Business and Economics Journal
ISSN: 2151-6219

Amin, Bus Eco J 2014, 5:4
DOI: 10.4172/2151-6219.1000119

Review Article Open Access

The Relevance of Firm-size in the Informal Sector

Mohammad Amin*

Senior Economist, Enterprise Analysis Unit, Development Economics (DECEA), World Bank, Washington DC, 20433, USA

***Corresponding author:** Dr. Mohammad Amin, Senior Economist, Enterprise Analysis Unit, Development Economics (DECEA), World Bank, Washington DC, 20433, USA, Tel: +374 10 23-72-61; E-mail: mamin@worldbank.org

Received date: March 21, 2014, **Accepted date:** November 13, 2014, **Published date:** November 20, 2014

Abstract

Using newly collected on informal firms in 11 countries in Africa, we explore whether firm-size matters at all for the structure, conduct and performance of the firms. While firm-size is known to be an important attribute of the firms in the formal sector, it is not obvious what the relevance of firm-size is for the informal sector. Informal firms are small, many of them run alone by the owner, and have limited variation in size. Notwithstanding the limited variation in firm-size, our results show that firm-size is highly correlated with a number of firm characteristics such as job growth, labor productivity, gender composition of the workforce and ownership, proclivity to register, access to finance and use of electricity and vehicles. Of course, there are firm characteristics such as perceived benefits from registering, quality of power supply faced by the firms and crime against businesses that show no variation by firm-size. Overall, we conclude that distinction between small and large firms is relevant for the informal sector, at least to an extent that it cannot be neglected by researchers and policy makers.

Keywords: Informality; Firm-size; Africa; JEL: O17, O55

Introduction

There is a large and growing body of work that focuses on how the size of the firm matters. This body of work shows that there are significant differences between small and large firms in their structure, conduct as well as performance. Presence of sunk costs and scale economies not just in the production process but also in exploring and developing new markets, dealing with the business climate and government officials could explain some of the observed differences between small and large firms. Also, size may matter not directly but indirectly through its covariates. For instance, if larger firms are more profitable and therefore in a position to hire more experienced or successful managers, this could in turn imply faster growth for such firms. The present paper attempts to explore the relevance of firm-size for unregistered or informal firms in 11 African countries. The importance of firm-size for the informal firms is a relatively neglected area and our results suggest that it is worth exploring.

Existing studies on firm-size related issues are almost exclusively focused on the registered or formal sector firms. We provide a few examples of the findings in the literature. One set of studies show that larger firms are more likely to engage in research and development than the small firms, and that among firms that engage in R&D, the amount spent on innovative activities rises with firm size [1]. At the same time, studies have found that among firms that engage in R&D, the productivity of R&D measured by innovations per dollar of R&D spending is higher in the relatively smaller firms [2,3].

Exporting activity, an important contributor to growth in many countries, is also known to be more common among large compared with small firms. Exporting activity is typically associated with sunk costs and scale economies, something that naturally favors the relatively large firms. For example, according to the new Exporter Dynamics Database (2012) compiled by the World Bank, a few large companies dominate export markets in developing and developed countries, with the top 1 percent often accounting for more than half, and sometimes nearly 80 percent, of total exports[1]. Similar results are reported for example, by Bigsten et al. [4], Neil et al. [5], Aitken [6], Roberts and Tybout [7] and Clerides et al.

Access to finance is another area where firm-size is known to play a critical role. Studies show that small firms are more affected in their growth rate by a poorly developed financial sector than the large firms [8,9]. There is also some recent evidence to suggest that poor business climate as reflected in high corruption, high taxes, high crime, anti-competitive practices, poor quality of courts and lack of easy access to information on rules and regulations has a much bigger negative effect on the growth rate of small relative to large firms [8,10]. However, this body of evidence is limited and far from conclusive.

The studies mentioned above are exclusively focused on the registered or the formal sector. However, in many developing countries, a substantial proportion of output and employment originates in the unregistered or the informal sector [11]. It is well known that firms in the informal sector (henceforth, informal firms) are typically very small often run by the owner himself/herself, do not engage in R&D, do not export and most of them have difficulty in getting finance from banks and other organized financial institutions. For example, for the 11 countries and 1,349 informal firms in Africa that the present study focuses on, about 30.3 percent of the firms have a single employee (including the owner/manager if he/she works at the firm), 24.3 percent have 2 employees, 15.3 percent have 3 employees and the remaining 30.1 percent have more than 3 employees. The average number of employees in the sample equals 3. Given the relatively small size of the firms on average and somewhat limited variation in firm-size, one wonders if firm-size has any relevance at all for the firm's structure, conduct and performance in the sense discussed above for firms in the formal sector.

[1] More information is available.

The present paper attempts to shed some light on the relevance of firm-size for a sample of informal firms. This is important not just for academic reasons but also from the policy point of view. For example, if we do find firm-size to be correlated with firm's desire to register, ease with which firm can access external sources of funds, etc., then policy measures can be appropriately targeted between small and large firms within the informal sector. Second, firm-size can be a useful proxy measure for firm-performance. That is, if we find a systematic correlation between firm-size and performance measures such as sales growth, labor productivity and worker salary then firm-size can be used as a reasonably good proxy measure for certain dimensions of firm-efficiency, and policy measures can be appropriately designed for firms of different sizes. Third, the quality of the business environment and the difficulties firms face because of not being registered may differ between small and large firms. If this is true reforms aimed at improving the business climate for the informal firms can be properly designed keeping in view how firms of different sizes are likely to benefit from such reforms.

The approach we take in this paper is descriptive rather than analytical, dictated mainly by data limitations (cross-section data) rather than by choice. That is, we present results on how various firm characteristics vary with firm-size. These results are in the nature of correlations or associations and do not necessarily imply a causal effect. Nevertheless, robust correlations of the kind presented below are helpful in understanding for example, whether it is the small or the large firms most in need of improved access to finance, infrastructure services etc. This is important and useful from the policy point of view, notwithstanding the true nature of the underlying causal links. Robust correlations and association are also useful as a starting point for future work aimed at unearthing the causal effects at play.

Data and the Measure of Firm-size

The data we use comes from a survey of informal firms in 11 countries in Africa. The list of countries covered along with the number of firms surveyed in each country is provided in Table 1. These surveys were conducted between 2009 and 2011 by the World Bank's Enterprise Surveys. The surveys cover only the unregistered or the informal firms and are restricted to 1 or 2 main cities in each country. A common methodology of random sampling was used for the selection firms in the survey. Due to lack of adequate information on the universe of informal firms (sampling frame), the surveys do not claim to be representative of the informal economies either at the country or the city level. Hence, the results presented below should be treated with due caution as pertaining to the surveyed firms rather than the larger informal economy.[2]

Country	Year survey was conducted	Number of firms surveyed	Number of firms with data on the number of employees in a regular month	Mean value of (log of) number of employees in a regular month	Standard deviation of (log of) number of employees in a regular month.	% of firms with more than 3 employees in a regular month
Angola	2010	119	107	1.799	0.789	86.9
Botswana	2010	99	98	0.661	0.71	35.7
Burkina Faso	2009	120	102	1.05	0.654	52.3
Cameroon	2009	122	120	0.916	0.604	54.2
Cape Verde	2009	129	101	0.648	0.582	32.4
Cote d'Ivoire	2009	129	112	0.73	0.65	34.2
DRC	2010	150	142	1.089	0.555	60.7
Madagascar	2009	127	126	0.576	0.523	29.4
Mali	2010	120	109	1.113	0.664	64.3
Mauritius	2009	132	109	0.431	0.466	14.2
Rwanda	2011	240	223	0.616	0.655	31.7
Full sample (all countries)		1487	1349	0.856	0.717	44

Table 1: Countries covered, sample size and firm-size. All the employment measures in the table refer to employment in a regular month during the year prior to the survey. The year of the survey shown relates to the time firms were actually interviewed. Information of many variables in the questionnaire relates to the period of 12 months prior the year of the survey indicated above. These variables are indicated in the text above.

The measure of firm-size we use is the log of number of employees working at the firm during a regular month in the last year prior to the date of the survey (Employment). Table 1 provides for each country the number of firms surveyed and the number of firms for which information is available on the employment measure, the mean value of employment and the standard deviation. There is substantial variation in Employment to warrant an analysis of the type that follows. For example, in the full sample, the mean value of Employment equals 0.856 and the standard deviation equals 0.717. That is, the coefficient of variation (standard deviation as a percentage of mean value) equals 83.8 percent. Individually across countries, the coefficient of variation ranges between a low of 43.8 percent in Angola

[2] More information on the sampling methodology and the actual data are available at www.enterprisesurveys.org.

and a high of 108 percent in Mauritius. The following graph shows the distribution of the sample across standardized values of Employment in the full sample. As the Figure 1 shows, about 54.6 percent of the firms have below sample mean level of employment (less than zero in the Figure 1). At the other extreme, there are only a few firms with employment higher than the mean by over 3 times standard deviation.

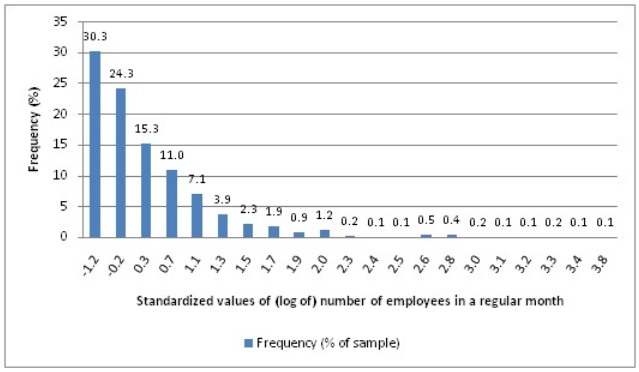

Figure 1: Size distribution of the firms in the sample Note: Standardized values are obtained as the value of Employment minus its mean and divided by the standard deviation.

