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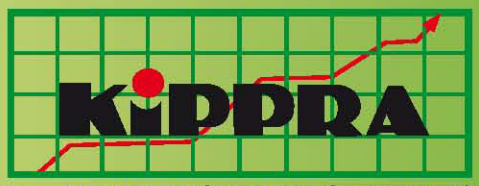

The KENYA INSTITUTE for PUBLIC POLICY RESEARCH and ANALYSIS

Effect of Business Environment on Productivity of Informal Manufacturing Enterprises in Kenya

Florine Mwiti and James Kimunge

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THE KENYA INSTITUTE FOR PUBLIC POLICY RESEARCH AND ANALYSIS (KIPPRA)

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Effect of Business Environment on Productivity of Informal Manufacturing Enterprises in Kenya

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Kenya Institute for Public Policy
Research and Analysis

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Abstract

A favourable business environment enables easy entry and exit of domestic and multinationals from the markets, lessens the cost of doing business, and hence leads to higher productivity and consequently job creation. This study uses firm level survey data of informal manufacturing enterprises in Kenya to study the effect of business environment on total factor productivity (TFP) using data on micro, small and medium enterprises collected by KNBS in 2016. The sector contained 1,044 observations/enterprises, which comprised 13 sub-sectors. Out of these sub-sectors, the study focused on five major sub-sectors in which a total of 998 enterprises were interviewed (95.6%). These were 370 firms in the wearing apparel, 206 firms in the manufacture of food products, 203 firms in the manufacture of furniture, 157 firms in the manufacture of fabricated metal products (except machinery and equipment) and 62 firms in the manufacture of wood and of products of wood and cork (except furniture, manufacture of articles of straw and plaiting materials. The study employed a Cob-Douglas production approach to derive the total factor productivity. The factors that affect this TFP, which were categorized into business environment related factors, entrepreneurial and enterprise characteristics, were aassesed. The study found that access to water, access to electricity, access to computer and training were significant business environment factors that influence productivity of informal enterprises in the manufacturing sector of Kenya. Other factors that were found to be important in determining the productivity of the informal sector were the level of education of the owner/manager, gender, age of the business, market outlet, and expenditure on research and business size. The study recommends increased distribution of electricity to ease access in the informal sector. Also, the study recommends decentralization of training centres to bridge skills gap in the informal sector. There is also need for renewed effort by policy makers to bridge the gender gap in the sector, since male-owned enterprises were found to be more productive than female-owned enterprises. To ease credit access by businesses in the informal sector, the study recommends relaxation of minimum requirements for accessing credit, especially the collateral. The study finally recommends that businesses should increase on their spending on research and development, since it is also a key determinant of productivity in the informal sector.

Abbreviations and Acronyms

DEA	Data Envelopment Analysis
GDP	Gross Domestic Product
ILO	International Labour Organization
KNBS	Kenya National Bureau of Statistics
MSMEs	Medium, Small and Micro Enterprises
OLS	Ordinary Least Squares
R&D	Research and Development
SFA	Stochastic Frontier Analysis
TFP	Total Factor Productivity

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1. Introduction

The informal sector has been highly recognized as a pathway to economic growth and reduction of poverty in both developed and developing countries. The sector has been proven to be of great importance especially in creating employment in developing economies. For instance, in Kenya, the informal sector accounted for 83.4 per cent of total employment in 2018. Some 898,000 and 787,800 new jobs were created in the informal sector in 2017 and 2018, respectively (Government of Kenya, 2018). The total number of people engaged in this sector (excluding agriculture) was approximately 16.9 million.

Although the informal sector is a major contributor to employment in Kenya, the sector still faces several constraints that weaken its productivity. Productivity is a measure of how resources are managed to achieve intended goals in terms of quality and quantity. One of the constraints depressing productivity in the informal sector is the high cost of doing business, which is determined by the business environment. It has been argued that a poor business environment constrains the growth of businesses in Africa.

Literature has also proven that inefficiencies in the business environment lead to distortions in the allocation of resources at the firm level and are responsible for the country differences in the level of output and total factor productivity (TFP) growth. For instance, Bah and Fang (2013) found that crime, corruption, inadequate infrastructure and poor access to credit facilities reduce TFP by between 7 and 19 per cent in 30 Sub-Saharan African countries. Diagne (2013) established that addressing the factors that negatively affect the business environment, more so power outages, corruption, crime, burdensome regulations, poor infrastructure and tax burden that negatively affect investment, TFP and output in Senegal would increase manufacturing firms investment and output by 94 and 79 per cent, respectively.

In Kenya, businesses still face an adverse business environment. According to a World Bank (2018) report, businesses in Kenya still incur huge losses due to theft, power outages, theft, damages during transportation and corruption, which were higher compared to other middle income countries in Africa, India and China. Moreover, the same report highlights some of the top obstacles identified by business managers, which were licences, tax rates, access to credit, corruption, security and infrastructure. However, there is scanty evidence on how this business environment influences productivity of enterprises especially if the enterprise is operating informally. This is the main focus of this study. The study sought to find out the effect of business environment on TFP of informal enterprises using manufacturing firms in Kenya as case study.

1.1 Statement of the Problem

A conducive business environment enables easy entry and exit of domestic and multinational businesses from the markets, leads to higher productivity and job creation. Several studies have found that poor business environment constrain the growth of businesses in Africa. Inefficiencies in business environment lead to distortions in allocation of resources at the firm level, increases firms' indirect costs and are responsible for the country differences in the level of output and TFP growth.

Although business environment has been identified as a major productivity constraint for many firms, there is scanty empirical evidence on the effect of business environment on productivity of enterprises especially in the informal sector. Moreover, studies that have established that the productivity of the enterprises in the informal sector is low have not explored whether the business environment has an influence on the productivity of the sector. This study therefore sought to establish the effects of business environment on productivity of enterprises in the informal sector, with focus on informal manufacturing enterprises.

1.2 Objectives of the Study

The main objective of this study is to find out whether business environment has an effect on performance of manufacturing enterprises in the informal sector in Kenya.

To address this objective, the study will answer the following research question:

What is the effect of business environment indicators on total factor productivity of informal manufacturing firms in Kenya?

2. Literature Review

The literature on measurement of total factor productivity (TFP) growth and its determinants is quite extensive (Lundvall and Battesse, 2000; Bernard et al., 2003; Melitz, 2003; Redding and Reenen, 2004; Griffith, Biesebroeck, 2005; Doraszelski and Jaumandreu, 2013; Voutsinas and Tsamadias, 2014; Kafouros, 2005 and Ray, 2014). However, only few studies have focussed on the effect of business environment on total factor productivity.

