

# The Gender Labor Productivity Gap across Informal Firms

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## Abstract

This study uncovers a gender labor productivity gap among informal firms in 14 developing economies. The results show that labor productivity is approximately 15.2 percent (or 0.165 log point) lower among women-owned than men-owned informal firms. Decomposition techniques reveal several factors that contribute to lower labor productivity of women-owned informal firms relative to men-owned informal firms. These include lower education, lower experience, lower capitalization, and less protection from crime among women owners than men owners of informal firms. However, the smaller size of the women-owned firms and their greater return from producing or selling under contract

and from security payments narrows the productivity gap. The results provide several specific and general policy recommendations for improving the labor productivity of women-owned informal firms and closing the gap with male-owned informal firms. For one, a substantial amount of the productivity gap can be closed by providing more resources to women such as education, managerial experience, and physical capital. The study also provides some preliminary results on another important policy objective—the costs and benefits of formalization as perceived by women-owned versus men-owned informal firms.

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# **The Gender Labor Productivity Gap across Informal Firms**

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## **1. Introduction**

A large literature has examined the difference in productivity and performance between businesses owned or run by women vs. men. The general finding is that women-owned or run firms perform worse than men-owned or run firms (Klapper and Parker 2010; Rijkers and Costa 2012; Hallward-Driemeier 2013; Campos and Gassier 2017; Gui-Diby et al. 2017; Islam et al., 2020; Essers et al. 2021). Factors that contribute to widening or narrowing of the gender-based gap are identified. Most studies in the area focus on the formal or registered firms. The few studies on informal firms that exist are mostly on the informal firms in rural areas. There is much to uncover about gender-based differences within the informal sector, especially in urban areas. The present paper contributes to this literature using firm-level survey data on informal or unregistered firms in 55 cities across 14 developing countries. The results show that labor productivity of female owned/run firms is on average lower by 15.2 percent (or 0.165 log point) compared to men owned/run firms. The difference is robust to several controls for firm, industry, and country characteristics. Using the Oaxaca-Blinder decomposition technique, we find the primacy as contributors to the productivity gap of factors such as education level of the owner/manager, manager experience, use of capital equipment, ties with the formal sector, and security payments that informal firms need to make to remain informal. For most of these factors, difference in their level rather than in their returns to labor productivity is what contributes to the productivity gap. As we discuss below, this is important from the policy point of view as it may be easier to improve the availability of resources to women than improve to the returns of resources to women. Several other specific and general policy recommendations to improve labor productivity of informal women-owned firms follow from our results.

Despite significant reductions in gender gaps along several dimensions in the last two decades, a high level of gender inequality persists in critical areas such as labor market activity, education, health, entrepreneurship, etc. (Klasen 2020 reviews the evidence). Understanding the prevalence, causes, and effects of gender gaps is important for efficiency and women's empowerment (Duflo 2012, Wodon and de la Brière 2018). For instance, many studies find higher overall development and growth resulting from reduced gender gaps in areas such as labor force participation (Goldin 1995; ILO 2017; Cuberes and Teignier 2018; OECD 2018; Baerlocher et al. 2021), education (Hill and King 1995; Klasen and Lamanna 2009; Balamoune-Lutz and McGillivray 2015; Minasyan et al. 2019; Hsieh et al. 2019; Dao et al. 2021), health (Bloom et al. 2015), and possibly intra-household bargaining power (see Doepke and Tertilt 2019).<sup>2</sup> Other studies have sought to highlight women's untapped potential by focusing directly on gender gaps in outcomes such as wages, employment, profitability and productivity of women vs. men owned/run firms (reviewed below).

In the studies exploring the impact of the gender of the entrepreneur or manager on firm performance, the general finding is that the unconditional gender differences in labor and total factor productivity favor men (e.g. Bardasi et al. 2011 for Europe and Central Asia and Latin America; Rijkers and Costa 2012 for Bangladesh, Ethiopia, and Sri Lanka; Hallward-Driemeier 2013 for Sub-Saharan Africa; Gui-Diby et al. 2017 for Asia; Essers et al. 2021 for Ethiopia). For instance, in a comprehensive study of 126 countries, Islam et al. (2020) find that labor productivity of women-owned firms is lower by 11 percent than that of men-owned firms.<sup>3</sup> Gender gaps are

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<sup>2</sup> For a review of the theoretical and empirical literature on the effects of gender inequality on economic growth, see Santos Silva and Klasen (2021), Seguino (2020), Cuberes and Teignier (2014), and Klasen and Lamanna (2009).

<sup>3</sup> However, in some cases the difference may narrow or even disappear after controlling for key industry and firm characteristics such as firm-size (e.g. Hallward-Driemeier 2013; Rijkers and Costa 2012; Gui-Diby et al. 2017).

also found in other firm performance measures such as profits of microenterprises (Hardy and Kagy 2018) and income of self-employed (Nix et al. 2016). With a few exceptions (discussed below), this body of work focuses on the formal or registered sector.

There are several reasons why a proper understanding of gender gaps is incomplete without analyzing what is happening in the informal or unregistered sector. First, the informal sector is large. Available estimates indicate that in the developing countries, the informal sector accounts for about one-third of GDP and 70 percent of employment (Loayza, 2016; Ohnsorge and Yu, 2021). Further, globally, it is estimated that two-thirds of all enterprises are unregistered at start-up (Autio and Fu, 2015), and over half of all existing enterprises operate unregistered (Acs et al., 2013). Thus, the gender gap (or lack of it) in the informal sector is likely to affect far more women than the gender gap in the formal sector. Second, related to the previous point, available evidence indicates a larger concentration of women relative to men in the informal sector than the formal sector (Hyland and Islam, 2021). Women constitute a large portion of the self-employed in developing economies - about 55 percent in low and lower middle-income economies. The presence of women in the informal sector may be a choice as it affords flexibility between homecare and market activities (Maloney, 2004; Nordman et al., 2016). However, they may also be pushed to the informal sector due to lack of opportunities in the formal sector, or due to other factors such as social norms or discriminatory laws (Hyland and Islam, 2021). Regardless, the state of the informal sector affects the livelihoods of many women. Third, formal and informal firms are very different and so we cannot assume that the findings for the gender gap in the formal sector apply to informal sector. For instance, compared to formal businesses, most informal businesses tend to be smaller, have low value added, employ fewer educated workers, have less educated owners and managers, have lower sunk costs, require lower working capital, and make less use of

formal institutions and available infrastructure facilities (see Lewis, 1959; Chen, 2012; La Porta and Shleifer, 2014; Ulyssea, 2020). These differences can have important implications for the size of the gender gap.