Information is also available in the survey on the monthly sales of the firm over the last year. The monthly sales figures are available for the last month, busiest and the slowest month during the last year and for a regular month over the last year. As expected, sales and employment figures show a high positive correlation (the correlation coefficient equals 0.38 between sales and employment in a regular month over the last year) and this is significant at less than the 1 percent level. However, cross-checking our results, we found some differences in how various firm characteristics relate to employment vs. sales. Below, we focus on the employment measure for two reasons. First, the employment measure is reported by a larger number of the sampled firms than the sales measure (91 vs. 82 percent, respectively). Second, given the small number of workers employed by the firms, we suspect that firms are less likely to make an error in recalling employment in a regular month over the last year than in recalling sales figure. Nevertheless, extension of the results below to the sales measure of firm-size would be a fruitful area for future research.

A few points about the data and the estimation method used below ought to be noted. First, there are some differences in the questionnaire used in the different countries. Also, in some cases, a particular question was not asked in some of the countries. Hence, we restrict ourselves to only those questions that were asked in a majority of countries if not all the 11 countries. We indicate below where the country coverage is less than complete. Second, all firms are given equal weights irrespective of the country to which they belong. Hence, countries with larger sample size get a larger weight in the regressions but this is not an issue with us since our focus is on firm-level characteristics and not country characteristics. Third, we use the Ordinary Least Squares (OLS) or logit estimation method as appropriate (indicated below). All results discussed below are based on formal regressions which are provided in Tables 2-21. These regression results use Huber-White robust standard errors and clustered on the country. We take due caution in eliminating any potential outliers that may have an unduly large effect on our results. Fourth, in the discussion that follows and unless otherwise indicated, all the results are statistically significant at the 10 percent level or less. The significance level is indicated in the text and also in the regression tables indicated. Fifth, the results outlined below pertain to the full sample and need not hold in all the countries individually. That is, they hold on average in the countries covered. Nevertheless, we have taken care to ensure that the results are not driven by an outlier country in the sample. Sixth, we have reported all our regression results below with country fixed effects in place. This is appropriate since our focus is not on cross-country comparisons and differences across countries in the level of development and other economic features are known to be a major source of spurious correlation for the relationship of interest. We note that some of our results are sensitive to the use of country fixed effects.

Results

In this section, we discuss the results on how firm-size correlates with various firm-characteristics. As mentioned above, the results discussed below are in the nature of correlations or associations rather than causations. However, this does not mean that the relationships highlighted below do not have causal implications – this may well be causal in nature but more work is required to ascertain (or reject) the possible causal effects.

All results presented below are based on regression analysis using country fixed effects. We also check that the results are robust to basic firm characteristics such as: age of the firm (log values), a dummy variable equal to 1 if the firm has a female owner and 0 otherwise, a dummy variable equal to 1 if the firm uses electricity and 0 otherwise, a dummy variable equal to 1 if the firm uses machinery and 0 otherwise, and a dummy variable equal to 1 if the firm manufactures the product itself and 0 otherwise. For future reference, we will refer to these controls collectively as "firm-level controls". Most of the specifications discussed below use all these controls. However, as necessary, a few specifications exclude one or more of these controls (indicated below).

Smaller firms have higher labor productivity

We define labor productivity as the (log of) sales in a regular month over the last year divided by the total number of employees working at the firm in a regular month over the last year. Labor productivity is often used as a measure of firm efficiency, especially when data limitations, as is true in our case, preclude the estimation of total factor productivity or profit levels. Labor productivity is also helpful in gauging the capacity of the firm to generate income for its workers. Ceteris paribus, one would expect labor productivity to decrease with firm-size since lager firms have resources or other inputs spread out more thinly across workers. Of course, this tendency for diminishing returns to labor could be countered if more workers imply more of other complimentary inputs.

Our results show a sharp decline in labor productivity as the number of workers at the firm increases. Regression results in Table 2 show the result holds even after controlling for the various firm-level controls listed above. The magnitude of the negative relationship between labor productivity and employment is also large. For example, with all the firm-level controls in place, the estimated coefficient value of Employment equals -0.47 (column 3, Table 2), which is also the elasticity of output per worker (without logs) with respect of the number of workers at the firm (without logs).

	-1	-2	-3
Dependent variable: Labor productivity (logs)			
Employment	-0.455***	-0.442***	-0.467***
	0	-0.001	-0.001
Country fixed effects	Yes	Yes	Yes
Firm manufactures the product		-0.332***	-0.317***
		-0.005	-0.007
Age of the firm (logs)		0.013	0.022
		-0.794	-0.677
Firm has female owner		-0.321**	-0.328**
		-0.017	-0.021
Firm uses machinery			-0.062
			-0.567
Firm uses electricity			0.099
			-0.334
Observations	1,125	1,031	993
R-squared	0.254	0.284	0.283

Table 2: Labor productivity decreases with firm-size. P-values in brackets. All regressions use Huber-White robust standard errors clustered on the country. Significance level is denoted by ***(1%), **(5%) and *(10%).

Alternatively, a one standard deviation increase in Employment is associated with a decrease in labor productivity of 0.23 standard deviation units of labor productivity. Put another way, moving from the firm with the smallest to the highest number of employees in our sample implies a decline in labor productivity of about 1.68 log points or about 33 percent of the mean value of labor productivity. These are economically large relationships. Figure 2 illustrates the point.

Job growth is slower for firms that were larger at start-up

It is often argued that small firms tend to grow faster than the large firms. Part of the rationale for supporting small and medium enterprises (SMEs) in the formal sector is because of higher job growth among SMEs vis-à-vis the rest. Does firm-size matter for job growth in the informal sector? We find that firms that were larger in terms of employment at start-up (i.e., when the firm started operations) continue to be larger today. However, there is some convergence or catching up in that the job growth rate (compounded, annual) is higher for firms that were smaller to begin with Figure 3. Regression results in Table 3 show that the negative relationship between job growth rate and (log of) number of employees at start-up is negative, economically large and statistically significant. For example, with all the firm-level controls included in the specification, a one standard deviation increase in the (log of) employment at start-up is associated with a decline in job growth rate of 0.19 standard deviation units (of job growth rate). Alternatively, a doubling of the number of employees at start-up is associated with a decrease of 4.6 percentage points in the compounded annual job growth rate – a large decrease given that mean value of job growth rate in our sample equals 0.3 percent for the sample of firms included in the specification.

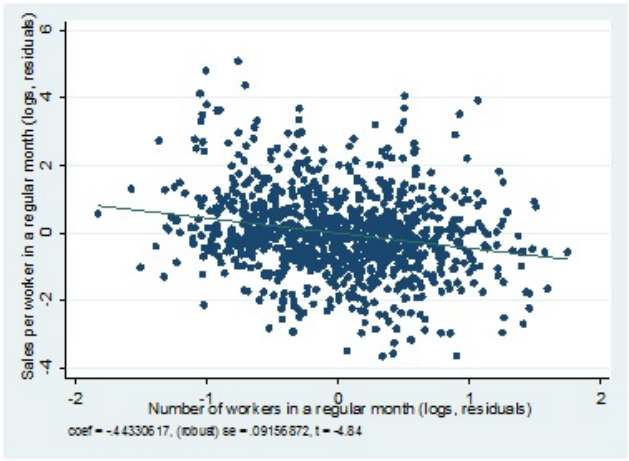

Figure 2: Labor productivity decreases with firm-size. Note: The figure is a partial scatter plot obtained after controlling for country fixed effects, age of the firm (logs), and separate dummy variables indicating if the firm has a female owner, firm uses machinery, firm uses electricity and if the firm manufactures the product itself. The negative relationship shown is significant at less than the 1 percent level with Huber-White robust standard errors clustered on the country. One observation is dropped in the figure above (outlier) although this does not change any of the results in the figure or in the text above.

	-1	-2	-3
Dependent variable: Job growth (%, annual compounded)			
Employment at start-up (logs)	-5.017***	-5.722***	-6.316***
	-0.007	-0.001	-0.001
Country fixed effects	Yes	Yes	Yes
Firm manufactures the product		3.622**	3.458**
		-0.033	-0.039
Age of the firm (logs)		-1.352	-1.243
		-0.391	-0.432
Firm has female owner		-2.488	-2.397
		-0.128	-0.146
Firm uses machinery			0.633
			-0.698
Firm uses electricity			3.657
			-0.149

Observations	1,339	1,243	1,199
R-squared	0.06	0.069	0.078

Table 3: Job growth is higher among smaller firms. P-values in brackets. All regressions use Huber-White robust standard errors clustered on the country. Significance level is denoted by ***(1%), **(5%) and *(10%).

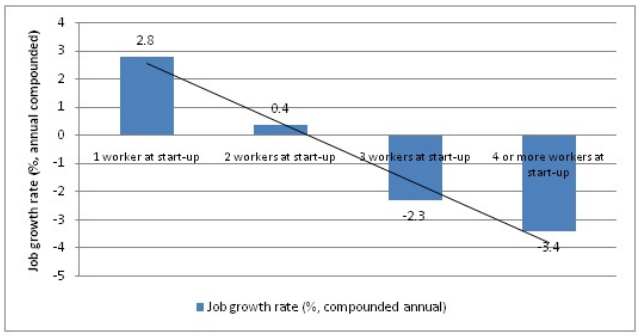

Figure 3: Job creation is higher among firms that are smaller at start-up.

Firms owned and managed my females are smaller in size and have lower labor productivity than firms owned and managed by males

About 35 percent of the firms in our sample are managed by females. There is no meaningful distinction in our sample between the gender of the manager and the largest owner. Hence, we use the words owner and manager interchangeably here. A number of studies have documented for the case of the formal sector that firms owned/managed by females are typically smaller in size than those owned/managed by males. We find a similar result for the informal firms in our sample (Figure 4). Table 4 provides the necessary results. That is, a female run firm is smaller than a male run firm in terms of Employment by 0.11 to 0.12 log points (columns 1-3), and this difference is significant at less than the 5 percent level. These estimates imply that on average, the number of workers (without logs) at a male run firm is about 1.13 to 1.16 times the number of workers at a female run firm.

