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*The Performance of Nigerian Manufacturing Firms: Report on the Nigerian Manufacturing Enterprise Survey 2001**

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Prepared by

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Executive Summary

This is an analysis of the performance of Nigerian manufacturing, primarily based on the Nigerian Manufacturing Enterprise Survey (NMES) fielded in July and August 2001. The main findings of the report can be summarised as follows:

- Aggregate statistics for the Nigerian macroeconomy and its manufacturing sector show that the 1990s was a relatively static period. The end of the decade witnessed moderate economic recovery and growth in the manufacturing sector despite a certain degree of macroeconomic instability. At the end of the 1990s Nigerian per capita value-added in manufacturing was very low at approximately USD 13, which corresponds to about 10 per cent of the level of Botswana and less than 50 per cent of that of Ghana and Kenya.
- Over the period from 1975 to 1999, Nigerian per capita exports halved, while for Botswana and Mauritius, the African success stories, they doubled. In 1999 Nigerian the per capita value of manufacturing exports was less than USD 1, by far the lowest number in the sample of countries reviewed.
- The survey data show large labour productivity differentials across sectors and firm size. Although a substantial part of these can be attributed to differences in capital intensity, the analysis shows significant differences in total factor productivity across some of the sectors. Taken together, the evidence on productivity differentials indicates that the food sector has relatively high productivity and the textiles sector relatively low.
- The average capacity utilisation rate is about 44 per cent. There is a positive association between firm size and capacity utilisation. Capacity utilisation is highest in the food sector and lowest in the chemicals sector.
- Investment in equipment and machinery is low, with more than half of the firms refraining from investing altogether, and with the majority of the investing firms reporting modest investment rates. Very few firms record investment rates that imply significant expansion. Regression results show that there is very little difference across sectors in these low investment rates.
- In line with the macro data, the survey data show that very few firms export, and that the decision to export is strongly related to firm size and technical efficiency. The lack of exports is identified as a key problem for Nigerian manufacturing.
- The garment sector, which has been the source of labour intensive exports in other countries, uses by far the most labour intensive technology across all the sectors. The firms in this sector are also relatively efficient and more oriented to exporting than other sectors. However the average propensity to export even in this sector is very low.
- Issues related to industrial policy and the business environment are analysed. The most frequently cited number-one problem for the firms is physical infrastructure, followed by access to credit, insufficient demand, cost of imported raw materials and lack of skilled labour. This aggregation masks considerable differences over the size range in problem perceptions; for instance among micro firms the most frequently cited main problem is credit access, while for medium and large/macro firms it is physical infrastructure.
- Detailed analysis of the supply and reliability of utilities confirmed the inadequacy of the supply of mains electricity. The majority of medium-sized

and large/macro firms have at least one computer and most of these firms have access to the Internet.

- Analysis of the state of infrastructure documents that less than half of the firms have a tarmac road in good condition in its immediate vicinity, and that the roads close to large firms tend to be poorer than average. A formal analysis shows that the existence of good roads near a firm increases their underlying efficiency by about 9 per cent.
- Various aspects of business awareness, alliances and networking, including their effects on total factor productivity, are analysed. There is no evidence that these aspects of firm behaviour directly impact on their underlying economic efficiency. They may impact on other aspects of firm performance but this remains a subject for future research.
- Labour market issues and wages are investigated. Differentials in earnings across categories of education and occupation are documented. There is a strong positive relation between earnings and firm size, irrespective of the level of education or skill.
- Technical efficiency has a strong impact on wages. Large, more efficient firms, pay wages that are substantially higher than wages in smaller, less efficient firms.
- Regional benchmarking of Nigerian productivity, exporting and investment is undertaken, based on comparable data from firms in Ghana, Kenya, Tanzania and South Africa. The results indicate that Nigerian firms record efficiency levels similar to those in Ghana, Kenya and Tanzania; however the South African efficiency level is significantly higher. Nigerian firms record a propensity to invest similar to what is found for Ghana and Tanzania, but lower than in Kenya and South Africa. Nigerian firms are much less oriented to exporting than firms in the other countries.
- The Report concludes by arguing that the key to reversing the poor performance of Nigerian manufacturing is an increase in firm level efficiency. The Report documents that more efficient firms are more likely to export, more likely to invest and pay their workers more. The key policy issue facing the Nigerian government is to understand and address the factors that will enable the efficiency of firms – their competitiveness – to increase.