Gasiorek et al. (2010) investigated the effect of business environment on firms in Morocco. Their study focussed specifically on credit access, water outages, regulatory and institutional environment and infrastructure. The authors found that water outages, infrastructure, regulations (measured by the number of permits per year) were negatively related with firm productivity.

Bah and Fang (2011) established that regulations, crime, corruption and poor infrastructure were the main factors that dragged productivity in Africa. The authors found that these factors decrease productivity by between 18 to 44 per cent and a decrease of between 40 and 77 per cent in output. In another study (2013), the same authors investigated the quantitative effects of business environment, specifically crime, corruption, infrastructure and access to credit facilities in 30 Sub-Saharan Africa countries. The study found that inefficiencies in these areas reduce TFP by between 7 and 19 per cent.

Diagne (2013) found similar observations: power outages, corruption, crime, burdensome regulations, poor infrastructure and tax burden negatively affect investment, TFP and output in Senegal. The study established that addressing these problems would increase manufacturing firms investment and output by 94 and 79 per cent, respectively. Nguinmkeu (2013) identified that quality of labour, administrative delays and corruption, infrastructure, illicit trade, inadequate access to credit and regulatory burden as the key challenges facing businesses in Cameroon, and hence affecting their productivity negatively.

Essmui et al. (2014) found that limited access to credit, corruption and high crime are the major factors that limit the growth of manufacturing enterprises in Libya. The study failed to find any significant relationship between business regulation and corruption on productivity of the firms. Lasagni, Nifo and Vecchione investigated how institutional quality affects productivity of firms in Italy. Some of the institutional quality indicators considered by the study were corruption, rule of law, regulatory quality, government effectiveness and voice and accountability. The study found that better institutions lead to higher firms' productivity. Corruption was found to be negative and significant while government effectiveness and voice and accountability were found to affect productivity positively. Giang et al. (2018)

did a study in Vietnam and discovered that lack of access to finance, bribery, low employees educational level and administrative burden were the main constraints to productivity among manufacturing businesses.

There is vast empirical literature on the other factors that can affect TFP growth at firm's level. Diaz and Sanchez (2008) argued that increase in the size of firm results to increase in organizational and managerial complexity. They found that inverse relationship between firm size and productivity can be expected, but also large firms easily access market and they also have better technology hence a positive association between these two can also be expected (Lundvall and Battesse, 2000; Biesebroeck, 2005).

Some studies have established that embodied technological intensity helps to improve productivity by importing capital goods and thereby infusing better technology to the firm and disembodied technological intensity affects productivity by fostering the quality of technology (Hasan, 2002 and Mendi, 2007). Considering data from manufacturing sector in Malaysia, Jajri (2007) found that the rate of growth in output, foreign investment and exports affect the productivity of the firms in a positive way. Gaitan, Herera and Pablo (2017) find that the main determinants of productivity in a firm are size, gender diversity and ownership. Size and institutional ownership (firms owned by shareholders) were positively related with productivity while a higher share of female directors was negatively associated with productivity.

Considering the innovation-based growth models, Aghion and Howitt (1998) and Grossman and Helpman (1991) argued that research and development (R&D) activities help to motivate innovations, which in return affects the TFP of a company. Other empirical studies have also supported that R&D activities have a significant role in the determination of productivity (Doraszelski and Jaumandreu, 2013; Leachman, Ray, 2014; Voutsinas and Tsamadias, 2014).

Another strand of studies pays attention on the relationship between total factor productivity and the intensity of market regulations. In their view, inadequate regulations can create perverse incentives that in return reduce TFP (Bridgam et al., 2009). Other related studies (for example Eslava et al., 2004, Bernard et al., 2006 and Bloom and Van Reenen, 2010) focus on the relationship between the competition intensity and productivity. These studies evidenced a positive relationship between competition intensity and productivity.

According to Taymaz (2010), other factors that determine productivity are firm characteristics such as composition of employees by age matter for firms productivity (firms with older employees are more productive), education of the entrepreneur (more educated entrepreneurs are more productive), type of

consumer and geographical market (firms that sell to institutions and government are more productive) and vocational training (training increases productivity). However, the author failed to find any effect of gender on productivity.

3. Methodology

3.1 Theoretical Framework

3.1.1 Theory of production

In every production process, resources are used in order to obtain some output. Resources comprises of several factors such as raw materials, land, machinery, tools and human resources. Enterprises or companies then combine these factors and transform them into outputs, which could be services or goods.

A combination of certain inputs results into some specific quantity of output, which can be shown in a production function equation. Production function demonstrates the relationship between output and input used in a given production. For instance, an enterprise producing output Q by use of inputs (X_1, X_2, X_3, ...X_n) the production function can be expressed as:

$Q = f(X_1, X_2, X_3, \ldots X_n)$

Where:

Q = Output

$X_1, X_2, X_3 \ldots X_n$ = inputs

Assuming that in the production process only capital (K) and labour (L) are used, this production function can be can be mapped as:

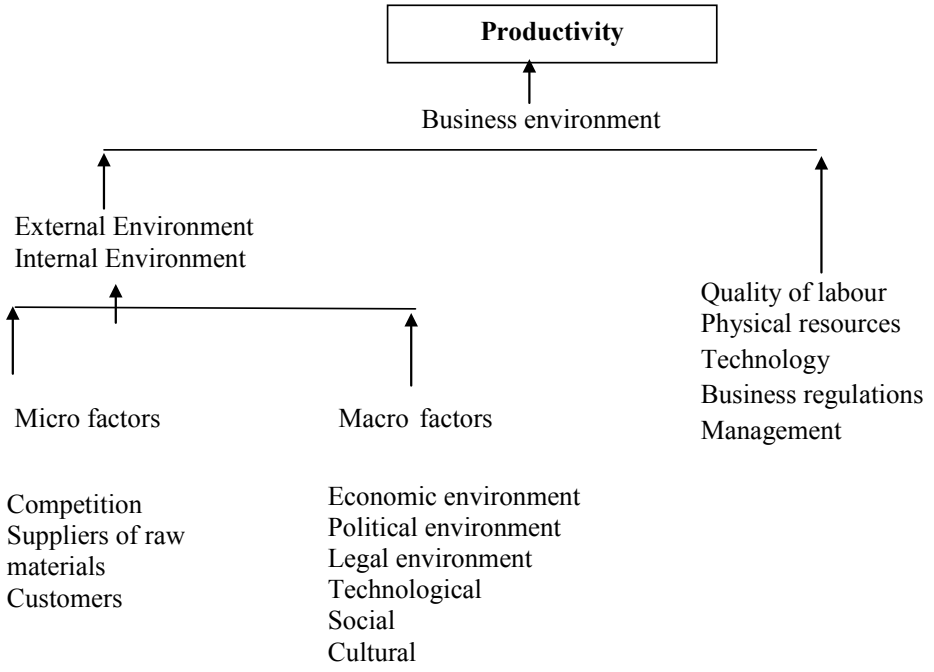
$Q = f(L, K)$

Where: Q= Output, L= Labour and K=capital

3.2 Conceptual Framework

Enterprises do not function in isolation, but they are surrounded by an environment known as business environment. These business environments consist of both internal and external environment, with external environment comprising of both macro and micro environment. Businesses may have to some extent control of the internal environment but the external environment is beyond its control. Therefore, since the businesses lack control over its environment, it may pose threats or opportunity for enterprises, thus impacting positively or negatively on the performance/productivity.