Smaller firm-size of female vs. male owned/managed firms is often thought to lead to lower productivity or efficiency of female vs. male owned/managed firms. In our sample, we find that female managed firms have lower labor productivity than male managed firms (columns 4-6, Table 4). However, this gender-based difference in labor productivity cannot be attributed to differences in firm-size since the difference continues to hold and becomes even stronger when we control for firm-size or Employment (columns 5 and 6).

	-1	-2	-3	-4	-5	-6
Dependent variable:	Employment (logs)			Labor productivity (logs)		
Firm has female owner	-0.123**	-0.107**	-0.111**	-0.233*	-0.288**	-0.328**
	-0.013	-0.032	-0.024	-0.06	-0.027	-0.021
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm manufactures the product		0.242***	0.217***			-0.317***
		0	0			-0.007
Age of the firm (logs)		0.161***	0.171***			0.022
		-0.002	-0.001			-0.677
Firm uses machinery			0.041			-0.062
			-0.477			-0.567
Firm uses electricity			0.190***			0.099
			-0.01			-0.334
Employment					-0.479***	-0.467***
					0	-0.001
Observations	1,342	1,229	1,182	1,119	1,119	993
R-squared	0.248	0.312	0.324	0.222	0.265	0.283

Table 4: Gender, firm-size and labor productivity. P-values in brackets. All regressions use Huber-White robust standard errors clustered on the country. Significance level is denoted by ***(1%), **(5%) and *(10%).

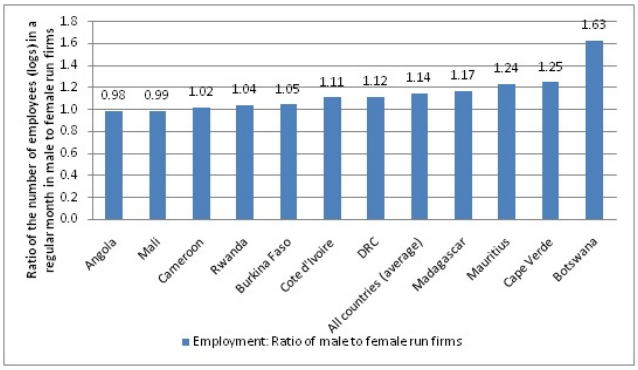

Figure 4: In most countries, employment is higher in male compared with female owned firms.

Large firms are older and have more experienced managers than the small firms

It is plausible to expect a positive relationship between firm-size and the age of the firm. Some possible reasons for this positive relationship could be that having been for a longer period of time, older firms are likely to have grown more than the younger firms;

firms that do well and grow in size over time are more likely to survive; and entrepreneurs that see better chances of survival set up larger firms (at start up) than the rest. Table 5 (columns 1-3) provides the regression results showing that older firms in our sample are indeed larger in size and this relationship is robust to the firm-level controls listed above (Figure 5). For example, according to our most conservative estimate (column 2, Table 5), a one standard deviation increase in Employment is associated with an increase of 0.22 standard deviation units of the (log of) age of the firm. In other words, a doubling of the number of employees (without logs) working at the firm is associated with increase in firm's age by about 19 percent of the initial level.

Further and along expected lines, firm-size is positively correlated with the (log of) number of years of experience the main decision maker has working in the sector (columns 4-6, Table 5). However, this positive correlation becomes much smaller in magnitude and statistically insignificant once we control for differences in the age of the firm.

	-1	-2	-3	-4	-5	-6
Dependent variable:	Age of the firm (logs)			Years of experience manager has in the sector (logs)		
Employment	0.261***	0.251***	0.270***	0.275***	0.235***	0.235***
	0	0	0	0	-0.001	-0.001
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm manufactures the product		0.117	0.121*		0.273***	0.228***
		-0.106	-0.078		-0.001	-0.003
Firm has female owner		-0.085**	-0.059		-0.186***	-0.159***
		-0.047	-0.135		-0.001	-0.003
Firm uses machinery			0.018			0.158*
			-0.76			-0.05
Firm uses electricity			-0.129**			-0.06
			-0.031			-0.284
Observations	1,324	1,229	1,182	1,316	1,224	1,177
R-squared	0.14	0.143	0.153	0.178	0.209	0.222

Table 5: Larger firms are older and have more experienced managers. P-values in brackets. All regressions use Huber-White robust standard errors clustered on the country. Significance level is denoted by ***(1%), **(5%) and *(10%).

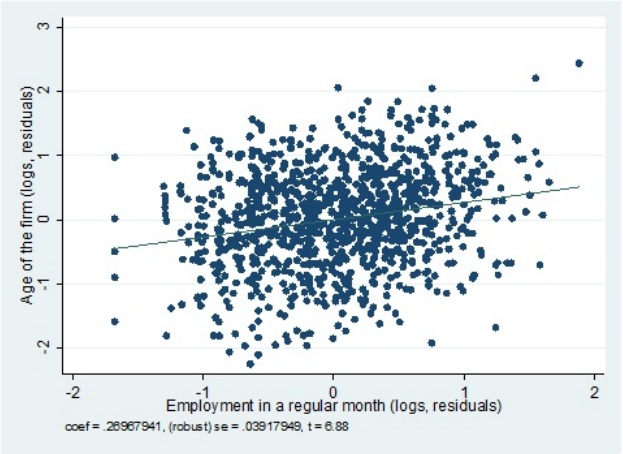

Figure 5: Larger firms are older than the smaller firms. Note: The figure is a partial scatter plot obtained after controlling for country fixed effects, and separate dummy variables indicating if the firm has a female owner, firm uses machinery, firm uses electricity and if the firm manufactures the product itself. The positive relationship shown is significant at less than the 1 percent level with Huber-White robust standard errors clustered on the country.

Compared with small firms, large firms are more likely to have multiple owners and also owners with more than one business when compared with the smaller firms

As expected, an overwhelming majority, 83.2 percent, of the firms in our sample have a single owner. A much smaller 13.6 percent have 2 owners and the remaining 3.2 percent have more than 2 owners. Number of owners averages about 1.3 (per firm) in the sample. Similarly, firms with more than one business activity are rare in our sample – less than 19 percent. These results are not surprising given that informal firms are typically small providing little scope for multiple owners or multiple business activities. However, we do find significant variation by firm-size. That is, the proportion of firms having more than one owner and more than a single main business activity increases sharply with the size of the firm. Table 6 provides the estimation results from the logit estimation (marginal effects). For example, according to the most conservative estimate for the relationship between firm-size and the probability of firm having multiple owners (column 1, Table 6), a one standard deviation increase in Employment is associated with an increase in the likelihood of a firm having more than one owner by 7.5 percentage points, significant at less than the 1 percent level. This is a large effect given that the percentage of firms in the full sample that have multiple owners is less than 19 percent. Figure 6 illustrates the point graphically.

	-1	-2	-3	-4	-5	-6
Dependent variable:	Firm has more than one owner (dummy)			Firm has more than one main business activity (dummy)		
Employment	0.104***	0.119***	0.118***	0.068***	0.065***	0.057**
	0	0	0	-0.004	-0.002	-0.014

Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm manufactures the product		-0.058***	-0.058**		-0.011	-0.004
		-0.004	-0.023		-0.474	-0.868
Age of the firm (logs)		-0.031***	-0.031***		0.02	0.024
		-0.001	-0.002		-0.331	-0.281
Firm has female owner			0.001			0.015
			-0.964			-0.589
Firm uses machinery			-0.00005			-0.023
			-0.998			-0.464
Firm uses electricity			-0.012			0.059*
			-0.594			-0.064
Observations	1349	1233	1192	816	751	725
Pseudo R-squared	0.094	0.113	0.11	0.046	0.041	0.044

Table 6: Larger firms are more likely to have multiple owners and multiple main business activity (Marginal effects from Logit specification). P-values in brackets. All regressions use Huber-White robust standard errors clustered on the country. Significance level is denoted by *** (1%), ** (5%) and * (10%). Estimates shown above are marginal effects from logit estimation and evaluated at the mean value of the continuous variable (log of) age of the firm.

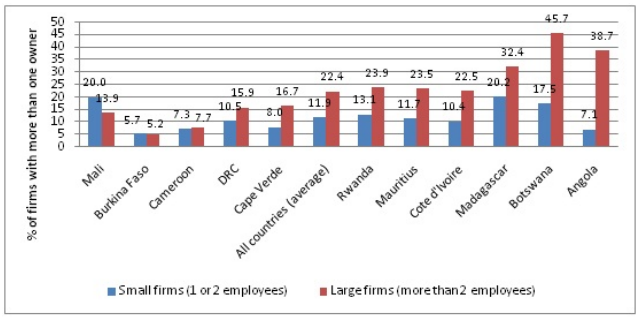

Figure 6: On average, large firms are more likely to have multiple owners than the small firms.

Large firms have more educated owners than the small firms

Somewhat surprisingly, only 8.7 percent of the firms in our sample have owners with no education at all. The overwhelming majority have some education including primary education (31.6 percent), secondary education (34.6 percent), vocational training (13.8 percent) and university degree (11.3 percent). There is not much by way of formal analysis on how the level of education affects the structure of informal businesses. One possibility is that the more educated may consider the informal sector as providing temporary employment until they find better jobs in the formal sector (necessity entrepreneurs). If this were true then we might expect informal businesses owned by the more educated to be smaller and perhaps less productive. However, another possibility is that entry into the informal sector is by choice and aimed at exploiting existing business opportunities (opportunity entrepreneurs). If this is true, we can expect the more educated owners to have larger businesses under the assumption that the more educated are more likely to be aware of business opportunities and more capable of exploiting them.

