersion in low-income countries than in high-income countries; Hsieh and Olken (2014) documented an extremely right-skewed firm size distribution.

In addition, the findings of this paper have potentially important implications for the gender wage gap literature, complementing recent work on level differences in outcomes for male- and female-owned firms.[3]. We also add to the growing body of empirical work on the consequences of the COVID-19 pandemic for the developing world.[4] Finally, we contribute to a larger body of literature that examines how individuals and firms respond to economic shocks; while the COVID-19 crisis and ensuing lockdown measures are notable in terms of how they impacted enterprises and individuals all over the world, enterprises and individuals in low-income countries are frequently subjected to similarly large economic disruptions and thus lessons learned from the context of COVID-19 extend to other settings.[5]

2   Context and Data

Garment Making in Ghana   Our study focuses on garment-making microenterprises in the mid-sized district capital of Hohoe, Ghana. Like many other industries in low- and middle-income country contexts, the majority of these enterprises are small in size and not formally registered. Although the primary input of bespoke garments is the garment making firm owner's (and any workers') labor, thread and fabric inputs are also important. Ghana does not have a domestic textile industry for these products and, instead, imports the bulk of them from the Netherlands, other European Union countries, and China (Ibrahim et al., 2017).

Garment making in Ghana is overwhelmingly bespoke, with customers that almost exclusively live within miles of a garment makers shop (Quartey, 2006). Demand for these made-to-order garments, in contrast with the ready-made imported alternatives, is primarily for special events, religious gatherings, or office wear (Quartey et al., 2011). It is exceedingly common practice to have bespoke (often matching) garments hand-made for funerals (which often have hundreds of people), graduations, local community group celebrations, religious revival events (also with hundreds of people), and weddings.

Importantly, both men and women own these enterprises. Male- and female-owned enterprises use the same production function. Male-owned firms tend to be slightly larger, whether measured by non-owner workers or total revenues. Other studies on gender from this context document an economically significant gender profit gap for these enterprises, and a lower market-to-firm ratio for female versus male owners, which leaves women demand constrained (Hardy and Kagy, 2018). Figure 1 shows the distribution of February 2020 sales for female- and male-owned businesses in our sample, immediately prior to the impacts of the pandemic. Notably, we observe a large bulge of female-owned firms in the left part of the distribution, clustering close to zero, and overlap between male- and female-owned firms in other parts of the distribution.

The 2020 COVID-19 Crisis in Ghana   Similar to many countries around the world, in late March 2020, the Government of Ghana instituted a nation-wide lockdown on all non-essential businesses, closed in-person schools and restricted the movement of individuals within Ghana in response to the global spread of COVID-19. The country formally went into lockdown on March 30, 2020 and the lockdown was lifted in some areas on April 20, 2020 when less-restrictive social distancing mandates were put in place. Schools were closed on March 16, 2020 and partially reopened on June 15, 2020 (Hale et al., 2021).

---

[3]See World Bank Group (2019) for a recent discussion of the gender profit gap in Africa.

[4]See for example Carnap et al. (2020); Miguel and Mobarak (2021); Eichenbaum et al. (2021), and Alfaro et al. (2020) for recent work.

[5]For example, the 2014 Ebola outbreak in West Africa (Huber et al., 2018), election violence in Kenya (Ksoll et al., 2021), climate disasters (Cavallo et al., 2013), and electricity crises in Ghana (Hardy and McCasland, 2021).

While mandated lockdowns were quite short-lived, large gatherings and events remained rare for the duration of our data collection period. Anecdotes from firm owners and members of the research team who were in Ghana in 2020 suggest that the absence of these types of occasions created a lasting negative demand shock for garment-makers throughout the period of our data. In addition, imports of inputs to Ghana were severely disrupted for the duration of our data collection period (Amponsah et al., 2020), putting pricing and scarcity pressure on key inputs for garment-making firm owners. In appendix Table A1 we present self-reported impacts and coping strategies from this period. Notably, 98% and 99% of female and male owners, respectively, reported loss of demand/customers. About two thirds of both owner genders reported difficulties with accessing supplies.

Sampling We began our sampling process with 569 firm owners identified during a census listing activity in September of 2019.[6] We followed up with these firms in person in January 2020, and identified 557 that remained operational. Implicitly, this means our sample excludes new entrants that entered between September 2019 and January 2020. Our targeted sampling frame for this study is thus operational firms as of January 2020 that had been open for at least six months. We interviewed 518 of these 557 firm owners for our primary phone survey, launched in August 2020. Of the 518, 28 owners reported having zero sales in February 2020. Our primary analysis excludes these firms, categorizing them as closed in the pre-crisis period. The remaining 490 firms (102 male and 388 female) are our main analysis sample of interest. Appendix Tables A2 and A3 show tests for differences between the 557 target sample, the 518 surveyed firms, and our final 490 firm analysis sample separately for female and male owners. We find no significant differences on observables, strong evidence that our sample is representative of our sampling frame.

Generalizability The type of enterprise we study is ubiquitous in low- and middle-income countries, the town we study is similar to small towns around the continent, and the COVID-19 policies pursued in Ghana in the early period of the pandemic mirror those pursued in many other African countries (Hale et al., 2021). Hardy and Kagy (2020) show that pre-COVID differences in earnings by owner gender observed in our setting are echoed in nationally representative data (the Ghana Living Standards Survey, GLSS).

With respect specifically to firm exit, previous census and survey data collected in this context in February 2014 and February 2015 suggest an average yearly exit rate of $\sim 11\%$ for female-owned firms and $\sim 7\%$ for male-owned firms. This difference of $\sim 4\%$ is not statistically significant. These pre-COVID annual exit rates in our context are comparable to pre-COVID annual exit rates documented across low- and middle-income countries in the literature which range from 8% to 18% (McCaig and Pavcnik, 2021; McKenzie and Paffhausen, 2019), and smaller than the half-yearly COVID-period exit rates we report below.

As we noted above, economic crises of various magnitudes are pervasive in low- and middle-income countries. This February 2014 to February 2015 time period happens to coincide with an energy crisis in Ghana, where extreme weather events interacted with hydropower systems and aging infrastructure to generate frequent planned and unplanned blackouts over the course of several years (Hardy and McCasland, 2021). The lights crisis was less acute than early COVID, but serves as a useful reminder that volatility is quite important to understanding the private sector in low- and middle-income countries and may indeed be the default circumstance.

---

[6]Surveyors canvassed the town identifying any commercial store fronts and inquired with locals about any less visible enterprises. A list of enterprises from the local trade association was also cross-checked. Surveyors also collected basic information on listed firms and owners, including owner gender.

Key Variables   The phone survey that constitutes the bulk of our data included a retrospective panel on enterprise sales, profits, hours worked, and wages paid for each month from February 2020 through July 2020, generating a six-month panel. In addition to the retrospective panel, we asked detailed information about owners' alternative income sources, generating measures of total income for each owner for February 2020 and July 2020. We define a firm as being closed in a specific month if sales that month are zero. Persistent closure is defined as having zero sales for at least four of the five observed crisis months. This naming convention is for expositional ease and is not meant to imply that we have data on closure beyond the six-month period.

We augment descriptive statistics on selection into closure in Table 2 with some measures from the September 2019 census data. We also present information on sample attrition from the September 2019 census in Appendix Tables A2 and A3

3   Findings

Characterizing the Shock   We plot the monthly share of closed firms by gender between February 2020 and July 2020 in Figure 2. By construction, all enterprises in our sample were open in February. The lockdown measures are associated with increases in closure for both male- and female-owned enterprises. Only 36% of male-owned enterprises, and 21% of female-owned enterprises were open in April. This 15% difference is significant at the one percent level. Both male- and female-owned firms began to re-open as the lockdown measures lifted. By July 2020, 86% of male owned enterprises and 80% of female-owned enterprises are open, a statistically insignificant difference.[7] Visually, Figure 2 shows that firm closures are most common in March, April and May, consistent with the lockdown timeline described in Section 2.