In this study, we contribute to the literature by exploring the gender labor productivity gap (henceforth, productivity gap) across informal businesses. We define informal businesses as those that are unregistered with the relevant national authority. Gender of the largest owner is used to define whether the business is owned by a woman or man. There is little distinction for us between ownership and management as for over 96 percent of the firms in our sample, the largest owner is also the manager (main decision maker). In our sample of 2,759 firms across 14 economies, 45 percent are owned by women (see table A1). We find robust evidence that women-owned informal businesses have lower labor productivity than those owned by men. As mentioned above, we uncover an unconditional gender labor productivity gap of about 15.2 percent (or 0.165 log point).<sup>4</sup>

Using the Oaxaca-Blinder decomposition technique, we decompose the productivity gap across informal firms to uncover what factors contribute to the gap. Lower education and experience of women owners of informal businesses relative to men have widened the productivity gap. Low use of physical assets such as vehicles by women-owned businesses has also widened the productivity gap. This finding may reflect either the inability of women entrepreneurs in the informal sector to obtain physical assets, or a choice of women entrepreneurs to engage in activities that require less capital. Security is also a concern, as the inability of women to pay for security contributed to enlarging the productivity gap. This is consistent with the findings uncovered for formal firms (Islam et al., 2020). However, the small size (in terms of employment) of women-

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<sup>4</sup> Throughout the paper, difference in labor productivity is first computed in log terms (log difference). The log difference is converted to percentage terms using the following formula from Halvorsen and Palmquist (1980): percentage change =  $(\exp(\log \text{ difference}) - 1) * 100$ .

owned businesses, and their relatively higher (compared to male-owned firms) returns from producing or selling under contract and from security payments have narrowed the productivity gap. It is important to note that a sizeable portion of the productivity gap is explained by the location fixed effects or is unexplained by the covariates in the data.

The study builds on the few others that have explored gender gaps in labor productivity among informal firms. Many of these studies have documented gender gaps in informal firms in rural areas (Nagler and Naude, 2017; Rijkers and Costa, 2012). In contrast, this study examines informal firms in largely urban areas. Nagler and Naude (2017) use household enterprise data in rural areas for four Sub-Saharan African economies - Ethiopia, Malawi, Nigeria, and Uganda and find that enterprises owned by women are less productive than those owned by men. Rijkers and Costa (2012) similarly find gender gaps for rural informal enterprises in Ethiopia, Bangladesh, Indonesia, and Sri Lanka. However, with the addition of control variables, half the gender gap disappears in Ethiopia, and no gender gap is observed in Bangladesh and Sri Lanka. Some studies are also region-specific. Bruhn (2009) explores the gender gap in productivity in 9 economies in Latin America and the Caribbean, with 3 economies - Mexico, Peru and Bolivia including data on informal firms. The study finds that female-owned micro and small enterprises are less productive than male-owned enterprises in Mexico (9 percent) and Peru (16 percent) but not in Bolivia. Hallward-Driemeier (2013) explores the gender gap in 19 Sub-Saharan African economies using enterprise modules of various labor force surveys as well as surveys of micro-enterprises that are assumed to be all informal. The study finds that female-owned enterprises are 50 percent less productive than male-owned enterprises. The corresponding gap is 6 percent for the formal sector, implying that the gender gap may be much larger in the informal than formal sector. However, the gender gap in the informal sector narrows considerably after including controls. Finally, there are



country-specific studies on informal firms. Munyegera and Precious (2018) use a census of establishments and representative household surveys in Rwanda and uncover a gender-based productivity gap that persists after the inclusion of controls. Nordman and Vaillant (2014) use informal enterprise surveys in Madagascar and show that even after the inclusion of control variables, female-owned enterprises are 28 percent less productive than male-owned enterprises.

Ours is the first study that we are aware of to decompose the gender gap in labor productivity of informal firms into a wide range of firm characteristics as well as internal and external operating business environment for many economies. Furthermore, using a specialized informal firm survey allows us to account for many factors that are largely unavailable in other data sets, including the ability to produce or sell under contract, use of infrastructure services, owner education and experience. The focus on urban areas is also relevant as this is typically where a large share of formal and informal firms coexist. Cities are the engines of economic growth and a major source of economic activity. The correlation between urbanization and economic development is reflective of agglomeration economies (Glaeser, 2011). Proximity in cities spreads knowledge, making workers more skilled and entrepreneurs more productive (Glaeser and Resseger, 2010). Informal and formal activities are more entwined in cities (Daniels, 2004). Therefore, urban areas may provide different degrees of informality, where for instance informal firms can contract with formal firms – an element that we find is an important contributor to the productivity of informal firms in this study, especially for women-owned businesses. Thus, cities may on one hand provide opportunities for informal firms and on the other hand increase competition between formal and informal businesses.

Our findings matter for policy makers (discussed in section 6). The presence of a gender gap not only means a lower standard of living for women, but also inefficient utilization of their

potential and less contribution to the economy. Our findings provide several ways for policy makers to reduce the productivity gap and improve the labor productivity of female-owned firms. That is, increasing the human capital of women entrepreneurs in the informal sector may help their businesses catch up with businesses owned by men. Enabling women-owned informal businesses to sell under contract, reducing the degree of informality, may further raise their productivity. Furthermore, we find that most women-owned businesses do wish to register. This implies that there is room to reduce informality if governments embrace policies that provide the right incentives to formalize.

To summarize, this is the first study we are aware of that decomposes the gender labor productivity gap across informal firms. Several contributors to these gaps are identified, with the magnitude of these contributions estimated. These findings provide concrete policy recommendations to aid women-owned informal businesses. The rest of the paper is structured as follows. Section 2 describes the data and variables used. Section 3 provides the decomposition methodology. Difference in the level of resources used by women- and men-owned firms is provided in section 4 along with the difference in the impact of the resources on labor productivity. Section 5 contains our main decomposition results based on the Oaxaca-Blinder methodology. Section 6 summarizes the main findings and suggests scope for policy intervention and future research in the area.

## **2. Data and Main Variables**

Our data source is the Informal Enterprise Surveys (IES) that is a specialized survey for informal businesses defined as those that are unregistered with the relevant authorities in the country. The data we use consists of a random sample of 2,759 informal or unregistered firms collected by the World Bank's Enterprise Surveys team in 55 cities or regions in 14 countries in Africa, Asia, and

Latin America. The surveys were conducted between 2009 and 2014 in the various countries and include manufacturing and services sector firms. Table A1 provides the distribution of the sample by country along with the survey year. A somewhat similar survey instrument and methodology was used across countries.<sup>5</sup> Given the cross-sectional nature of the data, each firm and country are surveyed once at a particular point in time. Thus, it cannot be guaranteed that responses from firms would be similar at other points in time.<sup>6</sup>

It is important to note that there is much debate about the definition of informality. The IES data we use defines informal firms as those that are not registered with the relevant authorities. This is consistent with many other studies in the related literature (Amin and Okou, 2020; Loayza and Roginlini 2011; Gindling and Terrell 2005; Rand and Torm 2012; Mead and Morrisson 1996). Another important issue relates to the representativeness of the sample. A nationally representative sample of informal firms would require a complete list of all informal firms in the country. However, such a list does not exist for most countries at the national or even the regional and city level. Hence, most studies using data on informal firms tend to rely on random sample of informal firms taken from one or two main urban centers of the country (see for example, Harris 2014, Rand and Torm 2012). These random samples are not necessarily representative of the underlying informal economy, although it is not clear if the sample bias systematically affects the results. Likewise, the sample we use is also random, restricted to 55 regions/cities across 14 countries, and not necessarily representative of the informal economy in the city or the country. This point notwithstanding, the informal surveys we use have been used extensively in the literature to study the sector (see Amin and Islam 2015, Islam 2019, La Porta and Shleifer 2014).

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<sup>5</sup> Details of the methodology can be accessed through the following link:  
<http://www.enterprisesurveys.org/methodology>

<sup>6</sup> The difficulty in accounting for time periods is one of the limitations of cross-sectional data sets.

## 2.1 *Main variables – description and motivation*

Summary statistics of all the variables used are provided in table A2. The outcome or dependent variable is (log of) labor productivity of the firm. Labor productivity equals the total sales (in USD) of the firm in a typical month over the last year divided by the total number of workers (paid plus unpaid and including the owner if applicable) in a regular month over the last year. Total sales are converted to USD using official exchange rate taken from World Development Indicators (WDI), World Bank.