In our sample, firm-size and the level of education of the owner are positively correlated. However, this positive correlation is primarily due to differences in firm-size between owners with secondary, primary or no education vs. the rest of the owners who have vocational training or university degree (Figure 7). Table 7 provides regression results for how a change in firm-size is associated with the change in the level of education indicated by a dummy variable equal to 1 if the owner has vocational training or university degree and 0 if the owner has either no education or only primary or secondary education. These results show that the positive relationship between firm-size and education level is indeed economically large and statistically significant. For example, according to the most conservative estimate (columns 3, 6) obtained with all the firm-level controls included in the specification, a unit increase in the number of employees (without logs) at the firm is associated with an increase of 12.2 percentage points in the likelihood of firm having an owner with vocational training or university degree rather than having just primary, secondary or no education at all.

	-1	-2	-3	-4	-5	-6
Dependent variable:	Education level (No education (1), primary education (2), secondary education (3) and higher education (4))			Dummy variable indicating if owner has vocational training or university degree		
	OLS					
			Marginal effects (logit)			
Employment	0.096**	0.141**	0.081**	0.050**	0.061**	0.045*
	-0.029	-0.011	-0.029	-0.045	-0.035	-0.089
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm manufactures the product		-0.013	-0.103**		0.044	0.003
		-0.696	-0.036		-0.167	-0.929
Age of the firm (logs)		-0.153**	-0.133**		-0.055**	-0.052*
		-0.02	-0.046		-0.035	-0.06
Firm has female owner			0.003			-0.013
			-0.98			-0.846
Firm uses machinery			0.248***			0.101***
			-0.001			-0.001

Firm uses electricity			0.132			0.074**
			-0.162			-0.045
Observations	987	908	864	987	908	864
R-squared	0.281	0.297	0.312	0.162	0.173	0.186

Table 7: Larger firms have owners with higher education level. P-values in brackets. All regressions use Huber-White robust standard errors clustered on the country. Significance level is denoted by *** (1%), ** (5%) and * (10%). OLS estimation is used for columns (1)-(3) and logit estimation for columns (4)-(6).

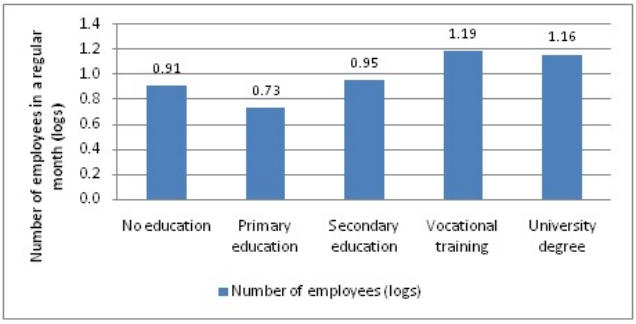

Figure 7: Firm-size is larger if the owner has higher education including university degree or vocational training.

Compared with large firms, small firms are more likely to have owners that were previously unemployed

About 24 percent of the firms in our sample have owners that were previously unemployed. Much like education, the owner's employment status can be an important predictor of the current state of the business. For example, if the owner was previously unemployed (that is, unemployed prior to joining/starting the current business), it could imply lower ability or human capital and it could also imply entry to the informal sector more by necessity than by choice. On both these counts we might hypothesize that the previously unemployed owners to have smaller businesses than those who were employed earlier.

To test for the stated hypothesis, we define a dummy variable equal to 1 if the largest owner was previously unemployed and 0 otherwise. Using this dummy variable and the logit specification, we find strong evidence of a negative relationship between being unemployment and Employment (columns 1-3, Table 8). For example, consider the specification in column 3 which includes all the firm-level controls listed above and gives us the most conservative results here. Estimation results for this specification show that a 1 standard increase in Employment is associated with a decrease in the probability of the firm having an owner who was previously unemployed by 5.4 percentage points, significant at less than the 1 percent level. This is an economically large effect given that only about 24 percent of the firms in the full sample have owners that were previously unemployed. Figure 8 provides a graphical illustration of the point.

Compared to small firms, large firms are more likely to use electricity, water, machinery and own vehicles

While it is difficult to imagine firms in the formal sector operating without such basic facilities as electricity and water.

	-1	-2	-3
Dependent variable:	Owner was unemployed before joining current business		
Employment	-0.090***	-0.083***	-0.074***
	0	-0.001	0
Country fixed effects	Yes	Yes	Yes
Firm manufactures the product		-0.03	0.001
		-0.485	-0.991
Age of the firm (logs)		0.019	0.027
		-0.476	-0.277
Firm has female owner			0.05
			-0.502
Firm uses machinery			-0.088***
			-0.009
Firm uses electricity			-0.05
			-0.218
Observations	992	913	869
Pseudo R-squared	0.051	0.05	0.067
Predicted value of the dependent variable	0.224	0.22	0.217

Table 8: Large firms are less likely to have owners who were previously unemployed (marginal effects form logit specification). P-values in brackets. All regressions use Huber-White robust standard errors clustered on the country. Significance level is denoted by *** (1%), ** (5%) and * (10%). Results shown are marginal effects obtained from a logit specification.

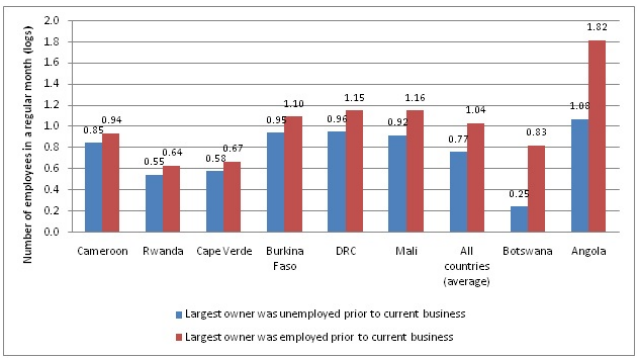

Figure 8: Previously unemployment owners have smaller business than the previously employed ones.

The situation is different in the informal sector. In our sample, about 67.5 percent of the firms use electricity, 32.5 percent use water for business activity, 46.9 percent use machinery and 21.1 percent use own vehicles (or other means of transport). It is plausible to expect that larger firms are more likely to use these inputs due to for example, scale economies in the use of the inputs, better access to the inputs and better access to resources to finance the purchase of the inputs.

Our data confirm that firm-size is positively and significantly correlated with the likelihood of a firm using electricity, water, machinery and vehicles (Table 9).[3] We note that this result holds even when we control for whether the firm manufactures the product itself or not. The magnitude of the relationship between firm-size and the likelihood of using the stated inputs is economically large. For example, a one standard deviation increase in Employment is associated with an increase of about 7.7 percentage points in the likelihood of a firm using electricity (column 1). This increase is statistically significant at less than the 1 percent level and it is economically large given that about 67.5 percent of the firms in the full sample use electricity. Figure 9 provides more details.

	-1	-2	-3	-4
Dependent variable:	Firm uses electricity	Firm uses water	Firm uses machinery	Firm uses vehicles
Employment	0.108***	0.108***	0.090***	0.125***
	-0.001	0	-0.001	0
Country fixed effects	Yes	Yes	Yes	Yes
Firm manufactures the product	-0.098*	0.179***	0.412***	-0.073***
	-0.068	0	0	-0.004
Age of the firm (logs)	-0.046**	-0.037*	-0.016	0.042*
	-0.011	-0.055	-0.413	-0.08
Firm has female owner	-0.01	0.184***	-0.019	-0.025
	-0.866	0	-0.649	-0.382
Firm uses machinery	0.328***	-0.068*		0.012
	0	-0.083		-0.589
Firm uses electricity		0.002		0.03
		-0.971		-0.379
Observations	1182	1177	1224	1175
Pseudo R-squared	0.247	0.101	0.151	0.151
Predicted value of the dependent variable	0.763	0.293	0.46	0.169

Table 9: Large firms are more likely to use electricity, water and vehicles (marginal effects from logit estimation). P-values in brackets. All regressions use Huber-White robust standard errors clustered on the country. Significance level is denoted by *** (1%), ** (5%) and * (10%). Results shown are marginal effects from logit estimation. The results shown hold qualitatively even without the various firm-level controls.

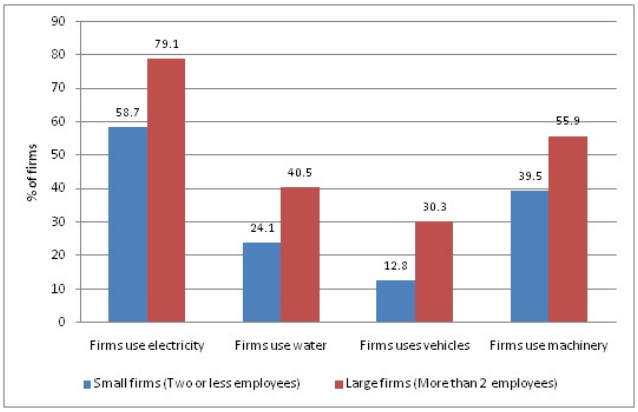

Figure 9: Large firms are more likely to use electricity, water, machinery and vehicles than small firms.

Compared with small firms, large firms are more likely to produce or sell under a contract but mainly so because of their age

A relatively small percentage of informal firms, 15.1 percent, produce or sell under a formal contract. Lack of formal contracts puts informal firms at a serious risk in case there is a dispute or disagreement regarding the delivery of good and services or the payment following the delivery. Yet, the small size of the informal firms may preclude working under formal contracts due to high fixed costs of writing a contract and approaching courts in case of a dispute. In our sample, we do find evidence that firm-size is strongly and positively correlated with the likelihood of a firm producing or selling under a contract (Table 10). However, this positive relationship between firm-size and the use of contracts appears to be largely due to the fact that large firms are older. That is, once we control for the age of the firm, the otherwise large and strong positive relationship between firm-size and likelihood of using contracts becomes much weaker and statistically insignificant (column 3, Table 10). Hence, we cannot be sure if it is larger size of the firm or higher age that leads to a higher probability of producing/selling under a contract.

