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Social Capability Deficits and Productivity Behaviour of African Entrepreneurs: Evidence from Lesotho Garment Producers

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Abstract

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Specifically, estimates from stochastic production frontier specifications show that inadequate business support physical infrastructural service deliveries as well as weak national infrastructure of financial intermediation that constrains business access to credit are positively and robustly associated with inefficiency scores of sampled plants. This case thus provides us with a useful example of how the role of African entrepreneurs vis-à-vis technological adoption continues to be shaped by the social and institutional context they face.

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Provincial systems of innovation and globalisation in South Africa[1]

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6 April 2009

Abstract

Despite attempts to induce regional competitiveness in industrial manufactures, poor productivity performances continue to plague the ability of African entrepreneurs to compete successfully in international markets. While many plausible explanations can be put forward to explain this failing, we argue in this paper that an analysis of the social and institutional context within which these entrepreneurs are embedded can provide us with useful insights into why they have continued to lag behind in efficiency performance. Adopting the framework proposed by Moses Abramovitz, the paper uses the case of Lesotho garment sub-sector to show how an environment characterised by significant social capability deficits inhibits the ability of resident producers to behave in efficient manner.

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1. INTRODUCTION

From the mainstream analytical perspective productivity improvement in backward economies can be read off from the logic of technological externality that allows national agents to appropriate what constitutes best practise in the frontier. This is true at least with respect to early neoclassical growth models of Robert Solow (1956, 1957) and his apologists. As laid down by the Nobel price winner, technological progress, which drives the long-run productivity growth, is basically a 'free' good that is costlessly available for everyone to use. Though this idea emerged strictly within the context of a single country growth analytic, subsequent contributors would later apply it within the context of a multi-country global setting by arguing that productivity improving technological or knowledge externality is international in character. Thus, the argument goes that if this factor diffuses costlessly from a national perspective it will be so as well from an international perspective.

For its simplistic interpretation of knowledge factor as exogenously driven this mainstream idea has come to be haunted by models which endogenise technology as in the 'new growth theory' for instance, as well as others that have come to be termed 'technological gap' models. Of relevance to the present effort is a strand of the latter category of arguments essentially captured in Abramovitz's (1986) hypothesis that the prospect for a successful international diffusion of technology and by implications productivity improvement in backward economies is governed by the adequacy of beneficiaries' social capability. It follows from this viewpoint that the likelihood of moving up the productivity ladder through successful adoption of incumbent best practises cannot be so bright for economies characterised by significant social capability deficits.

As a concept that emerged within the context of the debate on economic growth and convergence, it is understandable to note that research on social capability argument has largely been confined to cross-country growth performance comparison. Practically very little has been done to explore its implications for firm level productivity performances in backward economies. Indeed much of the extant literature bothering on productivity or efficiency performance in manufacturing plants has consciously or implicitly been inspired by some 'stylised' arguments. While there can be no denying the fact that these efforts have yielded some very useful insights we cannot as well dismiss the desirability of any attempt to inform the debate by employing a different analytical lens. This paper therefore proposes to do just that by investigating the relationship between national manifestations of social capability deficits and productivity behaviour of embedded manufacturing establishments.

For Africa an investigation of this type can hardly be more desirable than it is at this time of her manufactured export crises. Following the December 2004 expiration of the Agreement on Textile and Clothing (ATC) which effectively lifted quota restrictions previously applied by some developed countries to their textile and clothing imports, the continent's garment sub-sector was panicked into a state of distress[2]. Obviously anticipating

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[2] The ATC came into force subsequent to the accession of the World Trade Organisation as the world trade governing body. The Agreement, which was negotiated during the Uruguay Round to replace the Multi-fiber agreement regime, mandated the phase-out of quota on apparel and textiles over a ten-year period beginning in January 1995.

stiffer competition from producers in supposedly more efficient economies like India and China, many African manufacturers and exporters of garment products especially those whose businesses flourished under the generosity of AGOA trade preference incentives opted for the exit route to prevent possible losses[3].

For the small landlocked country of Lesotho particularly this development had some far reaching implications. Her erstwhile rising exports since qualifying for the AGOA trade benefits in 2001 suddenly took a major plunge as factory closures and plant downsizing became the order of the day. According to a press statement by the Lesotho National Development Corporation (LNDC), three garment producers closed down their Lesotho plants in 2004 alone with another following suit in January 2005 (LNDC, 2005). Other estimates put the number of factory closures that were reported in January 2005 at six (Bennet, 2006). Those that avoided outright closures had their capacities reduced to cope with the anticipated realities of stiffer competition. Similar downturns in exports with related socio-economic consequences were reported as well in other significant garment exporting countries like South Africa, Swaziland, Kenya, Namibia, Tanzania and others. Figure 1 below provides a visual illustration of the trend in export performances of some the countries where the ATC quota removal seemed to have had some immediate and significant impacts. It is clear from the figure that the rising values of these countries garment exports from 2001 could not be sustained beyond 2004 when the Agreement came to an end.
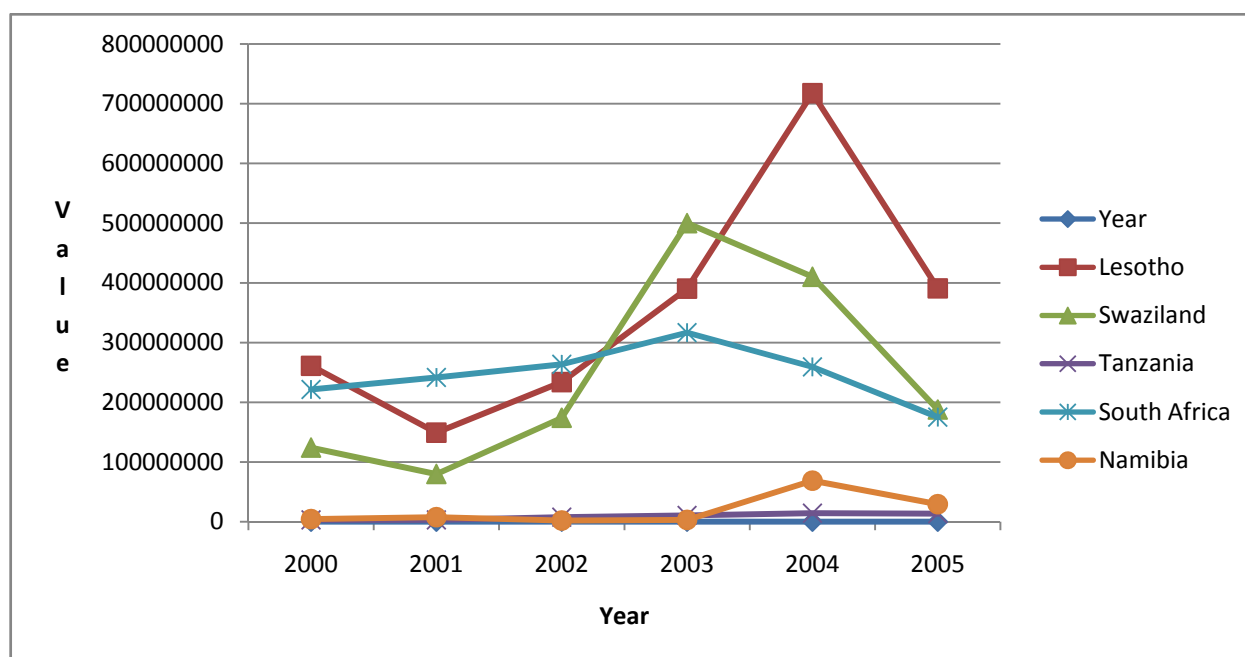
Figure 1: Garment Exports from selected sub-Sahara African Countries to rest of the World
Source: UN Comtrade.