For our main explanatory variable, we define a female-owned firm as a firm where the largest owner is female. All other firms are male-owned. For over 96 percent of the firms in our sample, the largest owner is also the main decision maker. Thus, there is almost no distinction in our sample between the largest owner and the manager (main decision maker).<sup>7</sup> Table A1 provides the percentage of female-owned firms by country in the sample. Ghana has the highest percentage of female-owned firms (64 percent) followed by Guatemala (57 percent). At the other end of the spectrum are Mali (18 percent), and DRC (23 percent). The average for the whole sample is 44.9 percent.

We account for several factors that are found important for the productivity of businesses. We account for firm size using (log of) the total number of employees in a regular month. Informal firms of different sizes may show different levels of productivity. Large informal firms may have more resources, but they may face transformation and evasion costs that smaller informal firms are not burdened with (Amin and Islam, 2015). It is also well-established that formal firms are more productive than informal business (La Porta and Shleifer, 2014). Thus, the degree of

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<sup>7</sup> Restricting the sample to only those firms where the largest owner is also the main decision maker makes no noticeable difference to any of the results discussed.

informality may matter. While all the firms in the sample are informal, as defined in terms of being unregistered, we account for whether an informal firm produces or sells under contract from another business or person. This may capture some degree of formal networks for informal firms.

We account for fixed assets proxied by whether informal firms use vehicles in their current operations. Furthermore, we capture if the informal businesses use infrastructure services such as power or water in their business that may enhance their productivity while also accounting for the scale and nature of their activities. Along similar lines, we account for whether the informal businesses are within a fixed premise or mobile, whether they are in the manufacturing or service sector. There is evidence that firms led by women tend to be engaged more in the service sectors than the manufacturing sectors (Klapper and Parker 2010; Bardasi et al. 2011; Hallward-Driemeier 2013; Amin and Islam 2014). Access to finance is an important determinant of performance and there is evidence that women entrepreneurs may face greater difficulty in accessing finance (Moro et al. 2017, Muravyev et al. 2009). Access to finance is captured using two variables – whether firms use a bank account to run business and whether firms have a loan at the time of the survey. Finally, the estimations account for business environment variables such as whether firms make informal payments to remain unregistered, and whether they experience crime or paid for security. The latter was found to be an important contributor to the gender productivity gap in formal firms (Islam et al., 2020).

### **3. Labor Productivity Decomposition Methodology**

The literature has utilized Oaxaca-Blinder decompositions to explore contributors to gender wage gaps, wage inequality, and productivity (Oaxaca 1973; Blinder 1973, Fortin 2008, 2011). Palacios-Lopez and Lopez (2015) use the Oaxaca-Blinder decomposition to explain the gender gap in agricultural labor productivity using household-level data. We apply the same methodology to explain the labor productivity gap between female-managed and male-managed firms.

A decomposition analysis allows us to illuminate the contributions of various factors to the gender gap in firm-level labor productivity. The factors can be broken down into endowment and structural effects. Endowment effects refers to the attributes or incidence of certain factors experienced by the firm, whereas the structural effect refers to the returns to these attributes or factors. However, the decomposition, just like the underlying regression analysis, cannot establish whether the relationships are causal. Furthermore, the decomposition methodology is dependent on the accuracy of the specification (see Guryan and Charles, 2013 for a summary of the limitations).

The decomposition methodology can be briefly summarized by first defining the labor productivity of female and male owned informal firms as follows:

$$Y_G = \beta_{G0} + \sum_{j=1}^J \beta_{Gj} X_{Gj} + \epsilon_G \quad (1)$$

Where  $Y_G$  is the log of sales per worker for firms with owner of gender  $G$ ,  $X$  is a vector of  $j$  observable factors that encompass firm-level characteristics as well as business environment elements that can influence the productivity of firms. The subscript  $G$  denotes the gender of the largest owner and equals  $F$  for female and  $M$  for male. Regional characteristics are captured by

location (within country) fixed effects included in the estimations.  $\epsilon_F$  is the error term. It is assumed that  $E(\epsilon_F) = E(\epsilon_M) = 0$ .

Taking the difference of the expected value of the log labor productivity of female and male owned informal firms we get the gender labor productivity gap ( $D$ ) as follows:

$$D = \underbrace{\sum_{j=1}^J [E(X_{Fj}) - E(X_{Mj})] \beta_{Fj}}_{\text{Endowment Effect}} + \underbrace{\beta_{F0} - \beta_{M0} + \sum_{j=1}^J [(\beta_{Fj} - \beta_{Mj}) E(X_{Mj})]}_{\text{Structural Effect}} \quad (2)$$

The goal of the decomposition analysis is to estimate the two components shown in equation (2) for each determinant ( $X$ ) of labor productivity.

## 4. Empirical results

### 4.1 Mean differences between female-owned and male-owned informal firms

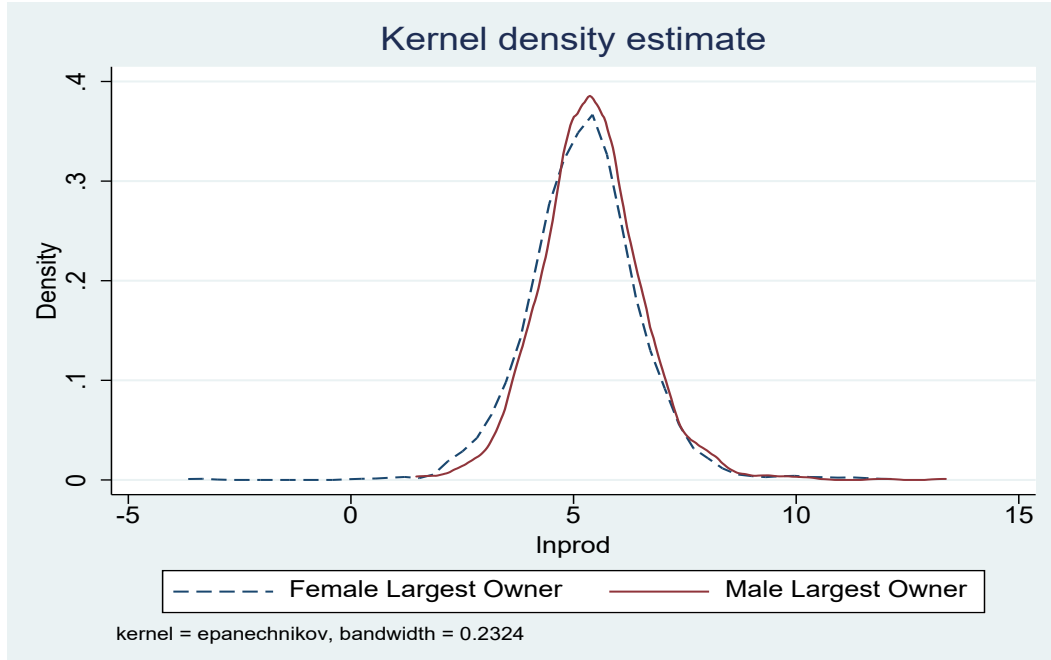
Table 1 provides descriptive statistics and means tests of several variables between female-owned and male-owned firms. The outcome variable for the analysis is labor productivity, defined as (log of) sales per worker (in 2009 USD) in a typical month. There is a statistically significant (at 1 percent) unconditional gender productivity gap, with labor productivity being 15.2 percent (or 0.165 log point) lower among female-owned firms than among male-owned firms. The US dollar equivalent in average log sales per worker is \$189 (5.24 in logs) for female-owned firms and \$221 (5.4 in logs) for male-owned firms. This is higher than the gender gap found by Hallward-Driemeier (2013) for the formal sector based on ES for Sub-Saharan Africa (6 percent) but lower than what many studies have found for the informal private sector (e.g. Hallward-Driemeier 2013; Rijkers and Costa 2012). The unconditional gender gap is also shown in the kernel density estimates of female-managed and male-managed firms in figure 1.