Table 1 presents a quantitative exploration of sales changes over the six months using the following specification separately for male- and female-owned firms:

$$Y_{i,t} = \alpha + \beta_1 Post_t + \epsilon_{i,t} \tag{1}$$

where $Y_{i,t}$ is the monthly sales outcome variable of interest for enterprise i and $Post_t$ is a binary indicator for the months of March, April, May, June, or July. February is the comparison month. To test the differences in β_1 between men and women, we run a pooled regression with both men and women where a binary indicator for if an owner is male is fully interacted with equation 1. Standard errors are clustered at the enterprise level. Level drops in sales are large and meaningful at about 200 Ghana Cedis (GhC) for both men and women and not statistically significantly different by gender. Relative to February sales levels for female-owned firms, this drop amounts of about a 67% drop in revenues. Relative to February sales levels for male-owned firms, this drop amounts to something closer to a 60% drop in revenues, where the difference is due to pre-pandemic differences in average firm revenues by gender.

Both female- and male-owned businesses see economically and statistically significant increases in closure during the crisis (46.8 percentage points and 37.6 percentage points, respectively), with female-owned businesses closing 9.1 percentage points more. Note that this difference in monthly closure is driven by peak-crisis months (as seen in Figure 2). Taking all five crisis months together, as we document in Column (8), there is no statistical difference in the *share* of male- and female-owned firms that persistently close.

---

[7] Appendix Figures A1 and A2 explore this same time period using different measures of closure: (1) monthly enterprise profits of zero and (2) monthly owner labor hours of zero. Both figures follow the same trend in terms of magnitude and significance.

We also estimate level sales drops in two sub-samples: firm-months with any positive sales and surviving (not persistently-closing) firms. In these conditional estimates, the equal level drops pattern remains the same. We fail to reject any difference in the level revenues losses of male- and female-owned firms over the crisis months we observe.[8]

Differential Selection into Persistent Closure by Gender We now turn our attention to firm exit selection patterns. Figure 3(a) and 3(b) plot the distribution of pre-crisis sales by persistent closure status for female- and male-owned firms, respectively. Persistently closing female-owned firms have a pre-crisis sales distribution that is visibly shifted to the left of female-owned firms that do not persistently close. These two distributions are significantly different with a Kolmogorov–Smirnov test p-value of 0.00. The pre-crisis sales distribution for enterprises owned by men that experience persistent closure and those that do not are visually and statistically overlapping (Kolmogorov–Smirnov test p-value of 0.95).

Table 2 tests for mean differences in pre-pandemic sales and other characteristics between enterprises and owners by persistent closure status, separately for men and women. Female-owned firms that persistently close are significantly negatively selected relative to female-owned firms that do not on all three of our proxies of pre-pandemic firm size (and productivity): monthly sales, monthly total wage bill, and number of workers. Importantly, Panel B shows no similar pattern of selection by pre-pandemic owner or household characteristics for women. Persistently closed male-owned firms exhibit no significant selection on enterprise characteristics. Instead, male owners who persistently close are positively selected on the existence of a pre-crisis income source outside of the garment-making firm. Male owners who persistently close are 36 percentage points more likely to have another income-generating activity outside of the garment firm pre-crisis.

Total Labor Earnings and Total Labor Supply In Table 3 we present evidence that differential closure selection by gender is associated with differential impacts on labor supply and total market earnings, using the following ANCOVA specification:

$$Y_{i,post} = \alpha + \beta_1 PC_i + \beta_2 * Y_{i,pre} + \epsilon_i \tag{2}$$

where $Y_{i,post}$ is the outcome of interest for owner i in July 2020, $Y_{i,pre}$ is the February 2020 value of the outcome of interest, and PC_i is an indicator for if the firm owner's business persistently closed during the observed period. The specification is run separately for male- and female-owned firms, and to test the difference in β_1 between men and women, we run a pooled regression with both men and women where a binary indicator for if an owner is male is fully interacted with equation 2. The table reports robust standard errors.

Women whose businesses persistently close have a 57 GhC lower total income in July 2020 compared to women whose businesses do not, significant at the one percent level. We detect no significant decrease in total income for male owners of persistently closed businesses, relative to male owners whose firms reopen. Women whose firms persistently close are 26 percentage points more likely than their male counterparts to exit to non-employment, working zero hours outside the home in July 2020. While both male and female owners experience large and statistically significant drops in firm profits (their income from the business), only men experience large and statistically significant increases in income from other sources.

---

[8]To corroborate these findings, we also consider how enterprise profits and owner hours worked response to the crisis. Results are reported in Appendix Table A4. Consistent with our revenue findings, we fail to reject any difference in profit level losses between male- and female-owned firms.

4   Interpretation

What drives these gender differences in informal labor market resilience in our context? We argue that female-owned firms are simply forced to exit to non-employment by the economic realities of a large negative shock, while the patterns observed for male entrepreneurs are more consistent with an occupational choice model of outside options relative to self-employed garment-making during crisis. These two disparate explanations are consistent with shared underlying fundamentals: marginal female-owned firms (near the viability threshold) exist where marginal male-owned do not precisely because of static underlying differences in occupational choice.

Observing the density of sales across male- and female-owned firms in the pre-pandemic period in Figure 1, it is immediately clear that an equal level shift to the left should result in more female- than male-owned businesses reaching a zero sales threshold. This simple visual construction would suggest that it is precisely those firms clustered close to zero prior to the pandemic that *tip* into closure in the presence of a large level shock. The average size of the monthly level shift relative to February 2020 is about 200 GhC, which visually corresponds to the left-tail female-owned firms we observe exiting in response to the shock. While not every firm with sales below this level shift threshold is observed closing, the simple difference in mass in proximity to zero revenues by gender can explain a large number of marginal female-owned firms closing where male-owned firms in the left-tail of the male sales distribution do not.

Prior work from this setting (and other work on gender differences around the world) provides some insight into this pre-pandemic equilibrium. Why is there a cluster of marginal near-zero earnings female-owned firms prior to the pandemic? Hardy and Kagy (2020) document more crowding in female dominant self-employed occupations, pondering whether this difference in crowding may result from cultural constraints in occupational choice, relative to male counterparts. This crowding could lead to lower average occupational match quality for women, with respect to the craft itself or to entrepreneurship. In other data from Ghana (collected for Hardy et al. (2019) and Hardy and McCasland (forthcoming)), applicants to study garment-making in informal firms were asked to report their motivations for pursuing the craft. Male applicants to study garment-making were 11 percentage points more likely than their female counterparts to report a passion for the craft and 6 percentage points more likely to report that training in the trade would complement their existing skillset, both statistically significant at the one percent level.

It is precisely these underlying differences in occupational choice that we argue also explain the closure selection pattern we observe for male-owned firms. As documented by Hallward-Driemeier (2013), Gindling and Newhouse (2014), and Calderon et al. (2017), male firm owners across a variety of settings likely have more access to wage employment and other opportunities outside small firm self-employment. In addition, Hardy and Kagy (2020), Ashraf et al. (2019), and Delecourt and Fitzpatrick (2021) suggest that *within* self-employment, men face fewer occupational choice constraints about the industry or sector in which to pursue entrepreneurship. In the context of agriculture, seminal work by Goldstein and Udry (2008) documents that men benefit from differential agricultural land property rights, suggesting men face fewer constraints in integrating farming into their basket of income-generating activities. Taken together, the literature supports both the absence of a cluster of marginal male entrepreneurs in the pre-pandemic equilibrium (because those men would have already selected out) and the presence of economically lucrative outside options for male entrepreneurs who experience shocks to their core garment-making businesses.

Considering the context of the garment-making industry described in Section 2, we believe it is reasonable to suggest that garment-making may have been harder hit by the pandemic, relative to the modal outside option for men in our context, self-employed agriculture. Although the

lockdown in Ghana was quite time-limited, large events like funerals, weddings, church revivals, and community meetings were limited for the duration of our data. Anecdotally, a large share of bespoke garment purchases correspond with these culturally important large events. This industry-specific shock may have shifted the cost-benefit calculus for men whose suite of pre-pandemic income generating opportunities included those in industries less exposed to the level shock of the COVID-19 crisis (like farming). Note that men's access to outside opportunities is orthogonal to pre-pandemic revenues in the core garment-making business, as shown in Appendix Figure 3(b). This orthogonality is consistent with our finding that selection into closure for men is not predicted by pre-pandemic sales.