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[3] The acronym AGOA stands for African Growth and Opportunity Act. It is a trade related development assistance initiative of the US government, and was passed into law in May 2000 to assist development efforts in sub-Sahara African countries. It extends preferential market access treatments to US imports of goods originating from designated beneficiaries. Further details can be obtained online at www.agoa.gov.

What does this say about the character of African entrepreneurs? As long as the prospect of competition on a level playing field with others continues to present a nightmare scenario productivity or efficiency behaviour of these entrepreneurs will naturally come to the fore as an obvious issue of concern. Thus the motivation of the present effort to probe deeper into this area of research finds a practical relevance of significance in this context.

In order to investigate the possible relationship between manifestations of social capability deficits and productivity of manufacturing plants in Africa Cobb-Douglas stochastic production frontier models are specified and estimated for a cross-sectional sample of Lesotho garment firms. Besides the fact that our brand of theoretical analytic represents a distinct departure from past approaches the focus on Lesotho's experience, which has not been previously reflected in the existing body of African evidence, also marks a significant contribution of the research. Results presented in this paper somewhat support the hypothesis that significant deficiencies in national social capability inhibit the propensity of embedded firms to behave efficiently. For instance, inadequate business support physical infrastructural service deliveries appear to be positively and significantly associated with inefficiency scores of our sampled firms. We also find further evidence that weak national infrastructure of financial intermediation that constrains business access to credit translates into poor efficiency performance among studied plants.

The next section discusses the concept of social capability with a view to relating its arguments to the prevailing socioeconomic condition facing African firms. Thereafter, the context of the research is taken up for discussion under section three. Section 4 describes the methodology employed in the study while Section 5 presents and analyses results obtained. Finally in Section 6 the paper's concluding remarks are presented.

2. SOCIAL CAPABILITY HYPOTHESIS IN THE CONTEXT OF AFRICAN SOCIOECONOMIC DYNAMICS

In a simple but elegant demonstration of the potential for catch-up by backward countries, Skonhoft (1995) perform a growth accounting exercise to illustrate the importance of Abramovitz's social capability argument. Signalling a major departure from the mainstream neoclassical tradition the catch-up arithmetic is worked out in terms of three main deterministic elements: technology gap; Research & Development (R&D) activity; and social capability. It is demonstrated that the prospects for closing the time lag of operating best practise technology and hence catching up in efficiency terms with the leader is bright not only when a country faces a large or modest technology gap but also when such country has heavy investment in R&D together with well developed social capability for exploiting new technology. Although Skonhoft did not expatiate very much on what constitutes social capability in his work we get a clearer idea of the concept from other contributors to the literature. A reflection on the following definitions for instance will offer us some useful insights:
  1. A nation's attitude to managing its resources in order to contribute to overall economic growth (Baussola, 1997)

2. The institutional factors such as educational systems (which supply the human capital necessary for assimilating spillovers), the banking system (which supplies financial capital for catch-up related investment), the political system etc. (Verspagen 1999).
3. The attributes and qualities of people and organisations that influence the responses of people to economic opportunity which originate in social and political institutions (Abramovitz and David, 1996)
4. Those array of factors including levels of human capital, economic infrastructure, and institutional capacities that affect the country's ability to adopt available technology as well as promote economic efficiency (Taylor, 2005)

As all these attempts suggest, varieties of socioeconomic factors that define the business climate in a given society will qualify for inclusion if we are to compile a list of social capability elements. This will often include but not limited to such things as national stock of human capital, quality of public physical infrastructural service delivery, quality of financial intermediation by banks and other national institutions, institutional quality etc. But while it seems a difficult task to capture all kinds of variables that may adequately describe the phenomenon, the import of its arguments for any analysis of industrial performance in backward economies should not be lost.

Specifically the views as enunciated by advocates all point to the fact that these elements are needed to be present in sufficient condition before local agents can successfully exploit the kind of advanced technology that is incumbent in the frontier. Their adequacies make it possible for producers in backward societies to learn, adopt, imitate or copy the latest production techniques externalized by the leaders and in the process close the technology or efficiency gap that exists between the two. On the other hand inadequate supplies of these elements make the internalization of advanced knowledge and hence efficiency improvement a difficult task.

This may especially be the case for many African producers whose activities are embedded in environments characterized by significant social and institutional barriers to doing businesses. It is a fact that Africa lags behind the rest of the world in the supply of both quality and quantity of those set of institutions and socioeconomic factors that drive productivity and enhance regional competitiveness. Using scores from the 2007 Global Competitiveness Index report, Figure 2 below compares the competitiveness of sub-Sahara African region with a number of other developing economies. Economies that fall in the latter group include North Africa, South East Asia, Latin America & the Caribbean as well as a special group of rapidly developing and large countries of Brazil, Russia, India and China (BRIC). As the figure shows these comparator groups outperform Africa in all areas of the five critical drivers of productivity identified by the report: institution; infrastructure; primary education; higher education and market efficiency (financial, goods and labour).

