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Firm Level Determinants of Investment in the Kenyan Manufacturing Firm

Augustus S. Muluvi
Kenya Institute for Public Policy Research and Analysis (Kippra)
P.O.Box. 56445-00200, Nairobi, Kenya

Abstract: This study uses firm level data to investigate the investment behavior in the Kenyan manufacturing firms. Using Probit and Tobit regression models the results shows that factors determining the decision to invest are different from those determining the share invested. Overall the results shows low levels of investment by Kenyan manufacturing firms and the importance of firm level data in explaining the investment behavior. On the policy front the study observes the role of government in the provision of stable macroeconomic policies, affordable credit and basic infrastructure in order to attract investment in this sector.

Key words: Competitiveness and business environment factors, investment behavior, investment intensity, propensity to invest

INTRODUCTION

It is known from economic development of newly industrialized countries (NIC) in East Asia that until a certain stage of maturity is reached, growth is driven largely by industrialization. In most other countries as well, the need for a buoyant manufacturing sector is acknowledged to be an important means to increase overall welfare (Isaksson, 2002). Manufacturing is considered instrumental for economic growth and development. The special interest in manufacturing stems from the fact that this sector is among other positive effect on the investment behavior things, a dynamic engine of modernization and accelerated growth, a creator of jobs and a generator of several positive spillover-effects (Tybout, 2000).

In spite of its importance, the development of manufacturing sector in sub-Saharan Africa (SSA) has seriously stagnated except in several countries in recent times. The share of manufacturing in value added in Gross Domestic Product (GDP) in SSA is 13% which is the lowest share in the world paralleling South Asia (Fukunishi, 2004). Like many other countries in the sub-Saharan Africa (SSA), the Kenyan economy remains predominantly agricultural. Industrialization, however, has been an integral part of the country's development strategies both in the colonial and post-colonial period.

While Kenya inherited a relatively well established industrial sector in the region, the sector's overall performance has been rather poor for most of the post-independence period with the exception of the period 1963 and 1972 when it registered an annual average growth rate of above 10% (Ikiara *et al*., 2005). Despite a shift from import substitution to export promotion since the mid-1980s, and reforming the policy environment under the SAPs, the performance of the manufacturing sector in Kenya remained poor in most of the 1980s and 1990s in its contribution to GDP, growth of output and the creation of employment and linkages with other sectors of the economy.

Between 1964 and 1971 gross fixed capital formation grew by 17.2% per year in constant prices. The global recession in the early 1980s plus a coup attempt in 1982 further reduced incentives to invest. Several MNCs actually withdrew or sold off their investments in Kenya in the late 1980s. The structural adjustment efforts from the early 1980s gradually changed the economic environment but this did not go far in improving the investment position (Bigsten *et al*., 1998). The Kenyan manufacturing sector in general suffers from low value added, low investment in equipment and machinery, low relative employment and relatively high wages. The sector has very small capital and industrial goods component and depends heavily on imported raw materials, capital goods and spare parts. Consequently, local linkages between and among industries are weak and generate requisite growth and employment synergy (Kimuyu, 1999). The Kenyan economy performed well between 2003 and 2007, this coupled with improved power supply, increased supply of agricultural products for agro processing, favorable tax reforms, rigorous export promotion and liberal trade incentives led to a modest expansion of the sector, from 1.2% in 2003 to 1.4% in 2004. During this period the sector contributed 13% to GDP (CBS, 2005).

The importance of investment in manufacturing sector cannot be overlooked. It has long been argued that fixed capital formation, or investment, is crucial in increasing the competitiveness of the manufacturing

sector in the world market. This is crucial in increasing the exports of manufactured goods. It is in this view that this study seeks to investigate further the investment behavior of Kenyan manufacturing firms in order to understand more on what ails the sector. Specifically the study seeks identify the firm level determinants of the decision to invest and the share invested. The study is guided by the hypothesis that firm level characteristics and business environment factors have a of the firm.

MATERIALS AND METHODS

The neo-classical investment model under perfect financial markets is considered here. Following standard theory, the model is based on the theory of adjustment costs.