	-1	-2	-3
Dependent variable:	Firm produces or sells under contract		
Employment	0.043***	0.328**	0.02
	-0.001	-0.04	-0.218
Country fixed effects	Yes	Yes	Yes
Firm manufactures the product		0.044	0.041

[3] Results shown in Table 9 include all the firm-level controls discussed above. This is so to conserve on space although the results do not change qualitatively even without the various firm-level controls shown. The positive relationship between firm-size and the likelihood of using machinery (column 3, Table 9) is weak and statistically insignificant at the 10 percent level if we control for the dummy variable indicating that the firm uses electricity.

		-0.417	-0.428
Age of the firm (logs)			0.035***
			0
Firm has female owner		-0.019	-0.013
		-0.253	-0.428
Firm uses machinery		-0.008	-0.01
		-0.813	-0.74
Firm uses electricity		0.02	0.026
		-0.459	-0.309
Observations	1332	1197	1173
Pseudo R-squared	0.088	0.103	0.116
Predicted value of dependent variable	0.122	0.115	0.11

Table 10: Producing and selling under contract and firm-size. P-values in brackets. All regressions use Huber-White robust standard errors clustered on the country. Significance level is denoted by *** (1%), ** (5%) and * (10%). Results shown are marginal effects from logit estimation.

Firm-size and manufacturing activity are positively correlated

It is commonly believed that relative to providing services including buying goods and simply reselling them, manufacturing activity often involves larger scale of operation. One reason for this could be high fixed costs associated with manufacturing activity. We find that is true even in the informal sector (Table 11). For example, on average, moving from a services firm to a manufacturing firm is associated with an increase in Employment between 0.22 to 0.28 log points (columns 1-3), significant at less than the 1 percent level. This is an economically large effect given that the mean value of Employment in our sample is 0.86. Figure 10 provides more details by country.

	-1	-2	-3
Dependent variable:	Employment (logs)		
Firm manufactures the product	0.282***	0.242***	0.217***
	0	0	0
Country fixed effects	Yes	Yes	Yes
Firm has female owner		-0.107**	-0.111**
		-0.032	-0.024
Age of the firm (logs)		0.161***	0.171***
		-0.002	-0.001
Firm uses machinery			0.041
			-0.477
Firm uses electricity			0.190***
			-0.01
Observations	1,258	1,229	1,182
R-squared	0.274	0.312	0.324

Table 11: Manufacturing firms are larger in size (OLS). P-values in brackets. All regressions use Huber-White robust standard errors clustered on the country. Significance level is denoted by ***(15), **(5%) and *(10%).

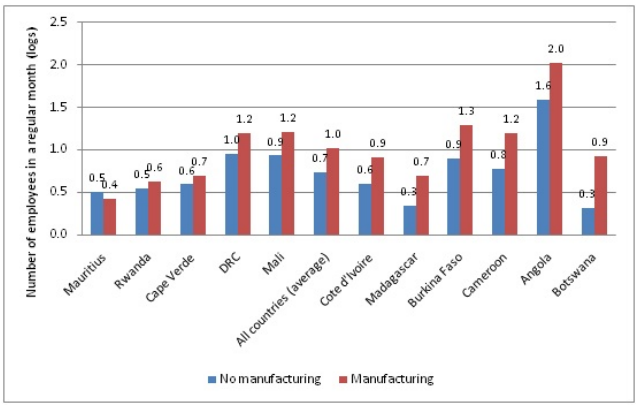

Figure 10: Manufacturing firms are larger in size than the non-manufacturing firms. Note: Manufacturing firm is defined as the ones which manufactures the main product itself. All other firms are classified as no manufacturing in the graph.

The quality of power supply shows mixed results for small vs. large firms

For the sample of firms that reported using electricity, the survey asked about the power supply situation during the previous month. Specifically, the survey asked if the firm faced any power outages; and firms that did face power outages were asked the number of incidents of power outages and the average duration of power outages as shown in the Figure 11. Using these variables on power outages (incidence, extent and duration), the data show mixed results for small vs. large firms. First, about 68.9 percent of the firms who use electricity report experiencing one or more power outage (during the previous month). Somewhat surprisingly, the percentage of firms that experienced power outages rises with firm-size (Table 12, column 1). For example, a one standard deviation increase in Employment is associated with an increase of 4.1 percentage points in the probability of a firm experiencing one or more power outage in the previous month against the sample average of 68 percent. The increase is statistically significant (at the 5 percent level). Second, for firms that did experience power outages, the average duration of power outages does not show any significant correlation with firm-size (column 2, Table 12). The same result holds if we consider all firms using electricity and assign a value of zero for the duration of power outages for firms that did not experience any power outage. Third, for firms that experienced one or more power outage, the number of incidents of power outage in the previous month is significantly lower for the relatively larger firms (column 3, Table 12). For example, a one standard deviation increase in Employment is associated with a decrease of 0.5 incidents of power outages, significant at less than the 10 percent level. This decrease of 0.5 incidents of power outages is not too large given that on average

firms experienced 10.7 incidents of power outages in the previous month. Further, if we consider the full sample of firms that use electricity and assign a value of zero to the number of power outages for firms with no power outages, the relationship between firm-size and the number of incidents of power outages becomes insignificant and disappears completely (column 4, Table 12).

	-1	-2	-3	-4
Dependent variable:	Firm experienced one or more power outage (marginal effects from logit estimation)	Duration (hours) of a typical power outage for firms that faced at least one power outage in the previous month (OLS)	Number of power outages in the previous month for firms that experienced at least one power outage (OLS)	Number of power outages in the previous month for all firms that use electricity and they experienced any power outage or not (OLS)
Employment	0.059**	-1.055	-0.706*	0.021
	-0.038	-0.353	-0.055	-0.943
Country fixed effects	Yes	Yes	Yes	Yes
Firm manufactures the product	-0.076***	-0.262	2.105	0.745
	-0.01	-0.732	-0.335	-0.577
Age of the firm (logs)	-0.039	2.488*	0.175	0.011
	-0.336	-0.055	-0.83	-0.989
Firm has female owner	-0.055*	-1.046	1.572**	0.385
	-0.08	-0.338	-0.047	-0.332
Firm uses machinery	0.041	0.45	-0.304	0.072
	-0.245	-0.473	-0.856	-0.958
Observations	803	523	502	757
Pseudo R-squared, R-squared	0.145	0.114	0.318	0.319

Table 12: Quality of power supply and firm-size. P-values in brackets. All regressions use Huber-White robust standard errors clustered on the country. Significance level is denoted by *** (1%), ** (5%) and * (10%). Results in column (1) are marginal effects obtained from logit estimation. Results shown do not change much qualitatively even if the various firm-level controls shown are not included.

Much like power supply, the quality of water supply shows mixed results for small vs. large firms

About 32.5 percent of the firms in our sample use water for business activity (i.e., for reasons other than hygiene and consumption). Firms that report using water and do so from public sources (or public and private sources) were further asked in the survey if they experienced any water shortage during the last month and if yes, then the number of incidents of water shortage and average duration (hours) of the water shortage incidents. We find some mixed results here. First, as reported above, the percentage of firms that use water increases sharply with firm-size (column 1, Table 13). Second, conditional on using water, large firms are more likely to have experienced one or more incident of water shortage in the previous month but this positive association is not robust to basic controls such as the age of the firm and manufacturing vs. services activity (column 2, Table 13). Third, for firms that use water and faced one or more incident of water shortage during the last month, firm-size shows no significant correlation with either the number of incidents of water shortage or the average duration of water shortage (columns 3 and 4, Table 13).

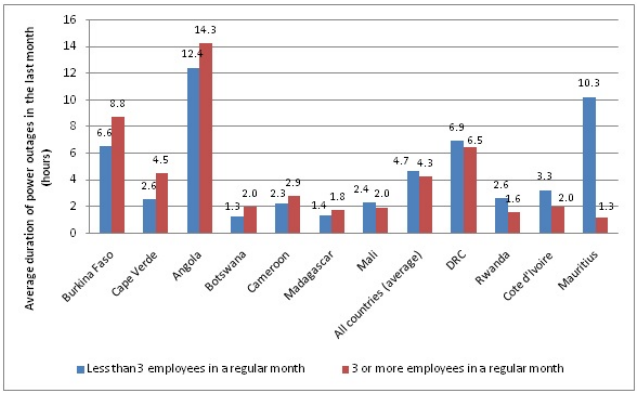

Figure 11: Average duration of power outages does not vary much by firm-size. Note: The sample used in the figure includes only those firms that experienced at least one incident of power outage during the last month prior to the survey. However, the insignificant difference in the duration of power outages shown between small and large firms holds even if we include firms that did not experience any power outage and assign a value of zero to these firms for the duration of power outage. This is discussed above in the main text.

	-1	-2	-3	-4
Dependent variable:	Firm uses water for business activity (other than hygiene and consumption); marginal effects from logit estimation	For firms using water from public sources, firm experienced one or more incident of water shortage in the last month (marginal effects from logit estimation)	Average duration (hours) of water shortage incident during the last month (for firms that use water from public sources and experienced one or more incident of water shortage in the last month; OLS)	Number of incidents of water shortage during the last month (for firms that use water from public sources and experienced one or more incident of water shortage in the last month; OLS)
Employment	0.108***	0.033	-1.758	0.084
	0	-0.247	-0.712	-0.974

Country fixed effects	Yes	Yes	Yes	Yes
Firm manufactures the product	0.179***	0.003	-10.844	-2.725
	0	-0.887	-0.206	-0.114
Age of the firm (logs)	-0.037*	0.026	-1.46	-1.012
	-0.055	-0.314	-0.802	-0.432
Firm has female owner	0.184***	0.03	-1.674	-1.316
	0	-0.252	-0.749	-0.578
Firm uses machinery	-0.068*	0.027	10.954**	2.629
	-0.083	-0.473	-0.031	-0.207
Firm uses electricity	0.002	0.014	-30.202	0.934
	-0.971	-0.754	-0.116	-0.471
Observations	1177	289	53	56
Pseudo R-squared, R-squared	0.101	0.159	0.222	0.459
Predicted value of dependent variable	0.293	0.132		

Table 13: Water shortage and firm-size. P-values in brackets. All regressions use Huber-White robust standard errors clustered on the country. Significance level is denoted by *** (1%), ** (5%) and * (10%). Results in columns (1) and (2) are marginal effects obtained from logit estimation. Results in columns (3) and (4) are based on OLS estimation method.