Many experts agree that the quality of institutional regime in SSA is relatively poor by international standard. In terms of the essential requirements for fostering economic development Africa exhibits significant weaknesses in virtually all areas. Contract enforcement mechanisms are rarely known for their virtues. On the responsibility to protect and not appropriate property rights the state is lacking in credible commitment. As one observer noted, the state is either too weak to protect or so strong that it threatens property

rights itself. Corruption and bureaucratic red tape seem synonymous with official regulations in most of these countries. Although experts still debate the factors that contributed to the poor institutional development of African countries, broad consensus appears to exist that it is one of the main factors responsible for the region's underdevelopment (Collier and Gunning, 1999; Azam, et al., 2002).
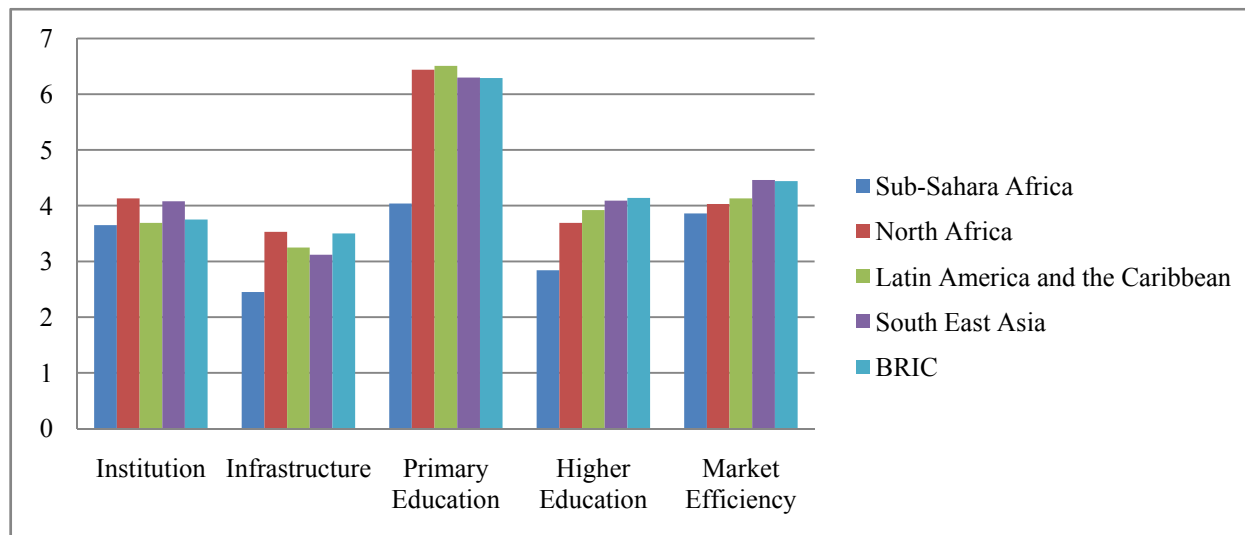

Figure 2: Average Scores for 2007 on the Global Competitiveness Index for SSA and other Comparator Economies
Source: World Economic Forum

Indeed since North (1990) students of development economics have more than ever before come to appreciate the role of institutions in economic performance. Efficient institutions that reduce transaction costs to exchange make it possible to capture gains from trade and raises profitability of investments. On the other hand inefficient regime of institution and norms, which guides interactions, creates uncertainty, raises transaction costs of investment and consequently reduces its attractiveness. It is hardly disputable that manufacturers facing institutionally induced high costs of transacting businesses like the Africans will have little to show in terms of productivity performances. We can put this nicely in an empirically verifiable hypothetical statement that illustrates the pattern of relationship between African entrepreneurs and their institutional environment thus:

Hypothesis 1: For resident African manufacturing establishments, technical inefficiency (efficiency) scores are positively (negatively) associated with measures of institutional weaknesses.

Another area where genuine concerns still hold sway is on the state of African infrastructure. In most of its constituent economies responsibilities to provide such services like power & water supplies, telecommunication, transport etc have traditional been vested in the hands of the state. However, just like its record of performance in other spheres of activities, government deliveries here have also been characterized by general inefficiency that rears its head in the form of poor and insufficiencies of service supplies along with their high costs. Available statistics on the state of the infrastructure show that only 58 per cent of the

continent's population has access to safe water. Also in comparison with averages of 146 and 567 for the world and high-income countries respectively there are only 18 mainline telephones per 1000 people in Africa (Nepad, 2001). More damning evidences which convey the impression that Africa is relatively worse off than the rest of world when we consider the percentage of population with access to key services like safe water and sanitation, good communication, efficient transport and uninterrupted power supplies are contained in other estimates[4].

Efficient infrastructure is important for the business of manufacturing. Power supply is virtually indispensable to modern day production activities while transport is needed to move intermediate and finished goods around locations. No one will also deny the fact that businesses can hardly survive without good communication and sufficient water supplies. Firms operating in environment characterized by infrastructural services deficiencies may end up spending more on overhead as they are more likely to be forced to acquire their own generating plants or to resort to alternative but less efficient transportation and communication methods. The consequence of all these for performance and operational efficiency in African firms is glaring and hence we are led to define our second hypothesis as follows:

Hypothesis 2: Technical inefficiencies in Africa manufacturing plants have positive association with measures of poor public infrastructural services deliveries.

Further compounding the problem for regional competitiveness are issues related to dearth of human capital and market efficiency. Illiteracy rate is high. It is estimated that the percentage African population falling in the category of age group above 15 that is illiterate is about 41 (Nepad, 2001). Even those with requisite skills for productivity and general economic development are known to have deserted the continent in some recent waves of human capital flight that have come to be termed 'the brain drain phenomenon'.

The importance of education to economic growth is already well recognised in economics[5]. Education affects a nation's ability to adapt modern technology needed for growth in several ways. One, effective operation and maintenance of sophisticated equipments used in industrialised countries equally demands sophisticated skills and knowledge that can only be achieved through schooling or training. Two, lateral communication between managers of highly specialised functions or activities that are typical of modern system of production organisation requires good education on their part to be effective. Three, it is also true that acquiring expertise in activities like administration, accounting, personnel, banking, insurance and legal services that are indispensable to contemporary industrial engineering requires significant investment in formal training. All these underscore the fact that good education and training are central to operational effectiveness and efficiency. Therefore, from an industrial organizational perspective it will amount to stating the obvious to assert that efficiency performance of producers in environment with significant lags in supplies of skilled workforce will always be below their technically feasible point. Because poor or inadequate education will make learning, imitation or adoption of new efficiency improving production

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[4] For a thorough analysis of the state of African infrastructure see Jerome, A. (1999).
[5] See Easterlin (1981)

methods and techniques a difficult task for workers we define the third hypothesis to be investigated as follows:

Hypothesis 3: Technical inefficiencies (Technical efficiencies) of African manufacturing firms have negative (positive) association with skill level of workforce.

Market efficiency especially with regards to access to finance was recently listed among the top five issues that the 2007 Africa Competitiveness Report identifies as needing urgent attention[6]. There is a widespread poor quality and generally low level of financial intermediation across the continent. Banks and other formal institutions of finance are mainly concentrated in urban areas where the bulk of the trade related activities they mostly support is carried out. Because of their perceived riskiness many growth inducing small scale and rural entrepreneurs are usually unable to secure financial assistances from these institutions. To finance their operations these group of borrowers often depend on informal and relatively unsophisticated sources like savings and credit associations.