Consider a price taking firm with a constant returns production function

$$Y_t = A_t F\{K_t L_t\} \tag{1}$$

where Y represents output, K denotes capital, L is employment, A represents total factor productivity, and t is time. In the absence of taxes, the firm's profit at time t is given b

$$\pi_t = p_t A_t F_t\{K_t L_t\} - G\{T, p^I_t\} \tag{2}$$

where p is the output price, I is investment, and G is an amalgam of the purchase price of capital, p^I, and adjustment costs. At any point in time the firm's objective is to maximize the sum of expected discounted profits:

$$\max_{L_t I_T} E_t \int_t^{\infty} e^{-r} \pi_t ds, \tag{3}$$

subject to the capital evolution constraint:

$$K_t = I_t S K_t \tag{4}$$

where r is the discount rate (assumed constant), t is the current time period, and δ is the geometric depreciation rate of capital. We assume a fairly flexible form for the adjustment cost function, allowing for non-convexities:

$$G\left(I_t, p^t\right) = B_t \frac{b_t}{1+b_t}\left(\frac{I_t}{S}\right)^{\frac{1+b_t}{b_t}} \left[p_t^I\right]^{\left\{1_{\{It>0\}}{}^{b_2+1\{It<0\}}{}^{b_3}\right\}} \Delta_t + 1_{\{I_t \not\in 0\}} .S.Z\Delta_t \tag{5}$$

where B_t and b_t are strictly positive parameters, $A_{(A)}$ is an indicator function equal to one if the event A is true and zero otherwise, b_2 and b_3 are parameters allowing for a price wedge between the purchase price and the selling price of capital goods, Δ_t is a (short) interval of time, S represents the size of the firm (which is treated as a constant, for simplicity), and Z is a 'flow' fixed cost.

The firm will invest if and only if there exists at least one investment level for which,

$$I_t . E_t \int_t^{\infty} \exp\{-(r+\delta)\} ds - G\left(I_t, P_t^I\right) > 0 \tag{6}$$

holds. Given that it is optimal to invest, the optimal level will satisfy the first order condition:

$$B_t\left(\frac{I_t}{S}\right)^{(I/b_t)}\left[p^I{}_t\right]^2 = E\int_t^{\infty} \exp\{-(r+\delta)\pi_{Kt} ds \tag{7}$$

for $I(_t)>0$. Eq. (7) determines the optimal level. We assume a Cobb-Douglas production function and utilize first order conditions for labor demand, and that expected future variables appearing in (7) can be written as:

$$E_t X(t+s) = X = X_t e^{E_t(g_{xt})^s}$$

where $E_t(g_{xt})$ is the expected growth rate of X={p,A,w}. Equation (7) can be written in log linear form:

$$\begin{aligned} \ln I_t &= a_0 a_1 \ln p_t^l + a_2 \ln p_{t+} a_3 \ln A_T - a_4 \ln w_t \\ &+ a_5 E_t g_t^p + a_6 E_t g_t^A - a_7 E_t g_t^w - a_8 r_t \end{aligned} \tag{8}$$

where α_0–α_8 are (positive) composites of the structural parameters.

One potentially strong assumption under which (8) has been derived is that economically viable investment projects can always be funded and that the cost of funds is independent of the source of financing. This makes investments independent of liquidity.

Besides the factors considered in (8), an augmented version of the accelerator model is estimated to allow for other firm level characteristics. The general formulation of the model employed can be written as

$$\Pr(I>0) = \Pr(X_1\theta + u_1>0)$$
(indicating the decision to invest) (9a)

$$1n = X_2\beta + u_2, iff\ I > 0$$

Z(indicating the investment expenditure) (9b)

