International Business Management 10 (9): 1679-1686, 2016
ISSN: 1993-5250

Influence of Access to Bank Credit on Enterprises Productivity in Ethiopia: Does Credit Matter to Improve Productivity?

Ajebush Argaw Shafi, Grag K. Ajay and Mammo Muchie
Business School, Tshwane University of Technology (TUT), Pretoria, South Africa

Abstract: This study examines SME productivity performance as a factor of access to credit within the Ethiopian economy. Empirical analysis is based on Ethiopian Large and Medium Manufacturing Enterprise Survey (LMMIS) data 2005-2011. Precisely, the research aims to understand whether or not SMEs with access to bank credit have higher levels of Total Factor Productivity (TFP) relative to counterparts without access to credit. To address this objective the study uses fixed effect regression modelling and neoclassical production function for specifying the relationship between inputs, efficiency and outputs. The study also applies inferential statistical techniques such as OLS (ordinary least square) for measuring the significance level and multivariate analysis to test the hypotheses of association. The following main conclusions can be drawn from the study. The study proves that SMEs that are run by individuals who have access to bank credit have a higher level of TFP. More precisely, average TFP among enterprises with access to bank credit is 1.3 times higher than enterprises with no access.

Key words: Bank credit, SMEs productivity, enterprises, elasticity, Ethiopia, SMEs

INTRODUCTION

The productivity of manufacturing enterprises in developing countries, particularly in Ethiopia, appears to be extremely low in comparison to their counterparts in the developed world (Bloom *et al*., 2010). This attribute of low-performance is especially, common among Small and Medium Enterprises (SMEs). Despite this reality in low-income countries there is great interest in SME development as a major tool of poverty reduction. In developing countries like Ethiopia, there are many constraints on the growth of potentially productive SMEs such that they cannot expand and cannot make technological improvements that are needed to increase their productivity performance (Lora and Pages, 2011). Together with other limiting factors, lack of access to finance is argued to be the main constraint of SME productivity growth. According to Panula in 2011, the ability of SMEs to fulfil their potential contribution in an economy depends on the level and accessibility of finance. This implies that access to credit should, on its own, enable SMEs to improve productivity performance. Access to external finance like bank credit may allow firms to have better capacity to acquire necessary working capital and technical inputs that could have favourable impacts on SME productivity and growth patterns. In other words, credit allows SMEs to invest beyond what their internal funds can support.

The focus of much of the literature on financial constraints on SMEs is limited to large and stock market-listed firms in developed countries with little attention given to small and medium-sized firms in developing countries that are particularly affected by credit constraints. This research contributes to the SME literature by investigating the effects of access to bank credit on SME productivity in Ethiopia using the large and medium enterprises manufacturing census survey data collected by the Ethiopian Central Statistical Agency (CSA) over the period 2005-2011. To the best of researchers knowledge, this study is the first to utilise empirical evidence from this database to investigate whether or not access to finance in the form of bank credit has an influence on SME productivity and profitability in Ethiopia.

This will help to understand how the typical value of the productivity of SMEs changes when one of the variables such as access to credit is varied while the other independent variables are fixed. The study adopts a fixed effect model and panel data estimators and takes SMEs total factor productivity as a partial productivity measure and as a proxy for enterprise performance. The findings of this study confirm that accessibility of bank credit (Prob. = 0.097<0.1) to an enterprise affects the enterprise Total Factor Productivity (TFP) on average, holding other factors constant.

Corresponding Author: Ajebush Argaw Shafi, Business School, Tshwane University of Technology (TUT), Pretoria, South Africa

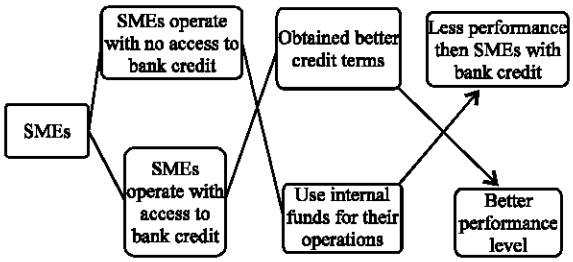

Fig. 1: Analytical model for the research study

Literature review: It is logical that SMEs are more likely to be credit-constrained than large firms (UNCTAD, 2001). This implies that the probability of being credit-constrained decreases with increasing firm size. Many studies in the developing and developed world provide evidence that SMEs face greater financing constraints than large firms (Beck *et al*., 2005; Bigsten and Gebreeyesus, 2007; Lora and Pages, 2011). In addition to this, numerous studies, particularly in developed country contexts, provide empirical evidence of the positive effects of credit access on SME productivity (Love, 2003; Ageba and Amha, 2006; Babajide, 2012; Alfaro *et al*., 2009; Ang and Mckibbin, 2005; Nichter and Goldmark, 2009).

