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Female Business Leaders, Business and Cultural Environment, and Productivity around the World

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Abstract

Studies of female business leaders and economic performance are rarely conducted with worldwide observational data, and with considerations on the underlying cultural, institutional, and business environment. This paper uses worldwide, firm-level data from more than 100 countries to study how female-headed firms differ from male-headed firms in productivity level and growth, and whether the female leader performance disparity hinges on the underlying environment. Female-headed firms account for about 11 percent of firms and are more prevalent in countries with better rule of law, gender equality, and stronger individualistic culture. On average, female-headed firms have 9 to 16 percent lower productivity and 1.6 percentage points lower labor productivity growth, compared with male-headed firms. The disadvantage is mainly in manufacturing firms, largely nonexistent in service firms, and present in relatively small firms. Although the female leader performance disadvantage is surprisingly not related to gender equality, it is smaller where there is less emphasis on personal networks (better rule of law, lower trade credit linkages, lower usage of bank credit, and more equalizing internet), less competition, and the culture is more collective. The study does not find that the female leader disadvantage is amplified in corrupt environments. Africa differs significantly in that it features lower female disadvantage, stronger female advantage in services relative to manufacturing, and stronger sensitivity of female business leaders to electricity provision and bank credit access.

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1. Introduction

While women are beginning to get ahead of men in selective countries in a few areas, such as college admission, in both high-paying and leadership jobs, women continue to lag significantly behind (Goldin et al. 2006; Blau and Kahn 2017). For instance, women remain severely under-represented both among corporate directors (Bilimoria and Piderit 1994, Westphal and Stern 2006, 2007) and conductors of symphony orchestras (Goldin and Rouse 2000). Among the largest U.S. firms (i.e., the Standard & Poor's 1,500 firms) in the 1990s, only 2.5 percent of top executives were women, and these female executives tended to serve in the smaller of these large firms (Bertrand and Hallock 2001). Things have improved only slightly since then: in a large sample of privately held and publicly listed firms, about 9.4 percent were found to have female CEOs (Faccio et al. 2014). Women's share in businesses ranges from 20 to 40 percent in the United States and European countries, and much lower in many developing countries (Klapper and Parker 2010). Based on the World Bank Enterprise Survey data, which we use in this paper, in some countries the share of firms led by women approaches zero.

Why do women not fare as well in labor markets as men in general and in top-level jobs in particular? Some attribute the gender disparity to differences in human capital and discrimination, which results in lower pay and responsibility (Polachek 1981, Goldin and Rouse 2000; Black and Strahan 2001). A new literature considers the roles played by psychological and non-cognitive traits such as self-confidence, risk aversion, acceptance of competition, and inter-personal skills, which are extensively surveyed in Gneezy et al. (2009), Bertrand (2011), and Blau and Kahn (2017). This new literature comes largely from laboratory and field experiments (Gneezy et al. 2009), with subjects often being college students, and the stakes involved being minor. Whether or not the findings generalize into the real world is uncertain but of critical consequence. Moreover, even when studies on women's labor outcomes are from the real world, the findings may not be relevant for women business leaders, who might differ significantly from the population of women in general. For example, self-confidence is rewarded differently among executives than clerical workers (Cattan 2014), female executives may be particularly self-confident among women, and they often do not fit female stereotypes (Adam and Funk 2012). For

these reasons, in her survey of the literature on gender and labor market outcomes, Bertrand (2011, p. 1544) states, "whether this body of psychological research will be more than just a decade-long fad and have a long-lasting impact on how labor economists think about gender differences will crucially depend on further demonstration of its economic significance in real markets." When facing competition in doing real-world jobs, for instance, women have much more time to plan, receive feedback, and they may be thoroughly trained in the tasks, and for which they have strong confidence, then the apparent disadvantage of women in confronting competition may disappear (Lavy 2012).

In this paper, we use a worldwide sample of firms to study how female-headed firms fare relative to male-headed firms in productivity and its growth, and how the disparity is related to the underlying cultural, institutional, and business environments. Most of the existing studies focus on developed countries and on outcomes related to accounting and stock market performance, corporate financial structure, and risk taking. However, we know little about how female business leadership affects firms' productivity levels and growth, and whether female business leadership interacts with the local cultural, institutional and business environment in shaping firm outcomes.

Understanding the role of female business leadership in productivity is important. After all, an economy's long-term growth depends crucially on its productivity level and its sustainable growth (Syverson 2011). By focusing on productivity, we put our emphasis squarely on the key determinants of long-term prosperity. And by focusing on the role of female business leadership in a developing country, we focus on a key area of untapped potential for long-term growth.

We find a significant female leadership productivity disadvantage: conditional on a rich set of conventional controls, female-headed firms exhibited lower productivity level by around 15 percentage points, and labor productivity growth by around 2 percentage points, and these disadvantages are more pronounced in manufacturing than in services, with complete disappearance in service sectors. The disadvantage is also more pronounced in small and medium enterprises (SMEs). Two contexts amplify the female leadership disadvantage: when personal networks loom large, such as in places that use extensive trade credit networks, where bank credit is important, or that do not have good internet

environment; and when competition is fierce. Surprisingly, and contrary to the literature, we do not find that female business leaders suffer more disadvantage where corruption is more severe. Given the strong interest in Africa in terms of its special development challenges, we also pay particular attention to African countries. African countries overall have little female disadvantage on productivity performance. But here in manufacturing sectors, the female advantage in productivity is more pronounced than the world average, while in services there is an *advantage* in productivity growth.

Our paper is related to the literature on the impact of female business leaders. This literature has focused on the impact of female business leadership on accounting and stock market performance,[1] such as accounting profitability and Tobin's Q (Ahern and Dittmar 2012; Matsa and Miller 2013; Benouri et al. 2018), accounting quality (Lara et al. 2017), financial structure and firm survival (Weber and Zulehner 2010, Faccio et al. 2016), and labor costs (Matsa and Miller 2013).[2] Focusing on U.S. and European firms, this literature finds female disadvantage in typical accounting and/or stock market performance, though some also find no significant impact differences *vis-à-vis* male leaders, and some indications of lower corporate risks and higher survival likelihood. Few studies deal with the reasons for female business leader disadvantage.[3] We differ in focusing on productivity and its growth and find pronounced female disadvantage, in our extensive coverage of firms from more than 100 countries, and in novel evidence that female business leaders tend to fare less well than male ones in adapting to competition, in contexts requiring personal networks, in countries with worse rule of law. We also pay particular attention to Africa.

2. Hypotheses

The traditional view is that the gender identity of corporate leaders should not matter for

[1] See Wolfers (2006), Adams and Ferreira (2009), Adams and Funk (2012), Ahern and Dittmar (2012), Sila et al. (2016), Ahern and Dittmar (2012), Carter et al. (2003, 2010), Erhardt et al. (2003), Gul et al. (2011), and Rose (2007).

[2] See also Beck et al. (2010) on female loan officers' impact on lower portfolio risks; Berger et al. (2014) find the opposite.

[3] An exception is Hanousek et al. (2017), who show that the effect of corruption on firm performance is especially severe for female-headed firms.

corporate performance. This view is forcefully expressed by Friedman (2007), which argues that corporate leaders' only goal is to maximize profits, and the executive labor and the capital markets should result in prefect matches between corporate leaders and specific firms.

As discussed above, this irrelevance view has been contradicted by existing evidence that gender identity matters for leadership positions. In this paper, we are mostly concerned with how female business leadership affects productivity and its growth. Productivity performance of a firm depends on the leader's risk attitudes, time horizon, aspiration, objective function, time input, and past business experience, among others. We summarize what the literature has found on the gender differences in these areas, and offer our hypotheses to guide our empirical exploration. To improve productivity performance, business leaders need to take risks, have long-term horizons, have strong aspirations and incentives to excel, and be strongly competitive. How do female and male business leaders likely differ in these aspects?

The literature suggests that women tend to be more *risk averse*, and prefer more stable performance than men. Evidence from lab and field experiments shows that women, in general, tend to be more risk averse and less overtly ambitious than men (Croson and Gneezy 2009). In the business world, female directors are found to be more risk averse (Levi et al. 2014).[4] Consistent with strong risk aversion of female business leaders, firms run by female CEOs have lower leverage and less volatile earnings than similar firms run by male CEOs (Bosma et al. 2004; Faccio et al. 2016), and studies in Canada suggest that women (but not men) prefer to run a small and stable business (Verheul et al. 2012). Since both productivity level and its improvement require taking risks, especially in R&D inputs and strategic decisions, the lower tolerance for risks could put women business leaders at a disadvantage for productivity and its growth. Furthermore, the preference for lower risks also implies that productivity *dispersion* among female-headed firms should be smaller than that among male-headed firms.

[4] It is also possible that the firms (or their shareholders / boards of directors) have these characteristics (i.e. are less risk averse) and are therefore selecting CEOs which they perceive as also having these characteristics. In such cases, the differences in performance would reflect the preferences of those selecting the CEOs rather than anything necessarily to do with the gender of the CEO per se.

There is suggestive evidence that women have lower aspiration for successes. Part of the reasons may be the lack of confidence.[5] Representative population surveys in 17 countries show that women are less confident of their entrepreneurial skills (Koellinger et al. 2013). Furthermore, placing lower value on money than men, women may care less about achieving traditional monetary successes (Blau and Kahn 2017).[6] Consistent with this, female owners are found to be less motivated than male owners by firm growth and profitability, and more by goals such as personal fulfillment, flexibility and autonomy (Anna et al. 1999; Morris et al. 2006; Klapper and Parker 2010). Female corporate leaders may also be more motivated by social goals such as labor welfare. Based on evidence of gender quotas for corporate boards in Norway, female-headed firms tend to be more pro-labor, with higher labor costs and lower short-term profits (Matsa and Miller 2013). Higher labor costs could hinder the adoption of labor-saving technologies and hurt productivity growth.[7]

Time allocation of female corporate executives may also hinder corporate successes. Greater career discontinuity and shorter work hours account partly for the female earning disadvantage in the financial and corporate sectors after graduation from MBA programs (Bertrand, Goldin and Katz 2010). Similarly, the gender gap among young lawyers is partly attributable to the presence of young children (Azmat and Ferrer 2017). Along the same lines, self-employed women (some of which are likely to be entrepreneurs) do more housework, have shorter hours at work, and spend more time on childcare, and these factors account for a large share of the gender earnings differentials among the self-employed (Hundley 2001). Gender norms reinforce the roles played by aspiration and time allocation in constraining women's corporate leadership success. The short work hours for married females is likely partly due to gender norms that push married women to do more household work to fit the gender norm (Bertrand, Kamenica and Pan 2015). With these strains on women's time, it is not surprising that male top executives are more likely than

[5] In the long run, the lack of confidence could be a result of the "system" that traditionally discriminates against women being business leaders rather than an inherent trait.