Some governments responded to this instance of market failure by setting up development finance institutions under various guises. Typically, these agencies will carry the mandate to correct the manifestation of market inefficiency by ensuring that the credit needs of producers in the targeted areas are met. But over the years experience has shown that objectives are seldom met as it often turns out that the targeted intervention constitutes no more than a new form of failure that pitches government failure side by side with market failure.

Furthermore, when judged by world standard many of Africa's stock markets are extremely relatively small. With the exception of South Africa all of her major markets accounted for only 0.2 per cent and 2.0 per cent of world and emerging stock market capitalisation respectively at the end of 2003 (Jefferis and Smith, 2005).

This kind of financial environment will no doubt achieve practically very little in terms of savings mobilizing from the surplus units and consequent allocation to the deficit units in any efficient manner. Quite as early as Schumpeter (1911) the foundation for the argument that efficient financial intermediation is important for economic growth has been laid. Recent theoretical and empirical modelling reinforce this position in some unequivocal terms (Greenwood and Jovanovic 1990; Bencivenga and Smith 1991; Roubini and Sala-i-Martin 1992): Well developed and vibrant system of financial intermediation help increase growth by channeling savings to highly risky but equally productive activities. A repressed financial system on the hand has negative consequences for domestic productivity because it raises the cost of capital for investors in two main ways. One, because of the repression, the internal cost of fund will be positively off its market determined equilibrium value as many potential demands will be left unsatisfied by the inefficient internal facilities. Two, since some of these finance constrained investors may now be forced to resort to external sources, a higher cost of

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[6] As if echoing the plight of the continent's deficiencies in social capability the said report identifies significant lags in the basics of infrastructure, education, sound policies, business access to finance as well as pervasiveness of corruption as the five main obstacles to improving productivity and competitiveness of the region. In our empirical analyses in this paper these areas of concerns have been sufficiently reflected.

transaction that raises overall cost of fund is likely to be associated with this alternative choice. The nature of association between high cost of capital and efficiency of operations is obvious and this brings us to the fourth and final hypothesis that we state as follows:

Hypothesis 4: For resident African entrepreneurs technical inefficiency has positive relationship with plant level manifestations of economy wide financial repression.

We investigate all these hypotheses in the context of Lesotho garment manufacturers. But before this is done it is important that we have an idea of what extant literature on manufacturing productivity in Africa has to say.

3. PRODUCTIVITY BEHAVIOUR IN AFRICAN MANUFACTURING PLANTS

The phenomenon of manufacturing efficiency in Africa with respect to why productivity performance often departs from its most efficient level has been visited with some noticeable interests. Over the years, a plethora of explanations ranging from size to export orientation, from human capital to trade policy regimes and other variables of institutional environment have all appeared in the writings of many prominent scholars of industrial organizations.

For instance, size has been found to be positively associated with productive performance of Kenyan firms (Lundvall and Battese, 2000) and Ivorian firms (Chapelle and Plane, 2005). Another analytical model postulates that export oriented strategy increases firm level efficiency (Krugman, 1987; Grossman and Helpman, 1991). This was tested and confirmed at plant level for the four African countries of Cameroon, Kenya, Ghana and Zimbabwe (Bigsten, et al., 2000).

In investigating the consequences of human capital for performance, Soderbom and Teal (2004) find that observable skills are not quantitatively important as determinants of productivities among manufacturing firms in Ghana. Evidences that trade liberalisation has positive impact on industrial productivity are contained in Tybout (2000) and Chete and Adenikinju (2002). While all these competing explanations have offered interesting insights, studies that focus on variables of institutional factors represent a kind of analytical departure that is similar in spirit with the social capability arguments.

Theoretical models of institutional failures and firm performance such as in Hall and Jones (1999) argue that the observable differences in cross country levels of output per worker can be explained by differences in the quality of social infrastructure. With social infrastructure being defined as institutions and government policies that define the business climate in a region, McArthur and Teal (2002) test this hypothesis for a cross sectional sample of 27 African economies.

In their empirical model, corruption is used to proxy for social infrastructure and their estimation finds significant evidence of negative correlation with performance in two ways. One, at the individual firm level, companies that pay bribe are found to be 20 per cent lower in levels of output per worker. Two, at the global level, firms operating in countries where corruption is endemic are reported to be 70 per cent less efficient than firms that operate in relatively corruption free economies.

In a similar investigation Chapelle and Plane (2005), use the concept of *dual industrial structure* to shed some lights on efficiency performance of Ivorian firms. The reasoning goes that the proven ability of small informal firms to co-exist with the large ones despite suggestions that the former is less likely to be as efficient as the latter must have been due to the existence of some forms of market or government failures.

Government and market failures that constrain firm access to finance, promote corruption, encourage trade unionism and deliver poorly on public infrastructural services are hypothesized to be antithetic to productivity. Because large firms are more likely to be confronted with most of these failings due to their formal status, it is reasoned that they will be relatively worse-off in efficiency performance than their smaller and informal counterparts. Various indicators of government and market failures were introduced in the inefficiency model. On the basis of their findings, the authors could only confirm their hypothesis with respect to trade union. The importance of other variables of institutional and market failings such as public infrastructure, corruption and access to credit constraints could not be clearly established.

To the extent that social capability hypothesis emphasizes these elements of social and institutional environment that the above studies acknowledge, the present study compares well in this direction. It however departs in a different direction because of its different analytical inspiration (that allows for better analysis and modeling of the social capability elements) as well as the subject matter of its empirical case study.

4. METHODOLOGY

To investigate the relationship between manifestations of social capability deficits and productivity behaviour of African entrepreneurs, stochastic production frontier models are specified and estimated for a representative sample of Lesotho garment producers. We first motivate the choice of this modelling technique before describing the data and variables that are used in the estimation.

Stochastic Production Frontier Technique

Following the seminar work of Farrel (1957), analysis of technical efficiency attracted significant attention from researchers and policy makers alike. Over the years several approaches to measuring efficiency have been developed with the two principal ones being data envelopment analysis (DEA) and stochastic frontiers. The DEA approach is a non-parametric form of analysis that relies on linear programming technique to estimate production function. Its main source of attraction is found in the fact that it neither requires parametric assumptions nor assumptions about functional relationship between input and output to be made. However, because of its deterministic nature all deviations from the frontier are taken to reflect inefficiencies. This means that the computed inefficiency scores may be sensitive to measurement errors or other statistical noise that may be present. Therefore its usefulness especially with respect to survey data is limited (Teal and Soderbom, 2002).