However, other studies assert that credit access has no impact on firm' productivity and that the direction of causality between access to finance and SME productivity performance runs both ways, especially in developing economies (Ghani and Suri, 1999). Hanson (2001) argues that there is weak evidence that access to finance generates positive impact on firm' productivity. Similarly, Reyes, etc., in 2012 find that short-term credit does not have an impact on farm productivity, while other factors as education and the type of activity do. In general most economists and researchers suggest that a well-functioning and efficient financial system encourages competition, reduces the cost of capital and allocates capital efficiently.

Conceptual framework: The conceptual framework for this research (Fig. 1) represents the model of the effects of access to bank credit on SME productivity. It indicates that SME productivity is expected to be positively influenced by efficient access to bank credit. The conceptual framework illustrates the systematic ways to test for the hypothesis.

First, SMEs that employ >10 and <100 people are divided into a group that has access to bank credit and a group of firms that use informal sources of finance for normal operation. Under the assumption that banks can offer better credit terms, it is examined whether firms with access to bank credit have relatively higher levels of TFP than the group of firms without access to bank credit.

MATERIALS AND METHODS

This research is designed identify the how access to finance affect the level of SME productivity. Thus, analytical or normative research is implemented in combination with descriptive research.

Population and sampling methods: This research draws empirical data from a detailed dataset generated by the Ethiopian Large and Medium Enterprises Survey for the period of 2006-2011 conducted by the Central Statistical Agency (CSA) of Ethiopia. The dataset incorporates detailed information on 2865 manufacturing establishments employing 10 persons and more. For this study, however, only enterprises employing >10 and <100 people are considered; hence 1542 enterprises are used in the study. The dataset incorporates information on quantity and unit prices of the commodity products, capital, labour, raw material and energy inputs as well as investment and other industrial costs, sales, employment, use of raw materials and energy, investment, depreciation and stock of capital, access to credit, access to output market (local and export), type of ownership, number of years in business and the conditions of accounting record keeping.

Regression model: In this study, researchers want to answer the following question: what is the productivity performance of enterprises that have access to bank credit in contrast with enterprises operating without access to bank credit in Ethiopia? The major contribution of this study is to find out whether or not access to finance in the form of bank credit influences SME productivity.

Labour productivity is measured as the log of output per employee, output is equal to sales income deflated by its respectively sector producer price index, bank credit is a dichotomous (yes, no) variable where yes means the enterprise has a credit or revolving credit facility from a commercial bank, age is measured as the log of years of firm in the market, firm size is defined by the number of employees, instrumented variables are bank credit firms with guarantees and utility expenses respectively. The validity of these instruments is corroborated by implementing the Hausman test. In all estimations the errors are heteroscedasticity-robust standard errors, regressions are estimated with unweighted sample observations because the interest lies in the relationship between the independent and dependent variables. Level

of output (Y) is measured as total value of production (in local currency) by Ith the firm, Labour (L) wage total (total value of annual wage paid) and (K) total book value of the fixed assets at the beginning of the year, (M) value of total raw materials and ε_i = firm's level of efficiency, it is also the error term.

Three different models are estimated using the above variables, a basic model where the input output variables are directly applied to the production function, a second model where material inputs and capital are lumped together and a third model where a host of control variables are introduced. Capital and material inputs are lumped in the second model to consider the fact that credit can be used to finance raw material purchases as well as capital (technology). In the third model, variables such as age of enterprise, ownership type, industry type and region are introduced to control for the effect of enterprise specific factors.

By applying Nerlove's in 1963 basic model, the analysis starts by specifying a Cobb-Douglass production function that captures the relationship between inputs, efficiency and output (Eq. 1):

$$q_i = f(L,K,M) = AL_i^a K_i^b M_i^c \quad (1)$$

Where:

q = Output is a function of three input variables
L = Labour
K = Capital and material
M = Inputs
A = Constant
a-c = The parameter and A are all positive constants calculated from empirical data

This function helps to determine what happens to the output if enterprises operate with and without access to bank credit. By assumption enterprises use bank credit to buy capital intensive technology and material inputs.