Finally, our findings on total labor supply and total earnings (including both the core garment-making business and all other income-generating activities) are consistent with underlying occupational choice being the key mechanism through which differential closure selection patterns function. Women who close their firms are 26 percentage points more likely than men to exit to non-employment, suggesting that these women close their firms because the firms are not viable under the current economic conditions and not because better income-generating opportunities await.

In Table 2, we also explore care-taking responsibilities as a possible source of selection into firm exit for women (and men). Although we lack detailed time use data, we find no relationship between the presence of children age 15 or under in the household and firm exit for women (or men), in contrast to work that finds shocks to care-taking responsibilities drove female exit from the labor force during the COVID-19 crisis in high-income countries (Fairlie et al., 2021; Albanesi and Kim, 2021). While it is quite likely that women carry larger status quo care-taking burdens in our context and that women experienced larger shocks to care-taking burdens in response to the crisis, we have no evidence that these differential care-taking burdens drove differential firm exit.

5   Conclusion and Policy Takeaways

The findings from this paper have implications for research and policy. We provide some of the first evidence on informal labor market resilience by gender during the COVID-19 crisis, documenting differing dynamics and predictors of earnings loss for male and female firm owners. Vulnerable women appear to be falling off of the economic ladder and shifting into non-employment rather than other income generating opportunities. Men in this context appear more resilient to economic shocks. These findings are occurring in a context that already has existing gender inequities, as women-owned enterprises are less profitable than their male-owned counterparts in general. As policy makers and governments continue to respond to the ongoing COVID-19 pandemic and begin to prepare for future disruptions, incorporating gender specific evidence and approaches is necessary.

References

Albanesi, Stefania, and Jiyeon Kim. 2021. "The gendered impact of the COVID-19 recession on the US labor market."Technical report, National Bureau of Economic Research.

Alfaro, Laura, Oscar Becerra, and Marcela Eslava. 2020. "EMEs and COVID-19: shutting down in a world of informal and tiny firms."Technical report, National Bureau of Economic Research.

Amponsah, Randy, Isaac Atta Frimpong et al. 2020. "Ghana in the face of COVID-19: economic impact of coronavirus (2019-NCOV) outbreak on Ghana." *Open Journal of Business and Management* 8 (04): 1404.

Ashraf, Nava, Alexia Delfino, and Edward L Glaeser. 2019. "Rule of law and female entrepreneurship."Technical report, National Bureau of Economic Research.

Bardasi, Elena, Shwetlena Sabarwal, and Katherine Terrell. 2011. "How do female entrepreneurs perform? Evidence from three developing regions." *Small Business Economics* 37 (4): 417–441.

Blau, Francine D, and Lawrence M Kahn. 2017. "The gender wage gap: Extent, trends, and explanations." *Journal of economic literature* 55 (3): 789–865.

Caballero, Ricardo, and Mohamad Hammour. 1994. "The Cleansing Effect of Recessions." *American Economic Review*.

Calderon, Gabriela, Leonardo Iacovone, and Laura Juarez. 2017. "Opportunity versus necessity: understanding the heterogeneity of female micro-entrepreneurs." *The World Bank Economic Review* 30 (Supplement_1): S86–S96.

von Carnap, Tillmann, Ingvild Almås, Tessa Bold, Selene Ghisolfi, and Justin Sandefur. 2020. "The macroeconomics of pandemics in developing countries: an application to uganda." *Center for Global Development Working Paper* 555.

Cavallo, Eduardo, Sebastian Galiani, Ilan Noy, and Juan Pantano. 2013. "Catastrophic natural disasters and economic growth." *Review of Economics and Statistics* 95 (5): 1549–1561.

Delecourt, Solène, and Anne Fitzpatrick. 2021. "Childcare matters: Female business owners and the baby-profit gap." *Management Science* 67 (7): 4455–4474.

Eichenbaum, Martin S, Sergio Rebelo, and Mathias Trabandt. 2021. "The macroeconomics of epidemics." *The Review of Financial Studies* 34 (11): 5149–5187.

Fairlie, Robert W, Kenneth Couch, and Huanan Xu. 2021. "The Evolving Impacts of the COVID-19 Pandemic on Gender Inequality in the US Labor Market: The COVID Motherhood Penalty."Technical report, National Bureau of Economic Research.

Foster, Lucia, Cheryl Grim, and John Haltiwanger. 2016. "Reallocation in the Great Recession: Cleansing or not?" *Journal of Labor Economics*.

Gindling, Thomas H, and David Newhouse. 2014. "Self-employment in the developing world." *World development* 56 313–331.

Goldstein, Markus, and Christopher Udry. 2008. "The Profits of Power: Land Rights and Agricultural Investment in Ghana." *Journal of Political Economy*.

Hale, Thomas, Noam Angrist, Rafael Goldszmidt, Beatriz Kira, Anna Petherick, Toby Phillips, Samuel Webster, Emily Cameron-Blake, Laura Hallas, Saptarshi Majumdar et al. 2021. "A global panel database of pandemic policies (Oxford COVID-19 Government Response Tracker)." *Nature Human Behaviour* 5 (4): 529–538.

Hallward-Driemeier, Mary. 2013. *Enterprising women: Expanding economic opportunities in Africa*. World Bank Publications.

Hardy, Morgan, and Gisella Kagy. 2018. "Mind the (profit) gap: why are female enterprise owners earning less than men?" In *AEA Papers and Proceedings*, Volume 108. 252–55.

Hardy, Morgan, and Gisella Kagy. 2020. "It's Getting Crowded in Here: Experimental Evidence of Demand Constraints in the Gender Profit Gap." *The Economic Journal* 130 (631): 2272–2290.

Hardy, Morgan, Isaac Mulangu Mbiti, Jamie Lee Mccasland, and Isabelle Salcher. 2019. "The apprenticeship-to-work transition: experimental evidence from Ghana." *World bank policy research working paper* (8851): .

Hardy, Morgan, and Jamie McCasland. 2021. "Lights off, lights on: The effects of electricity shortages on small firms." *The World Bank Economic Review* 35 (1): 19–33.

Hardy, Morgan, and Jamie McCasland. forthcoming. "Are Small Firms Labor Constrained? Experimental Evidence from Ghana." *American Economic Journal: Applied Economics*.

Hoynes, Hilary, Douglas L Miller, and Jessamyn Schaller. 2012. "Who suffers during recessions?" *Journal of Economic perspectives* 26 (3): 27–48.

Hsieh, Chang-Tai, and Peter J Klenow. 2009. "Misallocation and manufacturing TFP in China and India." *The Quarterly journal of economics* 124 (4): 1403–1448.

Hsieh, Chang-Tai, and Benjamin Olken. 2014. "The Missing "Missing Middle"." *Journal of Economic Perspectives* American Economic Association vol. 28(3), pages 89–109, Summer.

Huber, Caroline, Lyn Finelli, and Warren Stevens. 2018. "The economic and social burden of the 2014 Ebola outbreak in West Africa." *The Journal of infectious diseases* 218 (Supplement_5): S698–S704.

Ibrahim, Isaac et al. 2017. "Impact of Sino-Africa economic relations on the Ghanaian Economy: The case of textiles." *Int. J. Innov. Econ. Dev* 3 7–27.

Ksoll, Christopher, Rocco Macchiavello, and Ameet Morjaria. 2021. "Electoral violence and supply chain disruptions in Kenya's floriculture industry."Technical report, National Bureau of Economic Research.

McCaig, Brian, and Nina Pavcnik. 2021. "Entry and exit of informal firms and development." *IMF Economic Review* 69 (3): 540–575.

McKenzie, David. 2017. "Identifying and spurring high-growth entrepreneurship: Experimental evidence from a business plan competition." *American Economic Review* 107 (8): 2278–2307.