Large firms are more likely to have a bank account to run the business and also more like to maintain separate bank accounts for business and household purposes than the small firms

As discussed in the introduction, there is substantial evidence now that in the formal sector, large firms have better access to finance and more likely to use banking facilities than the small firms. We find similar results for the informal firms in our sample which can be shown in the Figure 12. For example, about 38.3 percent of the firms in our sample have a bank account to run the business and among firms that have a bank account, close to 58.6 percent have separate bank accounts for business and household purposes. However, both these percentage figures are much higher for large compared with small firms (Table 14). For example, a one standard deviation increase in the value of Employment is associated with an increase of 10.8 to 12.1 percentage points (depending on the controls included in the specification) in the likelihood of a firm having a bank account to run the business and this increase is significant at less than the 1 percent level (columns 1-3, Table 14). Similarly, for firms that do have a bank account, the probability of having separate accounts for business purposes from household purposes increases by 13.2 to 15.8 percentage points from a one standard deviation increase in the value of Employment, significant at less than the 1 percent level (columns 4-6, Table 14).

As expected, large firms are more likely to apply for a loan and more likely to have a loan for business purposes

About 13.4 percent of the firms in our sample applied for a loan during the last year in the full sample and about 7.6 percent currently have a loan for business purpose.

	-1	-2	-3	-4	-5	-6
Dependent variable:	Firm uses a bank account for running the business (marginal effects from logit estimation)			Firm maintains a bank account for business separate from household purposes (marginal effects from logit estimation)		
Employment	0.157***	0.169***	0.151***	0.172***	0.203***	0.205***
	0	0	0	0	0	0
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm manufactures the product		-0.076	-0.092*		-0.011	0.022
		-0.107	-0.069		-0.814	-0.722
Age of the firm (logs)		-0.015	-0.007		-0.054	-0.047
		-0.498	-0.795		-0.363	-0.478
Firm has female owner			0.012			0.078
			-0.778			-0.367
Firm uses machinery			0.052			-0.068
			-0.322			-0.25
Firm uses electricity			0.083**			0.098
			-0.013			-0.32
Observations	1328	1217	1166	487	446	438
Pseudo R-squared	0.116	0.126	0.13	0.104	0.116	0.122
Predicted value of dependent variable	0.345	0.342	0.348	0.585	0.59	0.588

Table 14: Larger firms are more likely to have bank accounts for business purpose and separate from household needs (marginal effects from logit estimation). P-values in brackets. All regressions use Huber-White robust standard errors clustered on the country. Significance level is denoted by *** (1%), ** (5%) and * (10%). Results shown are marginal effects from logit estimation.

Under the assumption that larger firms have better access to finance than the small firms, we expect both these percentage numbers to be higher for large firms than the small firms. The data do not reject this expectation (Table 15). Consider for example, the percentage of firms that applied for a loan during the last year. According to the most conservative estimate provided in column 1 of Table 15, a one

standard deviation increase in Employment is associated with an increase in the probability of a firm applying for a loan by as much as 6.5 percentage points, significant at less than the 1 percent level. This is a large increase given that in the full sample only 13.4 percent of the firms applied for a loan.

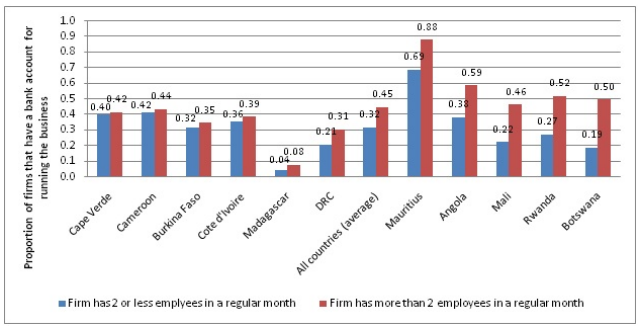

Figure 12: Large firms are more likely to have bank accounts for running the business than small firms.

For firms with outstanding business loans, a qualitatively similar result holds with the corresponding increase equaling 2.1 percentage points (based on estimates in column 4, Table 15) and significant at less than the 1 percent level. The increase is large given that on average only 7.6 percent of the firms in the full sample have a loan. Figure 13 illustrates the point graphically.

	-1	-2	-3	-4	-5	-6
Dependent variable:	Firm applied for a business loan during the last year			Currently, firm or owners have a business loan		
Employment	0.090***	0.094***	0.091***	0.030***	0.032***	0.032***
	0	0	0	0	0	0
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm manufactures the product		0.001	0.001		-0.006	-0.007
		-0.957	-0.965		-0.69	-0.668
Age of the firm (logs)		-0.002	0.0003		0.007	0.01
		-0.871	-0.983		-0.374	-0.242
Firm has female owner			0.032*			0.033**
			-0.074			-0.011
Firm uses machinery			0.01			0.008
			-0.646			-0.416
Firm uses electricity			0.006			-0.0002
			-0.851			-0.989
Observations	1330	1217	1167	1335	1221	1171
Pseudo R-squared	0.066	0.061	0.063	0.057	0.061	0.071
Predicted value of dependent variable	0.111	0.119	0.121	0.058	0.061	0.061

Table 15: Larger firms are more likely to apply for and have outstanding business loans. P-values in brackets. All regressions use Huber-White robust standard errors clustered on the country. Significance level is denoted by *** (1%), ** (5%) and * (10%). Results shown are marginal effects from logit estimation.

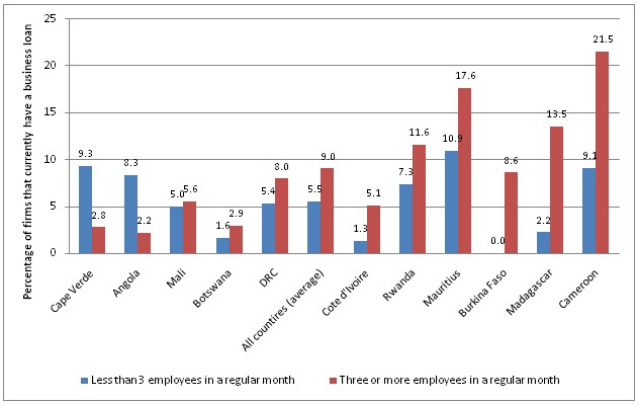

Figure 13: In most countries, large firms are more likely to have outstanding business loans than the small firms.

Large firms are more likely to use banks and microfinance institutions than small firms to finance their day-to-day operations

Focusing on financing of day-to-day operations of the firm, it is well known that informal firms rely heavily on own funds. This is true in our sample too with 91 percent of the firms reporting use of own funds to finance day-to-day operations can be shown in the Figure 14. Nevertheless, use of other sources of finance is not entirely absent. That is, 20.6 percent of firms report using credit or advances from suppliers and customers, 21.6 percent borrowed money from friends and relatives, 6.7 percent used moneylenders, 3.7 percent used banks and 4.5 percent used microfinance institutions. Table 16 provides estimation results on how the likelihood of a firm using these sources of funds varies with firm-size.[4] Somewhat surprisingly, we find no significant difference in the proportion of firms that use own funds between small and large firms (column 1). Similarly, firm-size is

[4] To conserve on space, Table 16 shows results with all the firm-level controls discussed above included in the specification. However, results are qualitatively similar even without these controls. Similarly, to conserve on space, Table 16 shows results for banks and microfinance grouped together (column 2); results for all sources other than own funds, banks and microfinance institutions are also grouped together (column 3). Results shown for these groups hold qualitatively for the various items within the groups.

uncorrelated with the likelihood of a firm using other sources of finance except for banks and microfinance institutions (column 3). For banks and microfinance institutions considered separately or jointly, large firms show a higher probability of using these than the small firms. For example, with all the firm-level controls discussed above in place, a one standard deviation increase in Employment is associated with an increase of 3.1 percentage points in the likelihood of a firm using either banks or microfinance institutions (or both) to finance its day-to-day operations (column 2). The increase is significant at less than the 1 percent level and also economically large given that only 6.7 percent of the firms in the full sample use either banks or microfinance institutions or both.

	-1	-2	-3
Dependent variable:	Firm uses own funds to finance day-to-day operations	Firm uses banks or microfinance institutions to finance day-to-day operations	Firm uses sources other than own funds, banks and microfinance institutions to finance day-to-day operations
Employment	0.007	0.044***	-0.002
	-0.518	0	-0.957
Country fixed effects	Yes	Yes	Yes
Firm manufactures the product	0.008	-0.026***	0.090***
	-0.583	-0.002	-0.005
Age of the firm (logs)	-0.002	-0.001	0.002
	-0.857	-0.706	-0.94
Firm has female owner	0.007	0.006	0.052*
	-0.678	-0.583	-0.077
Firm uses machinery	-0.02	-0.0003	-0.002
	-0.189	-0.981	-0.971
Firm uses electricity	0.015	0.025	0.014
	-0.274	-0.128	-0.718
Observations	1165	1132	1111
Pseudo R-squared	0.07	0.081	0.058
Predicted value of dependent variable	0.931	0.051	0.377

Table 16: Source of funds for day-to-day operations of the firms. P-values in brackets. All regressions use Huber-White robust standard errors clustered on the country. Significance level is denoted by *** (1%), ** (5%) and * (10%). Results shown are marginal effects from logit estimation. Results are shown with all the firm-level controls to conserve on space but they are qualitatively similar even without the various firm-level controls included in the specification.