Figure 3.1: Conceptual framework



Source: Authors own conceptualizing

3.3 The Model Estimated

3.3.1 Measure of total factor productivity

There are two main directions for measuring TFP in the literature: the non-parametric approaches which include Data Envelopment Analysis (DEA) and TFP index; and the parametric approaches which include Stochastic Frontier Analysis (SFA) and estimation of the production function.

Different studies have tried to estimate TFP using these various statistical techniques. However, due to certain limitations of these techniques, such as the assumption of constant returns to scale and perfect market conditions, the semi-parametric approach, such as the Levinsohn–Petrin (L-P) approach, has become popular over the years to estimate TFP compared to ordinary least squares (OLS) (Blalock and Gertler, 2004; Vial, 2006; Ghosh, 2009; Kato, 2009; Coricelli, Driffield, Pal and Rolland, 2012; Sharma, 2014).

Hasan (2002), Mendi (2007), Saliola and Şeker (2012), Doraszelski and Jaumandreu (2013), Leachman and Ray (2014), Voutsinas and Tsamadias (2014) measured total factor productivity (TFP) by estimating the Cobb-Douglas

production function using Levinsohn and Petrin's approach. Jajri (2007) utilized a more output oriented data envelopment analysis (DEA) method and Malmquist approach to estimate TFP and the determinants of TFP.

TFP is usually obtained from the estimated production function and is used to measure firm productivity. The index of relative TFP for each firm at time can be generally defined as follows:

$$\theta_{it} = \frac{Y_{it}}{\int(K_{it}, L_{it})} \quad (1)$$

Where Y_{it} is the output of firm *i* at time *t*, K_{it} is the capital input of firm *i* at time *t*, L_{it} is the labour input of firm *L* at time *t*, and $\theta_{it} = 1$ indicates the central tendency of TFP. If a firm's θ value is above 1, it indicates a high TFP relative to the other firms, whereas a value below 1 indicates a low TFP. Rearranging equation (1) as an equation of Y_{it}, we have:

$$Y_{it} = \int(K_{it}, L_{it})\, \theta_{it} \quad (2)$$

The next feature is the technology of production, which can be explained by use of different hypotheses. The Cobb-Douglas functions and the trans-logarithmic production are the two most commonly used methods. This study adopted the production technology following the Cobb–Douglas production functions due to its flexibility, algebraic tractability and good approximation of the production process (Reynès, 2017). Therefore, equation (2) can be written as follows:

$$Y_{it} = AK_{it}^{\alpha} L_{it}^{\beta} \theta_{it} \quad (3)$$

The TFP differences reflect shifts in output while holding all the inputs constant. Therefore, to come up with an output/input ratio that measures TFP, the individual inputs must be weighted appropriately when generating a single-dimensional input index. In this case, the Cobb–Douglas production function provided an easy and correct weighting. Transforming equation (3) into a linear expression by taking the logarithm of both sides, we have:

$$lnY_{it} = \ln A + \alpha lnK_{it} + \beta \ln L_{it} + \ln \theta_{it} \quad (4)$$

Assuming , we can rewrite equation 4 as:

$$lnY_{it} = \ln A + \alpha lnK_{it} + \beta \ln L_{it} + u_{it} \quad (5)$$

From equation (5), the natural logarithm of the total factor productivity index is equal to the residual term in the econometric production function. In practice, equation 5 can be estimated using Levinsohn and Petrin (2003) approach. The main idea behind Levinsohn and Petrin approach is that an intermediate input can be used as a control for the unobserved firm productivity characteristics, thus ensuring unbiased estimates of the production function. Levinsohn and Petrin

(2003) presented the production function in equation (5) as follows:

$$lnY_{it} = \ln A + \alpha lnK_{it} + \beta \ln L_{it} + \gamma \ln M_{it} + \omega_{it} + \varepsilon_{it} \quad (6)$$

Where:

ω_{it} is productivity and

ε_{it} is the unpredicted shocks. In equation (6), the residual μ_{it} was split into two elements, ω_{it} and ε_{it}. The intermediate input was also added as a freely variable input. The intermediate input's demand function is given as:

$$\ln M_{it} = \int M\ (\omega_{it}, lnK_{it}) \quad (7)$$

The intermediate inputs demand function must be monotonic in the firm productivity element for all relevant to qualify as a valid proxy. Levinsohn and Petrin (2003) assumed that input and output were common across firms and that demand function in equation (7) above has no error. Assuming monotonicity holds, the intermediate input's demand function can be inverted to yield as a function of capital and intermediate inputs:

$$\omega_{it} = \int \omega\ (\ln M_{it}, lnK_{it}) \quad (8)$$

Substituting equation (8) into equation (6), we can rewrite the production function as follows:

$$lnY_{it} = \beta \ln L_{it} + \varphi(\ln M_{it}, lnK_{it}) + \varepsilon_{it} \quad (9)$$

Where

$$\varphi(\ln M_{it}, lnK_{it}) = \ln A + \gamma \ln M_{it} + \int \omega\ (\ln M_{it}, lnK_{it}) \quad (10)$$

Equation (9) can be used to estimate β the labour coefficient, but not the other capital and intermediate inputs parameters. The estimation of β is reasonable since the function $\varphi(lnM_{it}, lnK_{it})$ controls for unobserved productivity. Another important assumption is that productivity follows a Markov process. Accordingly, ω_{it} can be written as:

$$\omega_{it} = E[\omega t - 1] + \xi_{it} \quad (11)$$

Substituting equation 10 into equation (6), we get:

$$lnY_{it} = \ln A + \alpha lnK_{it} + \beta \ln L_{it} + \gamma \ln M_{it} + E[\omega t - 1] + \xi_{it} + \varepsilon_{it} \quad (12)$$

We can write equation (12) as:

$$\ln Y_{it}^{*} = \alpha lnK_{it} + \gamma \ln M_{it} + E[\omega t - 1] + \eta_{it}^{*} \quad (13)$$

Where

$$\ln Y_{it}^{*} = lnY_{it} - \beta \ln L_{it} \text{ and } \eta_{it}^{*} = \xi_{it} + \varepsilon_{it} \quad (14)$$

In equation (14), the term η^*_{it} was assumed to be uncorrelated with lnK_{it}, but this generally does not hold for the case of lnM_{it}. Therefore, to facilitate calculation, the assumption that η^*_{it} is uncorrelated with $lnM_{i(t-1)}$ was used. Then, the equation (13) will produce consistent estimates of the coefficients α and γ. Furthermore, parameter β was obtained from equation (9) in a previous step. Therefore, once consistent estimates of parameters α, β, and γ of the production function in equation (6) are determined, we are able to consistently estimate the firm-level TFP as a residual. From the discussion, it is evident that the Levinsohn and Petrin (2003) method requires variables such as output, labour, capital, intermediate inputs (raw materials).