Acknowledgements

The Nigerian Manufacturing Enterprise Survey (NMES) was carried out in July and August 2001 by UNIDO with the assistance of the Centre for the Study of African Economies (CSAE) within the framework of the UNIDO-CSAE research collaboration agreement. Joergen Estrup, Chief Economist, UNIDO, and Francis Teal, Deputy Director, CSAE, acted as focal points. Kandeh Yumkella, UNIDO Representative, and Director, Regional Industrial Development Centre, Lagos, Nigeria, provided overall guidance. Jebamalai Vinanchiarachi, UNIDO, acted as the direct supervisor in the conduct of the survey. A team from UNIDO and CSAE, consisting of Kandeh Yumkella, Jebamalai Vinanchiarachi, Francis Teal and Måns Söderbom, designed the questionnaire.

The Survey Core Team consisted of Kevin Urama, National Coordinator of the project, Manos Antoninis, Caleb Owolawase and Olufunke Alaba. Emeka Ezenwanne, Oluyemisi Agboola and Segun Ajayi organised appointments with the firms. Emmanuel Obiajulu, Chidi-Martins O-Martins, Marcellinus Amadi, Orakwe Martin and Gregory Onuh acted as enumerators. Mukaila Sadiq, Samson Oladunjoye and Risikat Oshunlalu acted as data entry clerks. Gloria Adesanya acted as survey secretary.

We want to express our deepest gratitude to the respondents. Without the cooperation of over 170 owners and managers and close to 1,000 workers, the survey and this report would not have been possible. The respondents were extremely generous in giving their time to the interviewers. The information they provided has made it possible to document and understand the challenges that face the Nigerian manufacturing sector.

We thank Neil Rankin and Godius Kahyarara for excellent research assistance, and direct contributions to Chapters 4-6. We thank Jebamalai Vinanchiarachi for written comments on a draft version of the report. A previous version of the report was presented at a National Forum on 'Competitiveness and Private Sector Growth', Abuja, 1-2 July 2002, organized by the African Institute for Applied Economics (AIAE). We are grateful to the conference participants for useful comments.

This report is meant to be accessible to non-specialists, and we have therefore tried to make the presentation as rigorous as we could without making it too technical. We alone accept responsibility for all errors and shortcomings of the report.