[6] The gender gap among young lawyers, for instance, is found to be partly attributable to lower aspiration (to become law firm partners) (Azmat and Ferrer 2017).

[7] Higher labor costs could also imply hiring better-quality employees, thus resulting in better productivity performance of firms led by women.

female top executives to have the knowledge and experience related to businesses and management (Bruch 1992).

These factors—stronger risk aversion, lower aspiration, stronger non-business objectives, less time to devote to corporate businesses, and less business experience—tend to hinder female-headed firms' productivity performance. Indeed, there is evidence that female-headed firms tend to be less successful in several firm performance measures in the United States (Loscocco and Robinson 1991), the Netherlands (Bosma et al. 2004), or Sri Lanka (de Mel et al. 2009).[8] Since we focus on both productivity level and growth, *ex ante* we do not distinguish the level or the growth, since the same factors could manifest in either or both. For instance, stronger risk aversion would lead to lower R&D inputs, which lower both the level and the growth of productivity. Since the bundling of childcare and managing a firm is serious only in SMEs (Hundley 2001), we expect the female leader productivity performance gap is more severe in SMEs relative to non-SMEs.

The impact and dispersion hypothesis: Female-headed firms tend to have lower productivity performance, and lower productivity dispersion. The female leadership productivity disadvantage is especially severe for small firms.

Role of market competition

In laboratory and field experiments, women are consistently shown to be less competitive, tend to opt out of competition, and tend to be less effective than men under competitive pressures.[9] As Croson and Gneezy (2009, p. 453) summarize, "Males are more likely to see a risky situation as a challenge that calls for participation, while females interpret risky situations as threats that encourage avoidance." These experimental findings are replicated in real-world situations. The differences in attitudes toward competition, for instance, translate into differences in performance in competitive vs. non-competitive entrance exams in Paris (Ors, Palomino, and Peyrache 2013), in career choices (Buser, Niederle, and Olsterbeek 2014), and in explaining the lower share of women among entrepreneurs in European countries (Bonte and Piegeler 2013). After U.S. banks experienced de-

[8] Others find similar performances among these two types of firms (Kalleberg and Leicht 1991).

[9] See Gneezy, Niederle and Rustichini (2003), Croson and Gneezy (2009), Niederle and Vesterlund (2011), Niederle and Vesterlund (2007), Flory, Leibbrandt and List (2015).

regulation with rising competitive pressures, female-headed banks experienced relative performance decline compared to male-headed banks, consistent with women being less effective in handling competitive pressures (Amore and Garofalo 2016).[10] There are indications that the gender effect may depend on the social context. In a matrilineal society, children show no gender disparity in competitiveness, but in a patriarchal society, boys exhibit stronger competitiveness than girls (Anderson et al. 2013).

Relatedly, a society's orientation toward individualism (vs collectivism) also has implications for female business leadership and productivity. An individualistic country emphasizes more on individual efforts and less on group coordination. Relative to collectivistic societies, individualistic societies are therefore more encouraging of competition fueled by individual achievement. This cultural trait has two implications for female business leaders. First, individualism would encourage women toward individual achievement, which would attract women into the business world, and as a result, individualistic countries should feature a higher share of female business leaders than collectivist countries. Second, given women's comparative disadvantage in tolerating (and enjoying) competition, it is likely that female-headed firms fare worse in productivity performance in more individualistic and competitive countries. For instance, female business leaders likely would put in fewer of the inputs that competitive environments demand, such as socializing with other successful, competition-oriented executives in other firms, or they are less likely to promote competitive employees within the firm. We thus expect that individualistic countries feature a higher share of female business leaders, but also greater female disadvantage in productivity performance.

The competition hypothesis: Individualistic countries should feature a higher share of female business leaders as well. In places in which competition is fiercer—including the case of individualistic societies--the effects of female business leadership on productivity performance should be more negative.

Asymmetric gender impacts of corruption

[10] However, women are not less competitive in all goals: when goals are benefits of offspring, women do not show a competitiveness gap (Cassar, Wordofa and Zhang, 2016). Among Israeli teachers, women do not differ from men in competitive tournament performance with any gender mixes (Lavy 2012).

The literature seems to suggest that women tend to be more ethical and less adapted or tolerant to corruption. Indeed, women are more likely to be reciprocal in gift exchanges (Croson and Buchan 1999, Buchan et al. 2008), and therefore less involved in corruption. Another reason for lower corruption for women is their weaker access to the personal networks traditionally dominated by men (Goetz 2007). Furthermore, since women tend to be more risk averse (Croson and Gneezy 2009) and corruption entails risk of being detected and punished, women are naturally more reluctant to participate in corrupt activities. Women, including female top executives, also tend to have lower overconfidence (Lundeberg et al 1994, Barber and Odean 2001, Huang and Kisgen 2013), which makes them less likely to underestimate the probability of being caught, again reducing their susceptibility to corruption. Thus, it is not surprising that firm-level data (from Georgia) and cross-country individual data (World Value Survey) show that women are less involved in bribery and are less likely to condone taking bribes, while cross-country evidence shows that corruption is less severe in countries with higher presence of women in the parliament, government, and the labor force (Dollar et al. 2001; Swamy et al. 2001). The negative effect of corruption on the level of technical efficiency is found to be particularly strong for female-headed firms (relative to male-headed firms) in 14 Central and Eastern European countries (Hanousek et al. 2017).

Since women business leaders are likely to be risk averse and apprehensive of the risks of expropriation associated with corruption, we suspect that in corrupt environments they are more reluctant to invest in innovations and long-term investment, and the effects of corruption on productivity performance should be especially pronounced and more negative.

The corruption hypothesis: the effects of corruption on productivity performance should be more adverse for female than for male business leaders.

Access to personal networks and female business leader effects

Business leaders organize various inputs into outputs that are sold to customers. A key function for business leaders is to obtain or to help obtain scarce inputs, such as bank credit, trade credit, key suppliers, and key customers, all of which likely requires personal networks. For instance, firms need to establish and maintain trade credit relationships

among firms—between the firm and its supplier and its customers—and such relationships are often based on personal networks or access to power. How well male versus female business leaders would perform would depend on their access to such key contacts and personal networks.

The literature suggests that women have less access to personal and professional networks and spend less time networking (Goetz 2007). For instance, young female lawyers have been found to spend significantly less time in professional networking (Azmat and Ferrer 2017). Based on representative population surveys in 17 countries, women are found to have less extensive networks (i.e., personally less likely to know someone who started a business) (Koellinger et al. 2013). This is not surprising: typically women spend more time in household chores and networking as parents, which takes away time from professional networking. Indeed, recent research suggests that even in the United States, wives frequently conform to the gender norm of not out-earning husbands, and when wives do out-earn their husbands, they instead spend more time doing household chores to maintain intrahousehold harmony (Bertrand, Kamenica and Pan 2015).

This lack of professional and business networks does not augur well for the potential positive effect of inter-firm trade credit relationships. Trade credit is a key source to finance firms in developing countries, especially where access to bank credit is limited (Fisman and Love 2003). Trade credit relationship needs strong trust built on personal relationship between upstream-downstream trading partners, which requires strong relationships. Or trade credit relationship requires strong relationship with privileged firms such as state-owned enterprises which have better access to bank finance (Cull et al. 2009). Furthermore, in societies where women are discriminated against, some social clubs do not admit women, again rendering women in networking disadvantage. Moreover, trade credit relationship also implies financial risks of default. Women's relative apprehension of risks again would discourage the use of trade credit relationship. The lack of networking and the apprehension of trade credit risks thus put women business leaders at a disadvantage in environments where trade credit relationships are important, such as in environments of financial constraints. For instance, limited use of trade credit relationship could put female business leaders at a disadvantage in funding firm expansion and productive investments,

which would limit long-term productivity improvements.

Similarly, in many developing countries, the lack of access to network-based relationship might also put female business leaders in disadvantage in accessing other key firm inputs such as bank loans, or even electricity. With limited supply of bank credit in many developing countries, access to loans typically requires access to scarce relationships such as political connections, or connections to bank staff (Faccio 2006; Claessens et al. 2008; Cull et al. 2015). In a similar vein, vulnerable firms, which likely would include many women-led firms without access to political power, are more likely to pay utility bribes for connections and keeping connections (Clarke and Xu 2004). Thus, where bank credit access and electricity connections are scarce and important, female-headed businesses might have worse productivity performance.

To counter the constraints posed by personal networks, there are also empowering and non-personalizing forces facilitating female business leadership. One is the rule of law, which empowers traditionally disadvantaged groups. By having the protection of the court system, unfair practices by trading partners and competitors could be curbed, and disadvantaged groups are more empowered to take necessary investment and transactions. Since this effect would be more strongly felt for disadvantaged groups, of which women belong, we expect that the female business leadership disadvantage would be smaller in countries with better rule of law.

The other empowering force for female business leaders is the advance in technology, and in particular, the wide availability of internet. Previous research has shown that internet has proved to be a general-purpose technology, affecting most industries, and empowering small firms (relative to large firms) (Clarke, Qiang and Xu 2015). By similar token, disadvantaged women business leaders may benefit particularly from the equalizing effects of internet, by having access to wider markets and customer bases, by having cheaper advertisement, by lowering technology costs, and by reducing the need for personal networks. Furthermore, recent decades have witnessed increasing catchup in terms of education by women relative to men, partly due to men's comparative advantage in brawn versus brain (Pitt, Rosenzweig, and Hassan 2012; Zhang and Xu 2016). Rising skills of women also make women better at adopting modern technologies, further

facilitating women business leaders' relative advantage. We thus expect that availability of internet would reduce women business leaders' productivity performance disadvantage.