Table 1: Investment/Capital ratio by size, sector and ownership

	Percentage of firms Investng in plant and equipment	Inv in PE/RIE ratio if firm invests firms	Inv in PE/RIE for all iand and buildings	Percentage ofFirms investngin firm invests	RatioIf all firms	In LB/RLB ratio for
Size						
Small firms (0-49)	27	0.37	0.11	23	0.27	0.6
Medium (50-99)	26	0.26	0.08	17	0.23	0.02
Large firms(100+)	47	0.31	0.12	25	0.25	0.02
Sector						
Food	51	0.23	0.06	22	0.28	0.12
Garments and textiles	38	0.21	0.03	16	0.26	0.41
Chemical and paints	35	0.16	0.02	12	0.12	0.07
Paper and publishing	28	0.11	0.08	17	0.12	0.08
Metal	29	0.81	0.05	17	0.18	0.11
Ownership						
Domestic	31	0.21	0.03	26	0.21	0.04
Foreign	40	0.36	0.04	11	0.18	0.02
All firms	35	0.22	0.11	18	0.19	0.05
No.of obs	73	37	73	37	23	37

PE/RPE: Investment in Plant and Equipment/ Replacement Value of Capital Stock of Plant and Equipment; LB/RLB: Inestment in Land and Building/Replacement Value of Capital Stock of Land and Building

LB/RLB: Investment in Land and Building/Replacement Value of Capital Stock of Land and Buildings Here, θ and β are parameter vectors, X_1 and X_2 are explanatory variables, and u_1 and u_2 are error terms, allowed to follow some bivariate distribution. Notice that the investment behavior is defined in two ways i.e. the decision to invest (propensity to invest) and the share invested (investment intensity) (Appendix).

For the decision to invest, the dependent variable is defined as a binary variable, taking a value of unity if the firm invested in the year 2009 and zero otherwise. The estimation proceeds by a probit regression and the sign of estimated coefficient represent the direction of the effect of independent variable on the probability of investing. For the investment expenditure, the dependent variable is the average rate of investment in plant and equipment and land and building i.e. the ratio of such investment to the value of the capital stock of the firm. Here the tobit estimator is used since the dependent variable is bonded between zero and one. The explanatory variables considered here include log size of the firm, log number of employees, productivity measured as value added, infrastructure investment proxied by log age and log age squared. Other factors considered include skill proxied by average wage, firm ownership, export status, sector, access to credit and variables to control for investment climate (transportation, trade and custom regulations, credit cost, electricity etc) expected to constraint investment (Table1, 2, 3).

Data sources: The analysis contained in this study is based on a sample cross-sectional data collected from 131 manufacturing firms located in Nairobi (Kenya) in 2009. The above data was supplemented by 2002/3 data from Regional Program Enterprise Development (RPED) based in the Africa Private Sector Group of the World Bank.

RESULTS AND DISCUSSION

Table 1 reports the proportion of manufacturing firms investing in both plant and equipment and land and building by size, sector and ownership for the year 2009. One key observation made isthe low percentage of firms investing. Of the 131 firms interviewed, only less than half were investing in plant and equipment and land and buildings. This may be due to both the risk and uncertainty affecting the timing of investment or for small firms, accessibility of investment funds. For the whole sample the average rate of investment in plant and equipment i.e. the ratio of such investment to the value of the capital stock of the firm is around 10%. In an internationally comparative context this is a very low rate of investment. The rate of investment in land and building is around 5%.

In terms of size, large firms are more likely to invest at 47 and 25% in both plant and equipment and land and buildings respectively. Large firms are more likely to invest because they have more access to the formal capital markets; hence they are expected toface lower firm specific capital costs. However smaller firms tend to invest a higher proportion of their value of capital than large firms i.e., 37 and 6% in both plant and equipment and land and buildings respectively.

The comparison of investment participation by sector reveals that more firms in food sector are likely to invest in both plant and equipment and land and building at 51 and 22% followed by textile and garments at 38 and 10%, respectively. Likewise the proportion invested in these two sectors is also high comparatively. As concerns textile and garments more firms have been investing in this sector in recent times owing to the African Growth and Opportunity Act (AGOA) initiative. On the aspect of

