Technology Use and Firms with Female Principal Owners in Kenya

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Abstract: Firm-level data from Kenya indicates that establishments rely on technologies such as computers, generators and cell-phones to conduct operations when regulations and security pose significant hurdles in the business environment. While all firms rely on technology in the face of obstacles, those with female owners experience net effects that are statistically distinct from those experienced by male counterparts. A gender-of-owner disaggregated Oaxaca-Blinder type decomposition of differences in technology use indicates that up to 18 percent of the total gap is unexplained by differences in measurable characteristics, suggesting that female-owned firms use technology to a greater extent than is warranted by the level of observed covariates.

Keywords: Technology, Kenya, Firms, Female Owners, Business Obstacles

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I. Introduction

It is well-recognized that firms in Africa face large operation costs due to regulatory obstacles to business operations and inadequate infrastructure capabilities. These capabilities include direct measures such as access to telephone land-lines, electricity and water connections, as well as indirect measures such as lack of secure, uncorrupt environments within which to engage in every-day activities. When hurdles of this nature exist, firms may rely on technology to overcome many of the difficulties faced. For example, if there are significant delays in obtaining mainline telephone connections, firms may opt to rely on technologies such as cell-phones and computers to conduct business and use email and the internet for communication and advertisement purposes. When the supply of electricity is unreliable, firms may invest in generators. Furthermore, if crime is rampant, firms may pay for security and security equipment to protect their businesses. These examples indicate that the use of technologies such as cell-phones, computers and generators may be endogenous to regulatory obstacles, poor infrastructure, and insecure business environments.

In dealing with the constraints presented by excessive regulation and lack of infrastructure, it may be argued that firms owned by women are at an even greater disadvantage. This is because women-owned businesses tend to be more credit-constrained that those run by men. Moreover, unlike firms operated by men, women-owned businesses are often isolated from formal and informal networks that provide information and

support. Women-run businesses also tend to be small-scale. For these reasons, giving gifts or making informal payments to expedite licenses for telephone land-lines or electricity connections pose a greater hardship for them. Since women-owned firms face higher implicit and explicit costs of operation, intuitively, one would expect different patterns in their reliance on technology as compared to businesses owned by men.

Kenya constitutes an interesting environment to study the dependence on technology. Like other African countries, Kenyan infrastructure is poorly developed and firms face a plethora of regulatory impediments related to business and licensing permits, access to land, telecommunications, zoning restrictions and regulations on pricing and hours of operation. However, unlike other African countries, a sizeable proportion of firms list one or more women as principle owners. Furthermore, as is well known, cell-phone usage is widespread in the country (Aker and Mbiti 2010). Using the World Bank's Enterprise Survey data on Kenyan manufacturing firms, retail firms, Information and Technology (IT) firms and micro-enterprises, this study analyzes whether businesses in general, particularly those that list a woman as one of the principle owners, rely on technologies such as cell-phones, computers and generators to circumvent problems arising from inadequately developed infrastructure and excessively stringent operating laws. In particular, the key research question is whether Kenyan firms adopt technologies such as cell-phones, computers and generators when obstacles to business are binding, and whether

firms with female owners, given their relative disadvantages in the labor market, are even more likely to rely on such technologies to overcome hurdles.[1]

Conditioning on covariates that include regional indicators, firm and industry characteristics such as age of the enterprise, number of permanent and temporary workers and value of property and machinery, as well as characteristics of the top manager including educational level and experience, the results of this research demonstrate that firms in Kenya are significantly more likely to use technologies noted above. In particular, the probability of technology use is 0.07 higher for all firms in the full sample and 0.01 higher for firms in industries with low barriers to entry for women if regulations pose a moderate, major or very severe constraint. Although all firms rely on technology when obstacles to business operations are present, we find that Kenyan firms with female ownership exhibit statistically different patterns as compared to their male-only owned counterparts. In particular, conditional on firm, industry and top manager characteristics, the probability of owning a computer, generator or cell-phone increases by 0.15 in the full sample of industries if the firm has one or more female owners. Tests for the joint significance of the interactions of female-owned firm indicator variable with different obstacles

[1] Analyses that focused on cell-phones, computers and generators separately yielded statistically similar results. Given this, these three technologies are considered jointly in this study.

emphasize that differential patterns exist in the manner in which female-owned firms react to regulatory hurdles in Kenya.

In order to explain the distinct pattern in the reliance on technology by female-headed firms, we implement an Oaxaca-Blinder type decomposition procedure. Results from this decomposition indicate that up to 18 percent of the total observed gap in use of technology between firms with female owners and those without is unexplained by differences in measurable characteristics. This suggests that female-owned firms rely relatively more on technology, conditional on observable characteristics.

2. Literature Review

Existing studies of the influence of regulatory obstacles on technology adoption have mainly focused on developed countries and have been theoretical in nature. For example, Acemoglu and Autor (2010) argues for changes in the standard model for studying skills and trends in earnings inequality in order to account for the fact that there has been an increase in the use of technologies to substitute capital for low-skilled labor in the United States and other developed countries, and thus, the evolution of technology should be treated endogenously. Alesina and Zeira (2009) notes that stringent labor market policies may be responsible for the relative increased reliance on machines to complete low skilled jobs in Europe as compared to the United States. Acemoglu *et al*. (2007) models technology adoption endogenously particularly when regulations govern relations between a firm and its suppliers.

In terms of the developing world, relevant studies have concentrated on the adverse economic impacts of restrictive labor legislations. These include Almeida and Carneiro (2009) which finds that stricter labor laws restrict firm size and the use of informal labor in Brazil, and Lall and Mengistae (2005) which finds that labor laws combined with power shortages are significant determinants of city-level productivity differences in India. Sanyal and Menon (2005) notes that Indian states with "pro-worker" laws are less likely to attract new domestic investment or new foreign direct investment (Menon and Sanyal 2007). Finally, Besley and Burgess (2004) finds that restrictive labor laws in India are correlated with reductions in employment and productivity, especially in the registered manufacturing sector. These studies focus on the negative economic consequences of labor regulations; none consider that technology adoption decisions may be endogenous in environments where regulations exist.

An exception is Amin (2009) which finds that retail stores in India respond to strict labor laws by substituting away from workers to computers. Hence when labor regulations are restrictive, retail stores are more likely to own a computer. However, the focus of the study is labor laws - even though there are robustness checks with respect to some of the other obstacles that a firm may face, these hinge on the assumption that the non-labor obstacles are negatively correlated with computer usage. As we show below, this assumption need not always hold. Moreover, Amin (2009) treats ownership of a generator and

financial indicators for the firm (whether firms have a checking or savings account or an overdraft facility) as exogenous. However, firms are more likely to own generators when they report that availability of electricity is an obstacle to every-day operations. Further, state-level laws governing employer-employee relations are likely to be correlated to the ease with which firms obtain lines of credit and overdraft facilities.

This research contributes to the literature in four ways. First, it considers all impediments to every-day operations, not those related to labor regulations alone. That this is important is clear from an exercise which reveals that many of the regulatory and infrastructural obstacles in a firm's business environment are correlated at the 95 percent or higher level.[2] Second, it considers three different forms of technology that may respond to the stringency of regulations and dearth of infrastructure – computers, generators and cell-phones. Third, it disaggregates technology adoption effects by gender-of-owner and shows that firms that have female owners respond to impediments in ways that are statistically distinct. Finally, to the best of our knowledge, this research is the first to document the endogeneity of technology adoption in the face of business hurdles in Africa.