The personal network hypothesis: The effects of female corporate leadership on productivity improvement would be especially negative where access to personal network is important, that is, where trade credit relationship is important, where access to electricity and to bank credit is scarce and important, but less negative and pronounced where the rule of law is stronger, and where the availability of internet is better.

3. Data and Empirical Results

The key data source is the World Bank's Enterprise Surveys (WBES) in 579 cities of 103 countries. The WBES data are collected by the World Bank to benchmark the business climate in developing countries across the world and to understand the determinants of firm performance. In each country the survey is based on the universe of eligible firms obtained from the country's statistical office with stratified random sampling with replacement, and the result is a representative sample of the non-agricultural private economy in the country.[11] Stratification is based on two criteria: the sector of activity and firm size. Typically, the stratified sampling yields between 100 – 1,000 firms per country, with 108 firms for the median city. Industries range from manufacturing and construction to services and retail and wholesale trade.[12]

We include data collected after 2006, although some WBES were conducted earlier. Prior to that year, there was considerable heterogeneity across countries in terms of the questionnaire format, sectors covered, and sampling methodology. Moreover, the samples for surveys conducted before 2006 were not generally representative. A complete list of variables and data sources is shown in Table 1; the summary statistics for our key variables are in Table 2. Our final sample consists of up to approximately 65,000 firms covering 579 cities in 103 countries.[13]

[11] Thus, wholly state-owned firms are not in the sample.

[12] See http:\\www.enterprisesurveys.org for a more detailed description of the WBES.

[13] For each dependent variable, the number of observations differs, and the figure of 65,000 is for the dummy variable of female head which has fewer missing observations. The 579 cities in 103 countries refers to the sample where the missing data issue does not arise.

Empirical specification

We focus mainly on productivity and its growth, the key indicator and the driver for an economy's long-run growth and eventual prosperity. Static measures of performance such as labor productivity or total factor productivity (TFP) capture the current level of efficiency and technology. By further using productivity growth, we filter out time-invariant measurement errors. Our base estimation equation is:

$$Y_{icjt} = FIRM_{icjt}\theta + E_{cjt}\beta + FemHead_{icjt}\beta_{FH} + FemHead_{icjt}E_{cjt}\beta_{FH*E} + u_j + v_t + \epsilon_{icjt} \quad (1)$$

Here, *i, c, j,* and *t* index firms, country (and sometimes city), industries, and year respectively. When the outcome is productivity growth, we control for the initial-period level of productivity to account for potential mean-reversion. Since growth rates are heavily influenced by outlier issues,[14] we follow Davis and Haltiwanger (1999) by calculating mid-point growth rates by dividing the change in productivity between the survey year and three years earlier by the simple average of productivity in the beginning and ending years. This bounds the resulting growth rate between – 2 and +2, thereby significantly reducing the influence of outliers.[15] We cluster the heteroskedasticity-corrected errors at the country level. *FemHead* is an indicator for the firm being led, with details provided later, by a woman at the observation year. Among the control variables, *FIRM* is a vector of firm-level controls, dummies for firm size being middle or large.[16] We also control for industry and year dummies. E_{cjt} is a vector of the underlying business, institutional, and/or cultural environment. In some specifications, we allow *FemHead* to change the intercept only; in others we allow *FemHead* to have effects hinging on the

[14] To see this, consider a firm whose employment grows from 10 to 110 workers compared to one whose employment grows from 100 to 200 workers. Both firms increase employment by 100 workers. However, whereas the former shows a growth rate of 1,000 percent, the latter shows a growth rate of only 100 percent.

[15] Since the dependent variables are bound between -2 and +2, non-linear Tobit estimation of equation (1) may be used. However, it is not necessary when one is mainly interested in the marginal effect. The Tobit model requires "commitment to functional form and distributional assumptions, about which we do not usually feel strongly" (p 197-198, Angrist and Pischke, 2009), while OLS has the virtue of "simplicity, automation, and comparability across studies" (p197, Angrist and Pischke, 2009). We have experimented with estimation using the Tobit model, finding qualitatively similar results to those which are based on OLS.

[16] We include two firm-size dummies. The first is for firms which initially employ between 20 and 100 workers, and the second for firms that initially employ more than 100 workers.

underlying environment.

The key variables are *FemHead* and its interactions with elements of the underlying environment. In our base specification, we allow it to affect the intercept. That is, it captures the average differences in female-headed firms with male-headed firms. In light of our hypotheses discussed above, we also allow *FemHead* to interact with some aspects of our environmental indicators, in particular, those related to individualism, the rule of law, corruption, competition, and the importance of social/personal network.

We now discuss what *FemHead* represents. It is not the classical sense of causal effects—which would represent context-invariant effects. The effects of *FemHead* simply represent how female-headed firms differ from male-headed firms after conditioning on exogenous controls. It is clearly context-varying, would depend on a society's institutions, culture, norms, which change over time. For instance, recent research shows that children's competitiveness does not show gender disparity in matrilineal society but does in patriarchal society (Anderson et al. 2013). This is why we allow its effect to depend on the underlying environment. What we could do is to ensure its robustness, and that the differences are not due to important omitted variables. We thus control for basic firm characteristics, which may be correlated with both productivity growth and FemHead. Since the literature on gender and firms argue that industry and firm sizes are two key factors on which female-headed firms differ, we also control for industry dummies, and size dummies. As such, we also estimate the association between the gender of the head of the firm and productivity outcomes for observationally identical firms using propensity score matching. An advantage of our study is that all firms are selected from the same industries. Furthermore, by examining the growth of productivity, selection of female-headed firms in terms of static characteristics are eliminated, and the effects are more likely to reflect the "true" conditional disparity between male- and female-headed firms.

Measurements of the environmental variables

The business environment variables are measured at the city-industry-year level. While firm-level business environmental indicators are available from WBES, we do not directly use individual answers because they reflect choices made by firms and that are, therefore, endogenous. We instead follow the literature by using the local average across firms of the

BE indicators at the city-industry level as a proxy for the local BE (Dollar et al. 2005; Hallward-Dreimeier et al. 2006; Aterido et al., 2011; Xu 2011).

We look at several aspects of the business environments that are discussed earlier that might interact with female leadership in affecting productivity. Corruption is measured as Corruption Obstacle (i.e. the extent to which corruption is viewed as an obstacle by firms in the city-industry cell).[17] In particular, the survey asks, "to what extent is corruption an obstacle to the development of the firm?" and the answer is scaled from 0 to 4, where a higher number implies a more severe constraint. To aid interpretation, for this question, we construct a dummy variable of moderate or severe obstacles for that area (i.e., the values of 3 and 4), and call it Corruption Obstacles. We then calculate the city-average of Corruption Obstacles, and view it as the local BE indicator on corruption. To measure access to scarce and critical inputs that might need personal and professional networks, we have several indicators: Power Outage (i.e., city-industry share of firms that experienced a power outage in the survey year); Overdraft (i.e. city-industry share of firms with overdraft facility), which captures access to formal finance; and Trade Credit (i.e. city-industry average of the proportion of total annual sales of goods and services that are paid for after delivery). To capture the relaxation of dependence on personal network and the availability of modern technology, we use Web Intensity (i.e., city-industry share of firms that answer that they use websites to conduct business). To capture competition, we have Informal Competition, which is measured by the share of firms in a city that self-report as competing with informal firms.[18] We in addition control for other key measures of business environment such as *Capacity Agglomeration,* which captures the concentration of firms within a city that possess high capacity either in terms of technology, management or their ability to adapt to a changing competitive environment.[19]

For cultural/institutional environment at the country, we have several groups of variables. First, on female empowerment, we have indicators from the OECD Development

[17] See Table 2 for definitions and sources of all key variables.
[18] We do not have other variables capturing competition intensity with formal firms due to the lack of data.
[19] Following, for example, Clarke *et al*. (2015), we proxy Capacity Agglomeration by the share of firms in a city that employ more than 50 workers. The use of this proxy is consistent with evidence from many studies which have shown that (reasonably) large firms have stronger capacity than other firms in developing countries.

Center: The SIGI index of discrimination in the family (Discriminatory Family) is based on laws on child marriage, household responsibilities, inheritance, and divorce; the SIGI Physical Integrity Index (Restricted Physical Integrity) includes laws on violence against women and reproductive autonomy, attitudes towards and prevalence of female genital mutilation (FGM) and domestic violence, missing women, and access to family planning.[20] In addition, we obtain indicators from the World Development Indicators: Literacy Rate is the adult female literacy rate; Gender Equality is a CPIA index on gender quality (1=low, to 6=high). Second, we measure a country's individualistic culture by Individualism, which is based on World Value Survey, and it captures the extent to which the people in a society are mentally and habitually empowered to make their own choices and to pursue them in their actions. In more individualistic societies, we presume that competition is more encouraged and fiercer. Finally, we use the rule of law index from the World Bank's Governance Indicators (Kaufman, Kraay and Mastruzzi 2004). To aid interpretation and to normalize in light of the different scales of these indicators, we transform all these indicators into dummy variables, which equal one when the value is above the median values among the countries, and zero else.

Incidence of female-headed firms and their basic characteristics

Female-headed firms ideally would have women being the primary owner and running the firm, that is, acting as both owners and chief executives. Female-owned firms may not be a good indicator for entrepreneurs because family ownership is prevalent in both developed and developing countries (Anderson and Reeb, 2003), and when women inherit family firms without effective control, the firm is not in reality a female-headed firm. Furthermore, the previous literature using the firm sample of several African countries in the WBES data has documented that using the definition of women managers tends to better capture firms truly led by women than that of women's participation in firm ownership (Aterido and Hallward-Driemeier, 2011). We thus conservatively define female-headed firms. We rely on two variables in the WBES data set to capture aspects of female leadership: women's participation in ownership ("whether women have some ownership of the firm"), and

[20] More information on the SIGI can be found here: https://www.genderindex.org/.

whether the top manager is a woman. We define female business leadership as the firm's top manager is a woman *and* women have ownership share in the firm.