Måns Söderbom and Francis Teal
Oxford, August 2002

Map of Nigeria

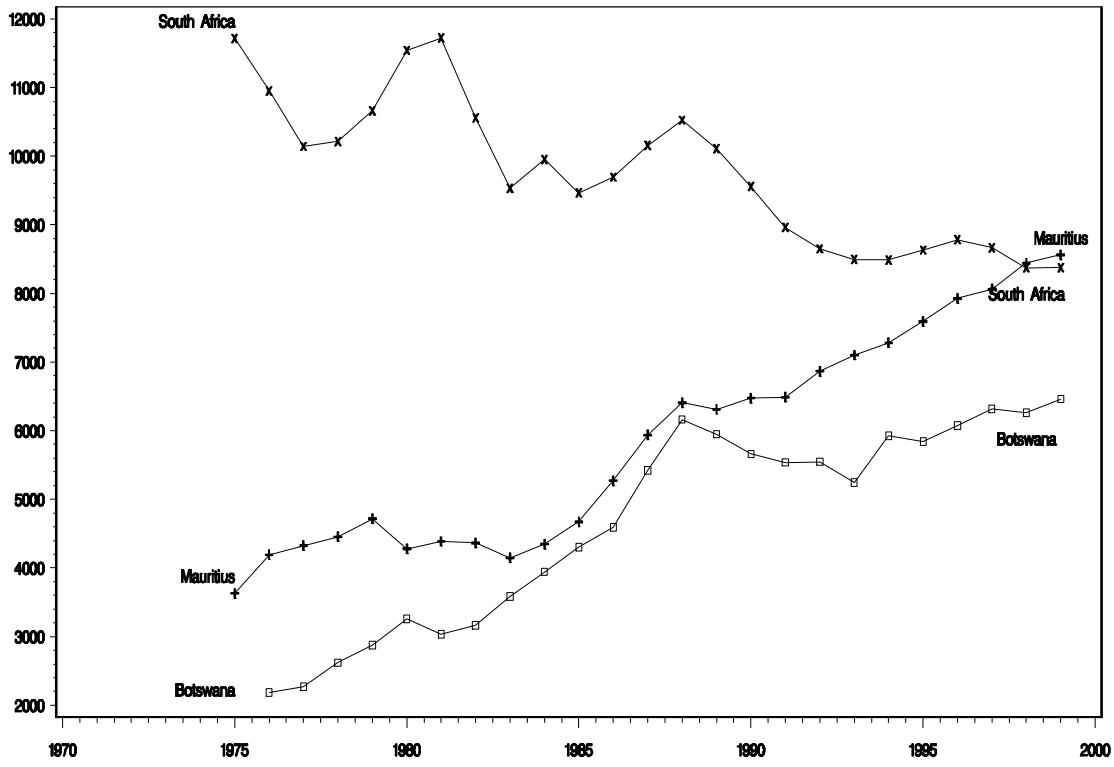
1. Introduction

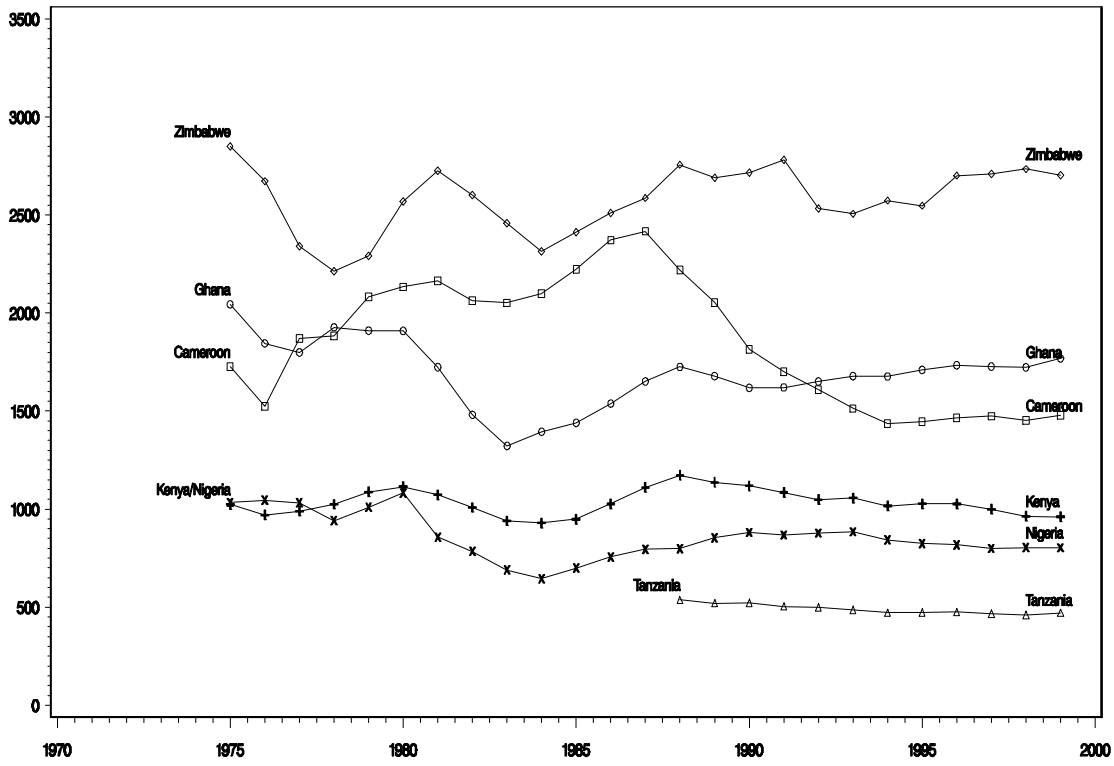
This report focuses on the performance of firms in Nigeria's manufacturing sector drawing on the UNIDO firm survey carried out in 2001. The objective of the study is to identify the policy issues that need to be tackled to reverse decades of poor performance in the economy. These policy issues divide between those affecting the demand side of the sector – domestic and foreign – and those affecting the supply side – infrastructure, institutional quality and costs. While the focus of most of the report is on issues specific to Nigeria, one of the premises of the study is that international comparisons, drawing on both macro and micro data, can significantly enhance the understanding of Nigeria's problems and opportunities. Figure 1.1 shows the development of the per capita gross domestic product at purchasing power parity prices for Nigeria over the period 1975-98, along with eight other countries – Botswana, Cameroon, Ghana, Kenya, Mauritius, South Africa, Tanzania and Zimbabwe. These countries have been chosen for two reasons. First they represent the range of divergent outcomes that have characterised African economies over the last two decades. Second, most of these countries are ones for which micro data on their manufacturing sector are available and can be used to place Nigerian manufacturing in its African context, see Section 7 below. The graph, which was constructed using data from the 2001 World Development Indicators (WDI) database, shows that at the end of 1999 per capita GDP in Nigeria was at USD (PPP) 800, some 20 per cent below the level of 1975. The long run implications of failure relative to success are obvious from the figure. Botswana and Mauritius are the two African success stories. In 1975 Botswana was twice as rich as Nigeria on a per capita basis. By 1999 the gap was eight fold. In a comparison with Mauritius the gap is even larger, by 1999 Mauritius has ten times the per capita income of Nigeria. In the West African context Nigerian per capita income is about half that of Ghana. In the wider African context Nigerian per capita income is close to that of Kenya.