3. Business Environment

We begin our analysis by describing the business landscape in Kenya. Table 1 provides a snap-shot of some of the

[2] A pair-wise weighted correlation matrix of the 6 obstacles studied here (regulations, infrastructure, security, workforce, corruption, finance) indicates that the majority are significantly correlated.

measures constructed by the World Bank using the Enterprise Survey Data for Kenya from 2007. In general, Kenya is a difficult climate given a variety of regulatory, corruption, crime and infrastructure-related problems. For example, Kenya is worse than the regional average in the number of days required to obtain an import license, the percent of firms indentifying tax rates and tax administration as a major constraint, and the percent of firms identifying business licensing as a major constraint. At 79 percent, the proportion of firms expected to make informal payments to public officials is more than twice the average for other countries in sub-Saharan Africa. Corruption appears to be major problem in public dealings since 71 percent of firms are expected to give gifts in order to secure a government contract. Finally, about one third of all firms identify crime, theft and disorder as a major obstacle in Kenya.

In terms of infrastructure-related constraints, although Kenya ranks more favorably than the regional average in terms of the number of power outages in a typical month, the proportion of sales lost due to such outages is slightly higher than the regional average proportion. Moreover, although the number of days required in order to obtain a water connection or a mainline telephone connection in Kenya is marginally fewer than the mean number of days for other countries in sub-Saharan Africa, the number of days to obtain an electrical connection is almost 10 days more as compared to the regional average.

The finance indicators show that Kenya compares more favorably than the regional average in terms of the proportion of

firms with credit from financial institutions and the value of collateral required for a loan. However, such averages mask important differences in access to finance as is clear from International Finance Corporation (2006), which reports that women entrepreneurs in Kenya consider access to finance as one of the biggest obstacles they face. The lack of adequate finance arises primarily because women have unequal access to land and property in Kenya, and are thus unable to provide collateral to secure loans from formal institutions. The restricted access to credit implies that women-owned businesses are often unable to expand, and thus remain at a microenterprise level. There are further differences that disproportionately affect women-owned firms in Kenya; women entrepreneurs are one and half times more likely to cite customs and trade regulations as a barrier as compared to male entrepreneurs (World Bank 2006).

4. Data and descriptive statistics

Data used in this research are from the Enterprise Survey implemented by the World Bank in Kenya in 2007. The Enterprise Survey is a firm-level survey which is representative of a country's private sector economy. In Kenya, the firms that were targeted were located in the capital city of Nairobi which is in the central part of the country, the coastal city of Mombasa, Nakuru in the Rift Valley and Kisumu which is located near Lake Victoria in the Western region of the country. Establishments in all manufacturing sectors, construction, retail and wholesale services, hotels and restaurants, transport, storage, and communications and computer and related activities were

administered the survey. Those that had five or more full-time permanent paid employees were stratified into five groups: manufacturing (food and beverages), manufacturing (garment), manufacturing (other), retail trade, and "rest of the universe" (RoU) which included construction, wholesale trade, hotels and restaurants, transportation, storage, and computer related activities. The data contain 466 firms from Nairobi, 107 firms from Mombasa, 102 firms from Nakuru and 106 firms from Kisumu, for a total of 781 firms. Of these, 657 firms employ five or more full-time permanent employees and 124 are "micro-establishments" (fewer than five permanent employees).

The Enterprise Survey asks detailed questions on the environment faced by firms in conducting business. These questions include those related to firm characteristics, gender participation, sales, costs of inputs, workforce composition, bribery payments made and obstacles related to telecommunications, crime, licensing, infrastructure, trade, competition, land and permits, taxation, access to finance, zoning restrictions and other restrictions on hours of operation and pricing and mark-ups. Given the level of detail, these data are particularly relevant for purposes of this study.[3]

[3] Carlin et al. (2007) argues that measures of obstacles may be endogenous in that firms experiencing the constraints more often are the ones who are likely to report the constraint as binding. We take averages of the obstacles variable to address this issue (similar to Angrist and Krueger 2001, Dethier *et al*. 2008 and Amin 2009, and a section in Carlin et al. 2007) and note that the main variable of interest is technology and not obstacles in of themselves. Further, we use these

The sampling methodology employed is stratified random sampling with replacement where the strata are firm size (number of employees), business sector (manufacturing, retail and other services) and geographic region within the country. Nairobi, Mombasa, Nakuru and Kisumu were selected since they collectively contain the largest share of economic activity in Kenya. All estimations and summary statistics are adjusted with sampling weights to account for the differing probabilities of selection across the various strata.

Among the total universe of 781 firms, 778 report information on whether any of the owners is female. In these data, 286 firms (36.76 percent) have one or more female owners. The largest proportion of firms with female owners is located in manufacturing garment industries (52.17 percent) followed by retail industries (43.48 percent) and manufacturing food industries (38.94 percent). The relatively high proportion of firms with female owners in manufacturing garment and retail industries is fairly typical of most countries in Africa and Asia. Figure 1 depicts the percentage of firms with female principal owners and those without by number of employees (firm size). The figure is arranged such that classifications that have the largest difference between female-owned and male-owned firms appear first. Firms are denoted as "small" if they employ 5-19 full-time workers, "medium" if they employ 20-99 full-time

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data because there are few alternatives with comparable detail on firm characteristics, obstacles and technology in one source.

workers and "large" if they employ 100 or more full-time workers.[4] From Figure 1 it is clear that firms with female owners dominate those with only male owners among the small and micro categories. Although still present among medium and large firms, they do not exceed the proportion of male-owned firms in these groupings.

Figure 2 shows the percentage of firms with female principal owners and without by industry. Again, the figure is arranged to depict the industries with the largest gender-of-owner differences first. The proportion of firms with female headship is especially high in manufacturing industries that include garments (17 percent), food (15 percent) and textiles (5 percent), in retail industries (25 percent), and in other industries such as hotels and restaurants (9 percent). Figure 2 reveals that firms with female headship are relatively more numerous in manufacturing non-metallic minerals. These minerals include gemstones and gold which is processed by small-scale artisanal workers in regions of the country near Lake Victoria.

Figure 3 is a disaggregation of ownership by gender and legal status. Firms are classified as "public" if shares are traded in the stock market. If shares are not traded or traded only privately, the firm is categorized as "private". "Sole proprietorships" are businesses that are owned and managed by

[4] The majority of businesses in Kenya are Small and medium enterprises (SMEs). SMEs in Kenya have noted advantages including the ability to generate employment, high level of productivity, and the means to rapidly absorb new technical innovations (Atieno 2009).

an individual, whereas "partnerships" are firms in which two or more parties share profits and liabilities. The "other" category includes combinations of all four groups, for example, cooperatives or mixed ownership. From Figure 3, it is evident that firms with female ownership exceed those with male ownership among establishments that are registered partnerships and surprisingly, among firms that are legally classified as public. The finding that firms with female ownership exceed those with male-only ownership in the public category may reflect the widely held belief that politically connected male owners find it expedient to include women (often wives) as owners in order to avail of tax and other financial benefits (for example, the "Mwamba" loans that are provided to large businesses for acquiring machinery and other assets by the Kenya Women's Finance Trust (KWFT), Ltd. can be accessed only by women business owners).