The share of firms with women at the helm displays drastic variations in the world. Before proceeding, we should keep in mind that the country-specific samples are not large and some industries are not represented, and we must therefore view the statistics about the extent of female entrepreneurship within a country with caution. With this caveat, within the sample, on average 10.9 percent of firms are led by female leaders (See Table 3). The ratio varies from below 1 percent in Morocco, the Arab Republic of Egypt, Jordan, Iraq, and Israel; to 1 to 5 percent in Pakistan, Sudan, India, Mauritania, and Bangladesh; to 5 to 10 percent in Sweden, Argentina, Turkey, Chile, Nepal, Ethiopia, Mexico, Tanzania, several large central Asian countries (such as Uzbekistan and Tajikstan), Senegal, Nigeria, Sri Lanka, and Peru; to between 10 and 15 percent in China, Brazil, Czech Republic, Malawi, Uganda, and Colombia; to 15 to 25 percent in Ghana, Slovak Republic, Honduras, Romania, Hungary, Indonesia, Vietnam, Poland, Kyrgyz Republic, and Ukraine; to more than 25 percent in Namibia, the Philippines, the Lao People's Democratic Republic, and Mongolia (35%, the highest in our sample).

The representation of female business leaders differs in many key aspects. It is higher in service sectors (12.6 percent) than in manufacturing sectors (9.8 percent). It is higher among SMEs (12.4 percent) than non-SMEs (7.3 percent). Among the regions, it is relatively higher in East Asia and Pacific (19.3 percent), Europe and Central Asia (15.27 percent), Latin American and Caribbean countries (11.8 percent), Sub-Saharan Africa (10.7 percent); and relatively lower in the Middle East and North Africa (0.54%), and South Asia (3.82 percent).

It is higher in countries with more gender equality: in the bottom half Discriminatory Family score (14.1 percent vs 8.2 in the rest), in the bottom half Restricted Physical Integrity score (13.5 vs 8.8 percent), in the top half Female Literacy Rate (14.4 vs. 6.5 percent), and in the top half Gender Equality score (14.6 vs. 9.2 percent). It is also higher in the top half of the individualism score (14.6 vs. 7.8 percent). Surprisingly, it does not differ by high or low rule of law score.

Baseline results

Table 5 reports how female business leadership is associated with productivity and its growth. In the first three columns we do not, and in the last three columns we do, control for the business environment indicators. We have more than twice the number of observations when explaining labor productivity and its growth than when explaining TFP. This is because for most service-sector firms there are no data to compute capital stock and therefore TFP. Because labor productivity, containing the contribution of capital as well, does not capture efficiency as well as TFP but have far more observations, we place equal weights on both measures, and their consistency would provide robustness checks. For productivity growth, only labor productivity growth (LP Growth) is possible. Since the empirical results on FemHead are very similar, we focus on the last three columns.

After controlling for the business environment and firm characteristics (including industry dummies), female-headed firms exhibit a lower productivity level and slower growth in labor productivity: a lower TFP by 9.3 percentage points (or 0.07 standard deviation, SD hereafter, of TFP), lower LP by 14 percentage points (or 0.1 SD), and lower LP Growth by 1.4 percentage points (or 0.05 SD). These results are consistent with the impact and dispersion hypothesis.

This hypothesis also posits that female-headed firms tend to have lower dispersion in productivity performance, and it receives support from the data. To see this, we construct the country-industry-leader-gender cell,[21] and then construct the standard deviation of TFP, log LP, and LP Growth. Figure 1 displays the kernel density distribution for male- and female-headed firms of the standard deviations of these outcomes. The distributions of the standard deviation curves of male-headed firms tend to be on the right-side of those of female-headed firms, indicating higher standard deviations of productivity and its growth among the male-headed firms. In Table 6 we conduct the t-test of the mean differences of the standard deviations of productivity performances of male- and female-headed firms. For all three outcomes, the tests indicate significantly higher standard deviations of productivity performances of male-headed than of female-headed firms.

Check of the baseline results based on propensity score matching

[21] We impose the restriction of at least five firms in each cell.

To ensure the robustness of the results on female business leadership, we conduct propensity score analysis. Specifically, we use nearest-neighbor matching to match female-headed firms with male-headed firms. For each firm, we estimate predicted probability of being a female-headed firm using logit regression, then match each female-headed firm with a male-headed firm with similar propensity scores. In the logit regressions, independent variables are the same as in the baseline regressions, including firm-level characteristics, city-level business environments, and country, industry and year dummies. The matching program imposes a common support by dropping treatment observations whose propensity score is higher than the maximum or less than the minimum propensity score of the controls, and match the nearest neighbor. The estimates of standard error are obtained by bootstrapping with 100 replications. The results are in Table 7. Once imposing matching, the female leadership disadvantage in TFP disappears, no longer being significant. In contrast, female-headed firms still have significant log LP disadvantage of 17.8 log points, and LP Growth disadvantage of 2.9 percentage points. The overall gist thus remains.

Female business leadership in Africa

We now investigate whether the female business leadership disadvantage differs in Africa. To this end, we first let FemHead interact with the Africa dummy in the first three columns in Table 8; we then estimate the FemHead effect using only the Africa sample in the last three columns. Since the sample on TFP is now much smaller, we should focus on log LP and LP Growth. The results indicate that the female business leadership disadvantage in Africa is largely non-existent, both in terms of productivity level and its growth. Table 9 relies on propensity score matching, and the results again confirm insignificant female business leadership disadvantage in Africa.

Sectoral differential

It is widely believed that women have comparative advantage in service (relative to manufacturing) sectors. Indeed, in our data, the share of female-headed firm in service sectors is 12.6 percent and in manufacturing sectors is 9.8 percent, about 30 percent higher. In Table 9 we interact FemHead with the service sector dummy in the first 3 columns, and estimate the FemHead effect using the manufacturing and the service samples separately

in the next 6 columns. Since most service-sector firms do not have sufficient data to estimate TFP, we only report the results for log LP and LP Growth.

The female leader disadvantage is much smaller in services than in manufacturing. By the pooled sample analysis, the difference in FemHead effects is significant for both log LP and LP Growth. By the sector-specific sample analysis, the disadvantage in service is half of that in manufacturing. Even in service, there is still a female leader disadvantage of 10.7 percent. In LP Growth though, the female leader disadvantage is no longer significant, while that in manufacturing remains pronounced and significant (2.4 percentage points).

Table 10 examines the sectoral differential in FemHead effects in Africa, using the African subsample. The African pattern in sectoral differential is quite different from the that of the world average. Similar to the world, the FemHead effects are much smaller in service than in manufacturing. In Africa, however, different from the world average, female-headed firms in service sectors actually have no absolute disadvantage in LP, and have absolute *advantage* in LP Growth by 4.8 percentage points. In contrast, the absolute disadvantage in manufacturing in Africa is significantly larger, especially in LP Growth (7.6 percentage points vs. 2.4 percentage points).

Size differential

Since small and medium sized enterprises (SMEs) often face unique constraints, it is useful to examine how women business leadership fares differently for SMEs and non-SMEs. Since most firms in developing countries have relatively small size, we define SMEs to be those hiring fewer than 50 full-time employees three years previous to the survey year.

Women are less present in non-SMEs than in SMEs. In our sample, the share of female-headed firm is 12.4 percent among SMEs, and 7.3 percent among non-SMEs. In Africa, the corresponding shares are 13.4 and 7.9 percent.

Table 11 allows SMEs and non-SMEs to have different FemHead effects. SMEs feature significant female leadership disadvantage in productivity performance, both in the level and its growth. In sharp contrast, female-headed non-SMEs do not have absolute disadvantage in productivity performance.

Table 12 suggests that in Africa, similar to the world average, female-headed non-

SMEs do not differ from male-headed non-SMEs in productivity performance, but different from the world average, female-headed small firms in Africa also do not suffer from significant productivity disadvantage.

Interactions with country-level cultural and institutional environments

Countries differ tremendously in their cultural and institutional environments, which could facilitate or hamper female business leaders. In Table 13 we thus interact FemHead with three types of variables: (i) the indicators on gender equality; (ii) the equalizing institutional environment as indicated by the rule of law; and (iii) the cultural environment as indicated by individualistic orientation of the country. The other control variables are the same as before. Since we control for the country-level fixed effects, we do not directly control for the above country-level indicators.

The female leadership effect on productivity performance does not hinge on indicators on gender equality, as shown by the consistent insignificance of the interaction terms of FemHead with the three indicators of gender equality. Thus, gender discrimination does not seem to hinder female business leaders in firm performance once they are in the leadership position. The effects of gender discrimination on business leaders are likely in selecting whether women become business leaders.

The female leadership effect on productivity level is significantly stronger in countries with a better rule of law. Increasing the rule of law from below to above the median (i.e., Good Rule of Law from zero to one) is associated with a reduction in the labor productivity effect of female leadership from -0.217 to -0.109, or a reduction by half, a large effect. This finding is consistent with the personal network hypothesis that the rule of law mitigates the effect of women leaders' lack of personal networks and therefore reduces their disadvantage.

The female leadership disadvantage in productivity level and growth is significantly higher in countries with stronger individualistic orientation. Increasing the individualism score of a country from below to above the median is associated with an increase of LP disadvantage from 4 to 26 log points, and the LP Growth disadvantage from non-existent to 3.2 percentage points. Thus, only in highly individualistic societies do we observe female business leadership disadvantage. This finding is consistent with the

competition hypothesis that individualistic culture facilitates competition and therefore amplifies female leaders' disadvantage in productivity.

Interactions with the business environment

We now investigate how the female leadership effects differ by the local business environment. We interact all the elements of the business environment with FemHead. We report the results for the world sample in the left, and those for the African subsample in the right, of Table 14.