McKenzie, David, and Anna Luisa Paffhausen. 2019. "Small firm death in developing countries." *Review of economics and statistics* 101 (4): 645–657.

Miguel, Edward, and Ahmed Mushfiq Mobarak. 2021. "The economics of the COVID-19 pandemic in poor countries."Technical report, National Bureau of Economic Research.

Morikawa, Masayuki. 2021. "Productivity of Firms Using Relief Policies During the COVID-19 Crisis." *Economic Letters*.

Nix, Emily, Elisa Gamberoni, and Rachel Heath. 2016. "Bridging the gender gap: identifying what is holding self-employed women back in Ghana, Rwanda, Tanzania, and the Republic of Congo." *The World Bank Economic Review* 30 (3): 501–521.

Quartey, Peter. 2006. "The textile and clothing industry in Ghana."

Quartey, Peter, Joshua Abor et al. 2011. "Do Ghanaians prefer imported textiles to locally manufactured ones?" *Modern Economy* 2 (01): 54.

World Bank Group. 2019. *Profiting from Parity: Unlocking the Potential of Women's Business in Africa*. World Bank.

Figures and Tables

Figure 1: Distribution of Feb 2020 sales by Gender
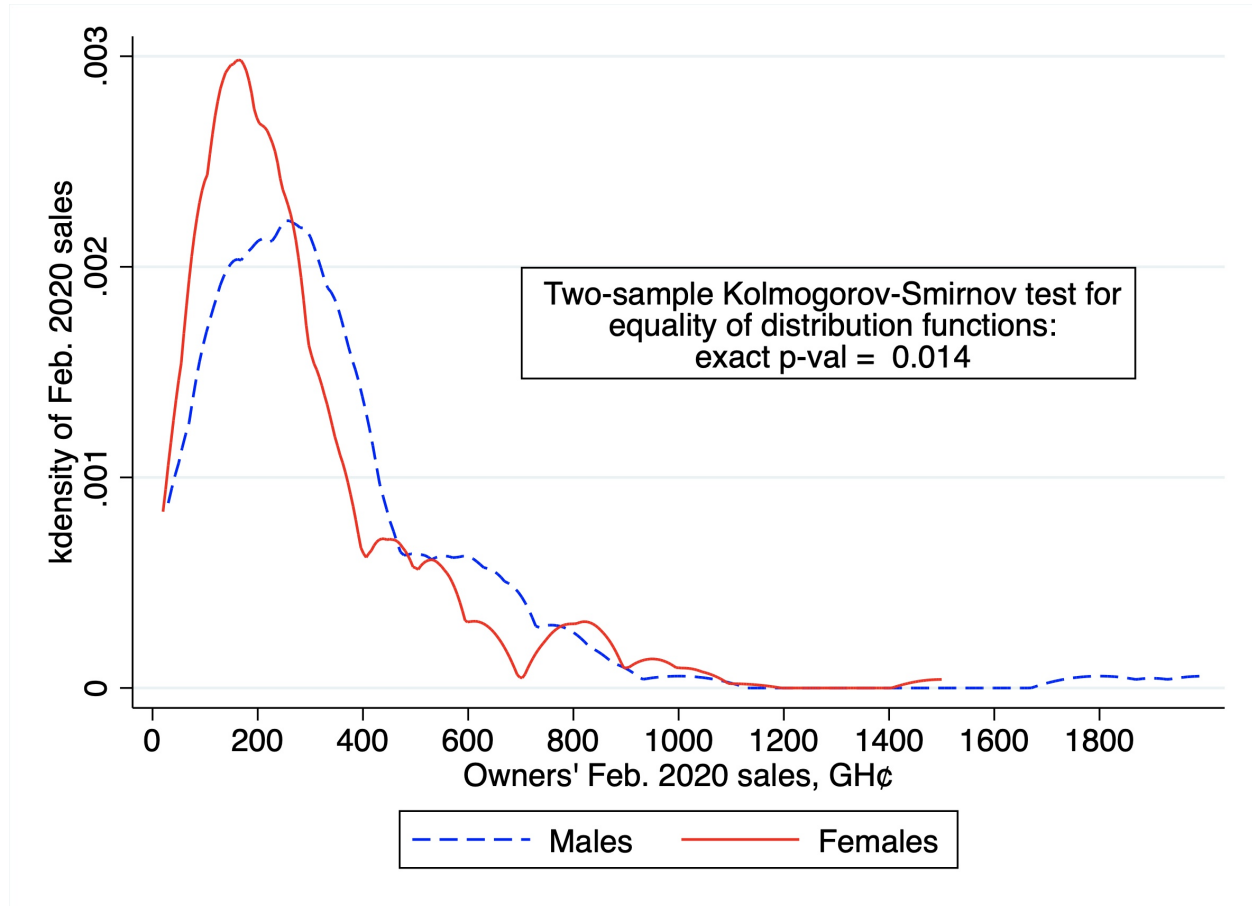
Note: This figure shows the distribution of February 2020 sales by gender for the 490 firm owners that make up our analysis sample, winsorizing the top earning female-owned firm for visual clarity. Data comes from the retrospective six-month panel of firm outcomes collected via phone survey. Male-owned firms are indicated in the dashed line (102 firms) and female-owned in the solid line (388 firms).

Figure 2: Share of Firms with Positive Sales, by Gender and Month
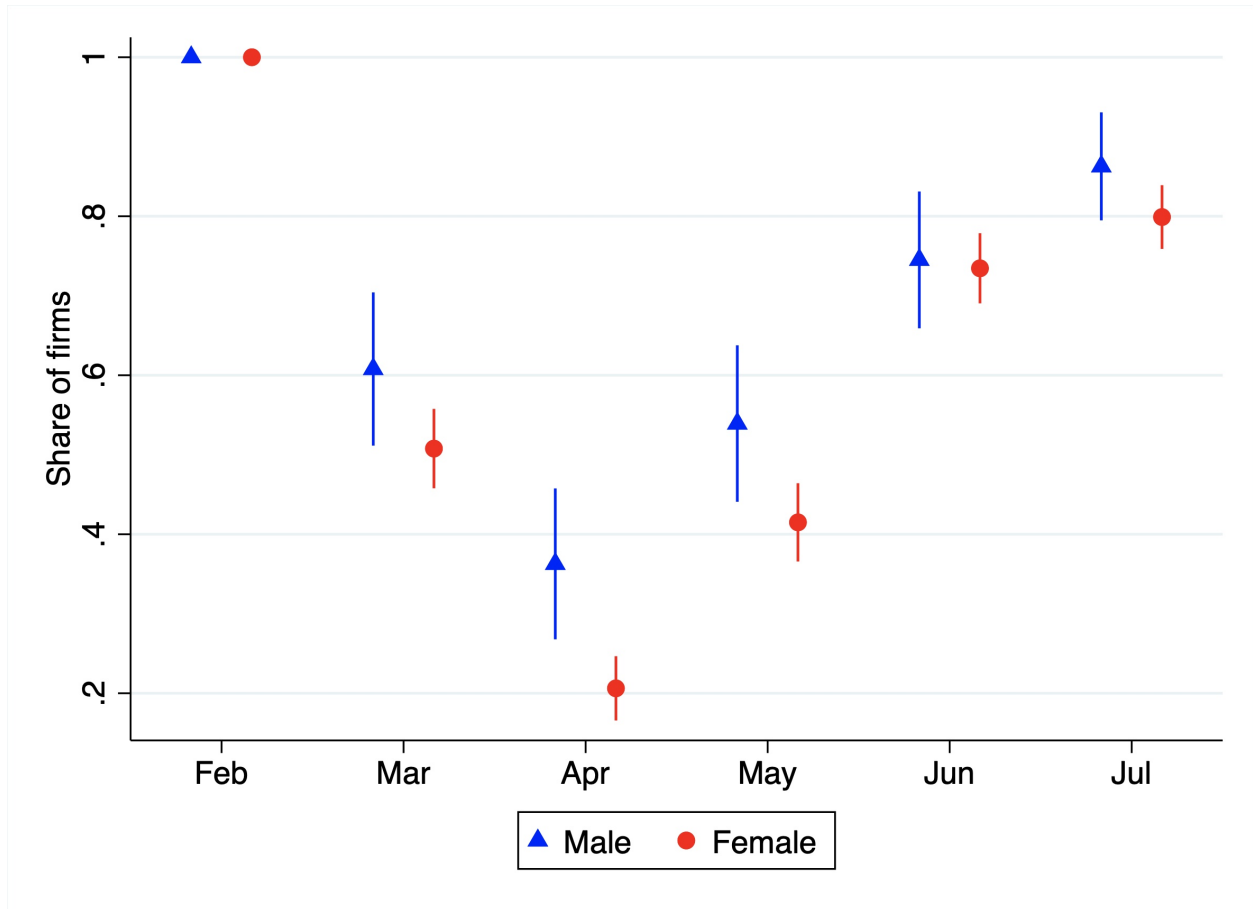
Note: This figure shows the share of firms reporting positive monthly sales (>0), for February through July 2020. Data comes from the retrospective six-month panel of firm outcomes collected via phone survey for the 490 firm owners that constitute our analysis sample. Male-owned firms are indicated with a triangle (102 firms) and female-owned with a circle (388 firms). Bars represent the 95% confidence interval.