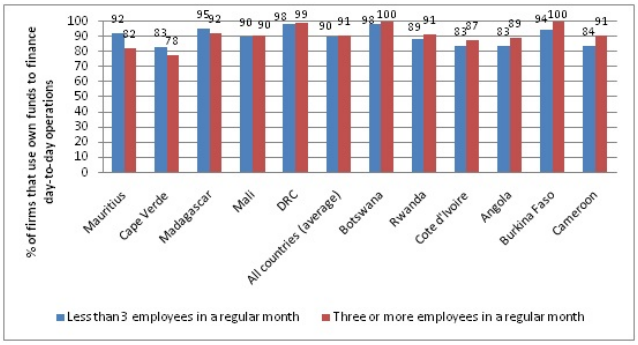

Figure 14: Large and small firms are equally likely to use own funds to finance their day-to-day operations.

Percentage of firms reporting own funds as the single most used source of finance for day-to-day operations does not vary much with firm-size

Going beyond the use of own funds and other sources of finance listed above, the Enterprise Survey asked firms for their most used source of fiancé for the day-to-day operations. Choices include own funds, credit from suppliers or advances from customers, moneylenders, microfinance institutions, banks, friends and relatives and the residual category of all other sources. No surprisingly, 81 percent of the firms chose own funds as the most used source of finance followed by credit from suppliers or advances from customers (6.7 percent) and friends and relatives (5.7 percent). As expected, banks were the most used source for a mere 2.6 percent of the firms. With the exception of banks, none of the other sources of funds show any significant correlation with firm-size (Table 17). For banks, there is a large positive correlation with firm-size (column 3, Table 17). However, this result should be treated with due caution due to limited variation in the data on the use of bank finance – for overwhelming majority (and all firms in some countries), banks are not the most used source of finance.

	-1	-2	-3	-4
Dependent variable:	Own funds	Credit/advances from suppliers/ customers	Banks	Other remaining sources
Employment	-0.041	-0.001	0.015***	0.008
	-0.159	-0.753	0	-0.683
Country fixed effects	Yes	Yes	Yes	Yes
Firm manufactures the product	-0.002	0.013***	-0.008***	-0.01
	-0.903	0	0	-0.588
Age of the firm (logs)	0.020*	0.003	0.0003	-0.025***
	-0.087	-0.254	-0.883	0
Firm has female owner	-0.002	-0.014***	0.004	0.032**
	-0.957	0	-0.22	-0.024

Firm uses machinery	-0.03	0.005	0.008	0.009
	-0.429	-0.533	-0.853	-0.564
Firm uses electricity	-0.01	0	0.007	-0.01
	-0.679	-0.999	-0.118	-0.641
Observations	1120	1120	914	1120
Pseudo R-squared	0.071	0.098	0.303	0.099
Predicted value of dependent variable	0.823	0.021	0.303	0.076

Table 17: Most used source of fund and firm-size. P-values in brackets. The dependent variables in columns (10-(4) are dummy variables indicating the most used source of finance for firm's day-to-day-operations. Sample size for banks (column 3) is small because in some countries not a single firm uses bank finance and these countries drop out in the estimation due to the country fixed effects. All regressions use Huber-White robust standard errors clustered on the country. Significance level is denoted by *** (1%), ** (5%) and * (10%). Results shown are marginal effects from logit estimation. The results shown do not change much qualitatively even if the various firm-level controls are excluded from the specification. The only exception is own funds in column (1) where the estimated coefficient value of Employment is negative and significant at less than the 5 percent level without the firm-level controls shown.

A majority of firms did not apply for a loan in the last year and the various reasons for not applying are equally commonly between small and large firms

About 86.6 percent of the firms in our sample did not apply for a loan during the last year. For these firms, the survey asked the main reason for not applying. The list of reasons includes no need for a loan (38 percent of the firms), complex application procedures (21.2 percent), high interest rates (10.9 percent), lack of required guarantees (16.4 percent), firm thought that it would not get the loan because it is not registered (7 percent) and the residual category of all other reasons (6.5 percent). We find no evidence that the percentage of firms reporting any of these reasons varies between small and large firms in a significant way (Table 18). For example, consider no need for a loan as the main reason.

	-1	-2	-3	-4	-5
Dependent variable:	No need for a loan	Complex application procedures	High interest rates	Lack of required guarantees	All other reasons
Employment	-0.013	0.011	0.022*	-0.039	0.016
	-0.671	-0.662	-0.094	-0.168	-0.388
Country fixed effects	Yes	Yes	Yes	Yes	Yes
Firm manufactures the product	-0.026	0.019	-0.018	0.025	-0.003
	-0.476	-0.452	-0.494	-0.139	-0.872
Age of the firm (logs)	0.01	0.01	0.006	-0.017**	-0.008
	-0.733	-0.635	-0.386	-0.011	-0.51
Firm has female owner	0.066**	0.004	-0.025	-0.015	-0.015
	-0.027	-0.904	-0.154	-0.388	-0.565
Firm uses machinery	-0.024	0.002	0.022	-0.001	-0.01
	-0.369	-0.946	-0.261	-0.954	-0.733
Firm uses electricity	0.05	-0.027	-0.035	0.008	0.013
	-0.303	-0.42	-0.367	-0.677	-0.574
Observations	1020	1020	1020	1020	1020
Pseudo R-squared	0.105	0.049	0.095	0.113	0.049
Predicted value of dependent variable	0.37	0.194	0.091	0.127	0.116

Table 18: Main reason for not applying for a loan during the last year. P-values in brackets. All regressions use Huber-White robust standard errors clustered on the country. Significance level is denoted by *** (1%), ** (5%) and * (10%). Results shown are marginal effects from logit estimation. The qualitative nature of the results remains even if the various firm-level controls shown are not included in the specification. The dependent variables are dummy variables equal to 1 if the main reason for not applying for a loan during the last year is as stated in column headings and 0 otherwise. The sample is restricted to only those firms that did not apply for a loan during the last year.

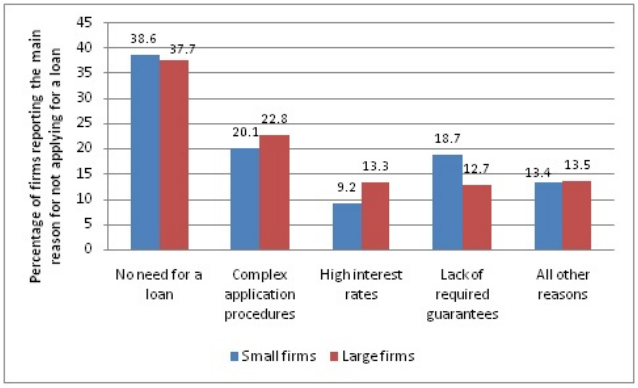

Figure 15: Main reason for not applying for a loan does not show much difference by firm-size. Note: Small firms are those firms that have 3 or fewer employees in a regular month and the rest are large firms. The sample used in the figure is restricted to only those firms that applied for a loan during the last year ad for which information on the number of employees is available (1,214 firms out of a total of 1,487 firms surveyed).The graph shows average values for the sample as stated.

Results in column 1 of Table 18 show that the percentage of firms reporting no need for a loan increases by a mere 0.9 percentage points (against the sample mean value of 38 percent as mentioned above) and this increase is statistically insignificant at the 10 percent level or less. Figure 15 provides more details.

	-1	-2	-3	-4	-5	-6

Dependent variable:	Firm has female workers (marginal effects, logit)			% of workers that are female (OLS; for the sample of firms that have at least one female worker)		
Employment	0.067***	0.097***	0.170***	-27.29***	-28.590***	-25.312***
	-0.04	-0.003	0	0	0	0
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm manufactures the product		-0.092**	-0.126**		7.747***	5.903**
		-0.027	-0.035		-0.005	-0.019
Age of the firm (logs)		-0.061***	-0.050*		1.345	1.221
		-0.002	-0.059		-0.214	-0.332
Firm has female owner			0.570***			12.589***
			0			-0.007
Firm uses machinery			0.062**			2.91
			-0.03			-0.385
Firm uses electricity			0.024			-2.902
			-0.575			-0.305
Observations	1292	1180	1129	699	651	631
Pseudo R-squared, R-squared	0.046	0.055	0.281	0.38	0.387	0.427
Predicted value of dependent variable	0.545	0.557	0.622			

Table 19: P-values in brackets. All regressions use Huber-White robust standard errors clustered on the country. Significance level is denoted by *** (1%), ** (5%) and * (10%). Results in columns (1)-(3) are marginal effects from logit regressions. Results in columns (4)-(6) are from OLS estimation method are for the sample of firms that have one or more female workers.

Large firms are more likely to have female workers in the workforce than the small firms; however, conditional on having female workers, large firms have proportionately fewer females in their workforce

The data on female workers are for the last month prior to the survey. About 54 percent of the firms in our sample have one or more female worker. On average across all firms, 40.5 percent of the employees are females. There is no strong reason to believe that firm-size and female employment should or should not be systematically correlated. Our results show two different results in this context. First, the likelihood of a firm having a female worker increases sharply with firm-size (Table 19, columns 1-3). For example, a one standard deviation increase in Employment is associated, on the conservative side, with an increase of 4.8 percentage points in the likelihood of a firm having a female worker, significant at less than the 1 percent level (column 1). However, restricting the sample to firms that have one or more female workers, the percentage of females in the workforce decreases sharply with firm-size (columns 4-6). For example, on the conservative side, a one standard deviation increase in Employment is associated with a decrease in the percentage of female employees by 18.4 percentage points, significant at less than the 1 percent level (column 6). This is an economically large increase given that the percentage of female workers in the sample equals 74.2 percent. Figure 16 provides more details.