The differences in the characteristics of female- and male-owned enterprises help explain the endowment effects in the decomposition analysis. Female-owned firms are much smaller (2.1 vs 3.1 employees), and less likely to have the (largest) owner with secondary or higher education than male-owned firms (61 vs. 71 percent). Differences in both these variables between female- and male-owned enterprises are statistically significant at the 1 percent level. This is line with earlier studies that have found enterprises owned by women to be smaller and that women tend to lag men in higher education (Klapper and Parker 2010, Nix et al. 2016, Essers et al. 2021). Managers of female-owned firms also have about 2.5 years less experience working in the industry on average than managers of male-owned firms. This difference is statistically significant at the 1 percent level. In terms of industry, we find that relative to male-owned firms, female-owned firms are much more likely in the services sector than the manufacturing sector. That is, 54 percent of female-owned firms vs. 49 percent of male-owned firms operate in the services sector, with the difference being significant at the 1 percent level. This is consistent with earlier studies that have found female relative to male entrepreneurs to be engaged disproportionately in services sector compared to manufacturing (Klapper and Parker 2010; Bardasi et al. 2011; Hallward-Driemeier 2013; Amin and Islam 2014). Female-owned firms are also less likely than male-owned firms to use inputs such as electricity (62 vs. 71 percent), water (28 vs. 43 percent), and vehicles (13 vs. 22 percent). All these differences are significant at the 1 percent level. Several studies have reported the greater difficulty that women entrepreneurs and managers face in obtaining finance (see for example, Moro et al. 2017, Muravyev et al. 2009). However, these studies are not specific to the informal sector where financial requirement is typically much smaller. We find mixed results in our sample regarding finance and gender. That is, the percentage of firms that use bank account for running business is lower among female-owned firms than male-owned firms (25 vs. 28



percent), with the difference being significant at the 10 percent level. In contrast, female-owned firms are more likely to have a business loan than male-owned firms (13 vs. 10 percent) and this difference is significant at the 1 percent level. Informal firms often face problems in operating outside the legal structure. Thus, they may have to make informal payments to remain unregistered and pay for security. We find that these costs are significantly less common for female- than male-owned businesses. That is, 8 percent of female-owned firms compared to 14 percent of male-owned firms make informal payments to remain unregistered. Similarly, 15 percent of female-owned firms vs. 21 percent of male-owned firms pay for security. Gender-based difference in both these variables is significant at the 1 percent level. Having a job or searching for one in the formal sector may signal lower interest in the current business with consequent effects on owner's motivation level and therefore labor productivity. We find differences in largest owner having a job in the formal sector or looking for one in the last 2 years in our sample. About 12 percent of the female owners do so compared to 14 percent of male owners. The difference is significant at the 10 percent level. There are a few areas where there is no significant difference between female- and male-owned firms. These include whether a firm produces or sells under a contract from another business or person, whether the (largest) owner started another business in the last three years, whether the firm experienced crime in the last month, and whether the firm is located within household or fixed premises and permanent structure or not.

**Figure 1: Density estimates of the log of labor productivity for female- and male-owned informal firms**



Source: Author's own calculations based on Informal Enterprise Surveys (IES), World Bank.

#### 4.2 Differences in returns to drivers of labor productivity

The mean differences between female and male-owned firms across several factors provide an indication of the differences in adoption or incidence of the factors. However, female-owned firms and male-owned firms could have the same endowments or factors (inputs or technologies), but the returns to factors may differ between them. A difference in returns is indicative of discrimination that women face, but it could also be due to omitted variable bias if a factor is correlated with unobserved determinants of productivity, such as owner's ability.<sup>8</sup> Differences in returns can be uncovered using regression analysis to estimate how various factors affect labor productivity for the female-owned versus male-owned firms subsamples. These firm-level regressions are presented in table 2.

<sup>8</sup> Another reason could be diminishing returns to a factor such as years of manager education when female-owned and male-owned firms have different levels of the factor.

We employ a specification with common control variables which include all the variables discussed in the previous section plus dummy variables for the city (within country) where the firm operates. Thus, our regression results as well as decomposition results are based on comparing female-owned and male-owned firms in the same city rather than across cities and countries. This helps overcome the omitted variable bias problem that plagues much of the cross-country regression analysis.

#### *4.2.1 Main Regression Results*

The regression results for the whole (male and female) sample are provided in column 1 of table 2. The sample is subsequently divided into female-owned firms (column 2) and male-owned firms (column 3). The coefficient of the female largest owner dummy in column 1 is negative and statistically significant at the 1 percent level. This implies that female-owned firms have lower levels of labor productivity than male-owned firms. The conditional gender gap (24.5 percent or 0.281 log point) as shown in column 1 of table 2 is much higher than the unconditional gender gap (15.2 percent or 0.165 log point) shown in table 1. This is different from some of the other studies that suggest that gender gaps in areas such as labor productivity and obtaining finance tends to reduce when accounting for individual or firm characteristics (see for example, Aterido et al. 2013, Hallward-Driemeier 2013).

Firm-size is negatively related to labor productivity for both the full sample of firms and the subsamples of female- and male-owned firms. This negative relationship is significant at the 1 percent level in all the three samples. The relationship is stronger (more negative) for female-owned firms than male-owned firms, although the difference does not seem to be too large (confirmed below). The inverse relationship between labor productivity and firm-size is consistent

with the results of Amin and Islam (2015) who use the same data source as we do. As Amin and Islam (2015) argue, there are several possible reasons for the negative relationship. These include diminishing returns to labor or decreasing returns to scale, transformation costs that larger firms face who may be preparing to formalize, evasion costs associated with operating informally which increase with greater visibility and therefore with firm-size.

Results for the higher education and labor productivity relationship are along expected lines. That is, labor productivity is significantly higher (at 1 percent) when the owner has secondary or higher education versus when owner has only primary education or no education. This positive and significant relationship between labor productivity and owner education level holds in the full sample as well as in the subsamples of female- and male-owned firms. In terms of the magnitude, in the full sample, labor productivity is higher by 25 percent when the owner has secondary or higher education compared to when the owner does not. The corresponding figure is lower for female-owned firms than male-owned firms (20.6 and 29.7 percent). Analyzing labor productivity of informal firms, La Porta and Shleifer (2008, 2014) note that higher levels of education of managers (owners in our case) in the formal sector than the informal sector is what makes formal firms far more productive than informal firms. However, most of the literature in the area is focused on education in the formal sector and worker education rather than owner or manager education (see Bartelsman and Doms, 2000; Konings and Vanormelingen, 2015). Nevertheless, important insights can be gleaned from this body of work. At the basic level, increased education implies that valuable skills are learned which can enhance labor productivity in the firm (Becker, 1975). Furthermore, education for both workers and owners can widen the access to different sources of information and may increase their ability to learn from experience, potentially raising productivity (Rosenzweig 1995 presents the arguments for workers). Education or training directly

relevant for running a business (such as an MBA degree) may be beneficial through more aggressive behavior as reflected in investments, etc. (Bertrand and Schoar 2003).