Stochastic frontier approach proposed independently by Aigner, Lovell and Schmidt (1977) and Meeusen and van den Broeck (1977) is able to overcome these problems and will consequently be employed in this investigation. Its framework is built around the assumption that firm level efficiencies are affected by both random and inefficiency factors. While the random component expresses the influences on productivity, of factors that are outside the firm's control, the inefficiency component expresses deviations from frontiers that are attributable to influences from firm specific factors. A typical formulation of its model will present a production function augmented in an econometric design fashion by an error term that is composed of two elements. The first component captures the random effect while the second accounts for the unobservable inefficiency. This basic specification has been altered and extended in a number of ways to take account of different situations. In this study the Battesse and Coelli's (1995) approach has been used to model the influences of environmental variables on technical efficiency scores and the development of the model proceeds as follows:

Assume the following expresses the relationship between output and input for a given firm:

$lnY_i = f(X_i; \beta) + e_i \quad i = 1, \ldots, n$ ………………………………………………………….. 1

Where Y_i is the production of the *i-th* firm; X_i is a (k*1) vector of input quantities used by the *i-th* firm; ß is a vector of unknown parameters and *n* represents the total number of firms. The error term e_i is defined as:

$e_i = (v_i - u_i)$ …..………………………………………………………………………….. 2

where the v_i are assumed to be independently and identically distributed $N(0, \sigma^2_v)$ two sided random errors and independent of the u_i. The u_i are themselves defined as non-negative one sided random variables associated with technical inefficiency and assumed to be iid as truncations at zero of the normal distribution with mean, μ and variance σ^2_u. If we denote technical efficiency of the *i-th* firm by TE_i its estimates will be given by:

$TE_i = f(X_i; \beta) + v_i - u_i / f(X_i; \beta) + u_i \quad or \quad TE_i = \exp(-u_i)$ ……………………………….. 3

Estimating equation 3 will require an appropriate functional specification of a production frontier.

An Inefficiency Effect Model:

Recognising that certain factors may operate at the level of the firm to hinder efficient operation is of little policy significance if we cannot disentangle the actual mechanism of this relationship. In other words, from a practical policy perspective, it will be of great interest if we are able to reveal the way efficiency performance of organisation responds to variations in these firm specific variables.

Fortunately a model of inefficiency effect can be developed to address this issue. Extant literature on stochastic frontier analysis reveals a number of different approaches. Earlier empirical works employ a two-stage estimation procedure in an attempt to identify the

various reasons for differences in predicted efficiencies of firms in the same industry. In the first stage stochastic frontier estimates are derived and predicted efficiencies using these estimates are in the second stage regressed on firm level explanatory variables of interest. Many have long criticized this approach. It is argued for instance that the firm level characteristics may be correlated with the structure of the production frontier so that two-stage procedure will yield inefficient estimates (Kumbhakar, et al., 1991; Reifschneider and Stevenson, 1991; Battese and Coelli, 1995). To overcome this problem a single-stage estimation technique has been suggested. Among the various approaches that have emerged over time in response to this include the one proposed by Battese and Coelli (1995). Its argument can be expressed into the combined form of equations (1) & (2) above by modeling the mean of u_i as a function of a host of firm specific explanatory variables thus:

$$lnY_i = f(X_i;\ \beta) + v_i - (Ź i\delta + w i) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\ 4$$

where $Ź i$ is a 1*p vector of explanatory variables for the inefficiency effect and δ is a p*1 vector of parameters to be estimated. For the *i-th* firm, technical efficiency is then expressed as:

$$= \exp(-u_i) = \exp(-Ź i\delta - w i) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\ 5$$

Varieties of hypotheses can be tested to verify the validity of the model assumptions. For instance the test that technical inefficiencies are not present in the model can be conducted under the null hypothesis given by H_0: $\gamma = 0$ with the γ parameter defined as $\gamma = \sigma^2 u\ /\ (\sigma^2 v + \sigma^2 u)$. If we fail to reject this hypothesis then the model approximates to the deterministic or average response function which can be effectively estimated with the ordinary least square technique.

Another hypothesis that the inefficiency effects are not influenced by changes in explanatory variables included can be tested with the null specified as H_0: $\delta_1 = \delta_2 = \delta_3 = \dots\dots \delta_n = 0$. The test with respect to the appropriateness of the functional specification can also be carried to ascertain whether or not a Cobb-Douglas specification for instance with constant returns to scale is preferable to say a Translog form with variable elasticity of factor input.

The validity of all these hypotheses can be tested by using the generalised likelihood ratio test with test statistics given by:
$$\lambda = -2\{\ \ln[L(H_0)/L(H_1)]\ \} = -2\{\ \ln[L(H_0)] - \ln[L(H_1)]\ \} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\ 6$$
This statistics is asymptotically distributed as a chi-squared with degrees of freedom equal to the difference between parameters of the hierarchically nested models. Critical values for the test are obtainable from the appropriate chi-square distribution table.

Data and Variables

From the database supplied by the Lesotho Bureau of Statistics (LBOS) twenty-nine garment producing firms provided information on operational performances for the 2004 period. From this database it was possible to obtain information on key variables of interest to the research. However, due to incidences of missing data and the fact that information on other material variables (especially social capability variables) could not be extracted from this

source, a fieldwork survey was conducted between April and October 2006 to gather such other data as might be needed. The field exercise basically involved the administration of a research questionnaire on establishment officials as well as consultation with other secondary sources[7]. Out of the 29 questionnaires that were administered 17 were finally used in the analysis implying about 58.6% response rate. This response figure also approximates to roughly 45% of the 38 garment firms that LNDC reports are in existence and the World Bank reckons account for the bulk of sectoral employment in the country.

Production Technology Variables:

In the production function whose descriptive statistics is given in Table 1 the dependent variable is proxied by a firm's gross output for the year 2004. While gross value added rather than gross output is often the preferred choice of many empiricists available data do not afford us the luxury of such leverage.

Three input variables: labour (l); capital (k); and energy ($engy$) are introduced. Consistent with approaches used in previous attempts all the three explanatory variables which are expected to be positively related to output have been calculated as follows: labour input is measured as the total number of employees; capital is defined as gross fixed assets; and energy input is captured by the total cost incurred on electricity, fuel and related items.

Table 1: Summary of Production Technology Attributes of Sampled Apparel Firms 2004

Production Technology	Mean Value
Output (y)	144679.2
Capital Stock (k)	7568.89
Labour (l)	1117
Energy Input (engy)	16599.17
No of Observations	17

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[7] The design of the questionnaire mimics the World Bank Enterprise Survey approach. The author benefitted tremendously from and acknowledges with thanks assistances received from the institution.