Although manufacturing is usually a small sector in African economies, in terms of share of total output or employment, growth of this sector has long been considered crucial for economic development. This special interest in manufacturing stems from the belief that the sector is a potential engine of modernisation, a creator of skilled jobs, and a generator of positive spillover effects (Tybout, 2000).

FIGURE 1.1

GDP PER CAPITA AT USD PPP (1995 PRICES)





The data is taken from the World Bank Development Indicators Data Base for 2001

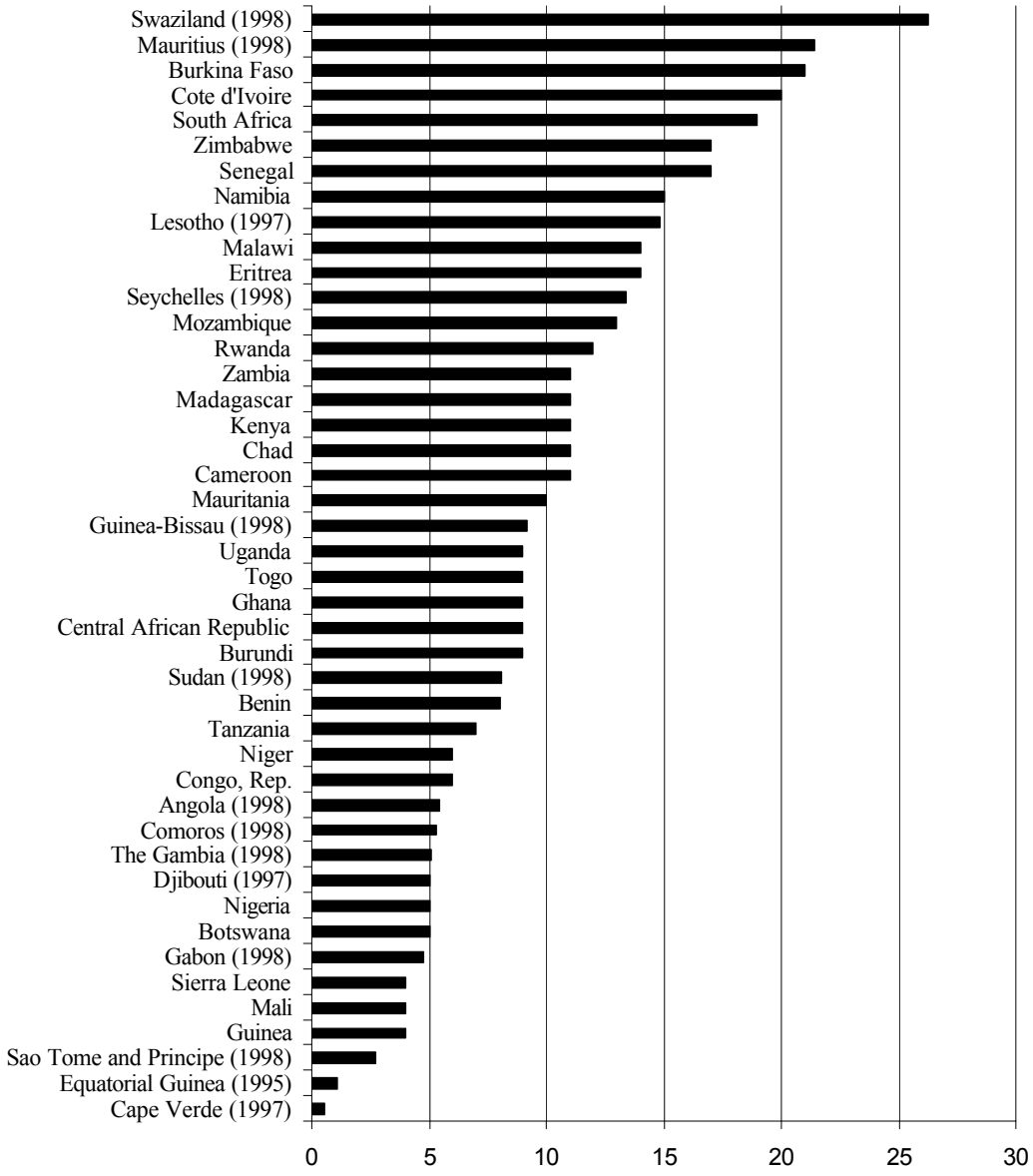
Historically, the growth in manufacturing output has been a key element in the successful transformation of most economies that have seen sustained rises in their per capita incomes, the most recent example being that of the NICs and their success in exporting manufactures. In most of Africa, performance in this area has been poor over the last decades. Figure 1.2 shows the percentage of manufacturing value-added to GDP in 43 countries in SSA. Nigeria has only some 5 per cent of its GDP coming from manufacturing, which is low among the countries of Africa; compare the 20 per cent levels for South Africa and Mauritius.

The lack of high-quality data constitutes a major impediment for rigorous policy relevant research on African industry, and the majority of previous economic research on Africa has therefore been based on aggregate data. This report is based on primary firm-level data, collected as part of the Nigerian Manufacturing Enterprise Survey (NMES) fielded in 2001. This survey, organised by UNIDO with the assistance of the Centre for the Study of African Economies (CSAE) as part of a joint UNIDO-CSAE research programme, covered 178 firms drawn from the four manufacturing sub-sectors of food, wood, textile and metal. Large as well as very small firms, including informal ones, were covered. The survey used quite an extensive questionnaire, yielding detailed information on a wide range of issues such as managerial and company background, firm performance, labour force structure and skill, entrepreneurial constraints, infrastructure, expectations and governance. Further, at the same time as the firms were surveyed a sample of workers was chosen from each firm designed to cover the full range of personnel employed by the firms. As a result the NMES data set contains a wealth of firm-level and workers information.

The report is structured as follows. Section 2 provides a background in looking at the Nigerian economy and the manufacturing sector using macro data; Section 3 discusses the NMES survey instrument; Section 4 analyses firm characteristics and performance; Section 5 investigates industrial policy and the Nigerian business environment; Section 6 documents issues related to wages and the labour market; Section 7 provides a cross-country comparison of productivity levels based on micro data; and Section 8 provides a summary of the findings and lessons for future research.

FIGURE 1.2

THE PERCENTAGE OF MANUFACTURING VALUE-ADDED TO GDP IN SUB-SAHARAN AFRICA, 1999



Note: These numbers have been taken from World Bank (2001b), Table 12, pp. 296-297, except for earlier years than 1999 in which case the source is the WDI database (World Bank, 2001a).