Figure 3: Distribution of Feb 2020 Sales by Persistent Closure Status and Gender
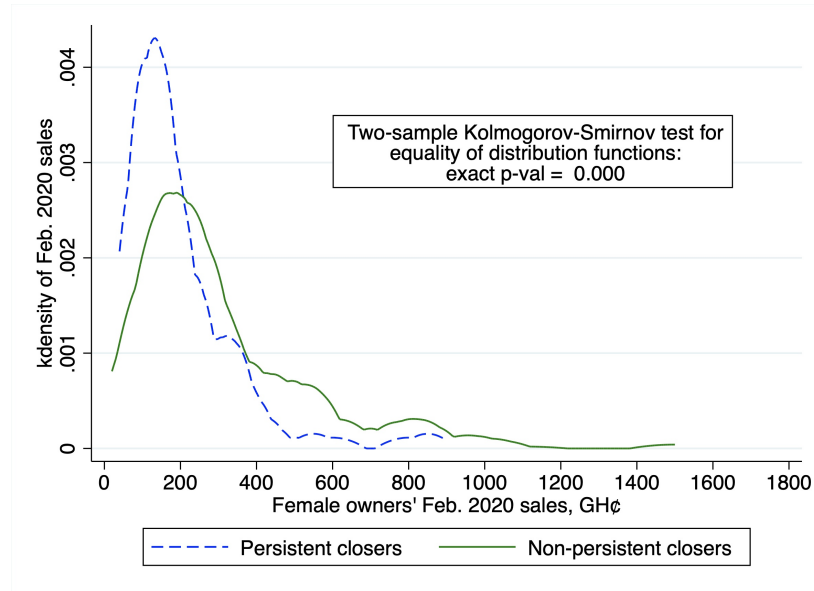

(a) Female firm owners
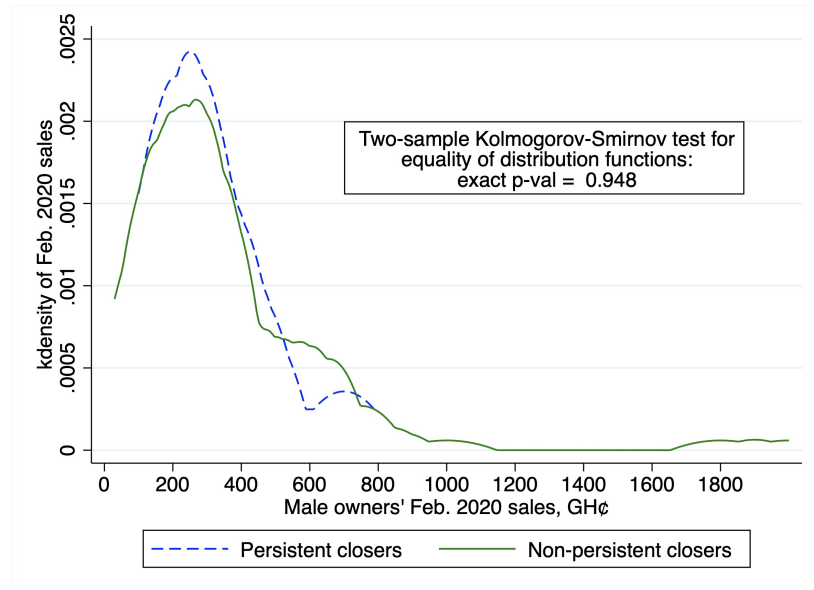
(b) Male firm owners

Note: This figure shows the distribution of February 2020 sales by persistent closure status for the 490 firm owners that make up our analysis sample, winsorizing the top earning female-owned firm for visual clarity. Persistent closure is defined as having zero sales for at least four of the five observed crisis months. Female-owners are shown in panel A, and male-owners are shown in panel B. Data comes from the retrospective six-month panel of firm outcomes collected via phone survey.

Table 1: **Firm Sales, Before and During Crisis**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Sales, GHC		Sales > 0		Sales, GHC (Conditional on Sales > 0)		Sales, GHC (Conditional on Survivor)		Persistent Closer (0/1)
	Females	Males	Females	Males	Females	Males	Females	Males	
Crisis period (Mar-Jul)	-201.7***	-209.1***	-0.468***	-0.376***	-116.0***	-126.8***	-207.1***	-194.9***	
	(18.73)	(28.28)	(0.0134)	(0.0286)	(18.71)	(30.09)	(22.85)	(32.27)	
=1 if Male									0.034
									(0.041)
Difference (male-female)	-7.445		0.0911***		-10.71		12.15		
	(33.82)		(0.0315)		(35.33)		(39.41)		
Constant	299.2***	345.5***	1.00	1.00	299.2***	345.5***	323.4***	352.7***	0.193***
	(19.51)	(29.48)	(.)	(.)	(19.51)	(29.50)	(23.61)	(33.91)	(0.020)
Observations	2328	612	2328	612	1421	420	1878	516	490
R^2	0.119	0.114	0.128	0.091	0.045	0.051	0.110	0.092	0.001
Num. of clusters	388	102	388	102	388	102	313	86	490

Note: Columns 1-8 report changes in monthly revenues between the pre-crisis period (February) and the crisis period (March-July). Columns 5-6 only consider owners who had positive sales in a given month. Columns 7-8 only consider owners who reported positive sales for two or more of the crisis months, i.e. not persistent closers/survivors. The difference row presents the coefficient on the interaction term between male and the crisis period indicator in a pooled regression with both female and male owners. The final column considers an indicator for whether or not the firm owner reported zero sales for at least four of the five crisis months, i.e. the firm is a persistent closer. Data comes from the retrospective six-month panel of firm outcomes collected via phone survey. Standard errors are clustered at the firm level. * p<0.1, ** p<0.05, *** p<0.01.