Finally, figure 4 shows the breakdown of firms by gender-of-owner and use of technology. The technologies considered are computer (the firm uses email or has its own web-site or has an internet connection), generator (the firm owns or shares a generator) and cell-phone (the firm uses cell-phones for communication with clients and suppliers). As noted above, about one-third of firms in these data have one or more female owners. Given this, it is remarkable to note that firms with female owners rely on computers and cell-phones to such a disproportionately large extent. Figure 4 shows that the percentage of cell-phone ownership by female-owned firms

exceeds that of male-owned firms (17 percent versus 15 percent, respectively). Use of computers and generators between female-owned and male-owned firms is comparable. The "technology" denoted bars in Figure 4 report the gender disaggregated ownership pattern for computer, generator and cell-phone combined. It is clear that in terms of usage of these three technologies, the share of firms with female headship is almost on par with the share of firms with male headship (68 percent versus 72 percent). Hence the patterns in Figure 4 suggest that in comparison to their share in the total population of firms in Kenya, female-owned firms use computers, cell-phones and generators to a relatively large extent.

Figures 1 – 4 provide a graphical description of characteristics of firms with female owners in Kenya. Next, we focus on the obstacles perceived by firms in the business environment of Kenya. The data report constraints related to twenty different types of obstacles. For expositional purposes, the twenty separate types of constraints reported by firms are combined into six categories of obstacles – regulations, infrastructure, security, workforce, corruption, and finance. The regulations group includes the following obstacles: labor regulations, licensing and permits, customs and trade regulations, regulations on hours of operation, regulations on pricing and mark-ups, zoning restrictions, tax rates, and tax administration. The infrastructure group includes obstacles related to telecommunications, electricity, transportation, and access to land. The security category includes constraints related to crime,

theft, and disorder, political instability, macroeconomic instability, and functioning of the courts. The workforce group includes obstacles related to an inadequately educated workforce, and the corruption group includes obstacles related to corruption and practices of competitors in the informal sector. The last group (finance) includes obstacles related to access to finance.

Table 2 reports weighted proportions of firms characterizing obstacles as binding. In these data, firms are asked to rank obstacles on a scale of zero to five – no obstacle, minor obstacle, moderate obstacle, major obstacle and very severe obstacle. The tables that follow report results for firms that describe constraints to be binding if they are moderate, major or very severe.[5] It is clear that the majority of firms report regulations, finance, infrastructure and corruption to be binding obstacles. For firms with female owners, the largest hurdles appear to be regulations and infrastructure. This ranking is about the same for firms with only male owners. Having a workforce that is uneducated is least constraining for firms in Kenya.

5. Business Obstacles and Technology Use

We begin this section by reporting differences in obstacles and firm level variables between female-headed and male-only headed firms. As noted above, obstacles are coded as binding if they represent moderate, major or very severe

[5] Excluding the moderate classification did not result in appreciably different results.

constraints. Furthermore, obstacles reflect a firm's perceptions of its operating environment. In order to eliminate possible measurement errors and other endogeneity issues that may contaminate these variables, we take averages of these variables at the region, industry, legal status and firm size level (Angrist and Krueger 2001, Dethier et al. 2008, Amin 2009). The estimations discussed in the following tables are conducted on constructed mean values of the obstacles.

Table 3 provides weighted descriptive statistics on the characteristics of firms with female owners and those without, and an indication of whether there is a statistical difference in these characteristics. The characteristics reported include ownership of technology (computer, cell-phone or generator), obstacles related to regulations, infrastructure, security, workforce, corruption and finance, regional indicators, firm and industry characteristics including firm size, value of property and machinery, legal status, industrial classification and whether payments were made for security or for protection or to the police, and finally, characteristics of the firm's top manager including whether she/he has an advanced degree and her/his number of years of experience in the sector.

Estimates in Table 3 indicate that on average, firms with at least one female among owners have slightly higher percentage values than firms without female owners in terms of technology adoption; however, the difference is not statistically significant. The reported differences in impediments for female-headed and male-only headed firms in Table 3 again show little

variation that is statistically discernible. Table 3 also reports differences in obstacles that might be considered less subjective. These measure actions that an establishment has engaged in and include variables that fall under the broad categories of corruption (payments made for security, protection payments and payments made informally to the police) and access to finance (proportion of working capital financed from formal and informal sources). Among these, there is a statistically discernible difference by gender-of-owner in payments made for protection - firms with female owners are about 13 percent more likely to make such payments to organized crime in order to prevent violence.

Differences in regional dummies indicates that there are relatively fewer female-headed firms in Nairobi and relatively more firms with female owner in Mombasa and Nakuru. In terms of firm and industry characteristics, although female-owned firms have more years of operation, slightly more full-time employees, lower property values, relatively fewer proportion of African-origin owners, the difference is measured precisely only in the case of property values. Finally, in terms of manager characteristics, female-owned firms have top managers who are relatively better educated but with slightly lower experience as compared to male-owned firms. However, these differences are not measured precisely.

Results in Table 3 indicate that firms with female owners are not very different from firms with all-male owners in levels of technology chosen or in terms of many of the firm,

industry and top manager characteristics considered. While this lack of difference between firms with female owners and those without is re-assuring for the estimations that involve the female-owned firm indicator and its interactions, it also points to the possibility that the women-owned firms in the sample may be less representative of the average women-owned firms in the economy. Indeed, these data are less useful to address questions on access to entrepreneurship as it includes a random sample of firms that have overcome barriers to entry and have "survived" to remain in existence. Although this issue plagues any data set that samples from the private sector of a developing economy, it is less problematic here since the objective is to study reliance on technology in the face of business constraints *conditional* on a firm's existence. Given the lack of differences between female-owned and male-owned firms' characteristics in Table 3, we are reassured that the measured gender-of-owner distinctiveness in technology adoption in response to business obstacles does not arise solely from consistent differences in measurable covariates between these types of firms. Moreover, in order to address the issue of comparability of results with those for the average woman-owned firms in the economy, we estimate our models separately for industries in which barriers to entry for firms with female-headship are conceivably lower. These include manufacturing industries such as garments, food, textiles, and non-metallic minerals, retail industries and service industries such as hotels and restaurants, and construction and transport. These are the industries in Figure 2 where the presence of firms

with female owners exceeds that of firms with only-male owners. In this sub-set, there are 502 firms where 215 have female owners and 287 have only male owners. The tables that follow present results separately for all industries and industries with low barriers to entry for women.

Marginal effects for technology adoption

Results for technology adoption, where establishments are coded as owning technology if they report owning a computer, generator or cell-phone, are reported in Table 4. The first column of Table 4 shows marginal effects from a probit model that includes only obstacles to everyday operations of the firm. The second column shows marginal effects that include obstacles and an indicator variable for whether the establishment has one or more female owners and the third column reports results for the variables in the second column along with the interactions of the female ownership variable with the different obstacle categories. The fourth column builds on the results in the third column by adding regional indicators, firm and industry characteristics and characteristics of the firm's top manager. Regressions are weighted to be representative of the population of firms using weights provided by the Enterprise Survey data for Kenya, and standard errors are clustered by region.