We find support for the personal network hypothesis that contexts requiring personal networks put female leaders at a disadvantage. *First*, the female leader disadvantage is larger where trade credit relationship is more important, as indicated by the significant and negative interaction term of FemHead and the trade credit intensity variable. The mean FemHead disadvantage in log LP is -0.27 at the mean Trade Credit, but -0.34 at one standard deviation above the mean, an increase in magnitude by a quarter. *Second*, the female leadership disadvantage is weakly larger where the local access to bank finance is greater. The interaction of FemHead and the local bank finance variable is consistently negative, though only marginally significant for LP growth. *Third*, since access to internet reduces the need for personal network, the hypothesis implies that the female leadership disadvantage is smaller where internet access is better. Indeed, the interaction of FemHead and local internet intensity is consistently positive and significant for both log LP and LP Growth. Increasing local internet intensity by one standard deviation of 0.23 is associated with a reduction of log LP disadvantage of female leaders by 0.06 or 6 percentage points, and of LP Growth by 1.6 percentage points.

The competition hypothesis that female business leaders face stronger disadvantage when facing more competition receives some support. The interaction of FemHead with our proxy of informal competition is negative and significant for TFP. Increasing informal competition by one standard deviation (0.2) is associated with rising female leader TFP advantage by 6 percentage points.

The corruption hypothesis that female business leaders face great disadvantage where corruption is worse does not receive support. The interaction of FemHead and our proxy of corruption is never significant.

4. Conclusions

Using the world-wide World Bank Enterprise Survey, we have examined how female-headed firms compare with male-headed firms in productivity level and growth, and how the cultural, institutional and business environments shape the female leadership effect. We find that conditional on a rich set of controls, female-headed firms robustly exhibit a lower productivity level by around 15 percentage points, and labor productivity growth by around 2 percentage points. The productivity level and growth disadvantages are significantly larger in manufacturing than in services—in fact, there is no productivity growth disadvantage at all in service sectors. In addition, the female leadership disadvantage is much more pronounced in SMEs, but non-existent in non-SMEs. We also find that female leadership disadvantage is larger where (i) personal networks are more important, as in the case of higher local usage of trade credit, higher local use of bank finance, a worse rule of law, and lower local internet penetration; and (ii) where competition is more severe, as in the case of higher local informal competition, and stronger national individualistic culture. Contrary to the literature, we do not find that female business leaders suffer more disadvantage where corruption is more severe. The findings provide confirmation of some of the lab and field experiment results on gender—such as women's difficulty with or indifference to competition—and other evidence on personal network access, and they also show a lack of support for the notion that corruption hurts women more than men. The lack of female business leadership interaction with corruption could show the selection effects of female business leaders from women in general.

We also pay particular attention to African countries. In contrast to the world average, African countries overall have little female disadvantage on productivity performance. But in manufacturing sectors, the female disadvantage in productivity level and growth is more pronounced than the world average, while in service sectors there is *advantage* in productivity growth. Female leadership disadvantage in productivity performance is more amplified where local access to bank finance is greater, and where local electricity outage is more frequent.

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Figure 1 Country-industry level distribution of productivity dispersion by gender

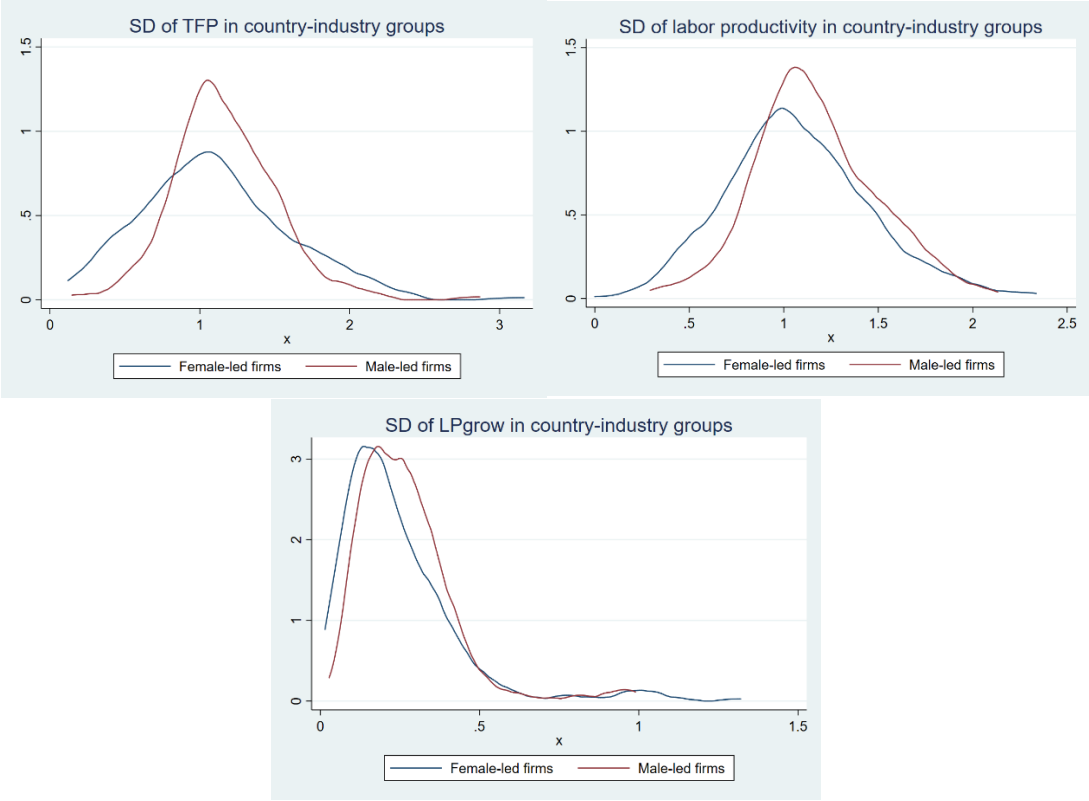

Table 1. Variable definitions and Sources

Variables	Definition and source
FemHead	Equals to 1 if both any of the owner and top manager are female, and 0 otherwise.
TFP	Total factor productivity, estimated as the residual from industry-specific production function with log value added as the dependent variable and log capital and log labor as the independent variables. K is replacement cost of land and machine. L is the number of permanent employees plus 0.5 times the number of temporary employees. Winsorized at tail 2 percent to avoid the outlier issue.
log LP	The logarithm of labor productivity (LP). LP is measured as sales over the number of permanent employees. Winsorized at tail 2 percent to avoid the outlier issue.
LP-growth	The annualized (Haltiwanger) LP growth rate over 3 years.
Foreign	The share of foreign ownership of the firm.
OwnLargest	The ownership share of the largest owner.
Middle	The firm's number of permanent employees three years ago was 20-100.
Large	The firm's number of permanent employees three years ago was more than 100.
Age6_10	The firm's number of employees three years ago was 20-100 (more than 100).
Age10plus	The firm's age is between 6 and 10 years (or 10 or more years).
Exporter	The firm is an exporter. It is defined as the share of sales for export is greater than 0.
Initial LP	The logarithm of initial labor productivity which is measured as the sales over the number of permanent employees three years ago.
$Corruption_c$	City-industry-level average of the firm's answer on whether corruption constitutes an obstacle, ranking from 0 to 1. The subscript c indicates that it is based on city-level average rather than a firm's answer.
$Formal\ Finance_c$	City-industry share of firms having a line of credit or loan from a financial institution. Based on WBES calculation.
$Trade\ Credit_c$	City-industry average of the proportion of total annual sales of goods and services that are paid for after delivery. Based on WBES calculation.
$Inf.\ Competititon_c$	City-industry share of firms who say that they directly compete with informal firms. It is a measure of the importance of the informal sector and its competition with the formal sector. Based on WBES calculation.
$Outage_c$	City-industry share of firms that experienced a power outage in the survey year. Based on WBES.
Web_c	City-industry share of firms that answer that they use websites to conduct business.
$Cap.\ Agglomeration_c$	The share of firms whose number of employees exceeding 50, as a proxy of capacity agglomeration. Computed based on sample firms.
Discriminatory family	The social Institutions and Gender Index (SIGI) index: Discriminatory family code Value, come from the OECD Development Centre. Equals to 1 if the value of the index above sample median, otherwise to 0.
Restricted physical integrity	The social Institutions and Gender Index (SIGI) index: Restricted physical integrity Value, come from the OECD Development Centre. Equals to 1 if the value of the index above sample median, otherwise to 0.
Good Rule of Law	World Bank's Governance Indicators: rule of law index. Equals to 1 if the value of the index above sample median, otherwise to 0.
High Literacy Rate	Literacy rate, adult female (% of females ages 15 and above), come from WDI. Equals to 1 if the value of the index above sample median, otherwise to 0.
Muslim proportion	Country-level Muslim population by percentage in 2010, come from Pew Research Center (2011). Equals to 1 if the value of the index above sample median, otherwise to 0.
High Gender equality	CPIA gender equality rating (1=low to 6=high), yearly, come from WDI. Equals to 1 if the value of the index above sample median, otherwise to 0.
High Individualism	Individual Empowerment (version 2), come from WVS. It measures the extent to which the people in a society are mentally and habitually empowered to make their own choices and to pursue them in their actions. Equals to 1 if the value of the index above sample median, otherwise to 0.