Adding intermediate materials to the Cobb-Douglas function presented in equation (3) gives:

$$Y_{it} = AK_{it}^{\alpha_1} L_{it}^{\alpha_2} M_{it}^{\alpha_3} \quad (15)$$

Equation (15) presents the specification of the standard Cobb-Douglas production function, and gives a relationship between output Y_i, and the factors of production capital , labour , and intermediate goods for a particular firm *i (*Saliola and Seker, 2011). Intermediate goods are included in order to reduce endogeneity between the inputs and the error term. It corrects for potential correlation between the inputs and the unobserved firms specific characteristics (the error term). This can be explained in circumstances where firms may respond to large positive productivity shocks by using more inputs (Levinsohn and Petrin, 2003).

All variables in the Cobb-Douglas specification are expressed as logarithms, and the resulting coefficients of each of the inputs represents the elasticity of labour, capital and intermediate materials to production (equation 16).

$$y_i = \alpha + \alpha_1 L_i + \alpha_2 K_i + \alpha_3 M_i + \varepsilon_i \quad (16)$$

$$TFP_i = \varepsilon_i = y_i - \hat{\alpha} - \hat{\alpha}_1 L_i - \hat{\alpha}_2 K_i - \hat{\alpha}_3 M_i \quad (17)$$

Finally, equation (17) demonstrates that in the Cobb-Douglas production function, total factor productivity of a particular firm can be calculated as the residual term of the production function specified in equation (16).

With the firm TFP having been estimated from equation (18), the relationship between business environment and productivity was estimated using OLS. TFP was the dependent variable while business environment indicators were used as regressors, with other variables that could explain productivity gap.

$$TFP_i = \hat{\beta}_0 + \hat{\beta}_1 Water_i + \hat{\beta}_2 Credit_i + \hat{\beta}_3 computer_i + \hat{\beta}_4 Electricity_i + \hat{\beta}_5 state\ of\ roads_i + \hat{\beta}_6 Bus\_age_i + \hat{\beta}_7 Market\_outlet_i + \hat{\beta}_8 Training_i + \hat{\beta}_9 Research\_dev_i + \hat{\beta}_{10} Bus\_size_i + \hat{\beta}_8 Educ_i + \hat{\beta}_9 Ownership_i + \hat{\beta}_{10\_} Gender_i + \varepsilon_i \quad (18)$$

The description of the variables used in the estimation of equations (17) and (18) is presented in Tables 3.1 and 3.2.

Table 3.1: Description of independent variables used in the regression equation

Variable	Description	Measurement
Business environment		
Water	Dummy variable, indicates whether an enterprise has access to water	If the business had access to water, zero otherwise
Credit	Dummy variable, indicates whether a business has access to credit	If the business had access to credit, zero otherwise
Computer	Dummy variable, indicating whether a business has a computer	If the business has access to computer for official uses, 0 otherwise
Electricity	Dummy variable, indicating whether a business has access to electricity	If the business had access to electricity, zero otherwise
State of roads	Categorical variable showing the state of the roads, whether good, fair or bad	A categorical variable showing state of roads, 1-bad, 2-fair, 3-good
Firm characteristics		
Business age	It is a measure of how long a business has been in operation	It was measured in years as a difference between when the business was established and the year of the survey
Market	The main customer of the business	It was measured as a dummy: 1 if the business sells to the other business and zero otherwise
Research and development	This is the amount of money (Ksh) that the business spends on research and development. It includes process and product innovation	It was measured in Ksh as the amount the business spent on research and development.

Business size	This was measured by number of employees working for the enterprise	Business size was measured as a categorical variable: 1 represents micro business (0–9 employees), 2 small businesses (10–49 employees) and 3 medium businesses (50–99 employees)
Ownership	It refers to the nature of the ownership of the business	It was measured as a dummy variable with 1 as sole proprietorship and zero otherwise
Education	The highest level of education of the business owner, co-owner(s) or manager	Education was measured as a categorical variable: 0 was used to represent those with no education, 1 primary, 2 secondary and 3 post-secondary
Entrepreneur characteristics		
Gender	The sex of the business owner(s)	It was measured as a dummy: 1 if male and zero otherwise
Training	Dummy variable showing whether employees have received training in the last six years	1 if training was received and zero otherwise

Source: Author's illustration

Table 3.2: Description of independent variables used in the production function

Labour	The total number of workers in a business	It was measured as total number of employees working in a business
Output	The total amount of goods produced by a firm	Following several studies, it was proxied by total sales of a business
Capital	These are the physical and financial assets that a business uses to produce goods and services for sale	It was measured as the initial capital plus the added capital in a firm
Intermediate inputs	The raw materials and inputs used in the production process	It was measured as the value of a firm's inputs and raw material

Source: Author's illustration

3.4 Data Source

The study used secondary data collected by the Kenya National Bureau of Statistics (KNBS) on Medium, Small and Micro Enterprises (MSMEs) in 2016 at national and county levels. The sample size was 24,164 enterprises. Among this, 17,895 businesses are not registered (informal enterprises) and 6,269 are registered (formal enterprises). The unit of observation was the establishment and the survey targeted those firms that engaged at most 99 persons. This survey used household-based approach and also interviewed businesses identified from business registers maintained by county governments. The survey was cross-sectional and was designed to provide estimates at national and county levels. The survey design was a representative probability sample that aimed at producing estimates at national, counties and urban and rural residence (for unlicensed businesses only). The survey covers firms that were registered (formal) and those that were not registered (informal), which formed the basis of the analysis.

The survey adopted a stratified random sampling method for the establishment-based sample in which a systematic random sample of establishments was drawn using equal probability selection method. For the household-based sample, a two-stage stratified cluster sampling design was used where the first stage involved selection of 600 clusters (354 in rural and 246 in urban areas) with equal probability. In the second stage, a uniform random sample of 24 firms in each cluster was selected using systematic random sampling method (KNBS, 2016).