The first column of Table 4 shows that of the various categories of obstacles, regulations, infrastructure, workforce and finance are significant. Estimates indicate that if regulations are moderate, major or very severe, the probability of owning technology is 0.19 higher. Since regulations includes obstacles

such as labor regulations, licensing and permits, regulations on hours and pricing as well as zoning restrictions, this is consistent with the hypothesis that technology is endogenous when restrictions are binding. For labor regulations in particular, this result is consistent with the labor-saving function of computers as noted in Amin (2009). The other obstacles that increase technology use include workforce and finance. The fact that inadequately educated workforce is positively correlated with technology use is interesting because it indicates that when such regulations pose an obstacle, firms use technology to overcome this hurdle. This substitution of capital (technology) for low-skilled labor (inadequately educated workforce) is broadly consistent with Acemoglu and Autor (2010) and Alesina and Zeira (2006). Moreover, inadequate access to finance, as reflected in a restricted access to fixed capital for purposes of expansion, also significantly influences firms to rely on technology. In terms of a negative effect, the obstacle that lowers the probability of technology use is infrastructure. This is expected since this group includes obstacles related to electricity.

The second column of Table 4 shows that conditional on obstacles, firms with one or more female owners are more likely to adopt technologies such as computers, generators or cell-phones. For such firms, the probability of technology use is higher by 0.02. Column (3) of Table 4 reports results for the interaction terms of female headship and the different obstacles in column (1). Note that if there were no differentiated impacts by gender of owners, the interactions terms should not be

Table 4: Marginal effects for technology adoption for all industries.

	(1)	(2)	(3)	(4)
Obstacles related to regulations	0.187***	0.189***	0.374***	0.065***
	(0.034)	(0.030)	(0.065)	(0.041)
Obstacles related to infrastructure	-0.050**	-0.052**	-0.059***	-0.020***
	(0.024)	(0.023)	(0.020)	(0.007)
Obstacles related to security	0.003	-0.001	-0.010	-0.006
	(0.042)	(0.040)	(0.036)	(0.010)
Obstacles related to workforce	0.054***	0.043***	0.037***	0.009
	(0.019)	(0.025)	(0.022)	(0.011)
Obstacles related to corruption	-0.020	-0.011	0.017	-0.002
	(0.040)	(0.043)	(0.038)	(0.012)
Obstacles related to finance	0.075***	0.073***	0.052***	0.009
	(0.018)	(0.022)	(0.023)	(0.005)
Establishment has one or more female owners		0.017*	0.818***	0.150***
		(0.007)	(0.055)	(0.169)
Female owner interaction with obstacles related to regulations			-0.344***	-0.041**
			(0.080)	(0.040)

Table 4: Marginal effects for technology adoption for all industries continued.

Female owner interaction with obstacles related to infrastructure			0.075**	0.022***
			(0.044)	(0.009)
Female owner interaction with obstacles related to security			0.034*	0.004
			(0.018)	(0.006)
Female owner interaction with obstacles related to workforce			-0.012	-0.008
			(0.026)	(0.009)
Female owner interaction with obstacles related to corruption			-0.099***	-0.021
			(0.028)	(0.010)
Female owner interaction with obstacles related to finance			0.032	-0.001
			(0.017)	(0.006)
χ^2 *value of joint test of significance of female principal owner interaction terms*			155.670 [0.000]	22.200 [0.000]
Includes regional indicators	NO	NO	NO	YES
Includes firm, industry, and top manager characteristics	NO	NO	NO	YES

Notes: Weighted to national level with weights provided by the Enterprise Survey for Kenya. Table reports marginal effects from probit regressions. Robust standard errors, clustered by region, in parentheses. *p*-values in square brackets. The notation *** is p<0.01, ** is p<0.05, * is p<0.10. Firm characteristics, industry characteristics and top manager characteristics include those listed in Table 3. Regressions have 778 firm level observations.

significant. This is not the case as evident from column (3). In particular, the net effect for infrastructure indicates that the probability of technology use for female-owned firms is higher when such obstacles are binding. Since this category subsumes access to land, this is as expected. When access to land is a major obstacle, results indicate that firms with female headship may substitute computers for workers in order to increase work capacity without increasing physical work-space. The interaction term on security is significant as well and is consistent with female firms relying more on computers to accomplish tasks when crime or theft is pervasive or when there is political instability. For example, if curfews are imposed to limit mobility during times of unrest, female-headed firms may use email and cell-phones to contact suppliers and other partners in business. Moreover, results in the third column of Table 4 show that probability of technology adoption is lower for female-headed firms that cite corruption to be a binding constraint. This category includes practices of competitors in the informal sector which may include favors that are extended to individuals in social networks. The negative coefficient on the corruption interaction term may indicate the relative isolation of female firms if membership in networks spreads knowledge on the benefits of technology adoption. Finally, a test of the null hypothesis that these interactions are zero can be rejected; that is, the female interaction terms are jointly statistically significant.

Column (4) of Table 4 includes regional, firm and top manager characteristics to the variables in column (3). With the

inclusion of these covariates, the indicator variable for firms with female owners decreases in magnitude - the coefficient indicates that the probability of technology adoption is 0.15 higher for firm with female-owners. Again, a test of the null hypothesis that the interactions effects are jointly zero can be rejected. Table 5 repeats the models in Table 4 for industries where barriers to entry are relatively low for women. We focus our discussion on the third and fourth columns of this table and compare results with the corresponding columns of Table 4. The third columns of Table 4 and 8 show that regulations, infrastructure and finance continue to have significant effects, although the magnitude of these effects is somewhat lower for the first two categories of obstacles. The interaction term on infrastructure continues to exert a positive but smaller effect on technology use, and the indicator for firms with female owners remains positive and significant, but again, is of diminished magnitude. The test of significance on the interaction terms reported at the bottom of Table 5 continues to confirm that the interaction terms are jointly different from zero. A comparison of results in the fourth columns is similar to the comparison of results in the third columns of the two tables except that the indicator variable for female headship loses significance and the joint test can no longer reject that the female-firm interaction terms are insignificant in Table 5.

Two points are noteworthy in the results of Table 5 which includes female-owned firms that are representative of the larger underlying economy – first, gender-of-owner effects are

Table 5: Marginal effects for technology adoption for industries where barriers to entry are relatively low.

	(1)	(2)	(3)	(4)
Obstacles related to regulations	0.200***	0.194***	0.229***	0.005***
	(0.070)	(0.072)	(0.115)	(0.002)
Obstacles related to infrastructure	-0.0001	-0.001	-0.017***	-0.001***
	(0.012)	(0.012)	(0.010)	(0.0004)
Obstacles related to security	0.017	0.015	0.008	0.001***
	(0.013)	(0.013)	(0.008)	(0.001)
Obstacles related to workforce	0.021*	0.021*	0.021	-0.0001
	(0.021)	(0.021)	(0.024)	(0.0003)
Obstacles related to corruption	-0.059***	-0.056**	-0.045**	-0.002**
	(0.026)	(0.025)	(0.022)	(0.001)
Obstacles related to finance	0.072***	0.070***	0.072***	0.001
	(0.025)	(0.026)	(0.031)	(0.001)
Establishment has one or more female owners		0.003***	0.413**	-0.0004
		(0.001)	(0.460)	(0.001)
Female owner interactions with obstacles related to regulations			-0.096	-0.0001
			(0.112)	(0.001)

Table 5: Marginal effects for technology adoption for industries where barriers to entry are relatively low continued