Social Capability Deficit Variables:

Five different measures of Lesotho's socioeconomic environment have been introduced to capture the possible impact of social and institutional inadequacies on firms' performances. The selection of these factors is guided by our earlier specified hypotheses in Section 2 and they are here identified to include various kinds of constraints imposed by: poor public infrastructural services deliveries *(infr)*; skills shortages *(skill)*; poor access to institutional credit *(crdt)*; bureaucratic impediments *(brc)* and official corruption *(crp)*. The last two variables *(brc and crp)* are alternative measures of institutional weaknesses. Table 2 below provides summary statistics for these variables while their histograms are given in the appendix.

Information on the likely impact of poor public infrastructural services were obtained by asking participants to reveal their responses to a question on whether on not the delivery of the service constitutes an obstacle in relation to their firms' operations. Responses were calibrated on a 5-point Likert scale ranging from 0 (no obstacle) to 4 (very severe obstacle). From the histogram in the appendix the modal response comprising about 47% of respondents is seen to be 3. This indicates that a significant number of participants were in agreement that the variable constitutes a major obstacle but not of a severe type. However, if we consider the fact that the next in line in terms of response with the highest frequency is 4 with more than 23% rating the service delivery as a very severe obstacle we get the impression that majority of participant firms perceived this variable as a serious impediment.

Poor delivery of public utility services represents a failure on the part of an economy to provide adequate business support infrastructure and are expected to raise the competitive stake for firms experiencing its negative influence. Our expectation follows that this variable will positively impact on technical inefficiencies of firms.

Similar qualitative variables were developed to capture the effects of skill constraints, bureaucratic impediments, poor access to credit and official corruption on firm performances. The skill constraint variable measures the extent to which differences in employees' level of education translate into productivity advantages at firm level. Firms were asked to describe on average the level of educational attainment of their supervisory and other related staff. The feedback from a discrete choice response bounded between 0 (primary school or less) and 4 (graduate) reveals a mean value of 2.412 with a standard deviation of 0.939. This implies that not much variation exists in the distribution of skill among establishments' employees. As further revealed in the histogram over 70% of the industry's stock of mid-level personnel attained between vocational and 'some university' levels in education.

Our objective here is to find a way of determining how plant level performances are affected by the economy's capability to meet industry's demand for skilled manpower. Recognizing the fact that inadequacy in supply of human capital could have significant bearings on job recruitment and hence quality of organizations' workforce, we argue that productivity performance of sampled firms will be positively associated with skill level of workforce. Thus higher level of skill as captured by educational attainment of employees variable is expected to show a negative impact on inefficiency scores.

Possible losses resulting from having to deal with varieties of official regulations have institutional inclination and were introduced by modeling information on respondents' perceptions of the magnitude of bureaucratically induced operational problems. We gauged this perception by asking respondents to indicate the extent of their disagreement or agreement with a statement like this 'Dealing with requirements imposed by legislation is a problem to the smooth operation of my business'. Close to 40% of participants expressed different levels of agreement with the statement while around 28% mirrored the opposite end (i.e. strongly disagreed and disagreed). With about 29% sitting on the fence one gets the impression that some disagreements exist on managers' perceptions of the quality of bureaucracy.

Inefficient system of administrative control may increase technical inefficiency of the plant since managers/staff will be forced to waste valuable times attending to cumbersome regulatory issues. Therefore this variable should impact positively on inefficiency.

Although the structure of our *business access to credit* variable question follows the same qualitative Likert-scale response design, its message was actually intended to extract information of an opposite kind. So rather than measuring responses in terms of increasing disturbances, participants were asked to reveal their judgments on the efficiency of financial institutions in terms of decreasing disturbances scaling from (0) very inefficient to (4) very efficient. The sample evidence reveals that close to 65% of respondents viewed financial institutions in the country as inefficient at different levels of magnitude. Only 6% said they were efficient while around 29% could not make up their mind. It is important to also recognise that none of the respondents considered these institutions to be very efficient. This convergence of responses around inefficiency as a general perception of financial institutions in the country is further revealed in the sample statistics, which shows a mean of 1.176 and standard deviation of 0.883. So just like the case of public infrastructural services deliveries, access to credit is also viewed by many to be a significant hindrance to business operations

Good access to institutional credit reduces transaction costs so that firms with better access are more likely to report higher efficiency scores than their counterparts. Therefore a negative correlation with inefficiency is what is anticipated from the coefficient of this variable.

Official corruption has been introduced as another manifestation of social capability deficits that is institutionally related and can potentially plague efficiency performance of the firm. We captured this variable by abstracting from participants' responses to the statement: 'Official corruption constitutes an impediment to doing business in this country'. With an option to choose from a 5-point scale ranging between 0 (fully disagree) and 4 (fully agree) the mean response was 2.118 with a standard deviation of 1.317 suggesting that respondents were generally unsure of their position on this matter. But in as much as corruption is seen to increase a firm's transaction costs a positive association with inefficiency should be the natural outcome of its estimated impact.

Finally, a word of caution is in order here. In capturing all but the skill constraint variable in the subjective sense of officials' perceptions we are not unmindful of the potential endogeneity issue inherent in the strategy. It is possible for instance that poor productivity itself may explain why firms find it difficult to obtain institutional credit or the incidence of

vexed judgments on quality of services. Data of a more sophisticated nature than ours will however be required to deal with possible biases from this strategy and its recognition is being admitted as a significant limitation of our exercise.

Table 2: Summary Statistics of the Main Social Capability Variables introduced in the Inefficiency Model

Variable	Obs	Mean	Std. Dev.	Min	Max
infr	17	2.824	0.951	1	4
skl	17	2.412	0.939	1	4
crdt	17	1.176	0.883	0	3
brc	17	2.118	1.054	0	4
crp	17	2.118	1.317	0	2

Having noted that, it is hardly surprising that majority of plant officials rated infrastructural services deliveries as significant obstacle to doing business in the country. From industrial establishment perspective Lesotho provides a relatively uncompetitive environment for the supplies of utility service input for production purposes. For instance, in comparison with some of her most important competitors in the global market for apparel (South Africa, China and India) not only is the cost of electricity service higher in the country, its quality in terms of frequency of outages is also worse-off. Water, which constitutes a critical input for the garment industry especially the denim plants, is also in limited supply as our findings reveal. Furthermore, besides the fact of its landlocked geography, transportation problems are further exacerbated by limited rail service networks and near absence of air transport. The railhead located in the capital is the only one the country can boast of. Very often its capacity is over stretched and delays in the deliveries of goods to client firms are common experiences. This service supply inadequacy has often meant that plants are forced to resort to the more expensive truck services to transport intermediate inputs and outputs within and out of the country.