4. Results

From the data set a total of 14,377 enterprises were interviewed, which were not registered by the Registrar of Companies, hence were considered as informal enterprises. Out of these informal enterprises, 2,330 enterprises were in the manufacturing sector. Data cleaning was then done to remove the inconsistent values in each of the variables included in the study. This resulted into 1,044 valid observations. The manufacturing sector had 13 different sub-sectors out of which we selected 5 sub-sectors which had large observations (at least 60 observations). These were manufacture of wearing apparel, manufacture of furniture, manufacture of food products, manufacture of fabricated metal products and manufacture of wood and wood products and articles of straw and plaiting materials.

Table 4.1: Distribution of sub-sectors in the manufacturing sector

	Manufacturing sub sectors	Frequency	Percent
1	Manufacture of wearing apparel	370	35.44
2	Manufacture of furniture	206	19.73
3	Manufacture of food products	203	19.44
4	Manufacture of fabricated metal products, except machinery and equipment	157	15.04
5	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	62	5.94
6	Manufacture of textiles	16	1.53
7	Repair and installation of machinery and equipment	10	0.96
8	Manufacture of leather and related products	9	0.86
9	Printing and reproduction of recorded media	5	0.48
10	Other manufacturing	3	0.29
11	Manufacture of beverages	1	0.1
12	Manufacture of chemicals and chemical products	1	0.1
13	Manufacture of basic metals	1	0.1
	Total	1,044	100

Source: Author's computation

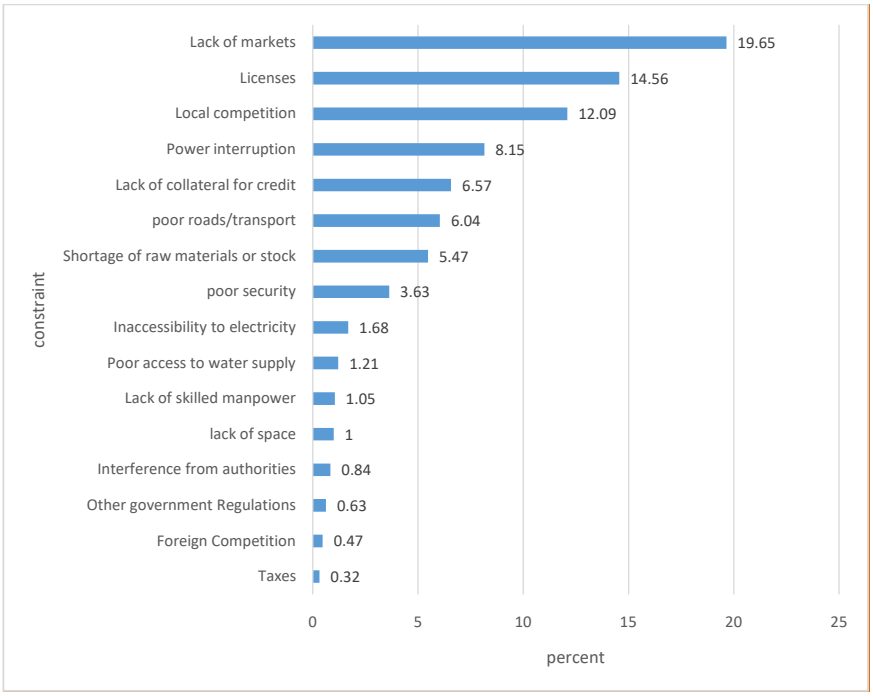
From this survey, enterprises were provided with a list of constraints they experience while running their business and further they were asked to choose

the main constraint they had experienced in the last one year. The obstacles included were: lack of collateral for credit, interference from authorities, licenses, taxes, other government regulations, lack of markets, poor roads/transport, local competition, foreign competition, lack of skilled manpower, shortage of raw materials or stock, power interruption, inaccessibility to electricity, poor access to water supply, poor security and lack of space.

Lack of markets was the top constraint, pointed out by 19.7 per cent of firms surveyed. This was followed by licenses at 14.56 per cent, local competition (12.09%) and power interruption (8.15%). As seen in the figure below, lack of collateral was also cited as a major constraint faced by businesses (6.57%). 6.4 per cent reported poor roads/transport as a stumbling block to their businesses. Insecurity was another challenge that businesses reported, with 3.63 per cent of the businesses reporting this as the top constraint. Also, shortage of raw material was reported to be a main problem experienced by businesses (5.47%).

Inaccessibility to electricity and poor access to water supply was also a severe stumbling block for 1.68 per cent and 1.21 per cent of firms, respectively. Another main constraint experienced by businesses was lack of skilled manpower (1.05%).

Figure 4.1: Main constraint experienced by enterprises in the last one year



About 1 per cent of the businesses identified lack of space as a key obstacle. The other hindrances reported were interference from government authorities (0.84%), other government regulations (0.63%), foreign competition (0.47%) and taxes (0.32%).

4.1 Descriptive Statistics of Variables used in the Regression Model

In the manufacturing sector, 30 per cent of enterprises that were operating in the manufacturing fabricated materials had access to credit. The figure for those in the food product was 32 per cent. Those businesses that were manufacturing wearing apparel had 35 per cent having access to credit. This figure compared closely to enterprises that were manufacture of furniture whose 37 per cent of the businesses had access to credit. Businesses that were manufacturing wood and wood products had a higher access to credit than these other sub-sectors (43%). The descriptive statistics are presented in Tables 4.2 to 4.4.

Access to water was generally low in all sub-sectors as compared to credit. Only 4 per cent of the businesses that were manufacturing fabricated materials had access to water. In the food products sub-sector, only 1 per cent of the enterprises had access to water, which is a crucial asset in the food industry. Three (3) per cent of businesses in the furniture sub-sector had access to water and two percent of the enterprises manufacturing wearing apparel had access to this utility. Businesses that were manufacturing wood and wood products also had low access to water, with only three (3) per cent having reported they have access to water.

In the five sub-sectors, access to electricity was generally high. Enterprises in the manufacture of fabricated materials, food product, furniture,wearing apparel and wood and wood products sub-sector had access to electricity at 98, 56, 77, 75 and 80 per cent, respectively. Access to computer was very low in all the sub-sectors (less than 1%).

Descriptive statistics also show that, on average, businesses in the five sub-sectors have been operating, on average, for between 9 to 11 years and most of these businesses were sole proprietorship. Enterprises in the fabricated material sub-sector and furniture train their employees more as compared to food, wearing apparel and wood and wood product sub-sector. Specifically, those businesses were manufacturing fabricated materials at 12 per cent of their employees while those in furniture sub-sector had 10 per cent reporting to have trained their employees. Most businesses in these five sub-sectors sell their products to SMEs (more than 90%) compared to individual consumers. On average, businesses were spending low on research and development (less than Ksh 500 per month) and some businesses reported as low as zero expenditure on research and development.