Table 2: **Selection Into Persistent Closure on Pre-Crisis Firm and Owner Characteristics**

	(1) Not Persistent Closer	(2) Females Persistent Closer	(3) Diff	(4) Not Persistent Closer	(5) Males Persistent Closer	(6) Diff
Panel A: Firm Characteristics, February 2020						
Sales (GHC)	323.38	198.13	-125.24***	352.67	306.88	-45.80
	(417.53)	(154.81)	(29.58)	(314.15)	(186.97)	(56.97)
Wage Bill (GHC)	6.05	1.73	-4.32*	14.07	21.88	7.81
	(32.11)	(13.89)	(2.42)	(44.73)	(69.88)	(17.76)
Non-Owner Workers	1.10	0.73	-0.37*	0.97	0.62	-0.34
	(2.10)	(1.51)	(0.21)	(1.66)	(0.81)	(0.27)
Firm Age	14.38	14.29	-0.09	18.01	18.31	0.30
	(8.74)	(9.26)	(1.17)	(12.53)	(12.83)	(3.42)
Panel B: Owner Characteristics, February 2020						
Age	38.61	38.66	0.05	41.31	39.88	-1.43
	(8.34)	(8.57)	(1.11)	(11.33)	(11.62)	(3.10)
Years Schooling	10.02	10.74	0.72	10.53	11.69	1.16
	(4.58)	(4.33)	(0.57)	(4.89)	(4.17)	(1.15)
Married (0/1)	0.76	0.72	-0.04	0.88	0.81	-0.07
	(0.43)	(0.45)	(0.06)	(0.32)	(0.40)	(0.10)
Children in the Home (0/1)	0.81	0.73	-0.08	0.84	0.75	-0.09
	(0.39)	(0.45)	(0.06)	(0.37)	(0.45)	(0.12)
Other Income-Generating Activity (0/1)	0.18	0.17	-0.01	0.27	0.62	0.36***
	(0.38)	(0.38)	(0.05)	(0.45)	(0.50)	(0.13)
Observations	313	75		86	16	
Share of firms, by gender	0.81	0.19		0.84	0.16	

Note: Sales, wage bill, firm size, married, children in the house, and presence of other income-generating activity come from the retrospective phone survey and correspond with February 2020. Firm age, age, and years of schooling were measured in the September 2019 census. Persistent closure is defined as having zero sales for at least four of the five observed crisis months. Sales, wage bill, and non-owner workers have not been winsorized. Children in the home are defined as people age 15 and below who eat from the same pot. Columns 3 and 6 report results of a t-test of difference in means by persistent closure status, by gender of firm owner. In columns 3 and 6, standard errors are in parenthesis. * p<0.1, ** p<0.05, *** p<0.01.

Table 3: **Income and Labor Supply by Persistent Closure Status**

	(1) Total income, GHC Females	(2) Total income, GHC Males	(3) Total hours Females	(4) Total hours >0 Males	(5) Firm profits, GHC Females	(6) Firm profits, GHC Males	(7) Other Income, GHC Females	(8) Other Income, GHC Males
=1 if Persistent Closer	-57.7***	159	-0.53***	-0.28**	-88.9***	-117***	24.0	275*
	(21.2)	(138)	(0.058)	(0.12)	(8.40)	(17.9)	(19.5)	(141)
Difference (male - female)		223		0.26*		-25.2		244*
		(138)		(0.13)		(21.5)		(141)
Constant	91.3***	214***	0.77***	1***	77.1***	106***	17.9**	101***
	(12.9)	(45.5)	(0.17)	(6.7e-08)	(7.95)	(22.1)	(7.66)	(27.1)
Observations	388	102	388	102	388	102	388	102
R^2	0.18	0.05	0.37	0.14	0.36	0.21	0.19	0.11

Note: This table reports how income and labor supply of hours changed for firm owners between the pre-crisis period (February) and July by persistent closure status and gender. All columns report the results from an ANCOVA specification where the February level of the outcome is controlled for. The outcomes considered are: firm owner's total reported income in July 2020 (including from the firm of interest, other self-employment, wage earnings, and farm profits); if the firm owner reported working >0 hours per week across all income generating activities in July 2020; profits from the garment-making firm; and other income in GhC (from other self-employment, wage earnings and farm profits). Persistent closure is defined as having zero sales for at least four of the five observed crisis months. The difference row presents the coefficient on the interaction term between male and persistently closed in a pooled regression with both female and male owners. Data comes from the retrospective six-month panel of firm outcomes collected via phone survey. Robust standard errors are reported in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

A   Appendix

Figure A1: Share of Firms with Positive Profits, by Gender and Month
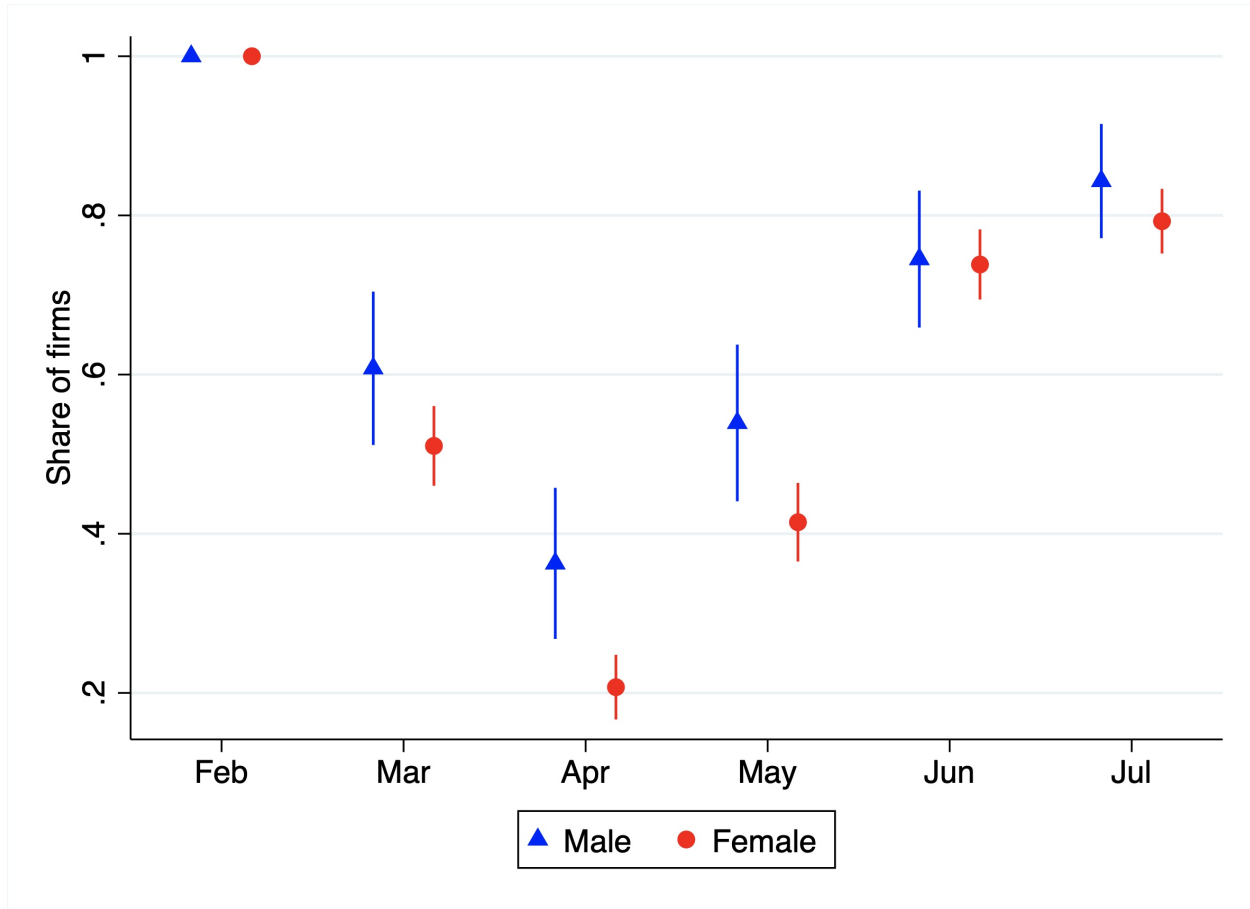
Note: This figure shows the share of firms reporting positive monthly profits (>0), for February through July 2020. The sample is limited to those reporting positive profits in Feb 2020. Data comes from the retrospective six-month panel of firm outcomes collected via phone survey for the 490 firm owners that constitute our analysis sample. Male-owned firms are indicated with a triangle (102 firms) and female-owned with a circle (386 firms). Bars represent the 95% confidence interval.