Taking the log of this equation and adding an error term (e_i) yields the Eq. 2 estimated by Mark Nerlove in 1963:

$$\ln(q_i) = \ln(A) + \alpha \ln(L_i) + \mu \ln(K_i) + \beta \ln(M_{(i)}) + \varepsilon \quad (2)$$

A fixed-model was fitted as follows (Eq. 3):

$$\ln\hat{Y}_i = \tilde{\alpha}_0 + \tilde{\alpha}_l \ln L_i + \tilde{\alpha}_k \ln K_i + \tilde{\alpha}_m \ln M_1 + \varepsilon_i \quad (3)$$

Where:

$\ln\hat{Y}_i$ = In (q_i)
$\tilde{\alpha}_0$ = In (A)
$\tilde{\alpha}_l$ = α
$\tilde{\alpha}_k$ = μ
$\tilde{\alpha}_m$ = β

The above regression equation will give the estimated values of Total Factor Productivity (TFP) by considering the enterprises operation with and without bank credit. In this model, the researchers are interested in examining the null and alternative hypothesis:

- H_0: = 1 (the null hypothesis that access to bank credit enhances SME TFP) or
- $H_1 \neq 1$ (the alternative hypothesis that access to bank credit does not enhances SME TFP)

Caveat: The estimation of TFP using simple Ordinary Least Square (OLS) applied to a time series data introduces simultaneity bias where TFP and input choice are correlated, input choice may be affected by level of efficiency. The lack of control for unobserved but systematic firm level characteristics adds to the potential of omitted variable bias. Alternative methods are used in the literature; fixed effects (to control for the effect of firm and time invariant unobserved factors) and instrumental variables and generalized method of moments (to control for potential endogeneity of inputs). Although, still within a time series OLS framework, attempt is made to control for firm level characteristics in this study.

RESULTS AND DISCUSSION

Model 1; estimation results: In model 1, the input-output variables are directly applied to the production function and each pair of the three variables is linked separately to estimate SME productivity. The detailed econometric result is shown in Appendix of Table 1. The result shows that the model (F (3, 4524) = 5871.67; Prob. = 0.000<0.01) is highly significant and capital (Prob. = 0.000<0.01), the labour of (Prob. = 0.000) and raw materials (Prob. = 0.000<0.01) are highly significant at the 1% level. For a given enterprise as the log of capital varies across time by one unit, the log of its output increases by 0.02 units holding other factors constant. As the log of the value of the wage total varies across time by one unit, the log of its output increases by 0.185 units holding other factors constant. The log of the value of raw materials varies across time by 1 unit, the log of its output increases by 0.717 units holding other factors constant.

Model 2; estimation results: In Model 2, raw materials and capital are lumped together. The detailed econometric result is shown in Appendix of Table 2. According to the results, the effect of the lumped inputs variable (Prob. = 0.000<0.01) on output is to increase it, such that as the log of the value of the lumped inputs varies across time by one unit, the log of its output increases by 0.762 units holding other factors constant and all years are

highly significant at the 1% level. The interesting finding is that the coefficients of the year dummies are negative. The cause of this is not investigated in this study.

Model 3; estimation results: In Model 3, a host of control variables are introduced as independent variables; output, capital, labour, raw materials, time-fixed effects, age of business, type of ownership, size of business, industry, while Region 1 is used as the reference region. The other variables were introduced to control for the effect of enterprise specific factors. It should be noted that variable "industry" was not included in the model because all the firms belonged to one industry the manufacturing industry. The detailed econometric result is shown in Appendix of Table 3. Time-effects dummies were created and included in the model, depicted in Appendix of Table 4. The following results were obtained: Capital (Prob. = 0.000<0.01), labour (Prob. = 0.000<0.01), materials (Prob. = 0.000<0.01) and all the years are highly significant, so they affect output. All independent variables except age affect output positively. According to the results, owner type (Prob. = 0.300>0.05), size of business (Prob. = 0.978>0.05) and region (Prob. ranging from 0.231-0.978) are not significant; therefore, they do not affect enterprise output. When, the time effects are excluded, the following results are obtained: The detailed econometric result is shown in Appendix Table 4. It should be noted that when the time fixed effects were removed from the model, the age coefficient became highly significant (Prob. = 0.003<0.01).