Female owner interactions with obstacles related to infrastructure			0.034**	0.001***
			(0.028)	(0.0003)
Female owner interactions with obstacles related to security			0.026	-0.0004
			(0.021)	(0.0005)
Female owner interactions with obstacles related to workforce			-0.003	-0.0003
			(0.017)	(0.001)
Female owner interactions with obstacles related to corruption			-0.022	0.0001
			(0.015)	(0.0004)
Female owner interactions with obstacles related to finance			-0.020	-0.0003
			(0.023)	(0.001)
χ^2 *value of joint test of significance of female principal owner interaction terms*			8.020	0.650
			[0.046]	[0.886]
Includes regional indicators	NO	NO	NO	YES
Includes firm, industry, and top manager characteristics	NO	NO	NO	YES

Notes: Weighted to national level with weights provided by the Enterprise Survey for Kenya. Table reports marginal effects from probit regressions. Robust standard errors, clustered by region, in parentheses. *p*-values in square brackets. The notation *** is p<0.01, ** is p<0.05, * is p<0.10. Firm and industry characteristics and top manager's characteristics are the same as those in Table 4. Regressions have 502 firm level observations in industries that include garments, retail, food, textiles, non-metallic minerals, hotels & restaurants, construction & transport.

evident and statistically jointly significant in column (3) and second, consistent with the main hypothesis of this study, firms are more likely to adopt these technologies when regulations and security pose significant hurdles. There is also evidence that female-owned firms appear to be particularly responsive to infrastructure related constraints in column (4) of Table 5.

The models in Tables 4 and 5 include average measures of perceived obstacles. As a robustness check, we use objective measures of obstacles where such variables measure behavior the firm has engaged in. These include indicators of corruption such as whether the establishment made protection payments to organized crime to prevent violence, whether the establishment paid for security (equipment, personnel or security services) or made informal payments to the police when transporting goods, and indicators of access to finance such as the average percent of working capital financed from formal sources (banks, non-bank financial institutions and credit) and informal sources (family and moneylenders). As discussed in Bardasi *et al*. (2007), corruption and access to finance are two obstacles in which all firms, especially female-owned ones, are particularly disadvantaged. Results for technology use for these objective measures are reported in Tables 6 and 7. In keeping with the structure above, Table 6 reports results for all industries and Table 7 reports results for those industries with low barriers to entry for women.

The first column of Table 6 shows that paying for security, making informal payments to the police, and the ability

Table 6: Marginal effects for technology adoption with objective measures of obstacles for all industries.

Objective Measures of Obstacles	(1)	(2)
Establishment made protection payments (to organized	-0.024	0.003
crime to prevent violence)	(0.140)	(0.002)
Establishment paid for security (equipment, personnel,	-0.152**	-0.007***
or security services)	(0.066)	(0.0003)
Establishment made informal payments to the police	0.213**	
when transporting goods	(0.075)	
Average percent of working capital financed from	0.007*	0.0001*
formal sources (banks, on credit)	(0.004)	(0.00004)
Average percent of working capital financed from	-0.008*	0.0002***
informal sources (family, moneylenders)	(0.004)	(0.00005)
Establishment has one or more female principal	-0.019	0.005***
owners	(0.095)	(0.001)
Female owner interactions with:		
Establishment made protection payments (to organized	0.050	0.003
crime to prevent violence)	(0.132)	(0.001)

Table 6: Marginal effects for technology adoption with objective measures of obstacles for all industries continued.

Establishment paid for security (equipment, personnel,	0.293	0.001
or security services)	(0.190)	(0.001)
Establishment made informal payments to the police	-0.135	
when transporting goods	(0.197)	
Average percent of working capital financed from	-0.007*	-0.0001***
formal sources (banks, on credit)	(0.003)	(0.00002)
Average percent of working capital financed from	0.017**	-0.0003***
informal sources (family, moneylenders)	(0.007)	(0.00005)
χ^2 *value of joint test of significance of female*	11.66	39.29
owner interaction terms	[0.009]	[0.000]
Includes regional indicators	YES	YES
Includes firm, industry, and top manager characteristics	YES	YES

Notes: Weighted to national level with weights provided by the Enterprise Survey for Kenya. Table reports marginal effects from probit regressions. Robust standard errors, clustered by region, in parentheses. *p*-values in square brackets. The notation *** is $p<0.01$, ** is $p<0.05$, * is $p<0.10$. Firm characteristics, industry characteristics, and top manager characteristics include those listed in Table 3. Column (1) had 503 firm level observations and column (2) has 776 firm level observations.

Table 7: Marginal effects for technology adoption with objective measures of obstacles for industries where barriers to entry are relatively low for women-owned firms.

Objective Measures of Obstacles	(1)	(2)
Establishment made protection payments (to organized	-0.607***	-0.0003
crime to prevent violence)	(0.096)	(0.0004)
Establishment paid for security (equipment, personnel,	-0.342	-0.0001***
or security services)	(0.220)	(0.0001)
Establishment made informal payments to the police	0.124**	
when transporting goods	(0.054)	
Average percent of working capital financed from	0.001	-0.000001
formal sources (banks, on credit)	(0.005)	(0.000001)
Average percent of working capital financed from	-0.022***	-0.000001
informal sources (family, moneylenders)	(0.006)	(0.000001)
Establishment has one or more female principal	-0.184	0.000001
owners	(0.148)	(0.00002)
Female owner interactions with:		
Establishment made protection payments (to organized	-0.185	0.00002***
crime to prevent violence)	(0.140)	(0.00003)

Table 7: Marginal effects for technology adoption with objective measures of obstacles for industries where barriers to entry are relatively low for women-owned firms continued.

Establishment paid for security (equipment, personnel,	0.308	0.00002*
or security services)	(0.385)	(0.00003)
Establishment made informal payments to the police	0.470***	
when transporting goods	(0.085)	
Average percent of working capital financed from	-0.008	-0.00000002
formal sources (banks, on credit)	(0.005)	(0.000001)
Average percent of working capital financed from	0.0002	0.000001
informal sources (family, moneylenders)	(0.005)	(0.000001)
χ^2 *value of joint test of significance of female*	379.470	10.360
owner interaction terms	[0.000]	[0.016]
Includes regional indicators	YES	YES
Includes firm, industry, and top manager characteristics	YES	YES

Notes: Weighted to national level with weights provided by the Enterprise Survey for Kenya. Table reports marginal effects from probit regressions. Robust standard errors, clustered by region, in parentheses. *p*-values in square brackets. The notation *** is $p<0.01$, ** is $p<0.05$, * is $p<0.10$. Firm and industry characteristics and top manager's characteristics are the same as those in Table 6. Regressions have 502 firm level observations in industries that include garments, retail, food, textiles, non-metallic minerals, hotels & restaurants, construction & transport.

to finance working capital from formal and informal sources have significant effects on technology use. Moreover, a test that the gender-of-owner interaction terms are jointly zero is strongly rejected. Column (2) of Table 6 excludes the variable that measures payments to police as it was asked only of manufacturing firms. This exclusion increases the number of firm level observations in column (2), and now the indicator variable for firms with female owners is significant and shows that the probability of technology use is 0.01 higher for firms with female headship. Results for female-owned firms in industries with fewer barriers to entry (Table 7) show that protection payments, payments to police and ability to raise funds from informal sources are significant, and that there are gender of owner disaggregated effects in the case of payments to police. The gender-of-owner disaggregated effects are also evident in the second column of Table 7, particularly in terms of protection payments and payment for security. Joint tests at the bottom of both columns in Table 7 show that the interaction terms are significantly different from zero. Finally, a column-by-column comparison of results in Tables 6 and 7 shows that effects particular to payments made to the police is similar in sign but smaller in magnitude, proportion of working capital financed from informal sources has the same sign but is larger magnitude, and interaction terms specific to variables measuring access to finance matter less in the smaller subset of industries.