Table 2. Summary Statistics

	N	mean	sd	p10	p25	p50	p75	p90
Firm-level variables								
TFP	20157	-0.066	1.379	-1.856	-0.983	-0.048	0.803	1.655
log LP	51079	9.653	1.543	7.581	8.659	9.773	10.727	11.598
LPgrowth	45711	-0.032	0.300	-0.281	-0.128	-0.042	0.042	0.184
FemHead	64997	0.110	0.313	0.000	0.000	0.000	0.000	1.000
Foreign	64997	0.057	0.213	0.000	0.000	0.000	0.000	0.000
OwnLargest	64997	0.788	0.266	0.400	0.500	1.000	1.000	1.000
Middle	64997	0.315	0.464	0.000	0.000	0.000	1.000	1.000
Large	64997	0.160	0.367	0.000	0.000	0.000	0.000	1.000
Age 6-10	64997	0.219	0.414	0.000	0.000	0.000	0.000	1.000
Age 10+	64997	0.685	0.464	0.000	0.000	1.000	1.000	1.000
Exporter	64997	0.224	0.417	0.000	0.000	0.000	0.000	1.000
Initial LP	45711	9.759	1.940	7.698	8.814	9.933	10.911	11.792
City-level variables								
Trade credit	490	0.436	0.194	0.183	0.287	0.426	0.577	0.700
Overdraft facility	490	0.370	0.264	0.068	0.143	0.303	0.585	0.775
Web	490	0.477	0.232	0.145	0.297	0.499	0.657	0.782
Inf competition	490	0.486	0.196	0.251	0.338	0.464	0.640	0.748
Corruption obstacle	490	0.488	0.272	0.093	0.286	0.478	0.690	0.875
Outage	490	0.549	0.261	0.212	0.332	0.532	0.782	0.919
Capacity agglomeration	490	0.281	0.147	0.101	0.178	0.271	0.368	0.471
Country-level variables								
Discriminatory family	82	0.463	0.502	0.000	0.000	0.000	1.000	1.000
Restricted physical integrity	75	0.520	0.503	0.000	0.000	1.000	1.000	1.000
Good Rule of Law	98	0.551	0.500	0.000	0.000	1.000	1.000	1.000
High Literacy Rate	90	0.533	0.502	0.000	0.000	1.000	1.000	1.000
Muslim proportion	103	0.379	0.487	0.000	0.000	0.000	1.000	1.000
Good Gender Equality	46	0.467	0.499	0.000	0.000	0.000	1.000	1.000
High Individualism	68	0.574	0.498	0.000	0.000	1.000	1.000	1.000

Table 3 The share of female business leadership in each country

Country	Share	Country	Share	Country	Share
Mongolia	34.51%	Rwanda	15.38%	Dominican Republic	8.90%
St. Vincent and the Grenadines	32.65%	Barbados	15.15%	Peru	8.90%
Lao PDR	32.32%	Slovak Republic	15.13%	Tanzania	8.78%
Latvia	27.83%	Burundi	14.74%	Uzbekistan	8.29%
Namibia	26.31%	Uganda	14.48%	Nepal	8.01%
Bahamas, The	25.18%	Trinidad and Tobago	14.20%	Mexico	7.95%
Philippines	24.82%	Lesotho	13.95%	Ethiopia	7.93%
Nicaragua	23.73%	Colombia	13.84%	Suriname	7.24%
Belarus	23.70%	Guyana	13.58%	Chile	6.96%
Ukraine	23.00%	Paraguay	13.43%	Central African Republic	6.94%
Estonia	22.38%	North Macedonia	13.32%	Turkey	6.77%
Grenada	21.83%	Ghana	13.29%	Sweden	6.73%
Congo, Rep.	21.74%	Uruguay	13.22%	Argentina	5.79%
Kyrgyz Republic	21.72%	Brazil	13.14%	Gabon	5.56%
Poland	20.85%	Venezuela, RB	13.12%	Mauritania	5.56%
Moldova	20.72%	Belize	12.67%	Liberia	4.35%
Indonesia	20.68%	Czech Republic	12.39%	Bangladesh	4.05%
Vietnam	20.31%	Zimbabwe	12.07%	India	3.13%
Bulgaria	19.72%	Malawi	11.61%	Azerbaijan	2.65%
Myanmar	19.58%	Guatemala	11.56%	Pakistan	2.15%
Croatia	19.37%	Armenia	11.20%	Sudan	1.72%
Georgia	19.18%	Congo, Dem. Rep.	11.18%	Tunisia	1.60%
Kazakhstan	18.55%	Bosnia and Herze	10.49%	Djibouti	1.51%
Bolivia	17.54%	El Salvador	10.32%	Afghanistan	1.23%
Dominica	17.33%	Panama	10.29%	Israel	0.94%
St. Lucia	17.33%	China	10.26%	Iraq	0.80%
St. Kitts and Nevis	17.24%	Ecuador	10.11%	West Bank and Gaza	0.52%
Russian Federation	16.61%	Costa Rica	9.90%	Yemen, Rep.	0.38%
Romania	16.53%	Albania	9.81%	Egypt, Arab Rep.	0.34%
Honduras	16.41%	Senegal	9.62%	Lebanon	0.24%
Bhutan	16.21%	Sri Lanka	9.47%	Jordan	0.21%
Hungary	15.60%	Antigua and Barbuda	9.40%	Morocco	0.00%
Slovenia	15.52%	Kenya	9.02%	Sierra Leone	0.00%
Lithuania	15.42%	Tajikistan	8.92%		
Jamaica	15.38%	Nigeria	8.91%		

Table 4. Incidence of Female Leadership

		Female Share
Industry	Manufacturing	9.75%
	Service	12.61%
Firm Size	SMEs	12.44%
	Non-SMEs	7.29%
Region	Africa	10.72%
	East Asia and Pacific	19.33%
	Europe and Central Asia	15.27%
	Latin America & the Caribbean	11.81%
	Middle East and North Africa	0.54%
	South Asia	3.82%
	Sub-Saharan Africa	10.72%
Discriminatory Family	Low	14.05%
	High	8.24%
Restricted Physical Integrity	Low	13.45%
	High	8.77%
Rule of Law	Low	10.95%
	High	10.82%
Female Literacy Rate	Low	6.48%
	High	14.35%
Muslim Proportion	Low	15.15%
	High	7.60%
Gender Equality	Low	9.17%
	High	14.63%
Individualism	Low	7.81%
	High	13.94%
World Average		11.07%

Notes: Low means the value is lower than the median of the index; High means higher than the median.

SMEs is defined as the permanent employees three years ago is less than or equals to 50, and Non-SMEs above 50.

Table 5 Effect of Female Corporate Leadership on Firm Productivity

Dep. Variables	TFP	log LP	LP Growth	TFP	log LP	LP Growth
	(1)	(2)	(3)	(4)	(5)	(6)
FemHead	-0.087**	-0.159***	-0.016**	-0.093***	-0.151***	-0.014**
	(0.034)	(0.038)	(0.008)	(0.031)	(0.034)	(0.007)
Foreign	0.387***	0.493***	0.051***	0.342***	0.480***	0.044***
	(0.049)	(0.049)	(0.012)	(0.050)	(0.047)	(0.010)
OwnLargest	-0.113	-0.352***	-0.036***	-0.098	-0.332***	-0.028***
	(0.070)	(0.088)	(0.010)	(0.077)	(0.080)	(0.007)
Middle	-0.048*	0.176***	0.032***	-0.062**	0.158***	0.032***
	(0.027)	(0.028)	(0.005)	(0.028)	(0.027)	(0.005)
Large	-0.158***	0.284***	0.045***	-0.190***	0.248***	0.041***
	(0.050)	(0.051)	(0.007)	(0.053)	(0.048)	(0.007)
Age6_10	0.053	0.089***	-0.009	0.045	0.082***	-0.010
	(0.047)	(0.022)	(0.007)	(0.046)	(0.026)	(0.007)
Age10plus	0.014	0.088***	-0.015**	-0.015	0.084***	-0.015*
	(0.041)	(0.028)	(0.008)	(0.037)	(0.032)	(0.008)
Exporter	0.198***	0.227***	0.029***	0.202***	0.234***	0.024***
	(0.038)	(0.045)	(0.006)	(0.035)	(0.034)	(0.005)
Initial LP			-0.104***			-0.091***
			(0.017)			(0.012)
Trade Credit$_c$				0.040	0.469***	0.060***
				(0.083)	(0.167)	(0.013)
Overdraft$_c$				0.124	0.262	0.025
				(0.104)	(0.159)	(0.016)
Web$_c$				0.408***	0.456***	0.042**
				(0.080)	(0.100)	(0.016)
Inf. Competititon$_c$				0.027	-0.023	-0.004
				(0.121)	(0.088)	(0.011)
Corruption$_c$				0.107	0.110	0.028***
				(0.076)	(0.072)	(0.010)
Outage$_c$				-0.091*	-0.059	-0.012
				(0.051)	(0.087)	(0.010)
capAgg$_c$				0.421*	0.120	-0.008
				(0.216)	(0.218)	(0.027)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	20,157	51,079	45,711	16,638	41,248	37,365
Adjusted R^2	0.283	0.388	0.372	0.265	0.360	0.284

Notes: *, **, *** represent statistical significance at the 10, 5, and 1 percent levels. Heteroskedasticity-corrected standard errors clustered at the country level in columns.

Table 6. Productivity dispersion by gender in country-industry cells

Variable	Gender	N. of cells	Mean	Std. Dev.	Diff. (S.E.)
SD of TFP	female	183	1.090	0.480	0.076* (0.043)
	male	183	1.165	0.336	
SD of LP	female	326	1.077	0.372	0.092*** (0.027)
	male	326	1.169	0.323	
SD of LP Growth	female	317	0.245	0.184	0.024* (0.013)
	male	317	0.269	0.153	

Notes: Each cell has at least 5 female-headed firms and 5 male-headed firms.

All variables are winsorized at 1% level.

Table 7. Propensity Score Matching, control variables are same to Column 1-3 of Table 5

Dep. Variable	Sample	Treated (Female)	Controls (Male)	Difference	S.E.	T (Z)
TFP	Unmatched	-0.175	-0.063	-0.112***	0.034	-3.26
	ATT (Bootstrap)	-0.175	-0.160	-0.015	0.051	-0.30
Log LP	Unmatched	9.410	9.680	-0.269***	0.022	-12.07
	ATT (Bootstrap)	9.410	9.588	-0.178***	0.030	-5.95
LP Growth	Unmatched	-0.022	-0.033	0.011**	0.005	2.34
	ATT (Bootstrap)	-0.022	0.006	-0.029***	0.008	-3.39

Notes: *, **, *** represent statistical significance at the 10, 5, and 1 percent levels. Bootstrap replicated 100 times.