Using the fixed-effects model, it was found that capital (Prob. = 0.002<0.01), labour (Prob. = 0.000) and raw materials (Prob. = 0.000<0.01) affect the production of an enterprise. For a given enterprise as the log of capital varies across time by one unit, the log of its output increases by 0.018 units holding other factors constant. As the log of the value of the wage total varies across time by one unit, the log of its output increases by 0.116 units holding other factors constant. The log of the value of raw materials varies across time by one unit, the log of its output increases by 0.701 units, holding other factors constant. There is a decreasing trend of enterprise output over time. The reason for this is not investigated in this study. This model was used to predict output and therefore used to calculate productivity.

Summary of the three SME productivity measuring models (Table 1) shows that the overall models estimate statistically significant coefficients on major input items (L, K and M). Most importantly, the models predicted a similar pattern in factor elasticity across the two groups of enterprises.

Estimated TFP and access to bank credit: The question of whether bank credit merely has an effect on enterprise productivity and to what extent it has an impact on SME productivity and profitability is investigated by comparing TFP and rate of return on main production inputs across a sample of local manufacturing SMEs with and without access to bank credit. SME TFP (total factor productivity) with and without access to bank credit during the survey years are analysed and it is calculated by subtracting estimated enterprise output from the actual output.

Table 1: Production function estimated using the variables capital, labour, raw materials, energy and other industrial inputs

					(95% conf. Interval)	
Output	Coef.	SE	t	p>|t|	1	2
ln_wage_{t-1}	0.185	0.009	11.99	0.000	0.167	0.203
$ln\_capital_{t-1}$	0.023	0.004	4.73	0.000	0.015	0.032
$ln\_material_{t-1}$	0.717	0.007	45.54	0.000	0.703	0.731
ln_energy_{t-1}	0.075	0.004	5.92	0.000	0.403	0.472
$ln\_other\sim s_{t-1}$	0.057	0.007	5.54	0.000	0.236	0.242
Constant	11.181	0.098	11.19	0.000	1.7882	0.173

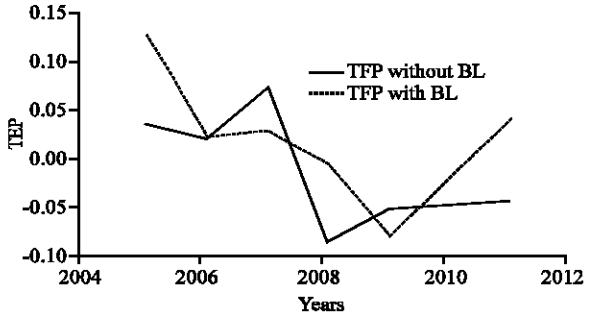

Fig. 2: Comparison of productivity trends for companies operating with and without bank loans; TFP without BL = TFP without bank loans; TFP with BL = TFP with bank loans; CSA survey data and researcher's calculations

Figure 2 shows that for SMEs operating without bank credit, TFP has a decreasing trend between 2005 and 2008 and then a slight increasing trend thereafter, whereas for companies with bank credit, TFP has a more gradual decreasing trend between 2005 and 2009 and then a sharp increasing trend thereafter. In general, Fig. 2 illustrates that TFP of enterprises operating without bank credit is slightly lower than SMEs operating with access to bank credit. The most interesting thing here is that the graphic presentation of the data analysis result is consistent with the empirical findings that is both empirical analysis results and the grap indicate that the mean of TFP values for SMEs with access to bank credit is slightly higher than that of SMEs TFP operating without access to bank credit.

Table 2: Production function estimated using the variables capital, labour, raw materials, energy and other industrial inputs

Variables (TFP)	Coefficients (without credit)	Coefficient (with credit)
ln_waget$_{-1}$	0.173*** (10.91)	0.245** (10.67)
ln_capitalt$_{-1}$	0.0652*** (6.43)	0.0399*** (4.62)
ln_materialt$_{-1}$	0.573*** (44.72)	0.508*** (45.21)
ln_energyt$_{-1}$	0.0881*** (6.50)	0.0592*** (5.71)
ln_other~st$_{-1}$	0.0410*** (3.92)	0.0562*** (5.43)
_cons	2.020*** (14.31)	1.512*** (10.99)
N	853	689
R^2	0.943	0.963

Table 3: Production function with capital and raw material lumped together as one input