The results in Tables 6-7 are broadly consistent with those in Tables 4-5 in showing that technology use is responsive

to business impediments whether the latter are measured as averages of perceptions or in a more objective format.

Oaxaca-Blinder type decomposition effects for technology use

In this section, we discuss estimates reported in Tables 8 and 9. Table 8 shows average predicted probabilities for technology uptake using data from firms with and without female owners, and female firm coefficients (coefficients from the full model in column (4) of Table 4 when the data are restricted to firms with female owners) and male firm coefficients (coefficients from the full model in column (4) of Table 4 when the data are restricted to firms with only male owners). We ask two questions in order to compare the technology uptake behavior of these firms. First, given the sample of firms with female owners, what would technology use be if it was decided in the universe of male firms? This question is answered by taking the female firm sample and by predicting technology use probabilities using the male firm coefficients. Then the converse is done for the male firm sample using female firm coefficients. This method is similar to Barmby and Smith (2001). The exercise is repeated for industries with low barriers to entry for women, and the average predicted probabilities for all industries and the smaller sub-set of industries are reported in Table 8.

The results in Table 8 indicate that predicted technology use for female firms using own coefficients is 0.99 while the corresponding number for male firms using own coefficients is 0.97. Hence on average, female firms rely on technology to a

Table 8: Average predicted probabilities using female firm and male firm sample data and female firm and male firm coefficients.

	All Industries				**Industries with Low Barriers to Entry for Women**			
	Firms with female own.		*Firms with no female own.*		*Firms with female own.*		*Firms with no female own.*	
	β_f	β_m	β_f	β_m	β_f	β_m	β_f	β_m
Tech.	0.985	0.967	0.986	0.970	0.983	0.982	0.976	0.973

Notes: Industries with low barriers include garment, retail, food, textiles, non-metallic minerals, hotels & restaurants, and construction and transport. All industries include a sample size of 778 firms of which 286 have female owners and 492 have only male owners. Industries with low barriers include a sample of 502 firms of which 215 have female owners and 287 have only male owners.

Table 9: Decomposition of average predicted probabilities using an Oaxaca-Blinder type method.

	All Industries				**Industries with Low Barriers to Entry for Women**			
	Total obs. gap	*Exp. gap*	*Res. gap*	*(Res./Total)*	*Total obs. gap*	*Exp. gap*	*Res. Gap*	*(Res./Total)*
Tech.	-0.015	0.004	-0.018	1.243	-0.010	-0.008	-0.002	0.176

Notes: Reports results of the decomposition when male firm coefficients are used as weights. Industries with low barriers include garment, retail, food, textiles, non-metallic minerals, hotels & restaurants, and construction and transport. All industries include a sample size of 778 firms of which 286 have female owners and 492 have only male owners. Industries with low barriers include a sample of 502 firms of which 215 have female owners and 287 have only male owners.

slightly higher degree than male firms. If the male firms had the same "behavior" as female firms as measured by the estimated coefficients for the female firms, the average probabilities for technology would be 0.99. This probability is higher than the true effect (0.97) for male firms indicating that female firms use technology to a somewhat greater extent. Moreover if the female firms had the behavior of male firms, the average probabilities would fall to 0.97. This is lower than the true effect (0.99) which further underlines that in comparison to male firms, female firms rely on technology to a somewhat greater degree. Finally, results in Table 8 show that restricting the analysis to industries with low barriers to entry reduces but does not completely close the gap (the gap declines from 0.015 to 0.010).

The difference in technology use between female and male firms can be decomposed into a component which is due to differences in sample characteristics (characteristic or explained component) and a component which is due to differences in behavior (preference or residual component). This decomposition is comparable to the Oaxaca-Blinder method; however, since the actual Oaxaca-Blinder decomposition is suitable for linear models only, we implement a comparable method that is used when the dependent variable is non-linear (Barmby and Smith 2001, Sayer *et al*. 2004, Fairlie 2006). The equation that underlies the modified Oaxaca-Blinder method is:

$$T_{mij} - T_{fij} = \beta_m(X_{mij} - X_{fij}) + (\beta_m - \beta_f)X_{fij} \qquad (1)$$

Where T_{mij} and T_{fij} represent average probabilities of technology use in male and female firm samples where the *mij* subscript

denotes male firms in region *j* and the *fij* subscript denotes female firms in region *j*, β_m and β_f are the estimated male and female coefficients from above and X_{mij} and X_{fij} are the male and female firm samples. The first term on the right hand side of the equation represents part of the total gap which is due to differences in observables (explained component) and the second term is the portion of the total gap that is due to differences in behavior (residual component). As is common in the literature, results of the decomposition are evaluated using male coefficients as weights.[6] These results are presented in Table 9.

The negative sign of the residual component in the first panel of Table 9 is reflective of the fact that the total observed gap in technology use is negative (note that in the equation above, female values are differenced from male values). For technology use in the full sample, 124.3 percent of the total gap is due to the residual component attributed to unobserved factors. In the sub-set of industries in the second panel of Table 9, 17.6 percent of the total gap is due to unobserved factors. Although this large difference suggests that in the full sample of industries, firms with female owners may be more versatile with technology use, note that restricting the sample to representative female-

[6] Results using female coefficients as weights are comparable. Furthermore, the decomposition was performed with and without the constant term. Results with and without the constant term were close to the sixth decimal place mainly because we condition on a large set of regional, firm, industry, and top manager characteristics. Given the appreciable lack of difference in estimates, we report results for models that include the constant term.

owned firms does not drive the residual component to zero. We interpret this as evidence that in environments where regulations are excessive, infrastructure is inadequate and lack of security is pervasive, female-owned firms adopt technology to a greater degree than is warranted by their level of measured characteristics. Thus they appear to "over-compensate", perhaps in order to counter-act the effects of firm-related or industry-related unobservables to which they are particularly susceptible.[7]

6. Conclusion and implications for policy

Using data on firms from Kenya, this study demonstrates that ownership of computers, generators and cell-phones increases when regulations, infrastructure, security, workforce, corruption and finance pose significant burdens to every-day operations. In particular, the probability of technology use is 0.07 higher for all firms in the full sample and 0.01 higher for firms in industries with low barriers to entry for women, if regulations are a binding constraint. This pattern is evident for female-owned firms which are often more credit-constrained than male-only owned firms in developing countries. Estimates indicate that conditional on observables, the probability of owning a computer, generator or cell-phone is higher by 0.15 if the firm is female-headed.

[7] As another robustness check, a nearest neighbor matching estimator (NNME) method developed in Abadie and Imbens (2002) and Imbens (2003) was used. The NNME results were consistent with those above, that is, female owned firms rely on technology to a higher level than justified by their level of observable characteristics. These results are available on request.

In order to explain the somewhat greater reliance on technology by female-owned firms in the face of regulatory and infrastructural hurdles, we implement an Oaxaca-Blinder type decomposition procedure which reveals that up to 18 percent of the total observed gap in use of technology between firms with female owners and those without remains unexplained by differences in measurable characteristics.