Table 2: Probit model on the decision to invest

	Coefficient	t-value	P>|t|
Sectors			
Metal	- 0.643	- 1.25	0.212
Chemical & paint	0.444	2.16*	0.031
Textile & garments	0.862	1.93*	0.053
Paper, printing and publishing	0.076	0.13	0.897
Firm level characteristics			
Age	0.064	2.19*	0.029
Ag	0.001	- 1.07	0.285
Access to credit	0.198	0.56	0.579
Exporting	- 0.010	- 0.02	0.982
Productivity	- 0.073	- 0.57	0.569
Size of the firm			
Small (1-49)	0.423	- 1.18	0.238
Medium (50-99)	0.254	- 0.18	0.854
Large (+100)	0.543	1.62*	0.157
Infrastructure and business environment			
Telecommunication	0.077	-1.27	0.205
Electricity	- 0.739	-1.60	0.110
Transport	0.088	0.16	0.869
Access to land	0.1521	18*	0.029
Custom and trade regulations	0.899	3.54***	0.000
Corruption	- 0.240	0.33	0.741
Crime and theft	0.032	- 0.85	0.348

Number of observations: 100; Log likelihood: -39.2; Dependent Variable: Decision to invest (1) those not investing(0); ***: Significant at 1%; **: Significant at 5%; *: Significant at 10%

ownership, it is observed that most investing firms in plant and equipment are owned by foreigners. The share of investment in plant and equipment to total capital is also high for the foreign owned firms. These results are not different from those obtained by Graner *et al*. (2002) on Tanzanian manufacturing in which size and ownership play a key role in determining investment into the sector.

The decision to invest: Table 2 summarises the probit results on the decision to invest. In the case of sector, food sector is used as a bench mark (omitted) category. Only firms in chemical and paint and textile and garments are statistically significant at ten percent level. Overall and based on the coefficients, firms in textile and garments are more likely to decide to invest followed by those in chemical and paint, paper, printing and publishing , then food sectors and lastly metal. Why firms in textile and garments are more likely to decide to invest can be attributed to AGOA initiative while for the chemical and paints, their likelihood to invest can be attributed to the growing market for the sectors product in the East African region in recent times.

The role of age in relation to investing is considered. The quadratic effect of firm age is considered by means of squaring the age term. The two variables are statistically significant at ten percent level and they have the expected signs implying an inverse U relationship between the decision to invest and firm age. This shows the importance of age on the decision to invest. Older firms are more likely to decide to invest because they are likely to have access to lower cost capital, a stronger financial base and greater experience than young firms. The inverted U relationship implies that the decision to invest increases with age up to a certain point after which it starts decreasing. n terms of size, large firms are statistically significant at ten percent level. Size signifies resource base of the firm and so large firms may have more resources for investment. On the business environment factors considered, only access to land and custom and trade regulations are significant at ten and one percent level. These results are not different from those obtained by Bigsten *et al.* (1997) on SSA manufacturing firms.

The share invested: The Tobit results for the share invested summarized in Table 3. In terms of the size, small firms are statistically significant, meaning that although large firms are more like to decide to undertake investment, they invest less share of their capital than small firms. These results are not different from those obtained in the descriptive statistics

Foreign ownership is highly statistically significant and this strengthens the argument that foreign owned firms are likely to have access to external capital and hence more likely to invest a large share. Like wise, exporting is statistically significant justifying the argument that firms focusing on foreign market are likely to invest more. This is because to compete in the export market firms must improve on the productivity and quality of their products. Hence they have to spend more in

Table 3: Tobit model on the share invested

	Coefficient	t-value	P>|t|
Sectors			
Metal	0.077	2.29**	0.025
Chemical & paint-	0.019	- 1.25	0.216
Textile & garments	0.1251	0.73*	0.019
Paper, printing and publishing	- 0.008	- 0.82	0.414
Firm level characteristics			
Age	0.10	0.51	0.615
Age2	- 0.00	- 0.01	0.994
Foreign ownership	0.10	2.50**	0.015
Skilled labor force	- 7.60	- 0.14	0.892
Access to credit	0.249	1.99*	0.050
Exporting	0.06	2.04*	0.045
Productivity	0.00	0.12	0.901
Size of the firm			
Small (1-49)	0.54	1.87*	0.571
Medium (50-99)	0.06	1.81	0.074
Large (+100)	0.01	0.08	0.897
Infrastructure and Business Environment			
Telecommunication	- 0.01	- 1.86*	0.067
Electricity	- 0.05	- 1.74*	0.085
Transport land	0.01	2.90***	0.005
Custom and trade regulations	0.09	2.89***	0.005
Corruption	0.03	0.82	0.414
Crime and theft	0.04	0.98	0.968