Variables (TFP)	Coefficients (without credit)	Coefficient(with credit)
ln_waget$_{-1}$	0.133*** (9.22)	0.169** (9.13)
ln_capitalt$_{-1}$	0.0638*** (38.31)	0.0604*** (31.90)
ln_energyt$_{-1}$	0.0801 (2.33)	0.0989* (1.96)
ln_other~st$_{-1}$	0.1129*** (4.52)	0.1638*** (3.82)
_cons	1.511*** (11.36)	1.021*** (5.16)
N	853	689
R^2	0.943	0.963

Authors calculation based on data from CSA manufacturing census (2005-2011) t statistics in parentheses ; *, **, *** p<0.05, 0.01, 0.001

Comparing coefficients on inputs (factor elasticity) for the two groups: The coefficients obtained from the estimation of SME TFP using a Cobb-Douglas production function for the two SME groups can be interpreted as input factor elasticity, it shows the responsiveness of sales or outputs to changes in the levels of each input factor used in production processes. Contrary to the estimation of the production function in all the three models explained above in a general sense, this study, provides summary results for the three models again for both credit recipients and non-recipient SME groups.

All three respective models estimate statistically significant coefficients on major input items (capital, labour and raw material) for the two SME groups with a slight difference in magnitude. Most importantly all three models predict a similar pattern in factor elasticity across the two groups of enterprises (Table 2) for a detailed report on the econometric results.

As presented in Table 2, raw materials and labour inputs have the highest elasticity in both credit recipient and non-recipient SME groups. In the basic and in the third models, a 100% increase in the value of capital is predicted to result in a 6% increase in the value of output of enterprises with no access to credit while this is 4% in those enterprises with access to credit (on average and holding other inputs constant) and a 100% increase in the value of labor is predicted to result in a 2% increase in the value of output of enterprises with no access to credit, while this is 2.5% in the group with access. Similarly, a 100% increase in the value of material input is predicted to result in a 50.7% increase in the value of output of enterprises with no access to credit and 50% in the other group.

Table 4: The t-test on the difference in mean of TFP across enterprises with and without Bank credit for model 1 (basic) and model 2

					(95%conf.. interval)	
Variables	Obs.	Mean	SE	SD	1	2
Yes	689	6.29	0.210	7.66	7.79	8.85
N	853	5.04	0.157	3.85	4.84	5.45
Combined	1542	6.97	0.174	6.52	6.63	7.31
Diff.	--	1.25	0.067	--	1.95	3.40

Table 5: The t-test on the difference in mean TFP across enterprises with and with out access to bank credit for model 3

					(95%conf.. interval)	
Variables	Obs.	Mean	SE	SD	1	2
Yes	689	4.234	0.131	3.754	6.513	7.031
No	853	3.156	0.060	1.473	3.037	3.274
Combined	1542	3.938	0.093	2.497	4.356	5.421
Diff.	--	1.078	0.071	--	3.476	3.757

Authors calculation based on data from CSA manufacturing census (2005-2011); diff. = mean (no)-mean (yes); t = 24.9597; pr (t<t) = 1.0000; pr(|t|>|t|) = 0.0000; pr (t>t) = 0.0000; H_a:diff.<0 H_a: diff.>0 H_o: diff. = 0; Satterthwaite's degrees of freedom = 1118.94

The average elasticity values across the two groups for enterprises operating without bank credit are 0.57 for material input, 0.17 for labor, 0.065 for capital, 0.08 for energy input and 0.041 for other related production inputs. For enterprises operating with bank credit, the average elasticity values across the two groups are 0.50 for material input, 0.24 for labor, 0.04 for capital, 0.06 for energy input and 0.056 for other related production inputs for the other groups, respectively.

In both models 1 and 2, the share of capital is lowest in the SMEs operating with access to bank credit. For each group of enterprises, the sum of the five-factor elasticity is around 1. This corresponds to the assumption of the Cobb-Douglas production function (Table 3). The input factor elasticity obtained from the estimation yields comparable results to several other studies the findings of this study is consistent with previous studies like Butler and Cornaggia in 2007.