Moving beyond education, labor productivity is also significantly higher (at 1 percent) for firms that use vehicles for running their business and for firms that use bank accounts. These results hold in the full sample and in the subsamples of female-owned and male-owned firms. However, other inputs such as use of electricity and water have only a weak and statistically insignificant relationship (at 10 percent or less) with labor productivity in all the three samples considered.

There are some relationships that are gender specific. Number of years of manager experience is associated with a significantly higher labor productivity (at 1 percent) in the full sample and among female-owned firms. However, there is no significant relationship between the two among male-owned firms. This could reflect diminishing returns to manager experience as men have a higher level of manager experience than women (see table 1). A similar result is found for firms that produce or sell under a contract versus those that do not. Starting another business in the last three years is associated with a significant reduction in labor productivity for female-owned firms. There is no significant relationship between the two in the full sample or among male-owned firms. Some gender specific relationships are significant for male-owned firms but not female-owned firms. Having a bank loan is associated with higher labor productivity (significant at 5 percent) for male-owned firms. However, the variable has no significant association with labor productivity in the full sample or among female-owned firms. Similarly, in the full sample and subsample of male-owned firms, labor productivity is higher (significant at 1 percent) for firms that make payments for security versus those that do not. No significant relationship is found between the two among female-owned firms.

Last, there are some variables that show no significant relationship with labor productivity either in the full sample or in the subsamples of female- and male-owned firms. These variables include whether the largest owner has a job in the formal sector or has been looking for one over the last 2 years, whether the firm uses electricity for its activities, whether the firm uses water for activity other than for typical consumption and hygiene, whether the firm is engaged in manufacturing or services activity, whether the firm pays informal payment to remain unregistered, whether the firm experienced crime last month, and whether the firm is located within household or fixed premises and permanent structures.

#### *4.2.2 Robustness – Water Outages*

A key finding of Islam (2019) is that water outages are a prominent factor in explaining the productivity of informal businesses. We do not include water outages in our main regressions as water outage information is only available for informal firms that use water in their business activities. Given the considerable drop in sample size, we provide the findings as a robustness check in table A3. The results show that the gender labor productivity gap stands despite the inclusion of water outages as a covariate. The gender labor productivity gap does increase for this subsample of informal businesses.

## **5. Decomposition Results**

Thus far, we have presented the mean differences of several factors between female-owned and male-owned firms. We have also used regression analysis to identify factors that may affect labor productivity for female-owned and male-owned firms. In this section, we explore if these differences have any significant contribution to the overall gender labor productivity gap through

the econometric Oaxaca-Blinder decomposition analysis. Table 3 presents the decomposition results. The labor productivity among female-owned firms is on average 15.2 percent (or 0.165 log point) lower than among male-owned firms as indicated in column 1 of table 3. This unconditional labor productivity gap is decomposed into an endowment effect and a structural effect as presented in columns 2 and 3 of table 3, respectively. Endowment effects refers to the attributes or incidence of certain factors experienced by the firm, whereas the structural effect refers to the returns to these attributes or factors. Take, for instance, the size of a firm. Female-owned firms are on average smaller than male-owned firms and this contributes to the labor productivity gap as an endowment effect. Furthermore, marginal increases in the size of a firm may have differential effects for female-owned and male-owned firms, and this would be captured as a structural effect. Below we present the results decomposed into endowment effects and structural effects.

### *5.1 Endowment effects*

Recall that male-owned firms are more productive than female-owned firms. Thus, any factor that narrows the gender gap favors female-owned firms over male-owned firms. The findings for the endowment effects are presented in column 2 of table 3. Only the variables that make a statistically significant contribution to the productivity gap are discussed. Female-owned firms are much smaller than male-owned firms (2.1 versus 3.1 employees) consistent with what other studies have found (Klapper and Parker, 2010; Hallward-Driemeier, 2013). Regressions in table 2 indicate that larger firm-size is associated with lower labor productivity. Thus, smaller size of female-owned firms contributes to narrowing the productivity gap by 75.8 percent (significant at the 1 percent level). This is the largest contribution to the productivity gap made by any variable via the endowment effect. Female-owned firms also benefit from location factors. That is, location or city

specific factors serve to reduce the gap by about 40.6 percent (significant at 5 percent level). Next, we found above that female-owned firms are less likely to have owners with secondary or higher education than male-owned firms. It was also found that having secondary or higher education vs. only primary or no education significantly improves labor productivity. Thus, difference in the proportion of firms that have secondary or higher educated owners widens the gap by 13.3 percent (significant at 1 percent level). Similarly, higher manager experience is associated with higher labor productivity and female-owned firms have lower level of manager experience than male-owned firms. This implies that manager experience widens the gap. It does so by 8.5 percent (significant at 5 percent level). A similar logic applies to the use of vehicles for business purposes. Use of vehicles is higher among male-owned firms than female-owned firms and it is associated with higher labor productivity. Thus, use of vehicles widens the gap by 13.3 percent (significant at 1 percent level). The last factor that contributes significantly to the productivity gap is if the firm pays for security. In table 1, we found that fewer female-owned firms pay for security than male-owned firms. From table 2, we know that labor productivity is higher for firms that pay for security vs. those that do not. Thus, it follows that security payment contributes to widen the productivity gap between female- and male-owned firms by 5.5 percent (significant at 1 percent level).

## *5.2 Structural effects*

Structural effects refer to the role of the returns to production factors or attributes of firms that lead to the widening or narrowing of the labor productivity gap between female- and male-owned firms. As for the endowment effects, we focus here only on those variables that make a statistically significant contribution to the productivity gap. Apart from location or city specific factors, the



only significant structural contributions to the gap come from whether the firm produces or sells under contract and whether the firm pays for security. Location specific factors widen the productivity gap via the structural channel by a large 2,198 percent (significant at 1 percent level). There are several potential candidates for the city specific factors such as the quality of physical infrastructure availability, market opportunities, nearness to required inputs, overall economic development, etc. Note that city fixed effects also include country specific factors (country fixed effects) such as culture and social attitudes towards women's work, gender disparity in labor and other laws, and access to institutions for women vs. men that could explain the high contribution of location specific factors.

Next, we found above that labor productivity is significantly higher for female-owned firms that produce or sell under contract than female-owned firms that do not. However, for male-owned firms, the difference in labor productivity between those that sell or produce under a contract and those that do not is much smaller and statistically insignificant (at 10 percent level). Thus, it follows that selling or producing under a contract narrows the productivity gap by 26.1 percent (significant at 5 percent level). The finding suggests that better linkage between the informal and the formal sector is likely to close the gap between female-owned and male-owned firms. Last, we found in table 2 that security payment is associated with significantly higher labor productivity for male-owned firms. However, for female-owned firms the relationship between the two is weak and insignificant. Thus, it is no surprise that structurally, making security payment widens the productivity gap by 24.2 percent (significant at 1 percent level).