The results of this study provide evidence that technology use is endogenous when regulations are restrictive and infrastructure is weak. Firms rely on computers, generators and cell-phones to overcome the deficiencies posed by stringent restrictions on hours of operations as well as inadequate telecommunications infrastructure and insecure operating environments. The estimates indicate that in addition to removing regulatory hurdles and improving infrastructure, firms may benefit from policies that enable greater technology use. A way of implementing this would be to extend access to loans that are relatively low-cost for purposes of purchasing computers, generators and cell-phones for business activities. Since operation of computers in particular requires a basic level of skills, the provision of inexpensive vocational training and literacy courses would also be of value. Finally, policies that build and expand networks among female-owned establishments would help diffuse know-how on using technology to mitigate regulatory and infrastructural burdens in the difficult business environment of Kenya.

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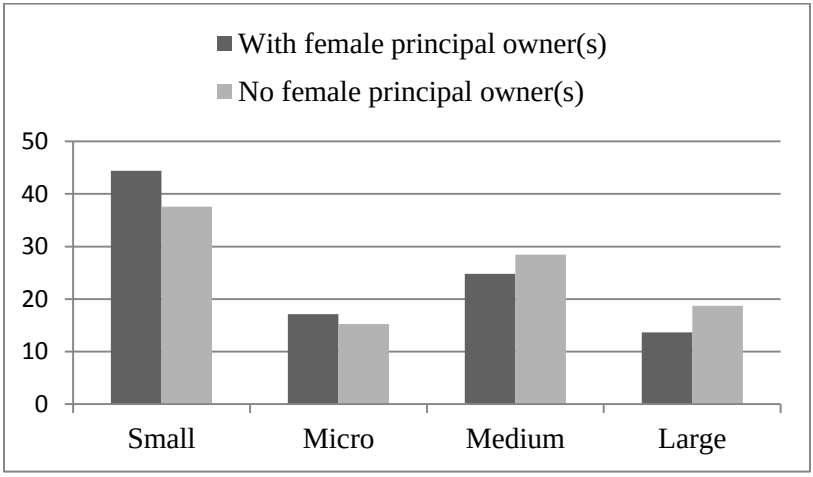
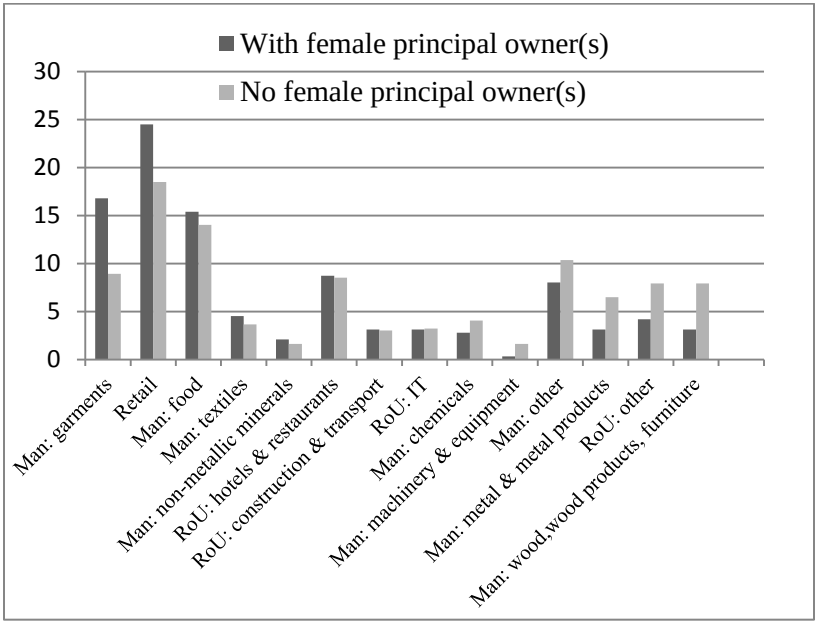
Figure 1: Percentage of firms with female owners and without, by firm size.



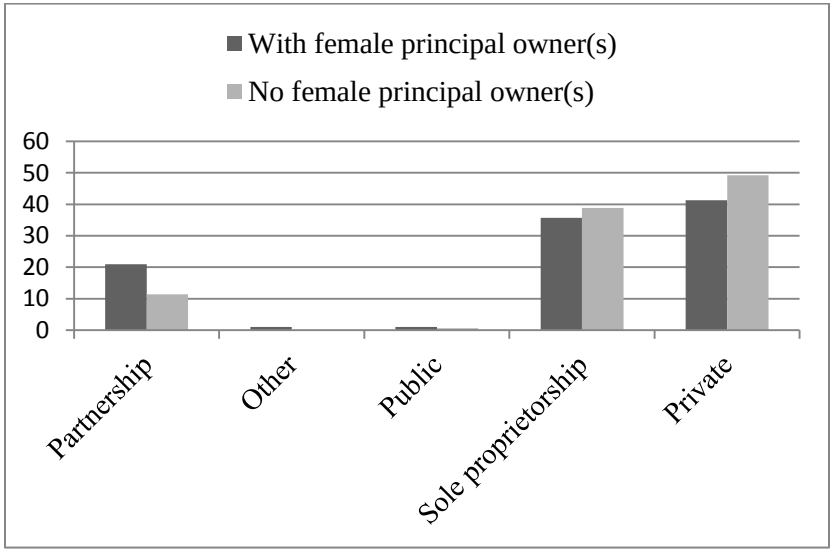
Notes: Author's calculations.

Figure 2: Percentage of firms with female owners and without, by industry.



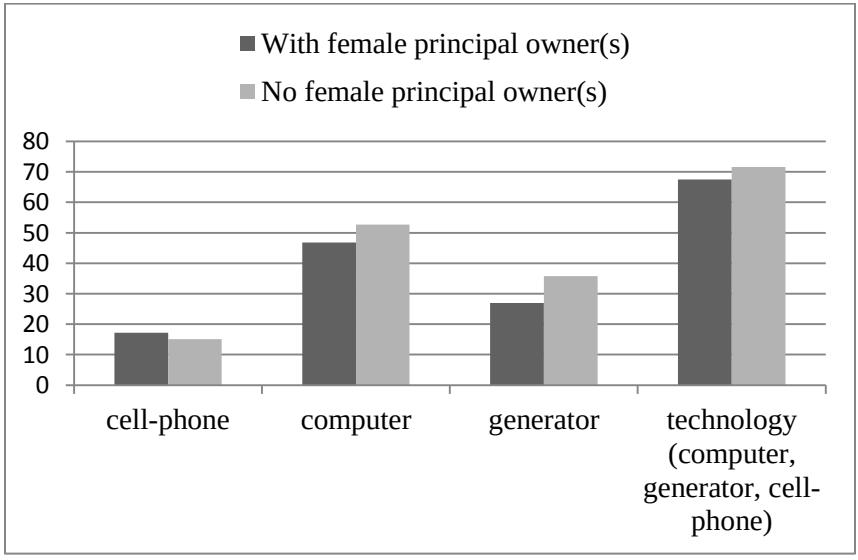
Notes: Author's calculations.

Figure 3: Percentage of firms with female owners and without, by legal status.



Notes: Author's calculations.

Figure 4: Percentage of firms with female owners and without, by technology.



Notes: Author's calculations.

Table 1: Business environment in Kenya.

Indicators	Kenya	Mean for sub-Saharan Africa
Regulatory, Corruption and Crime-related Indicators		
Days to obtain import license	25.92	19.23
% of firms identifying tax rates as major constraint	58.22	37.99
% of firms identifying tax administration as major constraint	32.00	26.20
% of firms identifying business licensing as major constraint	28.28	15.52
% of firms expected to pay informal payments to public officials (to get things done)	79.22	35.16
% of firms expected to give gifts in order to get an operating license	28.75	19.53
% of firms expected to give gifts in order to secure a government contract	71.20	38.33
% of firms paying for security	74.61	60.45
Losses due to theft, robbery, vandalism and arson against the firm (percent of sales)	3.87	1.68
% of firms identifying crime, theft and disorder as major constraint	33.09	27.68

Table 1: Business environment in Kenya continued.