To emphasize the importance of access to bank credit practices on SME productivity, the hypothesis of difference in mean of TFP of the two SME groups is tested and the results are presented. The t-test on the difference in mean of TFP across enterprises with and without access to bank credit indicates a slightly higher average TFP among enterprises with access to bank credit (Table 4 and 5). The results indicate that average TFP among enterprises with access to bank credit is 1.25 times

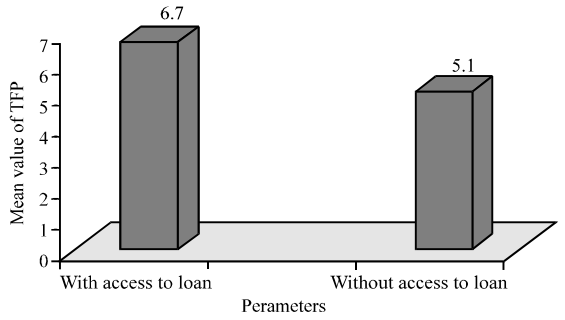

Fig. 3: TFP of enterprises with and without bank credit; CSA survey data and author's calculations

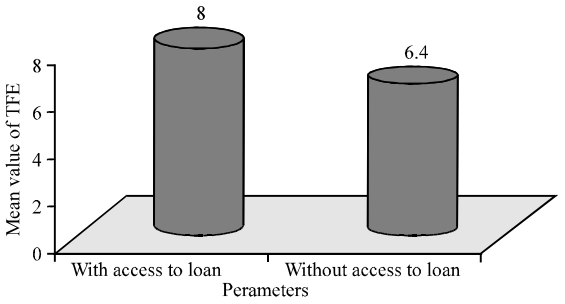

Fig. 4: A comparison of mean of TFP across the top three smallest industries; CSA survey data and author's calculations

higher in model 1 and in model 3 while 1.34 times higher in model 2. The differences in means are statistically significant across all the models. The same pattern holds when the basic model is estimated for the three biggest (pharmaceuticals, printing and chemicals) vs. the three smallest industry groups (food and beverages, cement, wood and furniture). Average TFP of enterprises with bank credit is 2.4 times higher in the first group and 1.7 times higher in the second group.

The significantly positive values of the t-test of the mean differences of SMEs operating with and without bank credit implies that SME productivity is serially correlated with bank credit. The potential implication of the results is that bank credit promotes productivity and the results are more consistent with the previous researchers (Love, 2003). In addition, the most recent World Bank in 2015, research discovered that firms that are credit constrained exhibit poorer performance and productivity. The researchers finding implies that credit allows SMEs to expand or make technological improvements and investments needed to increase their productivity beyond what their internal funds can support (Fig. 3).

Similarly, Fig. 4 illustrates that average TFP among enterprises with access to bank credit is 1.34 times higher in the second input output estimation model.

The testing result indicates that the mean of TFP values for SMEs with access to bank credit is slightly higher than that of SMEs that are "not efficient" in access to credit. This result is empirical evidence to demonstrate to SMEs that they should pay more attention to securing access to bank credit if they want to improve their productivity and survive in the uncertain business environment in Ethiopia.

Results remain robust to a variety of controls, alternative variables and tests. For example, a dummy variable of access to bank credit was used and later the real credit amount was included in the model with statistical results the same in the presence of multiple control variables like firm age, region and size. Moreover, all independent variables were lagged by one year, so coefficients truly reflect effects of independent variables on the output variable.

Summary of TFP estimation results: In general, the fixed effect regression analysis results show that the estimated value of the variables has a higher return to capital among enterprises operating without bank credit. This result implies that there is relative scarcity of capital for enterprises operating in the absence of bank credit which are at the same time concentrated in the industry groups with numerous but small firms, capital being in short supply for small firms. The result also shows higher returns to labour among enterprises operating with bank credit. This indicates a relative scarcity of labour in enterprises operating with bank credit which are at the same time concentrated in the industry groups dominated by a few big firms. This implies that labour is expected to be relatively scarce in big firms. In general, enterprises with increased revenue productivity will have a higher demand for capital since each unit of capital will produce more return. An increase in the marginal cost of labour will also increase the demand for capital which means the substitution of labour for capital will be inhabited. From the regression results, we can also observe that there is a very high return to raw materials in both SMEs with and without access to bank credit. In other words, return to raw material inputs is significant in both groups; approximately 62% in the credit recipient group and 60% in the group without access to credit, taking the average of the coefficients from the above given models. This is further supported by enterprises' reported perception from the survey, 33 and 35% of enterprises in credit recipient and non-recipient groups, respectively perceived shortage of raw material as a priority. The productivity of

SMEs estimated using the variables capital, labour, raw materials, energy and other industrial inputs has very high return on raw material inputs. Possible reasons for this might be because of the patterns of input use and conditions of exchange rate.