It is revealing that returns to the remaining variables such as firm-size, education level, manager experience and so forth are roughly similar between female- and male-owned firms. Thus, these variables do not make any significant structural contribution to the gap. This is an important

finding for two reasons. First, differences in returns between women- and men-owned firms may in part reflect underlying discrimination against women. This is much harder to address using policy tools than simply providing more resources to women (see for example, Nix et al et. 2016 for more discussion on this point). Thus, a substantial proportion of the productivity gap that we find in the informal sector can be closed by simply providing better resources to women such as education, manager experience, and physical capital, without having to deal with the more complex and difficult problem of gender discrimination. This is under the assumption that discrimination plays a relatively lower role in accessing resources relative to the returns to these resources. Second, roughly similar returns to factors for women- and men-owned firms implies that there is little or no efficiency cost of shifting resources from men-owned to women-owned firms. Thus, greater gender equality in resources does not necessarily lead to lower labor productivity in the informal sector overall.

## **6. Discussion and Conclusion**

There are both efficiency and human rights arguments for advancing equality between men and women. While the literature is replete with studies on the gender productivity gap for the formal private sector, very little is known about the informal private sector. The key questions are whether such gender productivity gaps persist in the informal sector, and if so, what are the key contributors that exacerbate or alleviate these gaps. These are the questions this study attempts to answer, and to our knowledge, this is the first study to do so using a unique firm-level cross-country database. Informal businesses are hard to capture as by definition they are not included in registration lists, and thus, it is difficult to gather data on how they function. While the data we employ is not as comprehensive as firm-level data sets of the formal sector, our study provides a baseline for future

studies to build on as more sophisticated survey methodologies are developed to capture the informal sector.

Our findings are relevant for policy makers in terms of how they could increase the productivity for female-owned informal businesses. We ascertain a gender labor productivity gap in the informal sector and point to specific factors that have contributed to it. Thus, it follows that labor productivity of female-owned firms can be improved and the gap with male-owned firms reduced by providing women with more education (secondary or higher), opportunities to acquire experience in running businesses, facilitating purchase of capital equipment, providing more security, and enabling contract-based transactions. While our findings are novel, we do caution that they have their limitations. We are unable to explain a sizeable portion of the gender labor productivity gap uncovered in the informal sector. Furthermore, the location seems to have a significant contribution to the gap that may be related to location-specific or country-level policies. Last, our sample is not necessarily representative of the informal economies in the country or even the cities. Thus, it remains to be established if our results hold outside the sample used.

There is of course an additional policy-relevant question – why are these informal businesses not formalizing? It is unclear if increases in productivity are sufficient to trigger formalization. While the analysis presented in this study is silent on the transitions into formality, the data does provide some self-reported information on plausible reasons.<sup>9</sup> The information is presented in tables A4 and A5 for countries for which data are available. Most firms in the sample would like to register (56 percent). About 52 percent of female-owned businesses would like to register, in contrast to 57 percent of male-owned informal businesses. In three countries in the

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<sup>9</sup> The informal enterprise survey data includes a section where respondents indicate their desire for registration, the reasons they remain unregistered, and the potential benefits of registering. Not all this information is available for all the countries or harmonized.

sample more female-owned business would like to register than male-owned businesses – Angola, Botswana, and Rwanda. In Angola, a large portion of the informal firms would like to register – 88% of female-owned firms and 86 percent of male-owned businesses. By far, in the full sample, the most frequently cited benefit for registering is access to finance – 67 percent of firms. This proportion is the same for female-owned and male-owned informal firms. The least cited reason is less bribes to pay (26) percent. About 36 percent of firms indicated that better access to raw materials, infrastructure services, government services, and ability to issue receipts to attract customers as potential benefits for registering. However, this information is unavailable for several countries where the surveys were implemented (see table A4).

The self-reported reasons for remaining unregistered are not available for all the countries in the sample. For the 8 out of 14 countries for which these data are available, most firms cite time fees and paperwork (55%) and taxes if registered (58%) as reasons not to register, with little difference between female-owned and male-owned informal businesses. Fifty-seven percent and 53 percent of male-owned and female-owned informal businesses, respectively, cite time, fees and paperwork as the reason for remaining unregistered. Fifty-seven percent of female-owned informal firms and 58 percent of male-owned informal firms cite taxes if registered as a reason to be unregistered. Inspections and bribes are cited by a small percentage of firms, regardless of the gender of the largest owner. About 43 percent of businesses see no benefit in registering, implying that many firms are less confident about the potential benefits they cite for being registered. This varied little by the gender of the largest owner – 44 percent of female-owned informal businesses, and 42 percent of male-owned businesses. Thus, although transitions between formality and informality may be slow, there is suggestive evidence that firms would like to formalize, and the government may have a role in why they do not.

Last, our study suggests several avenues for future research. We highlight some of them. First, our analysis focuses on labor productivity, but gender gaps in several other variables in the informal sector remain to be explored. Examples include gender gaps in wage rate, profit and total factor productivity of firms, firm dynamics and growth, adoption of new technology, and investment. Future research can explore gender gaps in these areas and their likely causes and effects. Second, it is important to check if the results are general enough to hold in other countries not included in our sample. Third, the decomposition technique we used does not identify the mechanisms or the channels through which factors impact labor productivity. Identifying the channels will help in the design and proper targeting of policies for the informal sector. Last, the decomposition technique also does not shed light on the causality issue. Exploring causal effects of the factors such as education and experience of the owners, use of vehicles, etc. on labor productivity of female- and male-owned informal firms is a challenge for future researchers.

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**Table 1: Descriptive Statistics and Test of Mean Difference by Gender of Largest Owner**

	All	Female-Owned	Male-Owned	
Log of Labor Productivity (Sales per Worker)	5.330	5.239	5.404	***
Log of total number of employees in regular month	0.657	0.505	0.782	***
Largest owner has secondary education or higher: Y/N	0.664	0.609	0.709	***
Manager experience (years)	10.100	8.702	11.241	***
Produces or sells under contract from another business or person Y/N	0.156	0.146	0.164	
Largest owner has a job in formal sector or looked for one over last 2 years Y/N	0.129	0.116	0.140	*
Largest owner started another business in the last three years Y/N	0.596	0.593	0.598	
Firm uses electricity for activity Y/N	0.671	0.622	0.712	***
Uses water for activity other than for typical consumption and hygiene Y/N	0.345	0.432	0.275	***
Firm uses vehicles in its current operations Y/N	0.181	0.130	0.223	***
Manufacturing firm Y/N	0.488	0.457	0.513	***
Firm uses bank account to run business Y/N	0.267	0.249	0.281	*
Firm has a loan at this time Y/N	0.112	0.132	0.095	***
Firm pays informal payment to remain unregistered Y/N	0.115	0.081	0.142	***
Firm experienced crime last month Y/N	0.089	0.079	0.097	
Firm pays for security Y/N	0.183	0.152	0.209	***
Firm located within household or fixed premises & permanent structure Y/N	0.695	0.697	0.694	