Table 8. Regressions on Africa Interaction or Africa Subsample

Panel A. Regressions

	Africa Interaction			Africa Subsample		
Dep. Variables	TFP	log LP	LP Growth	TFP	log LP	LP Growth
	(1)	(2)	(3)	(4)	(5)	(6)
FemHead	-0.078**	-0.163***	-0.019**	-0.142	-0.095	0.002
	(0.036)	(0.040)	(0.008)	(0.094)	(0.068)	(0.018)
FemHead*Africa	-0.167**	0.041	0.026			
	(0.082)	(0.090)	(0.021)			
Foreign	0.387***	0.493***	0.051***	0.647**	0.697***	0.109***
	(0.049)	(0.049)	(0.012)	(0.225)	(0.102)	(0.021)
OwnLargest	-0.113	-0.352***	-0.036***	-0.342*	-0.643***	-0.116***
	(0.070)	(0.088)	(0.010)	(0.170)	(0.181)	(0.037)
Middle	-0.049*	0.176***	0.032***	-0.040	0.213**	0.025
	(0.027)	(0.028)	(0.005)	(0.086)	(0.096)	(0.022)
Large	-0.158***	0.284***	0.045***	0.127	0.628***	0.089***
	(0.050)	(0.051)	(0.007)	(0.145)	(0.152)	(0.023)
Age6_10	0.053	0.089***	-0.009	0.363**	0.142**	0.011
	(0.047)	(0.022)	(0.007)	(0.164)	(0.059)	(0.012)
Age10plus	0.014	0.089***	-0.015**	0.370**	0.232**	0.021
	(0.041)	(0.028)	(0.008)	(0.143)	(0.084)	(0.014)
Exporter	0.198***	0.227***	0.029***	0.172*	0.028	0.022
	(0.038)	(0.045)	(0.006)	(0.085)	(0.208)	(0.023)
Initial LP			-0.104***			-0.144***
			(0.017)			(0.010)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	20,157	51,079	45,711	1,329	5,279	4,500
Adjusted R^2	0.283	0.388	0.372	0.142	0.278	0.622

Panel B. PSM for the Africa sample

Dep. Variable	**Sample**	Treated (Female)	Controls (Male)	Difference	S.E.	T (Z)
TFP	Unmatched	-0.734	-0.523	-0.212	0.181	-1.17
	ATT (Bootstrap)	-0.734	-0.580	-0.154	0.258	-0.60
Log LP	Unmatched	8.272	8.341	-0.070	0.080	-0.87
	ATT (Bootstrap)	8.270	8.395	-0.126	0.087	-1.46
LP Growth	Unmatched	-0.030	-0.061	0.031	0.030	1.05
	ATT (Bootstrap)	-0.031	-0.004	-0.027	0.051	-0.53

Notes: *, **, *** represent statistical significance at the 10, 5, and 1 percent levels. Heteroskedasticity-corrected standard errors clustered at the country level in columns. For Panel B, standard errors are obtained with bootstrapping replicated 100 times.

Table 9. Industry Interactive Effect

Dep. Variables	Service Interaction			Service			Manufacturing		
	TFP	log LP	LP Growth	TFP	Log LP	LP Growth	TFP	log LP	LP Growth
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
FemHead	-0.091**	-0.245***	-0.030***	-0.039	-0.107**	-0.008	-0.093***	-0.218***	-0.024**
	(0.035)	(0.042)	(0.011)	(0.148)	(0.045)	(0.007)	(0.035)	(0.040)	(0.010)
FemHead*Service	0.122	0.183**	0.030**						
	(0.175)	(0.071)	(0.013)						
Foreign	0.387***	0.493***	0.051***	0.298	0.555***	0.063***	0.390***	0.464***	0.045***
	(0.049)	(0.049)	(0.012)	(0.189)	(0.073)	(0.014)	(0.049)	(0.052)	(0.013)
OwnLargest	-0.112	-0.352***	-0.036***	-0.408**	-0.320***	-0.038***	-0.092	-0.339***	-0.030***
	(0.070)	(0.088)	(0.010)	(0.161)	(0.073)	(0.010)	(0.066)	(0.088)	(0.010)
Middle	-0.049*	0.177***	0.032***	-0.080	0.160***	0.030***	-0.044	0.202***	0.034***
	(0.027)	(0.028)	(0.005)	(0.100)	(0.028)	(0.005)	(0.028)	(0.040)	(0.006)
Large	-0.158***	0.283***	0.045***	-0.142	0.145***	0.027***	-0.153***	0.362***	0.056***
	(0.050)	(0.051)	(0.007)	(0.117)	(0.045)	(0.009)	(0.053)	(0.062)	(0.008)
Age6_10	0.053	0.090***	-0.009	0.197	0.069**	-0.010	0.042	0.107***	-0.009
	(0.047)	(0.022)	(0.007)	(0.176)	(0.030)	(0.009)	(0.048)	(0.030)	(0.007)
Age10plus	0.014	0.089***	-0.015**	0.199	0.104***	-0.013	0.002	0.076*	-0.017**
	(0.041)	(0.028)	(0.008)	(0.197)	(0.036)	(0.009)	(0.039)	(0.041)	(0.008)
Exporter	0.198***	0.227***	0.029***	0.376***	0.175**	0.041***	0.186***	0.259***	0.024***
	(0.038)	(0.045)	(0.006)	(0.130)	(0.075)	(0.007)	(0.034)	(0.041)	(0.006)
Initial LP			-0.104***			-0.112***			-0.099***
			(0.017)			(0.017)			(0.017)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	20,157	51,079	45,711	1,365	21,128	18,688	18,792	29,951	27,023
Adjusted R^2	0.283	0.389	0.372	0.278	0.396	0.398	0.287	0.398	0.357

Notes: *, **, *** represent statistical significance at the 10, 5, and 1 percent levels. Heteroskedasticity-corrected standard errors clustered at the country level in columns.

The share of female-headed firm in service sectors is 12.6 percent and in manufacturing sectors is 9.8 percent.

Table 10. Africa subsample: Service VS. Manufacturing

Dep. Variables	Service Interaction			Service			Manufacturing		
	TFP	Log LP	LP Growth	TFP	Log LP	LP Growth	TFP	Log LP	LP Growth
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
FemHead	-0.265	-0.281***	-0.080***	-0.083	0.005	0.048***	-0.252	-0.279**	-0.076***
	(0.166)	(0.096)	(0.025)	(0.240)	(0.066)	(0.015)	(0.155)	(0.097)	(0.023)
FemHead*Service	0.523	0.296**	0.131***						
	(0.404)	(0.107)	(0.024)						
Foreign	0.662**	0.697***	0.109***	0.114	0.681***	0.078**	0.787***	0.732***	0.140***
	(0.216)	(0.100)	(0.021)	(0.287)	(0.224)	(0.036)	(0.244)	(0.112)	(0.038)
OwnLargest	-0.324	-0.644***	-0.117***	-0.987**	-0.729**	-0.132***	-0.109	-0.558***	-0.104*
	(0.181)	(0.182)	(0.037)	(0.354)	(0.252)	(0.032)	(0.261)	(0.128)	(0.053)
Middle	-0.043	0.211**	0.024	-0.352	0.083	0.009	0.054	0.339***	0.039
	(0.087)	(0.096)	(0.022)	(0.289)	(0.115)	(0.022)	(0.062)	(0.109)	(0.028)
Large	0.124	0.620***	0.086***	-0.136	0.354	0.063	0.212	0.793***	0.106***
	(0.148)	(0.154)	(0.023)	(0.311)	(0.253)	(0.071)	(0.240)	(0.236)	(0.025)
Age6_10	0.356*	0.146**	0.013	0.906*	0.088	0.010	0.277	0.227**	0.011
	(0.166)	(0.058)	(0.012)	(0.429)	(0.052)	(0.011)	(0.160)	(0.094)	(0.021)
Age10plus	0.373**	0.236**	0.022	0.939***	0.131	0.004	0.267	0.384***	0.040
	(0.142)	(0.083)	(0.014)	(0.272)	(0.081)	(0.013)	(0.174)	(0.114)	(0.025)
Exporter	0.169*	0.030	0.023	0.491**	-0.058	0.033	0.079	0.097	0.006
	(0.081)	(0.209)	(0.023)	(0.165)	(0.251)	(0.037)	(0.089)	(0.175)	(0.017)
Initial LP			-0.144***			-0.145***			-0.142***
			(0.010)			(0.011)			(0.009)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,329	5,279	4,500	266	2,946	2,509	1,063	2,333	1,991
Adjusted R^2	0.143	0.279	0.623	0.176	0.211	0.607	0.138	0.369	0.646

Notes: *, **, *** represent statistical significance at the 10, 5, and 1 percent levels. Heteroskedasticity-corrected standard errors clustered at the country level in columns.

In Africa, the share of female-headed firm in service sectors is 11.4 percent and in manufacturing sectors is 9.9 percent.

Table 11. SMEs VS. Non-SMEs

Dep. Variables	SME Interaction			SMEs			Non-SMEs		
	TFP	Log LP	LP Growth	TFP	Log LP	LP Growth	TFP	Log LP	LP Growth
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
FemHead	-0.044	-0.108**	-0.002	-0.087**	-0.184***	-0.022***	-0.053	-0.050	0.005
	(0.064)	(0.053)	(0.010)	(0.039)	(0.035)	(0.008)	(0.062)	(0.051)	(0.009)
FemHead*SMEs	-0.060	-0.062	-0.018*						
	(0.084)	(0.058)	(0.011)						
Foreign	0.388***	0.488***	0.051***	0.401***	0.518***	0.058***	0.367***	0.437***	0.032***
	(0.049)	(0.049)	(0.012)	(0.075)	(0.055)	(0.015)	(0.059)	(0.052)	(0.011)
OwnLargest	-0.113	-0.347***	-0.035***	-0.137**	-0.380***	-0.047***	-0.075	-0.262*	-0.009
	(0.070)	(0.086)	(0.010)	(0.058)	(0.066)	(0.010)	(0.107)	(0.137)	(0.011)
Small	0.020	-0.103***	-0.007						
	(0.031)	(0.031)	(0.004)						
Middle	-0.044*	0.141***	0.029***	-0.056**	0.140***	0.029***	0.091**	-0.021	-0.008**
	(0.026)	(0.027)	(0.005)	(0.025)	(0.025)	(0.005)	(0.037)	(0.023)	(0.004)
Large	-0.143***	0.180***	0.038***						
	(0.047)	(0.044)	(0.008)						
Age6_10	0.053	0.089***	-0.009	0.047	0.088***	-0.008	0.090	0.117*	-0.013
	(0.047)	(0.022)	(0.007)	(0.049)	(0.023)	(0.008)	(0.082)	(0.060)	(0.011)
Age10plus	0.014	0.088***	-0.015**	0.027	0.088***	-0.013	0.004	0.108	-0.023*
	(0.041)	(0.028)	(0.008)	(0.048)	(0.027)	(0.008)	(0.075)	(0.084)	(0.013)
Exporter	0.198***	0.222***	0.028***	0.240***	0.201***	0.025***	0.129**	0.216***	0.026***
	(0.039)	(0.045)	(0.006)	(0.044)	(0.058)	(0.006)	(0.050)	(0.041)	(0.005)
Initial LP			-0.104***			-0.111***			-0.085***
			(0.017)			(0.018)			(0.013)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	20,157	51,079	45,711	13,385	36,900	32,639	6,772	14,179	13,072
Adjusted R^2	0.283	0.389	0.372	0.298	0.405	0.407	0.276	0.327	0.267

Notes: *, **, *** represent statistical significance at the 10, 5, and 1 percent levels. Heteroskedasticity-corrected standard errors clustered at the country level in columns.