CONCLUSION

Using the fixed-effects model, this research finds that in Ethiopia, capital (Prob. = 0.002<0.01), labour (Prob. = 0.000) and raw materials (Prob. = 0.000<0.01) affect the productivity of an enterprise. For a given enterprise, as the log of capital varies across time by one unit, the log of its output increases by 0.018 units holding other factors constant. As the log of the value of the wage total varies across time by one unit, the log of its output increases by 0.116 units holding other factors constant. As the log of the value of raw materials varies across time by one unit, the log of its output increases by 0.701 units, holding other factors constant. There is a decreasing trend of enterprise output over time. The reason for this is not investigated in this study. It is also finds that accessibility of bank credit (Prob. = 0.097<0.1) to an enterprise affects the enterprise TFP on average, holding other factors constant. However, this study finds that the amount of bank credit (Prob. = 0.872>0.1) does not affect TFP.

In general, the regression analysis results show that a stable and efficient supply of credit is needed in order to make productivity improvements in Ethiopia. Moreover, the findings indicate a clear pattern where banks lend to enterprises with lower levels of efficiency as measured by TFP and lower rates of return to capital. Conversely, banks do not lend to enterprises where efficiency and the rate of return on capital are higher. The reasons behind this need further investigation.

ACKNOWLEDGEMENTS

Researchers are most grateful to a number of persons at Tshwane University of Technology (TUT), various ministries, agencies, embassies and private companies in South Africa and Ethiopia who have provided information which is needed for this study. The authors would also like to thank for the financial support from the National Research Foundation (NRF) and TUT, the support is highly acknowledged.

APPENDIX A

Regression results: Production function estimated using the variables capital, labour, raw materials, energy and other industrial inputs:

Table 1: Model 1, production function estimated using the variables capital, labor, raw materials

					(95% coef. interval)	
Output	Coef..	SE	T	P>|t|	1	2
ln_capitalt-1	0.0232378	0.0042691	5.44	0.000	0.0148684	0.0316073
ln_waget-1	0.1852013	0.0092624	19.99	0.000	0.1670424	0.2033600
ln_materialt-1	0.7169264	0.0073499	97.54	0.000	0.7025170	0.7313359
Constant	1.9806200	0.0981002	20.19	0.000	1.7882960	2.1729450

Table 2: Model 2, raw materials and capital were lamped together

					(95% coef. interval)	
Output	Coef.	V	t	p>|t|	1	2
Lumped inputs	0.7620509	0.0111946	68.07	0.000	0.7401042	0.7839977
2006	0.1183011	0.0238410	-4.96	0.000	0.1650409	-0.0715613
2007	-0.1711872	0.0241556	-7.09	0.000	-0.2185438	-0.1238307
2008	-0.4460323	0.0239726	-18.61	0.000	-0.4930301	-0.3990345
2009	-0.4696224	0.0247958	-18.94	0.000	-0.5182341	-0.4210108
2011	-1.1821950	0.0244315	-48.39	0.000	-1.2300920	-1.1342970
Constant	3.2116050	0.1585041	20.26	0.000	2.9008610	3.5223490

Authors calculation based on data from CSA LMMIS (2005-2011)

Table 3: Model 3, control variables included in the model

					(95% coef. interval)	
Output	Coef.	SE	t	p>|t|	1	2
Capital	0.0181674	0.0045213	4.02	0.000	0.0093032	0.0270316
Labour	0.1135879	0.0113765	9.98	0.000	0.0912838	0.1358919
Raw materials	0.6991469	0.0079044	88.45	0.000	0.68365	0.7146437
2006	-0.1125746	0.0188684	-5.97	0.000	-0.1495668	-0.0755825
2007	-0.1116635	0.0190516	-5.86	0.000	-0.1490147	-0.0743122