**Table 2: Base OLS Regressions**

Dependent Variable	Log of Labor Productivity (Sales per Worker)		
	ALL	Female Largest Owner	Male Largest Owner
	coef/se	coef/se	coef/se
Largest Owner is Female Y/N	-0.281*** (0.073)		
Log of total number of employees in regular month	-0.448*** (0.040)	-0.515*** (0.067)	-0.427*** (0.041)
Largest owner has secondary education or higher: Y/N	0.223*** (0.061)	0.187** (0.089)	0.260*** (0.066)
Manager experience (years)	0.006*** (0.002)	0.007** (0.003)	0.004 (0.003)
Produces or sells under contract from another business or person Y/N	0.129** (0.056)	0.289*** (0.078)	0.007 (0.064)
Largest owner has a job in formal sector or looked for one over last 2 years Y/N	-0.048 (0.064)	0.002 (0.096)	-0.033 (0.088)
Largest owner started another business in the last three years Y/N	-0.045 (0.031)	-0.097** (0.049)	-0.038 (0.047)
Firm uses electricity for activity Y/N	0.088 (0.058)	0.088 (0.097)	0.083 (0.054)
Uses water for activity other than for typical consumption and hygiene Y/N	0.036 (0.081)	-0.003 (0.109)	0.069 (0.056)
Firm uses vehicles in its current operations Y/N	0.233*** (0.050)	0.218*** (0.081)	0.270*** (0.081)
Manufacturing firm Y/N	-0.038 (0.036)	-0.061 (0.042)	0.004 (0.046)
Firm uses bank account to run business Y/N	0.267*** (0.042)	0.293*** (0.076)	0.257*** (0.050)
Firm has a loan at this time Y/N	0.080 (0.060)	0.017 (0.105)	0.159** (0.069)
Firm pays informal payment to remain unregistered Y/N	0.036 (0.057)	0.127 (0.128)	-0.010 (0.064)
Firm experienced crime last month Y/N	-0.014 (0.083)	0.010 (0.119)	-0.041 (0.103)
Firm pays for security Y/N	0.159*** (0.036)	0.041 (0.053)	0.265*** (0.041)
Firm located within household or fixed premises & permanent structure Y/N	-0.021 (0.042)	-0.074 (0.054)	0.029 (0.051)

Constant	5.158*** (0.168)	5.098*** (0.133)	5.007*** (0.231)
Location (within country) Fixed Effects	YES	YES	YES
Number of observations	2,759	1,240	1,519
Adjusted R2	0.240	0.281	0.244

note: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1 Hubert-White robust standard errors (SE) clustered at the region-sector level in parentheses.

**Table 3: Decomposition Results**

	<b>Differential</b>	<b>Endowment</b>	<b>Structural</b>
	<b>coef/se</b>	<b>coef/se</b>	<b>coef/se</b>
Female-owned firms log of labor productivity	5.239*** (0.075)		
Male-owned firms log of labor productivity	5.404*** (0.060)		
Difference	-0.165*** (0.062)		
Log of total number of employees in regular month		0.125*** (0.019)	-0.050 (0.041)
Largest owner has secondary education or higher: Y/N		-0.022*** (0.008)	-0.048 (0.059)
Manager experience (years)		-0.014** (0.006)	0.028 (0.041)
Produces or sells under contract from another business or person Y/N		-0.002 (0.004)	0.043** (0.020)
Largest owner has a job in formal sector or looked for one over last 2 years Y/N		0.001 (0.002)	0.004 (0.013)
Largest owner started another business in the last three years Y/N		0.0002 (0.001)	-0.035 (0.045)
Firm uses electricity for activity Y/N		-0.008 (0.005)	0.003 (0.065)
Uses water for activity other than for typical consumption and hygiene Y/N		0.006 (0.013)	-0.026 (0.040)
Firm uses vehicles in its current operations Y/N		-0.022*** (0.006)	-0.010 (0.021)
Manufacturing firm Y/N		0.002 (0.002)	-0.032 (0.033)
Firm uses bank account to run business Y/N		-0.009 (0.008)	0.009 (0.024)
Firm has a loan at this time Y/N		0.003 (0.002)	-0.016 (0.012)
Firm pays informal payment to remain unregistered Y/N		-0.002 (0.003)	0.014 (0.016)
Firm experienced crime last month Y/N		0.0002 (0.001)	0.004 (0.012)
Firm pays for security Y/N		-0.009*** (0.004)	-0.040*** (0.012)

Firm located within household or fixed premises & permanent structure Y/N	-0.0001	-0.071
	(0.001)	(0.050)
Location	0.067**	-2.141***
	(0.032)	(0.143)
Total	0.116***	-0.281***
	(0.045)	(0.061)
Constant		2.083***
		(0.158)
<hr/>		
Number of observations	2,759	
<hr/>		

note: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. standard errors (SE) clustered at the region-sector level in parentheses.



## Appendix

**Table A1: Sample description**

Country	Survey year	Number of firms	% of firms with a female largest owner
Angola	2010	45	36%
Argentina	2010	201	55%
Botswana	2010	84	46%
Burkina Faso	2009	87	25%
Cameroon	2009	115	34%
Cabo Verde	2009	60	47%
Congo, Dem. Rep.	2013	369	23%
Ghana	2013	523	64%
Guatemala	2010	160	57%
Kenya	2013	367	42%
Mali	2010	67	18%
Myanmar	2014	211	36%
Peru	2010	344	53%
Rwanda	2011	126	40%
<b>All countries</b>			<b>45%</b>

Source: Author's own calculations based on Informal Enterprise Surveys (IES) data, World Bank.

**Table A2: Summary Statistics**

<b>Variable</b>	<b>Obs</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min</b>	<b>Max</b>
Largest Owner is Female Y/N	2,759	0.449	0.498	0	1
Log of Labor Productivity (Sales per Worker)	2,759	5.330	1.214	-3.422	13.359
Log of total number of employees in regular month	2,759	0.657	0.699	0	4.111
Largest owner has secondary education or higher: Y/N	2,759	0.664	0.472	0	1
Manager experience (years)	2,759	10.100	8.794	1	80
Produces or sells under contract from another business or person Y/N	2,759	0.156	0.363	0	1
Largest owner has a job in formal sector or looked for one over last 2 years Y/N	2,759	0.129	0.335	0	1
Largest owner started another business in the last three years Y/N	2,759	0.596	0.491	0	1
Firm uses electricity for activity Y/N	2,759	0.671	0.470	0	1
Uses water for activity other than for typical consumption and hygiene Y/N	2,759	0.345	0.476	0	1
Firm uses vehicles in its current operations Y/N	2,759	0.181	0.385	0	1
Manufacturing firm Y/N	2,759	0.488	0.500	0	1
Firm uses bank account to run business Y/N	2,759	0.267	0.442	0	1
Firm has a loan at this time Y/N	2,759	0.112	0.315	0	1
Firm pays informal payment to remain unregistered Y/N	2,759	0.115	0.319	0	1
Firm experienced crime last month Y/N	2,759	0.089	0.285	0	1
Firm pays for security Y/N	2,759	0.183	0.387	0	1
Firm located within household or fixed premises & permanent structure Y/N	2,759	0.695	0.460	0	1
Total duration of water shortages last month (in days)	735	1.948	5.731	0.000	30.000

Source: Author's own calculations based on Informal Enterprise Surveys (IES) data, World Bank.