Infrastructure-related Indicators		
Number of power outages in a typical month	6.90	10.30
Value lost due to power outages (percent of sales)	6.35	5.84
Delay in obtaining an electrical connection (days)	40.50	31.94
Delay in obtaining a water connection (days)	27.97	28.60
Delay in obtaining a mainline telephone connection (days)	27.09	32.73
Finance and trade-related Indicators		
Percent of firms with line of credit or loans from financial institutions	25.41	21.63
Value of collateral needed for a loan (percent of loan amount)	120.81	142.60
Percent of firms identifying access to finance as a major constraint	41.80	45.64
Percent of firms that trade identifying customs and trade regulations as a major constraint	23.59	20.11

Source: World Bank, Enterprise Survey Data for Kenya, 2007.

Table 2: Weighted proportions of firms characterizing obstacles as moderate, major or very severe.

	Total	With female principal owners	No female principal owners
Obstacles related to			
regulations	0.999	0.997	1.000
	(0.0005)	(0.002)	(0.00001)
infrastructure	0.868	0.898	0.852
	(0.014)	(0.066)	(0.019)
Security	0.677	0.707	0.661
	(0.106)	(0.132)	(0.087)
workforce	0.144	0.120	0.114
	(0.072)	(0.131)	(0.031)
corruption	0.819	0.829	0.814
	(0.060)	(0.047)	(0.065)
Finance	0.942	0.889	0.971
	(0.021)	(0.067)	(0.007)

Notes: There are 778 total firms in the sample of which 286 firms have female principal owners and 492 have only male principal owners. Weighted to national level with weights provided by the Enterprise Survey of Kenya. Table reports percentage values. Robust standard errors in parenthesis. Further decomposition of Table 2 by firm size, industry, and by use of technology is available on request.

Table 3: Descriptive statistics disaggregated by gender of principal owner.

	Firm with female owner	Firm with no female owner	Difference
Endogenous variable			
Firm owns a computer,	0.985	0.968	0.017
generator, or cell-phone	(0.003)	(0.016)	(0.017)
Obstacles related to regulations	0.998	0.999	-0.001
	(0.001)	(0.0002)	(0.001)
Obstacles related to infrastructure	0.923	0.839	0.084**
	(0.026)	(0.023)	(0.034)
Obstacles related to security	0.708	0.660	0.048
	(0.039)	(0.033)	(0.051)
Obstacles related to workforce	0.161	0.134	0.027
	(0.035)	(0.024)	(0.043)
Obstacles related to corruption	0.791	0.834	-0.043
	(0.031)	(0.019)	(0.037)
Obstacles related to finance	0.943	0.941	0.001
	(0.016)	(0.014)	(0.021)

Table 3: Descriptive statistics disaggregated by gender of principal owner continued.

Firm paid for security (equip.,	0.754	0.642	0.112
personnel, or security services)	(0.057)	(0.042)	(0.071)
Firm made protection payments (to	0.169	0.043	0.126**
organized crime to prevent violence)	(0.056)	(0.020)	(0.060)
Firm made informal payments to	0.199	0.213	-0.014
police when transporting goods	(0.051)	(0.036)	(0.062)
Average % of working capital fin.	29.965	25.998	3.967
from formal sources (banks, credit)	(2.905)	(1.981)	(3.516)
Average % of working capital fin.	2.955	2.180	0.774
from informal sources (family, etc.)	(1.176)	(0.733)	(1.386)
Nairobi	0.564	0.763	-0.199*
	(0.092)	(0.059)	(0.109)
Mombasa	0.409	0.221	0.187*
	(0.092)	(0.059)	(0.110)
Nakuru	0.015	0.007	0.008*
	(0.004)	(0.002)	(0.004)
Kisumu	0.012	0.008	0.004
	(0.004)	(0.002)	(0.004)

Table 3: Descriptive statistics disaggregated by gender of principal owner continued.

Natural log of number of years firm has been operating as of 2007	1.731 (0.156)	1.676 (0.121)	0.056 (0.198)
Natural log of value of machinery (machinery, vehicle equipment new and/or used)	5.891 (0.887)	7.065 (0.572)	-1.173 (1.056)
Natural log of value of property (land and buildings)	0.016 (0.006)	1.147 (0.398)	-1.131*** (0.398)
Natural log of total number of full-time employees	0.555 (0.095)	0.505 (0.070)	0.049 (0.118)
Natural log of total number of temporary employees	0.035 (0.008)	0.036 (0.006)	-0.001 (0.010)
Firm's industrial classification - manufacturing: food	0.004 (0.002)	0.018 (0.016)	-0.014 (0.016)
Firm's industrial classification - manufacturing: garment	0.105 (0.056)	0.055 (0.031)	0.051 (0.064)
Firm's industrial classification - manufacturing: other	0.071 (0.042)	0.311 (0.060)	-0.240*** (0.073)

Table 3: Descriptive statistics disaggregated by gender of principal owner continued.

Firm's industrial classification - retail	0.461	0.299	0.162
	(0.091)	(0.060)	(0.109)
Firm's industrial classification -	0.359	0.318	0.042
rest of the universe	(0.088)	(0.060)	(0.106)
Percent of firm owned by largest shareholders	95.990	95.888	0.103
	(1.916)	(1.556)	(2.468)
Legal status of establishment: public	0.001	0.0002	0.0004
	(0.001)	(0.0002)	(0.001)
Legal status of establishment: private	0.013	0.010	0.003
	(0.003)	(0.002)	(0.004)
Legal status of establishment: sole	0.910	0.896	0.015
proprietorship	(0.042)	(0.037)	(0.056)
Legal status of establishment:	0.076	0.094	-0.018
partnership	(0.042)	(0.037)	(0.056)
Legal status of establishment: other	0.0001	-	0.0001
	(0.0001)	-	(0.0001)

Table 3: Descriptive statistics disaggregated by gender of principal owner continued.

Firm has 100 full-time paid employees or more	0.003	0.002	0.001
	(0.001)	(0.001)	(0.001)
Firm has 20-99 full-time paid employees	0.008	0.007	0.001
	(0.002)	(0.001)	(0.002)
Firm has 5-19 full-time paid employees	0.019	0.018	0.001
	(0.004)	(0.003)	(0.005)
Firm has fewer than 5 full-time paid employees	0.970	0.973	-0.003
	(0.006)	(0.004)	(0.007)
Firm has African-origin principal owner	0.962	0.993	-0.031
	(0.030)	(0.001)	(0.030)
Firm has Indian-origin principal owner	0.008	0.006	0.002
	(0.002)	(0.001)	(0.003)
Years of managerial experience in this sector	7.617	8.016	-0.400
	(0.976)	(0.829)	(1.281)
Has MBA or PHD from Kenya or another country	0.006	0.003	0.003
	(0.002)	(0.001)	(0.002)

Notes: Weighted to national level with weights provided by the Enterprise Survey for Kenya. Table reports percentage values. Standard errors in parentheses. The notation *** is p<0.01, ** is p<0.05, * is p<0.10.