What seems surprising however is that similar majority of respondents viewed access to credit as an important obstacle as well. This is not to suggest that Lesotho has a very competitive financial sector. In the contrary the profile of the sector is defined by oligopolistic and related inefficient attributes. The banking sub-sector, which provides the bulk of financial intermediation services, is small, relatively underdeveloped and significantly dominated by three South African Banks (Nedbank, First National Bank and Standard Bank). The services they provide are mostly limited to overdraft facilities usually to large customers. On two key measures of financial depth, statistics reveal that at the end of the third quarter of 2004 bank liquidity and credit to deposit ratio stood at 60.7 per cent and 25.3 per cent respectively suggesting that the industry is generally averse to lending (Mohapi, P. L. and Motelle, S. I. 2007). Profile of the lending mix itself is also unfavourably biased against the private sector which received about 13.8% of total deposit in 2004. This performance compares badly with

70 percent and 95 per cent figures recorded for the two neighbouring economies of Swaziland and Namibia respectively during the same period (*ibid.*). Although two Development Finance Institutions (Lesotho National Development Corporation and Basotho Enterprise Development Corporation) were set up to enhance the economy's ability to provide financial intermediation, they have largely ceased to operate (World Bank, 2007).

But given that the garment industry in Lesotho is almost entirely controlled by foreign investors who ordinarily should be able to finance their operations through their outside network one would expect that they should have little problem with these institutional failings. This argument can easily be discounted on the ground that these responses are reflections of participants' judgments on the efficiency of local financial institutions and not on their own abilities to raise funds. Ordinarily firms will prefer to source their fund locally as resort to external sources may represent a less efficient choice since higher transaction costs are likely to be incurred.

It is plausible to argue that in a single country where a uniform set of institutional regime governs the affair of businesses the observed variations in respondents' perceptions of the magnitude of corruption and quality of bureaucracy are not true reflections of reality but mere subjective opinions. Firstly, we argue that firms differ in their strategies for dealing with institutional issues like corruption. These differing approaches define their unique experiences and the kind of judgments they pass on the phenomenon. For instance, while some may be negatively or weakly disposed to offering inducements and fail to read its signs or simply dismiss it as manifestations of bureaucratic or other forms of inefficiencies, others may be positively disposed and always ready to play the ball even at the slightest opportunity. These differences are especially likely to influence the type of relationships that regulatory officials cultivate with establishments' staff.

Secondly, the burden of bureaucratic compliances may not be evenly spread across plants. Given that compliance with regulatory requirements could present different opportunity costs for different firms, a given system of administrative control could constitute varied levels of impediments to each and every organisation. Thus the revealed variations in perceptions can be understood within this context.

Finally, the last thing to note from the analysis of findings from questionnaire is the observed clustering of response values with respect to the skill constraint question around their mean figure of 2.412. This should be readily understandable given that for a limited one industry study focus where all firms are faced with the same input technology like ours, wide disparities in skill profile of employees is highly unlikely.

We put these findings into further empirical analysis by specifying and estimating an inefficiency effect models for our sampled firms using the framework discussed previously. The specification of the relevant model as well as presentation and analyses of results follow next.

5. MODEL SPECIFICATION, RESULTS AND ANALYSES

Model Specification:
Because of its widespread popularity among previous researchers of similar empirical disposition the production framework adopted for this study is that of Cobb-Douglas functional form. With respect to industrial data especially, it has been noted that this restricted form of Translog specification has more often than not been adopted in practise (Desai, 1976). Thus the estimated Cobb-Douglas Stochastic Frontier Production Function for our sample of Lesotho garment firms is assumed to be defined as:

$$lnY_i = \beta_0 + \beta_l \, ln(l_i) + \beta_k \, ln(k_i) + \beta_e \, ln(e_i) + v_i - u_i \; \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots..\ldots 7$$

where lnY represents the natural logarithm of output. $ln(l)$, $ln(k)$ and $ln(e)$ also stand for the natural logarithms of labour, capital and energy respectively. The subscript i indicates observation for the i-th firm. The v_i are random variables assumed to be independently and identically distributed $N(0, \sigma^2_v)$. The u_i are non negative random variables also assumed to be iid as truncations at zero of the normal distribution with mean μ_i and variance σ^2. Where:

$$\mu_i = \delta_0 + \delta_l Infr_i + \delta_2 skill_i + \delta_3 accr_i + \delta_4 brc_i + \delta_5 crp_i \; \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots..\ldots\ldots 8$$

$Infr_i$ captures the likely impact of poor public infrastructural services on the i-th firm's performances; $skill_i$ defines the level of education of the i-th firm's employees and its potential influence on productivity; $accr_i$ stands for the possible impact that poor access to credit has on the i-th firm's operations; Finally, both brc_i and crp_i represent our different measures for the influences on performances of the i-th firm of institutionally related bureaucratic impediments and corruption respectively.

Two other reality checks were further conducted to verify the validity of our empirical approach for the study. The first concerns ascertaining whether or not the stochastic frontier model was really a superior representation of the data over the average response function with no technical inefficiency. The second investigates the effects of all the explanatory variables in the inefficiency model to establish their significance as possible sources of technical inefficiencies. Both checks and the hypotheses deriving from them have been tested using the earlier suggested generalised likelihood ratio tests. Their results together with the maximum likelihood estimates for parameters of Cobb-Douglas stochastic frontier production function with embedded inefficiency effect factors are presented below. All models have been estimated with the aid of the computer software package 'Frontier 4.1' (Coelli, 1996).

Results and Analyses:

In Table 3 values of the generalised likelihood ratio statistics that were obtained using the restricted and the full model are reported in the first column and their respective critical values are given in the second. Given our null hypothesis that all firms operate on their efficiency frontier i.e. no technical inefficiency, it is seen from the Table that this hypothesis is easily rejected in favour of the alternative assumption that inefficiency effect is a defining attribute of production. The generalised one-sided LR statistics is significant at 5% level. Revealed value of the estimated γ-parameter reported in Table 4 also lends strong support to

this conclusion. With a significance value at 95% level, the γ-estimate reveals that about 52% of total variability is associated with inefficiency of production. A deterministic model with fully efficient production behaviour assumption cannot therefore serve our purpose as well as a frontier specification will do.

Similarly, we find from the second row of the table evidence against the null hypothesis that the coefficients of all explanatory variables in the inefficiency model are simultaneously equal to zero. Therefore, it can rightly be argued that all our speculated causes of inefficiencies are collectively significant in explaining efficiency variances among sampled firms.

Table 3: Generalised Likelihood Ratio Tests of Hypotheses for Parameters of the Stochastic Frontier Production Function

Null Hypothesis	LR Statistics	Critical Value	Decision
H_0: $\gamma = 0$ (No inefficiency)	13.80	11.07	Reject
H_0: $\delta_1 = \delta_2 = \ldots \delta_5 = 0$ (No functional relationship)	13.80	11.07	Reject

All values of the generalised likelihood ratio statistics are significant at 5% level

In Table 4 the most likelihood estimates of the parameters of production factors as well as inefficiency effect variables are reported. All the three input factors not only display the expected positive signs they are also statistically significantly related to output. The higher value of labour elasticity relative to other inputs should be expected given that clothing firms are labour intensive production technology.