Table 4.2: Descriptive statistics for enterprises in the manufacture of fabricated materials and manufacture of food product sub-sectors

	Manufacture of fabricated materials						Manufacture of food products				
Variable	**Obs**	**Mean**	**Std. Dev.**	**Min**	**Max**		**Obs**	**Mean**	**Std. Dev.**	**Min**	**Max**
Business environment											
Access to credit	157	0.31	0.46	0	1		203	0.33	0.47	0	1
Access to water	157	0.04	0.21	0	1		203	0.01	0.12	0	1
Access to electricity	157	0.99	0.11	0	1		203	0.56	0.50	0	1
Access to computer	157	0.01	0.08	0	1		203	0.00	0.07	0	1
State of roads	157	1.00	0.77	0	2		203	1.31	0.74	0	2
Training/skills	157	0.12	0.33	0	1		203	0.02	0.16	0	1
Entrepreneur characteristics											
Education of owner	157	1.60	0.98	0	3		203	1.62	0.95	0	3
Gender	157	0.98	0.14	0	1		203	0.67	0.47	0	1
Firm characteristic											
Age of business	157	9.18	6.12	1	34		203	9.05	7.39	1	49
Market outlet	157	0.90	0.30	0	1		203	0.94	0.25	0	1
Research & development	156	106.54	703.97	0	6120		203	271.03	1,836.39	0	15,000
Business size	157	0.04	0.22	0	2		203	0.03	0.20	0	2
Ownership structure	157	0.93	0.26	0	1		203	0.96	0.20	0	1

Source: Author's calculation

Table 4.3: Descriptive statistics for enterprises in the manufacture of furniture and wearing apparel

	Manufacture of furniture						Manufacture of wearing apparel				
Variable	Obs	Mean	Std. Dev.	Min	Max		Obs	Mean	Std. Dev.	Min	Max
Business environment											
Access to credit	206	0.38	0.49	0	1		370	0.35	0.48	0	1
Access to water	206	0.04	0.19	0	1		370	0.02	0.15	0	1
Access to electricity	206	0.77	0.42	0	1		370	0.75	0.43	0	1
Access to computer	206	0.00	0.00	0	0		370	0.01	0.07	0	1
State of roads	206	1.01	0.77	0	2		370	0.98	0.82	0	2
Training/skills	206	0.10	0.30	0	1		370	0.04	0.20	0	1

Entrepreneur characteristics											
Education of owner	206	1.43	0.89	0	3		370	1.42	0.86	0	3
Gender	206	0.99	0.12	0	1		370	0.32	0.47	0	1
Firm characteristics											
Market outlet	206	0.92	0.28	0	1		370	0.94	0.24	0	1
Research & development	205	125.12	986.66	0	10500		370	30.61	209.56	0	3000
Business size	206	0.01	0.12	0	1		370	0.01	0.13	0	2
Age of business	206	11.41	8.26	2	41		370	10.63	8.33	1	71
Ownership structure	206	0.91	0.28	0	1		370	0.92	0.27	0	1

Source: Author's calculation

Table 4.4: Descriptive statistics for enterprises in the manufacture of wood products sub-sector

Manufacture of Wood and wood products					
Variable	Obs	Mean	Std. Dev.	Min	Max
Business environment					
Access to credit	62	0.4355	0.4999	0	1
Access to water	62	0.0323	0.1781	0	1
Access to electricity	62	0.8065	0.3983	0	1
Access to computer	62	0.0161	0.1270	0	1
State of roads	62	0.7419	0.8285	0	2
Training /skills	62	0.0484	0.2163	0	1
Entrepreneur characteristics					
Education of owner	62	1.5806	0.8971	0	3
Gender	62	0.9355	0.2477	0	1
Firm characteristics					
Age of business	62	10.3065	5.9934	2	26
Market outlet	62	0.9839	0.1270	0	1
Research&development	61	210.2459	823.2732	0	6000
Ownership structure	62	0.9355	0.2477	0	1
Business size	62	0.0806	0.3289	0	2

Source: Author's calculation

4.2 Results from Cobb-Douglas Production Function

Table 4.5 shows that all the coefficients of labour, capital and intermediate inputs are positive and significant, with the exception of the capital coefficient in the food products industry, which is negative and weakly significant. Felipe and Adams (2005) and Wexler and Loecker (2016) attribute this to the measurement errors in the inputs. The coefficient of labour is highest in the manufacture of wearing apparels with a coefficient of 0.58, while the coefficient of capital is highest in the manufacture of fabricated materials with a coefficient of 0.20. The coefficient of intermediate inputs is highest in the manufacture of furniture with a coefficient of 0.52. These results imply that manufacture of wearing apparels is the most labour-intensive; the manufacture of fabricated metals is the most capital-intensive while the manufacture of furniture consumes the largest share of inputs and raw materials (intermediate inputs). With the exception of manufacture of furniture, all the sectors have their largest shares of labour input. This implies that most sectors are labour-intensive

Table 4.5: Results of the Cobb-Douglas production function

Sector	Labour	Capital	Intermediate inputs	No. of firms
Wearing apparels	0.58*** (0.04)	0.11*** (0.03)	0.30*** (0.03)	370
Furniture	0.38*** (0.06)	0.10** (0.04)	0.52*** (0.06)	206
Food products	0.63*** (0.07)	(0.09)* (0.05)	0.46*** (0.05)	203
Fabricated products	0.43*** (0.07)	0.20*** (0.06)	0.37*** (0.05)	157
Wood and wood products except furniture	0.55*** (0.11)	0.19** (0.03)	0.25*** (0.08)	62

Source: Author's calculation

Having estimated the production function, regression analysis was carried out to find out the determinants of TFP in the five manufacturing sub-sectors. The results are presented in Table 4.6.

Table 4.6: Regression results for determinants of productivity in the informal manufacturing sub-sectors