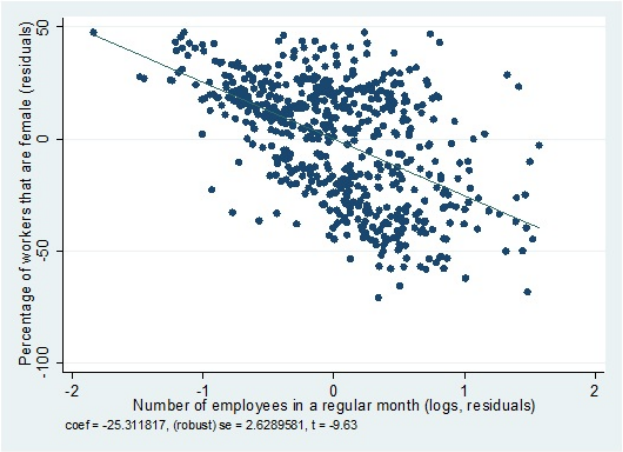

Figure 16: Conditional on having female workers in the workforce, the percentage of female workers decreases with firm-size .Note: The figure is a partial scatter plot obtained after controlling for country fixed effects, (log of) age of the firm, dummy variables for manufacturing activity, present of female owners, use of machinery and use of electricity. The sample used in the graph is restricted to those firms that had at least one female worker in the last month prior to the survey.

Preference for registering is higher among the relatively larger firms

In one of the survey questions, firms were asked if they would like to be registered. Close to 59 percent of the firms reported that they would like to get registered. However, the desire to register was much more common among large firms than the small firms. Figure 17 illustrates the point graphically and Table 20 provides the estimation results. According to the most conservative estimate provided in column 3 with all the firm-level controls in place, a one standard deviation increase in Employment is associated with an increase of 9.1 percentage points in the likelihood of a firm wanting to be registered (against the mean level of 59 percent, significant at less than the 1 percent level.

	-1	-2	-3
Dependent variable:	Firm would like to be registered		
Employment	0.142***	0.150***	0.124***
	0	-0.001	-0.008
Country fixed effects	Yes	Yes	Yes

Firm manufactures the product		-0.059	-0.035
		-0.229	-0.4
Age of the firm (logs)		0.03	0.034
		-0.268	-0.162
Firm has female owner			-0.034
			-0.437
Firm uses machinery			-0.03
			-0.435
Firm uses electricity			0.172***
			0
Observations	961	885	842
Pseudo R-squared	0.116	0.123	0.137
Predicted value of dependent variable	0.598	0.602	0.6

Table 20: P-values in brackets. All regressions use Huber-White robust standard errors clustered on the country. Significance level is denoted by *** (1%), ** (5%) and * (10%). Results shown are marginal effects from logit estimation.

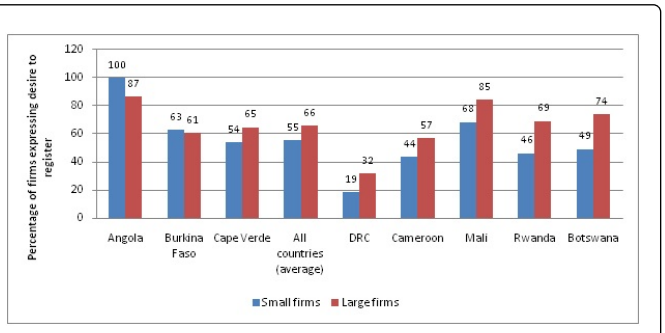

Figure 17: Large firms are more likely to express the desire to register than the small firms. Note: Small firms are those firms that have 3 or fewer employees in a regular month and the rest are large firms.

The survey also asked firms if registering would benefit them through better access to finance, better access to raw materials, infrastructure and government services and through less bribes to pay. We find no evidence that the likelihood of a firm reporting any of these benefits differs significantly by firm-size. Similarly, firm's perception of the maximum and minimum time it takes to register a business is roughly same for firms of different sizes.

Compared with small firms, large firms are more likely to spend on security and spend higher amounts on security as a proportion of their sales

In our sample, there is no difference by firm-size in the percentage of firms that experienced losses due to crime during the last month. Also, losses due to crime in the last month as percentage of last month's sales is also same for large and small firms and this holds whether we condition the sample on firms having some positive loss or not. However, we do find differences between small and large firms in security expenses. That is, the percentage of firms that spent a positive amount on security last month equals 24.6 percent in the full sample. However, the percentage figure is much higher among large firms than the small firms. For example, for the sample of firms for which information is available on security expenses and employment level, 25.3 percent of the firms spent a positive amount on security during the last month. The amount spent on security (as percentage of firm's sales last month) averaged 0.9 percent (value of zero assigned to firms that did not spend on security). Both these percentage figures vary sharply between small and large firms. For firms with 3 or fewer employees, 20.9 percent of the firms spent on security and the expenses involved equaled 0.64 percent on average. The corresponding figures for firms with more than 3 employees are much higher at 30.6 percent and 1.2 percent, respectively. Figure 18 illustrates the point graphically.

Table 21 provides the formal regression results for expenses on security and the likelihood of a firm spending on security using the continuous measure of firm-size, Employment. These results confirm a large and statistically significant positive relationship between firm-size and the likelihood of a firm spending on security. The same holds for expenses on security, although the positive relationship here is statistically weak with all the controls discussed above in place (significance level is close to 10 percent level, column 6 of Table 21). That is, with the country fixed effects and no firm-level controls included in the specification, a one standard deviation increase in Employment is associated with an increase of 0.29 percentage point in security costs (against the sample mean of 0.9 percent), significant at less than the 1 percent level (column 4). However, with all the firm-level controls mentioned above also added to the specification, the corresponding increase in security costs equals 0.18 percentage points (compared with 0.29 above). While this increase of 0.18 percentage points is still economically large given that the sample mean for security expenses equals 0.9 percent, it is somewhat weak statistically – significant between 10 and 11 percent (p-value of 0.105 as shown in column 6).

	-1	-2	-3	-4	-5	-6
Dependent variable:	Firm spent on security during the last month (marginal effects from logit estimation)			Expenses on security as % of firm's monthly sales (OLS)		
Employment	0.109***	0.113***	0.090***	0.417***	0.321**	0.251
	0	0	-0.002	-0.002	-0.043	-0.105
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm manufactures the product		-0.084**	-0.098**		-0.232	-0.319
		-0.043	-0.036		-0.272	-0.204
Age of the firm (logs)			0.027*		-0.119	-0.087
			-0.064		-0.374	-0.518
Firm has female owner			0.018			0.322**
			-0.484			-0.048

Firm uses machinery			0.04			0.357
			-0.121			-0.244
Firm uses electricity			0.094***			0.146
			0			-0.557
Observations	1320	1207	1157	1,124	1,033	990
Pseudo R-squared, R-squared	0.268	0.279	0.322	0.088	0.102	0.123
Predicted value of dependent variable	0.165	0.158	0.155			

Table 21: P-values in brackets. All regressions use Huber-White robust standard errors clustered on the country. Significance level is denoted by *** (1%), ** (5%) and * (10%). Results in columns (1)-(3) are marginal effects obtained from a logit specification while the results in (4)-(6) are obtained from OLS estimation method.

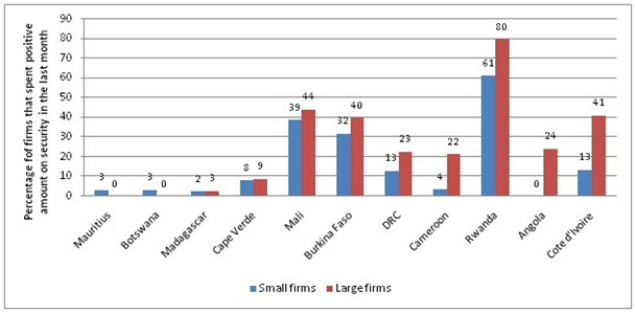

Figure 18: Large firms are more likely to spend on security than the small firms Note: Small firms are those firms that have 3 or fewer employees in a regular month and the rest are large firms.

Conclusion

The results presented above show significant differences by firm-size in various firm characteristics among the informal firms. These results are important not just for academic interest but also for proper targeting of policies aimed at improving the contribution of the informal sector to the overall development of the economies. The results above constitute a preliminary analysis or check on how firm-size correlates or does not correlates with issues related to firm-performance, business climate faced by the firms, inclination to register, etc., in the informal sector. While a more rigorous analysis is required to fully ascertain (or reject) the results mentioned above, we hope that the above findings serve to provide a useful starting point and to whet one's appetite to better understand the importance and relevance of firm-size for the informal sector.

References

1. Cohen WM, Klepper S (1996) "A Reprise of Size and R&D," Econ J 106: 925-951.
2. Acs ZJ, Audretsch DB (1991) "Innovation and Technological Change: An Overview," In Acs, Z. J., and D.B. Audretsch (edited) Innovation and Technological Change: An International Comparison, NY: Harvester Wheatsheaf.
3. Plehn-Dujowich JM (2006)"Innovation, Firm Size, and Adverse Selection," Unpublished Working Paper.
4. Bigsten AP, Collier S, Dercon M, Fafchamps B, Gauthier JW (1997) "Exports of African Manufactures: Macro Policy and Firm Behaviour," Mimeograph. Centre for the Study of African Economies, University of Oxford, UK.
5. Neil R., Soderbom M, Teal F (2006) "Exporting from Manufacturing Firms in Sub-Saharan Africa," Journal of African Economies 15: 671-687.
6. Aiteken B, Gordon H, Harrison A (1997) "Spillovers, Foreign Investment, and Export Behaviour," J of Int Econ 43: 103-132.
7. Roberts MJ, Tybout JR (1997) "The Decision To Export In Colombia: An Empirical Model of Entry with Sunk Costs," American Economic Review 87: 545-564.
8. Beck T, Demirguc-Kunt A, Makimovic V (2005) "Financial and Legal Constraints to Growth: Does Firm Size Matter?" J of Financ 60: 137-177.
9. Beck TA, Demirguc-Kunt, Makimovic V (2004) "Financing Patterns around the World: Are Small Firms Different?" Mimeograph, World Bank, revised August.
10. Schiffer, Mirjam, Weder B (2001) "Firm Size and the Business Environment: Worldwide Survey Results,"Discussion Paper 43, International Finance Corporation (IFC), USA.
11. La Porta, Rafael, Shleifer A (2008) "The Unofficial Economy and Economic Development," NBER Working Paper 14520, NBER, Cambridge, USA.