We now move to the second half of the table where inefficiency is modelled as a function of a number of explanatory variables. First of all, it is instructive to note that the mean technical efficiency figure is about 53%. This implies that garment firms in Lesotho were operating well below their technically feasible capacity during the study period. According to the value of our estimated y-parameter this inefficiency effects are significantly attributable to the impact that environmental variables exert on plant abilities to behave efficiently. Among the five proxies for different manifestations of social capability deficits that have been fitted only two display the expected signs that are statistically significant.

As reported in the table, the coefficient on infrastructural obstacles (δ_1) is positive and statistically significantly associated with technical inefficiency, suggesting that there are productivity losses emanating from poor delivery of public infrastructural services in the economy. Besides the fact that this result serves to confirm our earlier hypothesised

relationship similar finding was reported in a previous study. In a 2002 Government of Lesotho commissioned study on the Garment sub-sector it is revealed that inadequate water supply and poor deliveries in some other related public infrastructural services areas constitute some of the most serious challenges to the continued growth of the country's garment subsector (Salm, et. al., 2002).

Further evidence that an inefficient social and institutional environment impacts negatively on manufacturing firms' productivities is provided by the value of the estimated coefficients on access to credit (δ_3). The fact that this figure is negative and statistically significant goes to show that lack of good access to credit is a key contributor to technical inefficiencies of the firms. In other words, better access to credit will help reduce operational inefficiencies of sampled firms. On the basis of this evidence, it can be submitted that some support exist for our earlier argument that productivity performances of Lesotho garment firms suffer from institutional weaknesses arising from the economy's weak financial intermediation. This submission is again consistent with the findings of a recent World Bank Investment Climate Assessment exercise. The report of this exercise had cited lack of access to capital as one of the major obstacles to doing business in Lesotho (World Bank, 2005).

Table 4: Maximum Likelihood Estimates for Parameters of Cobb-Douglas Stochastic Frontier Production Functions with Embedded Inefficiency Model for Lesotho Garment Firms

Variables	Parameters	Coefficients	t-statistics
Intercept	β_0	3.67	3.80***
Labour	β_l	0.55	2.77***
Capital	β_k	0.33	2.16**
Energy	β_e	0.17	2.54**
Inefficiency Model:			
Intercept	δ_0	-4.91	-1.85*
Infrastructure	δ_1	0.96	2.04**
Employee Skill Level	δ_2	0.70	1.88*
Access to Credit	δ_3	-0.79	-2.32**
Bureaucracy	δ_4	0.39	0.87
Corruption	δ_5	0.41	1.21
Variance Parameters:			
	σ^2	0.43	2.11**
	γ	0.52	2.25**
Loglikelihood		-15.27	
Mean TE		0.53	

(*), (**), (***): Statistical significance at 90 per cent, 95 per cent, 99 per cent level of confidence, respectively.

Seemingly inconsistent however, with argument of our Hypothesis 3 and the tenet of social capability is the discovery that the proxy for employees' skill level (δ_2) has been estimated with a positive sign. Given the way the variable has been captured, it means that higher skill level as measured by the level of employees' education is positively associated with declining productivity (inefficiency). Obviously, this is a surprise finding as theoretical arguments support the notion that better trained workers are relatively more productive and an inverse relationship between inefficiency and level of education is a more plausible outcome. But in the specific context of our research failure to observe a negative relationship between skill level and inefficiency may be rationalised on the ground that garment production is essentially a labour intensive activity and there exists a threshold beyond which higher skill attributes will no longer matter for improved efficiency of factors. A somewhat similar argument can apply with respect to the observed positive association between skill and inefficiency. It might just be reasonable as well to suspect that firms with higher level of skilled workforce build up excessive wage bills that are uncompensated for by commensurate efficiency gains. The consequence will thus be that such unproductive expenditures will have a positive bearing on the level of the firm's technical inefficiency.

Finally, although both bureaucratic bottleneck (δ_4) and corruption (δ_5) variables show the anticipated positive signs it is difficult to accept any suggestion implied in Hypothesis 1 that these institutional variants of social capability deficits have any explanatory power on operational efficiency since their associated t-statistics are not significant at any conventional level of test.

6. CONCLUSIONS

We have made attempt in this paper to address the issue of productivity performance of manufacturing plants in Africa. This has become practically necessary in view of the fact that the continent recently suffered some setbacks in the export market for garment manufactures when the prospects of stiffer competition forced some of her resident producers to opt out of business.

The paper moves from the premise that the intellectual appeal of extant literature on productivity phenomenon in African firms is currently circumscribed by its limited exposures on both theoretical and empirical fronts. On the latter side, it is argued that probing into the specific cases of countries that have so far not been investigated will go a long way to enrich the emerging body of evidence from Africa. On this account, our paper contributes to the literature by extending the list of countries in the current empirical coverage to include the experience of Lesotho.

With respect to the former, it is further submitted that the depth of current analyses will be improved if we allowed the theoretical foundation of our works to be inspired by arguments other than some stylised ones. By abstracting form the theory of social capability and consequently drawing attention to the role regional socioeconomic infrastructures in shaping productivity behaviour of African entrepreneurs this research finds additional relevance in the continuing search for better understanding.

Our empirical approach is built around the hypothesis that some manifestations of social capability inadequacies exert negative influences on productivity performances of our sampled firms. Stochastic frontier model is the preferred choice of method for investigating the validity of all hypothesised relationships because it is able to overcome many of the empirical and statistical shortcomings of some other techniques. The main findings emanating from the fitted model support the general view that social capability deficits impacts negatively on abilities of firms to behave in efficient manners. Specifically the existence of inefficient public infrastructures is found to be positively associated with technical inefficiencies at firm level. It is also an empirical reality within the context of this investigation that poor access to credit as imposed by weak national system of financial intermediation translates into poor efficiency performance at firm level.

Obviously, the most important conclusion that can be drawn from these findings is that adequacy of regional economic infrastructural services is essential if resident firms are to realise their efficiency potentials and compete successfully in markets. Thus in the continued struggle for a virile industrial sector in Africa, it is evidently not sufficient to create temporary artificial advantages for firms by simply redefining the rules of market engagement in their favour. Complimentary policies and actions to improve the socioeconomic climate they face are the other part of the equation that deserves equal attention.

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APPENDIX

Histograms of Responses to Questions on different Manifestations of Social Capability Deficits

Public Infrastructural Services Deliveries as an Obstacle

Skill Constraints

Access to Institutional Credit

Bureaucratic Impediments

28

Institutional Corruption