Table 3: Continue

					(95% coef. interval)	
Output	Coef.	SE	t	p>|t|	1	2
2008	0.2000243	0.0192216	-10.41	0.000	-0.2377089	-0.1623397
2009	-0.1176818	0.0199841	-5.89	0.000	-0.1568613	-0.0785022
2011	-0.2995051	0.0265354	-11.29	0.000	-0.3515286	-0.2474815
Age	-0.0003254	0.0010252	-0.32	0.751	-0.0023354	0.0016845
Type of owner	0.0268923	0.0259663	1.04	0.300	-0.0240155	0.0778001
Size of business	-1.28e-0600	0.0000467	-0.03	0.978	-0.0000928	0.0000902
Region3	-0.0029157	0.1074276	-0.03	0.978	-0.2135312	0.2076998
Region4	-0.1145971	0.0956832	-1.20	0.231	-0.3021874	0.0729932
Region 7	0.0929129	0.1107985	0.84	0.402	-0.1243114	0.3101372
Region 13	-0.0289168	0.1513198	-0.19	0.848	-0.3255847	0.2677511
Region 14	-0.0940711	0.0878172	-1.07	0.284	-0.2662398	0.0780976
Region 15	-0.0705051	0.1303770	-0.54	0.589	-0.3261139	0.1851036
Constant	3.2837340	0.1642160	20.00	0.000	2.9617820	3.6056850

Authors calculation based on data from CSA LMMIS (2005 - 2011)

Table 4: Model 3, Time-effects dummies were created and included in the model

					(95% coef. interval)	
Output	Coef.	SE	t	p>|t|	1	2
Capital	0.0228719	0.0045584	5.02	0.000	0.0139349	0.0318089
Labour	0.1677416	0.0105091	15.96	0.000	0.1471381	0.1883451
Raw materials	0.7066097	0.0079061	89.38	0.000	0.6911095	0.7221099
Age	-0.0029436	0.0009996	-2.94	0.003	-0.0049033	-0.0009839
Type of owner	0.0212525	0.0263594	0.81	0.420	-0.0304259	0.0729310
Size of business	0.0000648	0.0000463	1.40	0.162	-0.0000259	0.0001555
Region3	0.0194881	0.1095471	0.18	0.859	-0.1952828	0.2342591
Region4	-0.0974228	0.0975165	-1.00	0.318	-0.2886073	0.0937618
Region 7	0.1061574	0.1130325	0.94	0.348	-0.1154469	0.3277616
Region 13	-0.0475086	0.1543503	-0.31	0.758	-0.3501178	0.2551006
Region 14	-0.0831760	0.0895028	-0.93	-0.930	0.3530000	-0.2586493
Region 15	-0.0456106	0.1329954	-0.34	0.732	-0.3063527	0.2151316
Constant	2.4178750	0.1464353	16.51	0.000	0.0000000	2.1307830

sigma_u |0 .49898822; sigma_e |0 .36075771

REFERENCES

Ageba, G. and W. Amha, 2006. Micro and Small Enterprises (MSEs) finance in Ethiopia: Empirical evidence. East. Afr. Soc. Sci. Res. Rev., 22: 63-86.

Alfaro, L., O.S. Kalemli and S. Sayek, 2009. FDI, productivity and financial development. World Econ., 32: 111-135.

Ang, J.B. and W.J. McKibbin, 2005. Financial liberalization, financial sector development and growth: Evidence from Malaysia. Centre for Applied Macroeconomic Analysis (CAMA) Working Paper 5, Australian National University.

Babajide, A.A., 2012. Effects of microfinance on Micro and Small Enterprises (MSES) growth in Nigeria. Asian Econ. Financial Rev., 2: 463-477.

Beck, T., A. Demirguc-Kunt and V. Maksimovic, 2005. Financial and legal constraints to growth: Does firm size matter? J. Finance, 60: 137-177.

Bigsten, A. and M. Gebreeyesus, 2007. The small, the young, and the productive: Determinants of manufacturing firm growth in Ethiopia. Econ. Dev. Cult. Change, 55: 813-840.

Bloom, N., A. Mahajan, D. McKenzie and J. Roberts, 2010. Why do firms in developing countries have low productivity?. Am. Econ. Rev., 100: 619-623.

Ghani, E. and V. Suri, 1999. Productivity growth, capital accumulation and the banking sector: Some lessons from Malaysia. World Bank Policy Res. Working Paper Series, Vol. 2252,

Lora, E. and C. Pages, 2011. Face-to-Face with Productivity. Finance Dev., 48: 16-19.

Love, I., 2003. Financial development and financing constraints: International Rev. Financial Stud., 16: 765-791.

Nichter, S. and L. Goldmark, 2009. Small firm growth in developing countries. World Dev., 37: 1453-1464.

UNCTAD, 2001. Improving the competitiveness of SMEs in developing countries. The Role of Finance to Enhance Enterprise Development. United Nations, New York, Geneva, USA.