**Table A3: Robustness – Water outages**

Dependent Variable	Log of Labor Productivity (Sales per Worker)		
	ALL	Female Largest Owner	Male Largest Owner
	coef/se	coef/se	coef/se
Largest Owner is Female Y/N	-0.331*** (0.075)		
Total duration of water shortages last month (in days)	-0.024*** (0.009)	-0.029** (0.012)	-0.018 (0.013)
Log of total number of employees in regular month	-0.570*** (0.100)	-0.598*** (0.131)	-0.569*** (0.117)
Largest owner has secondary education or higher: Y/N	0.289** (0.126)	0.291 (0.202)	0.296** (0.141)
Manager experience (years)	0.011* (0.006)	0.017** (0.007)	0.006 (0.011)
Produces or sells under contract from another business or person Y/N	0.316** (0.142)	0.602*** (0.147)	0.057 (0.116)
Largest owner has a job in formal sector or looked for one over last 2 years Y/N	-0.009 (0.143)	-0.081 (0.262)	-0.019 (0.167)
Largest owner started another business in the last three years Y/N	-0.157** (0.069)	-0.127 (0.116)	-0.131 (0.120)
Firm uses electricity for activity Y/N	0.066 (0.088)	0.039 (0.136)	0.091 (0.092)
Uses water for activity other than for typical consumption and hygiene Y/N	-0.196 (0.210)	-0.876** (0.411)	0.315** (0.138)
Firm uses vehicles in its current operations Y/N	0.439*** (0.090)	0.630*** (0.130)	0.337*** (0.090)
Manufacturing firm Y/N	0.148* (0.075)	0.205** (0.090)	0.091 (0.100)
Firm uses bank account to run business Y/N	0.215 (0.146)	0.158 (0.188)	0.313** (0.160)
Firm has a loan at this time Y/N	0.050 (0.067)	0.186 (0.152)	-0.030 (0.106)
Firm pays informal payment to remain unregistered Y/N	-0.274* (0.154)	-0.093 (0.213)	-0.401*** (0.148)
Firm experienced crime last month Y/N	0.046 (0.230)	0.098 (0.313)	0.145 (0.395)

Firm pays for security Y/N	-0.092 (0.166)	-0.305* (0.185)	0.192** (0.080)
Firm located within household or fixed premises & permanent structure Y/N	0.021 (0.082)	-0.047 (0.178)	0.097 (0.083)
Constant	5.344*** (0.234)	5.757*** (0.503)	4.699*** (0.384)
Location (within country) Fixed Effects	YES	YES	YES
Number of observations	735	393	342
Adjusted R2	0.338	0.391	0.366

note: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1 Hubert-White robust standard errors (SE) clustered at the region-sector level in parentheses.

**Table A4: Share of Female Owners and Reasons for Informality**

Country	Year of Survey	Largest Owner is Female	% of Firms that would Like to Register	Reason Unregistered					Registration Benefit			
				Time, fees and paperwork	Taxes if registered	Inspections and meetings with government officials	Bribes required if registered	No benefit	Better access to financing of loans	Better access to raw materials, infrastructure services, and government services	Less bribes to pay	Issue receipts to attract customers
Angola	2010	0.36	0.87						0.95		0.57	
Argentina	2010	0.55	0.47	0.37	0.75	0.17	0.14	0.36	0.56	0.43	0.20	0.45
Botswana	2010	0.46	0.55						0.73		0.05	
Burkina Faso	2009	0.25	0.61						0.90		0.56	
Cameroon	2009	0.34	0.50						0.68		0.45	
Cabo Verde	2009	0.47	0.70						0.78		0.09	
Congo, Dem. Rep.	2013	0.23	0.52	0.63	0.61	0.26	0.28	0.41	0.40	0.21	0.36	0.31
Ghana	2013	0.64	0.51	0.58	0.44	0.20	0.21	0.36	0.61	0.44	0.22	0.39
Guatemala	2010	0.57	0.31	0.57	0.54	0.24	0.27	0.46	0.50	0.31	0.18	0.39
Kenya	2013	0.42	0.54	0.53	0.56	0.33	0.33	0.47	0.76	0.59	0.37	0.43
Mali	2010	0.18	0.79						0.67		0.10	
Myanmar	2014	0.36	0.32	0.57	0.52	0.13	0.19	0.67	0.23	0.09	0.24	0.18
Peru	2010	0.53	0.53	0.57	0.56	0.24	0.13	0.52	0.67	0.32	0.13	0.52
Rwanda	2011	0.40	0.57	0.57	0.64	0.15	0.12	0.19	0.91	0.51	0.10	0.34
<b>Average</b>		0.41	0.56	0.55	0.58	0.21	0.21	0.43	0.67	0.36	0.26	0.38

**Table A5: Reasons for Informality by Gender of Largest Owner**

Country	Year of Survey		% of Firms that would Like to Register	Reason Unregistered					Registration Benefit			
				Time, fees and paperwork	Taxes if registered	Inspections & meetings with govt. officials	Bribes required if registered	No benefit	Better access to financing of loans	Better access to raw materials, infrastructure services, & govt. services	Less bribes to pay	Issue receipts to attract customers
Angola	2010	Female-owned	0.88						0.93		0.43	
Angola	2010	Male-owned	0.86						0.96		0.64	
Argentina	2010	Female-owned	0.39	0.31	0.72	0.15	0.09	0.30	0.48	0.39	0.19	0.39
Argentina	2010	Male-owned	0.57	0.44	0.78	0.18	0.19	0.43	0.66	0.47	0.20	0.51
Botswana	2010	Female-owned	0.56						0.84		0.03	
Botswana	2010	Male-owned	0.53						0.64		0.07	
Burkina Faso	2009	Female-owned	0.52						0.85		0.71	
Burkina Faso	2009	Male-owned	0.64						0.91		0.51	
Cameroon	2009	Female-owned	0.46						0.58		0.47	
Cameroon	2009	Male-owned	0.52						0.73		0.44	
Cabo Verde	2009	Female-owned	0.60						0.90		0.08	
Cabo Verde	2009	Male-owned	0.77						0.70		0.10	
Congo, Dem. Rep.	2013	Female-owned	0.47	0.60	0.61	0.32	0.30	0.44	0.35	0.14	0.40	0.32
Congo, Dem. Rep.	2013	Male-owned	0.54	0.64	0.61	0.24	0.28	0.40	0.41	0.24	0.35	0.31
Ghana	2013	Female-owned	0.44	0.54	0.43	0.19	0.18	0.39	0.57	0.39	0.19	0.30
Ghana	2013	Male-owned	0.63	0.64	0.45	0.23	0.25	0.30	0.69	0.54	0.27	0.54
Guatemala	2010	Female-owned	0.25	0.54	0.54	0.27	0.31	0.50	0.49	0.29	0.17	0.34
Guatemala	2010	Male-owned	0.39	0.60	0.54	0.19	0.21	0.40	0.52	0.33	0.20	0.46
Kenya	2013	Female-owned	0.52	0.56	0.51	0.32	0.31	0.46	0.79	0.63	0.36	0.47
Kenya	2013	Male-owned	0.55	0.50	0.58	0.33	0.35	0.48	0.74	0.57	0.38	0.41
Mali	2010	Female-owned	0.75						0.73		0.00	
Mali	2010	Male-owned	0.80						0.65		0.12	
Myanmar	2014	Female-owned	0.30	0.54	0.61	0.16	0.22	0.64	0.23	0.06	0.32	0.20
Myanmar	2014	Male-owned	0.33	0.59	0.47	0.11	0.17	0.68	0.23	0.10	0.21	0.17
Peru	2010	Female-owned	0.49	0.59	0.58	0.22	0.12	0.54	0.67	0.27	0.13	0.50
Peru	2010	Male-owned	0.57	0.54	0.54	0.26	0.14	0.49	0.68	0.37	0.13	0.54
Rwanda	2011	Female-owned	0.59	0.52	0.60	0.12	0.17	0.24	0.91	0.54	0.00	0.29
Rwanda	2011	Male-owned	0.55	0.59	0.67	0.17	0.09	0.16	0.90	0.49	0.15	0.37
<b>Average</b>		Female-owned	0.52	0.53	0.57	0.22	0.21	0.44	0.67	0.34	0.25	0.35

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Male-owned	0.59		0.57	0.58	0.21	0.21	0.42		0.67	0.39	0.27	0.41
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