Figure A2: Share of Firm Owners Working Positive Number of Hours in Garment-Making Firm, by Gender and Month
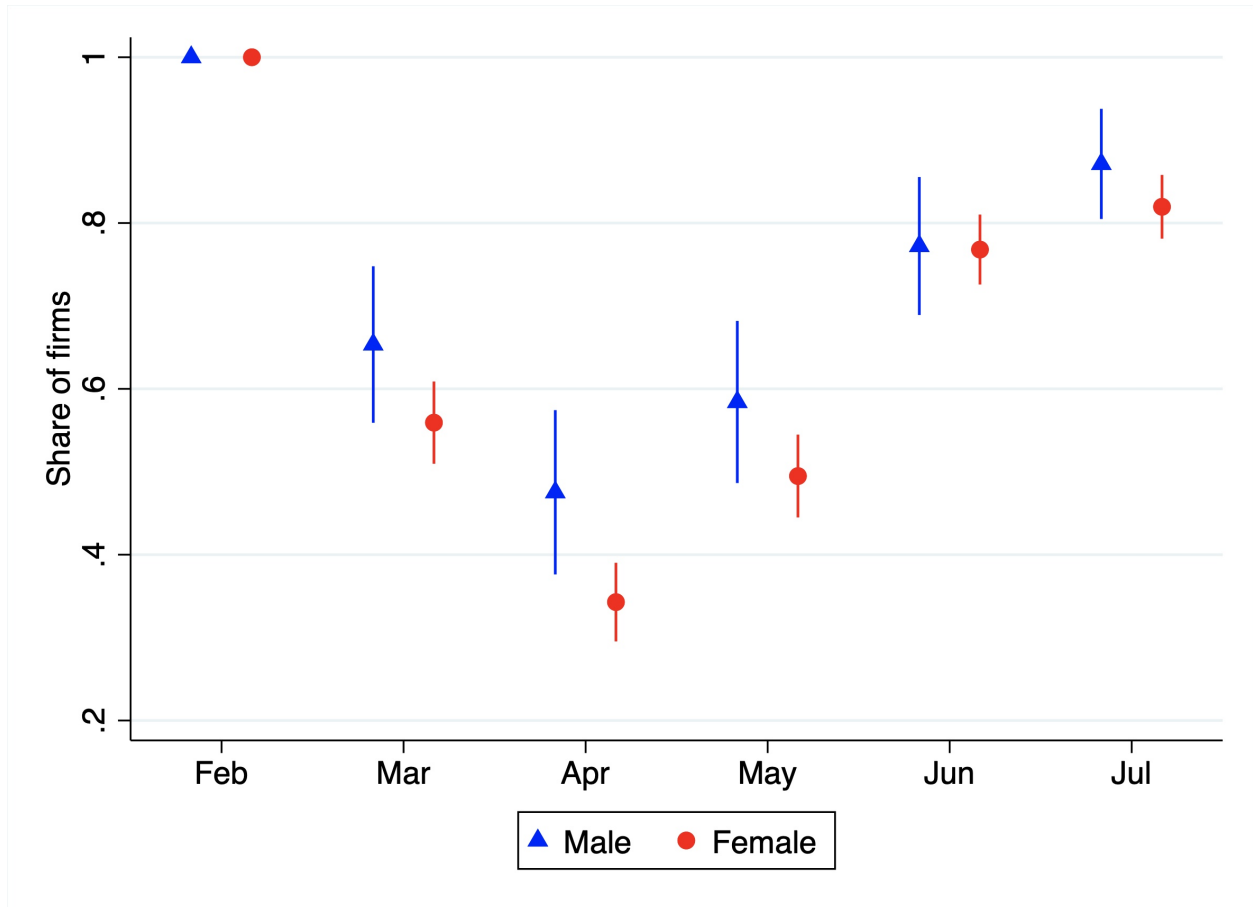
Note: This figure shows the share of firm owners who report working positive hours per week (>0) at the firm of interest, for February through July 2020. The sample is limited to those reporting positive hours worked per week in Feb 2020. Data comes from the retrospective six-month panel of firm outcomes collected via phone survey for the 490 firm owners that constitute our analysis sample. Male-owned firms are indicated with a triangle (101 firms) and female-owned with a circle (388 firms). Bars represent the 95% confidence interval.

Figure A3: Distribution of Feb 2020 Sales by Outside Option and Gender
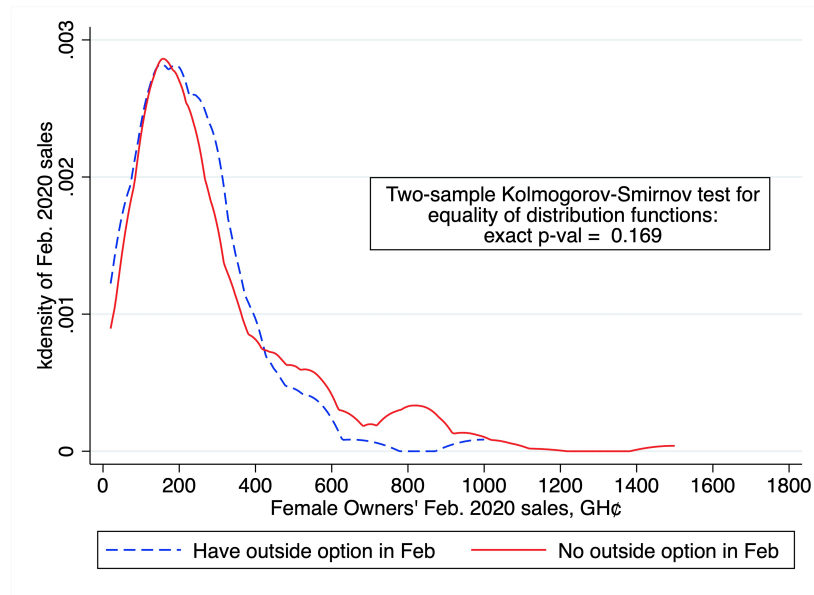
(a) Female firm owners
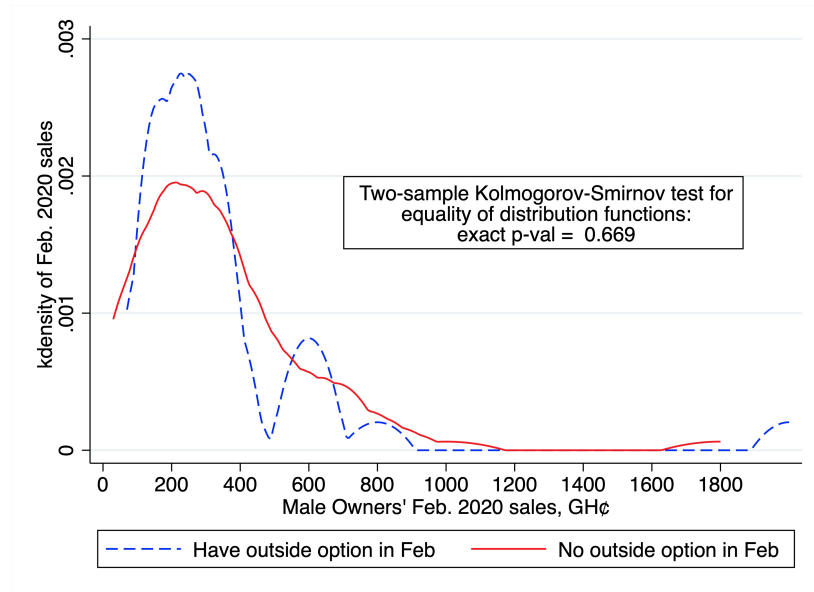
(b) Male firm owners

Note: This figure shows the distribution of February 2020 sales by if the owner has an outside option to generate income for the 490 firm owners that make up our analysis sample, winsorizing the top earning female-owned firm for visual clarity. An owner is defined as having an outside option if, besides the garment firm they own, they have another form of self-employment, work in small-holder agriculture, and/or have wage-employment (whether agricultural or non-agricultural). Female owners are shown in panel A, and male owners are shown in panel B. Data comes from the retrospective six-month panel of firm outcomes collected via phone survey.