Manufacturing sub-sectors	**Fabricated material**	**Food products**	**Furniture**	**Wearing apparel**	**Wood and wood products**
	Coeff. (std. error)	Coeff. (std. error)	Coeff. (std. error)	Coeff. (std. error)	Coeff. (std. error)
1. **Business environment indicators**					
Access to water	0.37 (0.29)	-0.46 (0.54)	-0.22 (0.33)	0.79*** (0.25)	1.11*** (0.25)
Access to electricity	0.14 (0.19)	0.53*** (0.15)	-0.05 (0.72)	0.18* (0.09)	-0.33 (0.26)
Access to computer	-0.04 (0.13)	1.23 *** (0.17)	0.00	0.48 (0.30)	2.76*** (0.37)
State of roads					
Fair	-0.03 (0.23)	0.15 (0.17)	-0.05 (0.15)	-0.08 (0.10)	0.18 (0.20)
Bad	0.11 (0.19)	-0.22 (0.16)	-0.23 (0.15)	0.05 (0.10)	0.18 (0.27)
Training	0.63*** (0.17)	1.19 (0.90)	0.03 (0.22)	-0.16 (0.27)	1.13 (0.94)
Access to credit	0.45 (0.35)	0.21 (0.16)	0.11 (0.25)	0.14 (0.17)	-0.26 (0.39)
2. Entrepreneur characteristics					
Education					
Primary	0.03 (0.28)	-0.06 (0.79)	0.18 (0.17)	-0.24* (0.14)	0.82** (0.33)
Secondary	-0.05 (0.27)	0.03 (0.20)	0.20 (0.20)	-0.10 (0.18)	0.85*** (0.29)
Post-secondary	0.22 (0.30)	-0.14 (0.21)	0.18 (0.19)	-0.13 (0.16)	0.88** (0.32)
Gender	-0.08	0.04 (0.14)	-0.02 (0.65)	0.18* (0.10)	-0.06 (0.26)
3. Firm characteristics					
Age of the business	0.03*** (0.01)	-0.01 (0.01)	0.00 (0.01)	0.01 (0.01)	0.00 (0.02)

Market outlet	-0.05	-0.35	0.07	-0.11	-1.98***
		(0.22)	(0.25)	(0.17)	(0.20)
Research & development	0.00 **	0.00***	0.00	0.00*	0.00***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Business size					
Small	-0.54	0.19	0.46***	-0.37*	-0.03
		(1.18)	(0.14)	(0.19)	(0.34)
Medium	-2.19****	-1.09	---	-1.63***	-2.38***
	(0.27)	(2.10)		(0.45)	(0.33)
Ownership	0.09	-0.12	-0.12	0.12	0.23
	(0.34)	(0.19)	(0.24)	(0.20)	(0.25)
4. Interaction variables					
Business size*credit	0.53	0.43	-1.05**	0.00	0.00***
	(0.50)	(1.08)	(0.54)	(0.00)	(0.00)
Business size*market	1.03**	-0.67	0.00	0.23	0.00***
	(0.51)	(1.05)		(0.21)	(0.00)
Business age * credit	-0.05	0.03	-0.01	0.00	0.02
	(0.03)	(0.20)	(0.02)	(0.01)	(0.03)
Constant	-0.08*	0.38**	0.09*	-0.07**	1.17**
	(0.65)	(0.29)	(0.78)	(0.27)	(0.51)

Source: Author's computation

Notes: Standard errors are in brackets

The coefficient of water was positive and significant in wearing apparel and wood and wood products. This implies that firms with access to piped water had higher productivity than those that did not. Specifically, a firm in the manufacture of wearing apparel sector with access to piped water had a productivity of 0.79 higher than firms in the same sector without access to this facility. However, firms with access to piped water in the manufacture of wood and wood products had a productivity of 1.11 lower than firms in the same sector but without access to piped water. Although this finding is in contradiction to the expectations, it is in line with Augier, Dovis and Gasiorek who found a negative relationship between water shortage and productivity on manufacturing firms in Morocco.

The coefficient of access to electricity was positive and significant in the food products and in the wearing apparel sub-sectors. Firms that had access to electricity in the manufacturing food products had a productivity of 0.53 higher than those without access to electricity and were in the same sub-sector. Similarly, firms with access to electricity in the wearing apparel sub-sector had a productivity of 0.18 higher than those without access to electricity. This finding was contrary to Giang

et al . (2018) whose study did not find any significant relationship between access to electricity and productivity. However, the current findings were inconsistent with Nguimkeu (2013), whose study established a negative and significant relationship between lack of access to electricity and firm productivity in Cameroon.

Firms with access to computers in the food products sub-sector had a productivity of 1.23 higher than similar firms, but without access to computers. Similarly, firms in the manufacture of wood and wood products (except furniture) had a productivity of 2.76 higher than those without access to these services. Surprisingly, Giang et al. (2018) found a negative and significant relationship between access to internet and productivity.

The coefficient of training was positive and significant in the manufacture of fabricated materials sub-sector. Firms which had accessed training in the last three years had a higher productivity by 0.63 compared to those in the same sector which had not. This is consistent with Taymaz (2010) who found that higher education, better training and export/institution market improve productivity of a firm. However, Giang et al. (2018) did not find a significant relationship between training and productivity.

The coefficient of education was negative but weakly significant in the manufacture of wearing apparel for those with primary education. This category had a productivity of 0.24 lower than those without any education. This can be possibly attributed to more experience for those without any education. However, the coefficient of education was positive and significant across all the three levels of education in wood and wood product sub-sectors. The size of the coefficient increased as education level increased. Specifically, those with primary, secondary and post-secondary education had a productivity of 0.82, 0.85 and 0.88, respectively, higher than those without any education.

The coefficient of gender was positive but weakly significant in the manufacture of wearing apparel. This implies that men in this sub-sector had a higher productivity by 0.18 compared to women. This was consistent with Sabarwar and Terrer (2008) who found a gender gap differential of 4.1 per cent, which was statistically significant at five per cent level. Pfeifer and Wagner (2013) found similar results. This finding can be attributed to the fact that male workers have a higher probability of being in work, lower probability of layoff due to longer tenure, more human capital investment, taste-based statistical discrepancy and that they are the main provider to the household income. However, Infante et al. (2014) found that participation of female managers improves productivity of manufacturing firms in North West regions of Italy. Bruhn (2009) found gender productivity differentials in micro and small enterprises and not medium and large enterprises. Wong et al. (2017) failed to find any significant effect of gender on productivity. Gaitan,

Herera and Pablo (2017) also found a positive relationship between gender and productivity. Taymaz (2010) failed to find any significant relationship between gender and productivity.

The coefficient of age was positive and significant only in the manufacture of fabricated materials sub-sector. Increase in firm's age by one year in this sector was found to increase productivity by 0.03. These results are in contrast with Giang et al. (2018) who found that older firms were less productive than young firms by 11 per cent. Lasagni, Nifo and Vecchione (2015) found the coefficient to be positive and negative in some sectors.

The coefficient of market outlet was negative and highly significant in the manufacture of wood and wood products. Firms that sell to individual consumers were found to have a productivity of 1.98 lower than firms that sell to MSMEs.

The coefficient of research and development was found to be positive and significant in four of the five sectors. The coefficient was not significant in the furniture sub-sector. However, the coefficient was very small. This indicates that research and development is critical in improving productivity, although firms spend minimal amounts on it. This finding was in line with Blanco and Prieger (2016) who found that research and development expenditure had a positive significant long-run effect on TFP. Other studies that have also found a positive relationship between R&D and productivity are Doraszelski and Jaumandreu (2013), Leachman and Ray (2014), and Voutsinas and Tsamadias (2014).