Number of observations: 98; Log likelihood: 34.65; Dependent Variable: total investment/total capital of the firm; ***: Significant at 1%; **: Significant at 5%; *: Significant at 10%

acquiring new plant and equipment as well as on research and development. Access to credit has the expected sign and statistically significant implying that the share of investment to total capital is determined by availability for funds. For firms to invest in plant and equipment more funds are needed. These results are in agreement with those obtained by Soderbom and teal (2000) on SSA.

On sector, food sector is used as a bench mark (omitted) category. Of all the sectors considered only metal and textile and garments are statistically significant at five percent level and 10% level respectively.This can be attributed to AGOA initiative. Overall, the results shows significant differences in the share invested across sectors. Firms in the textile and garments are investing more followed by metal, food, chemical and paint and lastly paper and printing. On infrastructure and business environment factors, most of the variables considered are highly significant apart from corruption, crime and theft.

CONCLUSION

In this study firm level evidence has been reported for investment in manufacturing firms. The results show low levels of investment in the Kenyan manufacturing firms. Overall the factors affecting the decision to invesare different from those affecting the share invested. Most of the investing firms were owned by foreigners. Large firms are found to be more likely to invest although the share invested was higher for the small firms.

In terms of age old firms are more likely to decide to invest because of their sound resource base. In terms of sector, the study found a significant differences in the share invested across sectors with firms in textile and garments and chemical and paints being more likely to invest. Access to credit is identified as a major limitation to investment especially in plant and equipment because of the need for collateral. Other factors identified as important determinants of investment behavior include exporting, infrastructure and trade related policies. The above results are not very different from those obtained by Bigsten *et al*. (1998, 1999), Teal (1998), Naude *et al*. (2000) and Soderbom and Teal (2000).

On the policy front these findings shows that increased access to credit will have a major impact on the investment behavior especially for the domestically owned firms. The government therefore needs to come up with good policies in order to make credit cheap and affordable. Investment is largely determined by the availability of investment opportunities and the generation of such opportunities requires reforms in the trade and macro economic policies. It is also important to note the role of government in creating environment in which the Kenyan manufacturing can flourish and prosper. This can be achieved by government ensuring a stable political and economic policies and provision of basic infrastructure in order to attract more firms to exploit opportunities in the manufacturing sector.

Appendix B

Explanatory variables:

- Firm size is defined by the number of employees of the firm both casual and permanent. It is classified in three groups, small (0-49), medium (50-99) and large (100+).
- Firm age is measured in years since the firm started operations.

Age and age suared are included in order
to capture potential changes in the quality of the firm as models of learning suggest.

- Sector-Four sectors are considered with food sector being the bench mark (omitted) category. These include metal,chemical and paint, textile and garments adpaper,printing and publishing.
- Productivity is measured by the value added defined as the totalsales of the firm less cost of inputs.
- Foreign Ownership-this variable is represented by a dummy, taking value 1 if foreigners own fifty percent or moreofa firmand zero otherwise.
- Exportparticipation-This variable is captured by a dummy, takingvalue1ifthefirmexportsandzerootheise.
- Access to credit-This is captured by a dummy variable, taking the value one if a firm has access to an overdraft facility at the bank and zero otherwise.
- Business Environment and Infrastructure variables - are captured by ratings (on a 1-5 scale) of the stimuli or barriers of infrastructure and business variables. Factors considered here include the availability of water, electricity, transportation and communication, corruption, customs and trade regulations, access to land and government efficiency. From the perception of the responded, the answer is calibrated into a binary form i.e., for barriers, answers ranging from 1 = "no obstacle" through to 3 = "moderate" are given value of one while responses of 4 = "major obstacle" and 5 = "very severe" are given a value of zero.

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