SMEs is defined as the permanent employees three years ago is less than or equals to 50, and Non-SMEs above 50.

The share of female-headed firm is higher amongst small firms (12.4 percent) than large firms (7.3 percent).

Table 12. Africa subsample: SMEs vs. Non-SMEs

Dep. Variables	SME Interaction			SMEs			Non-SMEs		
	TFP	log LP	LP Growth	TFP	log LP	LP Growth	TFP	log LP	LP Growth
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
FemHead	0.078	-0.065	-0.006	-0.439**	-0.075	0.010	0.098	-0.128	-0.020
	(0.163)	(0.123)	(0.031)	(0.165)	(0.089)	(0.024)	(0.172)	(0.126)	(0.031)
FemHead*SMEs	-0.423*	-0.044	0.016						
	(0.227)	(0.165)	(0.041)						
Foreign	0.658**	0.688***	0.106***	0.271	0.469***	0.025	0.610*	0.683***	0.116***
	(0.228)	(0.099)	(0.021)	(0.379)	(0.132)	(0.028)	(0.299)	(0.109)	(0.023)
OwnLargest	-0.333*	-0.632***	-0.114***	-0.668	-0.606**	-0.142**	-0.187	-0.580***	-0.078*
	(0.171)	(0.173)	(0.037)	(0.407)	(0.244)	(0.054)	(0.122)	(0.174)	(0.044)
Small	0.110	-0.125	-0.042*						
	(0.161)	(0.099)	(0.021)						
Middle	0.012	0.131	-0.001				-0.008	0.111	-0.004
	(0.141)	(0.092)	(0.014)				(0.140)	(0.091)	(0.015)
Large	0.182	0.551***	0.065***				0.167	0.461**	0.050**
	(0.179)	(0.171)	(0.016)				(0.221)	(0.163)	(0.023)
Age6_10	0.372**	0.139**	0.010	0.386	0.113*	0.022	0.437	0.160	-0.016
	(0.160)	(0.058)	(0.012)	(0.318)	(0.059)	(0.020)	(0.306)	(0.131)	(0.030)
Age10plus	0.377**	0.218**	0.016	0.180	0.139*	0.022	0.566*	0.313*	-0.001
	(0.144)	(0.083)	(0.015)	(0.258)	(0.069)	(0.026)	(0.271)	(0.150)	(0.030)
Exporter	0.170*	0.025	0.021	0.070	-0.180	-0.012	0.158	0.077	0.027
	(0.082)	(0.204)	(0.022)	(0.101)	(0.212)	(0.035)	(0.092)	(0.161)	(0.017)
Initial LP			-0.144***			-0.151***			-0.138***
			(0.010)			(0.009)			(0.010)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,329	5,279	4,500	556	2,623	2,147	773	2,656	2,353
Adjusted R^2	0.142	0.279	0.622	0.136	0.210	0.646	0.157	0.317	0.603

Notes: *, **, *** represent statistical significance at the 10, 5, and 1 percent levels. Heteroskedasticity-corrected standard errors clustered at the country level in columns.

SMEs is defined as the permanent employees three years ago is less than or equals to 10, and non-SMEs above 10 which is the median in Africa subsample

In Africa, the share of female-headed firm amongst small firms is 13.4 percent and amongst large firms is 7.9 percent).

Table 13. Country level interactions

Dep. Variables	TFP	log LP	LP Growth
Panel A			
FemHead	-0.044	-0.179***	-0.020***
	(0.037)	(0.026)	(0.007)
FemHead* Discriminatory Family	-0.066	0.043	0.012
	(0.080)	(0.060)	(0.012)
Observations	16,012	39,231	34,690
Adjusted R^2	0.293	0.422	0.416
Panel B			
FemHead	-0.093*	-0.156***	-0.014**
	(0.048)	(0.029)	(0.007)
FemHead* Restricted Physical Integrity	0.035	-0.039	-0.002
	(0.071)	(0.063)	(0.014)
Observations	14,833	36,718	32,352
Adjusted R^2	0.253	0.389	0.420
Panel C			
FemHead	-0.048	-0.097	-0.002
	(0.046)	(0.076)	(0.013)
FemHead* High Literacy Rate	-0.049	-0.080	-0.018
	(0.064)	(0.078)	(0.015)
Observations	19,730	49,748	44,493
Adjusted R^2	0.260	0.372	0.373
Panel D			
FemHead	-0.036	-0.141**	-0.009
	(0.043)	(0.069)	(0.016)
FemHead* High Gender equality	0.081	0.045	-0.005
	(0.098)	(0.086)	(0.018)
Observations	5,235	15,164	13,042
Adjusted R^2	0.153	0.308	0.493
Panel E			
FemHead	-0.161***	-0.217***	-0.023**
	(0.051)	(0.048)	(0.011)
FemHead* Good Rule of Law	0.135**	0.108*	0.013
	(0.063)	(0.061)	(0.013)
Observations	20,157	51,079	45,711
Adjusted R^2	0.283	0.389	0.372
Panel F			
FemHead	0.013	-0.039	-0.000
	(0.036)	(0.053)	(0.010)
FemHead* High Individualism	-0.177***	-0.220***	-0.032**
	(0.060)	(0.063)	(0.015)
Observations	17,281	41,142	37,483
Adjusted R^2	0.284	0.399	0.387

Notes: *, **, *** represent statistical significance at the 10, 5, and 1 percent levels. Heteroskedasticity-corrected standard errors clustered at the country level in columns.

All regressions have controlled for yearly, industry, country fixed effects and firm control variables which are same to baseline regressions in Table 5.

The country-level dummy variables used to construct the interaction term equals to 1 if the value of the original index above median, to 0 otherwise.

Table 14. Interactive Effect by Business Environment

	Panel A: Full sample			Panel B: African Subsample		
	TFP	log LP	LP Growth	TFP	log LP	LP Growth
FemHead	0.042	-0.111	-0.010	0.071	0.475	0.390**
	(0.191)	(0.096)	(0.024)	(0.722)	(0.322)	(0.176)
Trade Credit$_c$	0.040	0.502***	0.065***	0.923	0.284	0.075
	(0.091)	(0.167)	(0.012)	(0.692)	(0.486)	(0.061)
FemHead*Trade Credit$_c$	-0.005	-0.362**	-0.056*	-1.663	-0.141	-0.154
	(0.159)	(0.143)	(0.032)	(1.658)	(0.831)	(0.171)
Overdraft$_c$	0.127	0.276*	0.029*	-0.426	-0.358	-0.094
	(0.105)	(0.160)	(0.017)	(0.522)	(0.340)	(0.065)
FemHead*Overdraft$_c$	-0.055	-0.123	-0.035*	0.396	-0.586*	-0.234***
	(0.133)	(0.108)	(0.019)	(0.823)	(0.295)	(0.078)
Web$_c$	0.397***	0.429***	0.035**	0.031	0.879**	0.123*
	(0.084)	(0.099)	(0.016)	(0.510)	(0.353)	(0.067)
FemHead*Web$_c$	0.144	0.304**	0.071***	-0.355	-0.471	-0.059
	(0.212)	(0.134)	(0.027)	(1.455)	(0.401)	(0.119)
Inf. Competititon$_c$	0.050	-0.013	-0.001	0.074	-0.157	-0.034
	(0.122)	(0.091)	(0.011)	(0.323)	(0.323)	(0.056)
FemHead*Inf. Competititon$_c$	-0.287**	-0.098	-0.027	-1.540*	-0.631	-0.175
	(0.132)	(0.135)	(0.023)	(0.826)	(0.403)	(0.145)
Corruption$_c$	0.092	0.112	0.028**	-0.407	0.093	0.066*
	(0.077)	(0.076)	(0.011)	(0.239)	(0.228)	(0.038)
FemHead*Corruption$_c$	0.108	-0.068	-0.010	0.971	0.411	0.022
	(0.131)	(0.122)	(0.017)	(1.084)	(0.253)	(0.084)
Outage$_c$	-0.073	-0.064	-0.014	1.417*	0.454	0.018
	(0.054)	(0.088)	(0.010)	(0.742)	(0.364)	(0.058)
FemHead*Outage$_c$	-0.199	0.084	0.027	0.811	0.247	-0.161*
	(0.126)	(0.100)	(0.018)	(0.907)	(0.317)	(0.086)
capAgg$_c$	0.418*	0.107	-0.008	-1.635	0.873	0.045
	(0.219)	(0.216)	(0.027)	(0.966)	(0.902)	(0.143)
FemHead*capAgg$_c$	0.119	0.209	0.021	0.458	-0.741	0.016
	(0.312)	(0.294)	(0.040)	(1.681)	(0.644)	(0.188)
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	16,638	41,248	37,365	863	3,323	2,895
Adjusted R^2	0.265	0.360	0.285	0.123	0.279	0.502

Notes: *, **, *** represent statistical significance at the 10, 5, and 1 percent levels. Heteroskedasticity-corrected standard errors clustered at the country level in columns.