Table A1: **Self-Reported Measures of Impact of COVID-19 Crisis and Coping Mechanisms**

	(1) Female owners	(2) Male owners	(3) Difference
Loss in demand/customers	0.98	0.99	0.01
	(0.14)	(0.10)	(0.01)
Difficulty accessing inputs	0.66	0.70	0.03
	(0.47)	(0.46)	(0.05)
Worker absenteeism	0.02	0.08	0.06**
	(0.15)	(0.28)	(0.03)
Applied for and/or received any	0.23	0.29	0.07
gov't assistance during COVID	(0.42)	(0.46)	(0.05)
Temporarily migrated back to my	0.08	0.09	0.01
original home place	(0.27)	(0.28)	(0.03)
Found another job/earning	0.05	0.11	0.06
occupation	(0.22)	(0.31)	(0.03)
Spent savings to cover living	0.46	0.44	-0.02
expenses	(0.50)	(0.50)	(0.06)
Relied on lenders or family	0.12	0.05	-0.07**
for money	(0.33)	(0.23)	(0.03)
Observations	388	102	490

Note: This table reports the mean and standard deviation of self-reported measures of the impact of the COVID-19 crisis and coping mechanisms by gender of the firm owner. Column 3 reports results of a t-test of difference in means by gender of firm owner. In column 3 standard errors are in parenthesis. * p<0.1, ** p<0.05, *** p<0.01. The survey questions used to construct this table, excluding that related to government assistance, had an additional consent accompanying them in the survey. Some firm owners opted out of answering these questions. The number of observations for the first three rows is 470 and for the final four rows is 466.

Table A2: **Women Attrition Balance**

	(1)	(2) Mean	(3)	(4)	(5) Difference	(6)
	Open, Jan 2020	Surveyed	>0 Sales, Feb 2020	(Open - Surv.)	(Surv - Sample)	(Open - Sample)
Yrs. Exp, Garment-making	13.28 (8.88)	13.21 (8.72)	13.36 (8.83)	0.06 (0.61)	-0.15 (0.62)	-0.09 (0.62)
Yrs. Exp, Hohoe Garment-making	11.71 (8.43)	11.59 (8.26)	11.74 (8.39)	0.12 (0.57)	-0.15 (0.59)	-0.03 (0.59)
Apprentices	1.31 (2.15)	1.32 (2.17)	1.35 (2.21)	-0.01 (0.15)	-0.03 (0.15)	-0.04 (0.15)
Paid Workers	0.07 (0.32)	0.07 (0.32)	0.07 (0.32)	0.00 (0.02)	-0.00 (0.02)	-0.00 (0.02)
Unpaid Workers	0.15 (0.51)	0.15 (0.52)	0.15 (0.53)	0.00 (0.04)	-0.01 (0.04)	-0.00 (0.04)
Reason Self-Employed: Money	0.34 (0.48)	0.35 (0.48)	0.33 (0.47)	-0.00 (0.03)	0.02 (0.03)	0.01 (0.03)
Reason Self-Employed: Interest	0.17 (0.38)	0.17 (0.38)	0.17 (0.38)	0.00 (0.03)	-0.00 (0.03)	0.00 (0.03)
Reason Self-Employed: Own Boss	0.48 (0.50)	0.48 (0.50)	0.50 (0.50)	-0.00 (0.03)	-0.01 (0.04)	-0.02 (0.03)
Garment-Making Contacts, Hohoe	19.72 (16.94)	19.89 (17.14)	19.59 (16.64)	-0.16 (1.17)	0.30 (1.20)	0.14 (1.17)
Garment-Making Contacts, Other	4.42 (5.91)	4.50 (5.98)	4.52 (5.91)	-0.08 (0.41)	-0.02 (0.42)	-0.10 (0.41)
Observations	435	412	388			

Note: This table reports the balance in observables, collected during the July 2019 census, between the female firm owners in the full sampling frame (Open Jan, 2020), those in the surveyed sample (Surveyed) and those in the analysis sample that had positive sales in February 2020 (>0 Sales, Feb 2020). In columns 1-3, the mean is presented, with the standard deviation in parentheses. Columns 4-6 test for differences between these samples. Standard errors, in parentheses, are clustered at the firm owner level. * p<0.1, ** p<0.05, *** p<0.01.

Table A3: **Men Attrition Balance**

	(1)	(2)	(3)	(4)	(5)	(6)
	Mean			**Difference**		
	Open, Jan 2020	Surveyed	>0 Sales, Feb 2020	(Open - Surv.)	(Surv - Sample)	(Open - Sample)
Yrs. Exp, Garment-making	16.99	16.63	17.06	0.36	-0.43	-0.07
	(12.60)	(12.46)	(12.51)	(1.66)	(1.73)	(1.68)
Yrs. Exp, Hohoe Garment-making	14.88	14.74	15.12	0.14	-0.38	-0.24
	(11.88)	(11.30)	(11.34)	(1.54)	(1.57)	(1.55)
Apprentices	0.91	0.92	0.96	-0.01	-0.04	-0.05
	(1.77)	(1.80)	(1.83)	(0.24)	(0.25)	(0.24)
Paid Workers	0.13	0.14	0.13	-0.01	0.01	0.00
	(0.51)	(0.54)	(0.54)	(0.07)	(0.07)	(0.07)
Unpaid Workers	0.19	0.21	0.21	-0.02	0.00	-0.02
	(0.54)	(0.56)	(0.57)	(0.07)	(0.08)	(0.07)
Reason Self-Employed: Money	0.24	0.23	0.24	0.01	-0.01	0.00
	(0.43)	(0.42)	(0.43)	(0.06)	(0.06)	(0.06)
Reason Self-Employed: Interest	0.12	0.14	0.13	-0.02	0.01	-0.00
	(0.33)	(0.35)	(0.34)	(0.05)	(0.05)	(0.04)
Reason Self-Employed: Own Boss	0.64	0.63	0.64	0.01	-0.01	0.00
	(0.48)	(0.48)	(0.48)	(0.06)	(0.07)	(0.06)
Garment-Making Contacts, Hohoe	23.95	23.64	23.96	0.31	-0.32	-0.01
	(20.13)	(19.70)	(19.91)	(2.64)	(2.75)	(2.69)
Garment-Making Contacts, Other	6.68	6.24	6.16	0.44	0.08	0.52
	(6.63)	(6.08)	(6.00)	(0.84)	(0.84)	(0.84)
Observations	122	106	102			

Note: This table reports the balance in observables, collected during the July 2019 census, between the male firm owners in the full sampling frame (Open Jan, 2020), those in the surveyed sample (Surveyed) and those in the analysis sample that had positive sales in February 2020 (>0 Sales, Feb 2020). In columns 1-3, the mean is presented, with the standard deviation in parentheses. Columns 4-6 test for differences between these samples. Standard errors, in parentheses, are clustered at the firm owner level. * p<0.1, ** p<0.05, *** p<0.01.

Table A4: **Profits and Labor hours, Before and During Crisis**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Profits, GHC		Profits > 0		Hours per week		Hours per week > 0	
	Females	Males	Females	Males	Females	Males	Females	Males
Crisis period (Mar-Jul)	-131.0***	-138.5***	-0.467***	-0.380***	-23.36***	-20.35***	-0.403***	-0.329***
	(7.877)	(17.93)	(0.0134)	(0.0292)	(0.706)	(1.428)	(0.0153)	(0.0308)
Difference (male-female)	-7.506		0.0870***		3.014*		0.0744**	
	(19.52)		(0.0320)		(1.587)		(0.0343)	
Constant	190.8***	219.8***	1.00	1.00	47.22***	48.47***	1.00	1.00
	(8.649)	(19.08)	(.)	(.)	(0.458)	(0.733)	(.)	(.)
Observations	2316	612	2316	612	2328	606	2328	606
R^2	0.172	0.126	0.128	0.093	0.165	0.131	0.101	0.075
Num. of clusters	386	102	386	102	388	101	388	101

Note: This table reports how monthly firm profits and hours of labor worked changed between the pre-crisis period (February) and the crisis period (March-July), conditional on positive profits or hours in the pre-crisis period. The level of profits in GhC, an indicator for positive profits, the average weekly hours worked in a given month, and an indicator for whether the owner reported to work positive hours in the average week in a given month are considered. The difference row presents the coefficient on the interaction term between male and the crisis period indicator in a pooled regression with both female and male owners. Data comes from the retrospective six-month panel of firm outcomes collected via phone survey. Standard errors are clustered at the firm owner level. * p<0.1, ** p<0.05, *** p<0.01.