Small businesses in the manufacture of furniture had a productivity of 0.46 higher than micro businesses. However, small firms in the manufacture of wearing apparel had a productivity of 0.37 lower than micro firms in the same sector. However, for fabricated materials, wearing apparel and wood and wood products, medium businesses had a productivity of 2.19, 1.63 and 2.38, respectively, less than micro businesses. With the exception of the coefficient of small businesses in the furniture businesses, all the other coefficients were negative and significant. This implies that micro businesses have a higher productivity than small and medium businesses.

These results are consistent with Satpathy, Chaterjee and Mahakud (2017). Similarly, Williamson (1967), Tornatzky and Fleischer (1990) and Utterback (1994) found that smaller firms have higher productivity due to their efficiency. Diaz and Sanchez (2008) found an inverse relationship between firm size and productivity. However, Eiffert, Gelb and Ramachandran (2005) found that large and exporting firms have higher productivity than small and non-exporting ones. Lee and Tang (2001), Biesebroeck (2005) and Lopez (2015) found a positive relationship between the size of the firm and TFP. They attribute this to learning

by doing effects of the large companies. Lundvall and Battesse (2000) and Biesebroeck (2005) attribute this to the use of better technology by larger firms.

Results from interacting the variables

Turning to interaction variables, small and medium firms with access to credit in the furniture were found to have lower productivity than small and medium business without access to credit. These results may suggest that most of the firms in the informal sector did not access credit, and those that had access to credit did so at high cost, which is consistent with literature on access to credit in the informal sector. The coefficient of interaction term between business size and credit was positive and significant but very small in the manufacture of wood and wood products.

The coefficient of the interaction term between business size and market was positive and significant in the manufacture of fabricated materials and the manufacture of wood and wood products. This indicates that small and medium businesses that sell to individual consumers have a higher productivity than micro businesses that sell to the consumers. This indicates that size matters for productivity, regardless of the market that the firm sells.

The coefficients of credit, access to roads, ownership and the interaction between business size and credit were insignificant determinants of productivity in each of the sub-sector. Moreno-Badia and Slootmaekers (2009) and Gasiorek, Davis and Augier (2010) did not find any significant relationship between credit and sectoral productivity. However, Gatti and Love (2008) found a positive relationship between credit and productivity in Bulgaria. Similarly, Essmui et al. (2014) and Giang et al. (2018) found that improved access to finance and productivity are positively related. Gaitan, Herera and Pablo (2017) found that businesses owned by sole proprietors have higher productivity than ones owned by shareholders.

5. Summary, Conclusion and Policy Recommendations

The informal economy is the lifeblood of many economies today, especially is Sub-Saharan Africa. According to Kenya national statistics, the sector is a key source of employment especially for the young people. Currently, the informal economy has also demonstrated entrepreneurship, flexibility and also supplies local supply chains. The sector is also large and dynamic. This sector has been found to be crucial in terms of job creation compared to the formal sector.

However, despite its importance, the sector has been generally proven to be less productive than the formal sector. One of the underlying reasons behind low productivity of the sector is the poor business environment, which directly affects business performance. Example of the business environment factors that have impacted on businesses include lack of collateral for credit, interference from authorities, licenses, taxes, other government regulations, lack of markets, poor roads/transport, local competition, foreign competition, lack of skilled manpower, shortage of raw materials or stock, power interruption, inaccessibility to electricity, poor access to water supply, poor security and lack of space.

This study, therefore, sought to understand how these factors affects the productivity of business in the informal sector, specifically among manufacturing firms. TFP was estimated by use of Cobb-Douglas production function and was used as the dependent variable to estimate the effect of business environment and other firm and entrepreneur characteristics on enterprise productivity using OLS. The study concentrated on five sub-sectors in the manufacturing sector that were well represented in the survey data (fabricated material, food products, furniture, wearing apparel and wood and wood products sub-sector).

From the results, business environment variables had a significant effect on productivity of manufacturing firms. Access to water was a significant determinant of productivity especially for those businesses that were manufacturing wearing apparel and wood and wood products. Access to electricity had a positive and significant influence on productivity for those businesses that were engaged in the manufacture of food products and wearing apparels. Firms that had access to electricity and were manufacturing food products had a productivity of 0.53 higher than their counterparts without access to electricity. Similarly, firms with access to electricity in the wearing apparel sub-sector had a productivity of 0.18 higher than those without access to electricity.

Access to computer was another important determinant of productivity. Firms with access to computer in the food products sub-sector had a productivity of 1.23 higher those without access to computer in the same sub-sector. Similarly,

firms in the manufacture of wood and wood products had a productivity of 2.76 higher than those without access to computer. The coefficient of training was also positive and significant in the manufacture of fabricated materials sub-sector. Firms which had accessed to training had a higher productivity by 0.63 compared to those in the same sector which had not received any training.

Other factors that were found to be significant in explaining the productivity of the informal sector were the nature of the ownership of the business, size of the firm, gender of the main decision maker, education of the manager/owner of the enterprise, expenditure on research and development, age of business and market/main customer of the business.

These results have an implication on how business environment can have a negative effect indirectly on the performance of businesses in the informal sector. Therefore, this study recommends the following:

- The results confirm that business environment have a significant effect on firm productivity. This means that the current emphasis by the government on sparking Kenya's manufacturing sector to generate more jobs and drive economic growth is unlikely to succeed if they overlook the importance of business environment, which has an influence on performance of businesses. The findings of this study also show the relevance of the current debate on creating an enabling environment for businesses.
- Businesses with access to electricity were found to be more productive than those without. This calls for increased distribution of electricity especially for access by informal sector businesses. This will allow many businesses to use the utility and increase their productivity.
- Training has an influence on productivity. This emphasizes on the importance of skills in improving productivity in the informal sector. Therefore, there is need for policy makers to come up with a framework for training entrepreneurs in the informal sector and to encourage firms to train their workers. This can be done for example by decentralizing training centres in different regions in the country.
- Gender was also proven to be a key determinant of productivity. Male entrepreneurs were more productive in the informal sector than their counterparts. Given that a significant number of workers in the informal sector are women, this finding calls for renewed attention from policy makers to bridge this gender gap in the informal sector. There is need to abolish any social norms that could be limiting the performance of women in the informal sector through the existing and new institutions that focus on gender issues.

- Moreover, access to credit has a significant effect on firm productivity. This therefore necessitate for efforts from policy makers to encourage business people to take credit by relaxing some of the minimum requirements for accessing credit, such as collateral. This will strengthen the recent move of launching of Biashara Kenya Fund which aims at easing credit access.
- Spending on research and development was found to be positively related with productivity. This calls for business to set aside some amount for research and development. Alternatively, the government can develop a kitty and provide intellectual property rights (IPR) to innovators to encourage the businesses to make new or improved products. This will see the productivity of the informal sector rise.

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