2. Background: The Nigerian Economy and Manufacturing

Since independence in 1960, Nigeria has witnessed one civil war, six violent changes of government, substantial economic mismanagement and widespread and persistent poverty. Ruled by the military for all but eight years since 1966, Nigeria has thus failed dismally to take full advantage of fertile soil, massive oil resources and a relatively well-educated population. However, following democratic elections in 1999, the first in more than 15 years, there are now some signs of economic recovery. This section attempts to place Nigeria in context by giving an overview of the economy, one of the largest in Africa, and the industrial sector.

2.1 Three Erratic Decades

Since the late 1960s the Nigerian economy has been based mainly on the petroleum industry. In the 1970s a series of increases in the international oil price generated substantial windfall revenues for the government. It soon became apparent that these oil price shocks were, at best, a mixed blessing. Like many other African countries, Nigeria's early independence years had seen an industrial strategy that relied heavily on import substitution. At first this had appeared to work relatively well, with the share of manufacturing to GDP increasing from 2 per cent in 1957 to 7 per cent in 1967 (Utomi, 1998). The massive oil revenues meant that this strategy could be intensified, consequently the 1970s witnessed huge investments in state-owned enterprises. While this implied rapid expansion of the industrial sector, subsequent returns on investment projects were typically much below expectations. As elsewhere in Africa, the import substitution strategy turned out to be unsuccessful in generating growth in incomes and jobs. A second result of the oil price boom was the stagnation of the agricultural sector, mainly due to the great influx of rural people into the urban areas. As a result exports of cash crops like palm oil, peanuts and cotton declined rapidly. A third outcome of the increasing oil prices was economic rent-seeking on an unprecedented scale. Government schemes designed to curtail imports combined with the windfall revenues generated massive rents that were available for a select few.

Once oil prices fell in the late 1970s and early 1980s the economy went into a period of rapid economic decline. In 1983 the economy came close to a virtual collapse, real per capita income being about 30 per cent lower than at the onset of the oil price boom, ten years earlier. The subsequent couple of years witnessed political

instability, with two coups in 19 months during 1983-85. Towards the end of the 1980s the government introduced a number of economic reforms, involving deregulation of the foreign exchange market, abolition of import licenses and devaluation of the Naira. However, implementation of the new policies was slow, fiscal discipline remained weak, and substantial budget deficits therefore emerged in the early 1990s. In 1993 the government initiated the Nigerian Economic Summit, seeking to identify policy measures to reverse the poor economic performance. One outcome of the Summit was the Economic Action Agenda, which contained a blueprint for growth engineered by the private sector. Central to this Agenda was the deregulation of the economy. Little of this was implemented by the previous regime, and most of the market-oriented reforms were reversed in favour of protectionist policies.

Democratic elections in 1999 gave the presidential mandate to Olusegun Obasanjo, Nigeria's first democratically elected president since 1983. Subsequent years have been associated with a certain degree of economic recovery, relaxed exchange controls and considerable privatisation and deregulation policies. Preliminary estimates from the *Economist Intelligence Unit* Country Data suggest that per capita GDP grew by about two per cent in 2000 and about four per cent in 2001.

2.2 A Comparative Perspective: Manufacturing and Exports

Nigeria's economic performance during the last three decades has been discussed above. Figure 1.1 indicates vast differences across African countries in their ability to generate income growth over this period. What accounts for these very different outcomes? The most prominent feature of the rapid economic development of the Asian tigers was the growth of their manufacturing exports. Could it be that the differences in overall economic performance within Africa shown above are related to differences in the performance of the manufacturing sector and the ability to export? Figure 2.1 shows trends of manufacturing value-added per capita, measured in PPP adjusted real USD. For Nigeria the rapid increase in the late 1970s, driven mainly by the massive investments in state-owned enterprises, is apparent. At the time of its peak in 1980 the level of per capita manufacturing value-added in Nigeria was close to that of Botswana, and much higher than in Kenya and Ghana. Subsequent years witnessed a dramatic slump, and manufacturing value added per capita fell by a stunning 75 per cent between 1980 and 1986. In 1993 Nigeria reached the lowest level

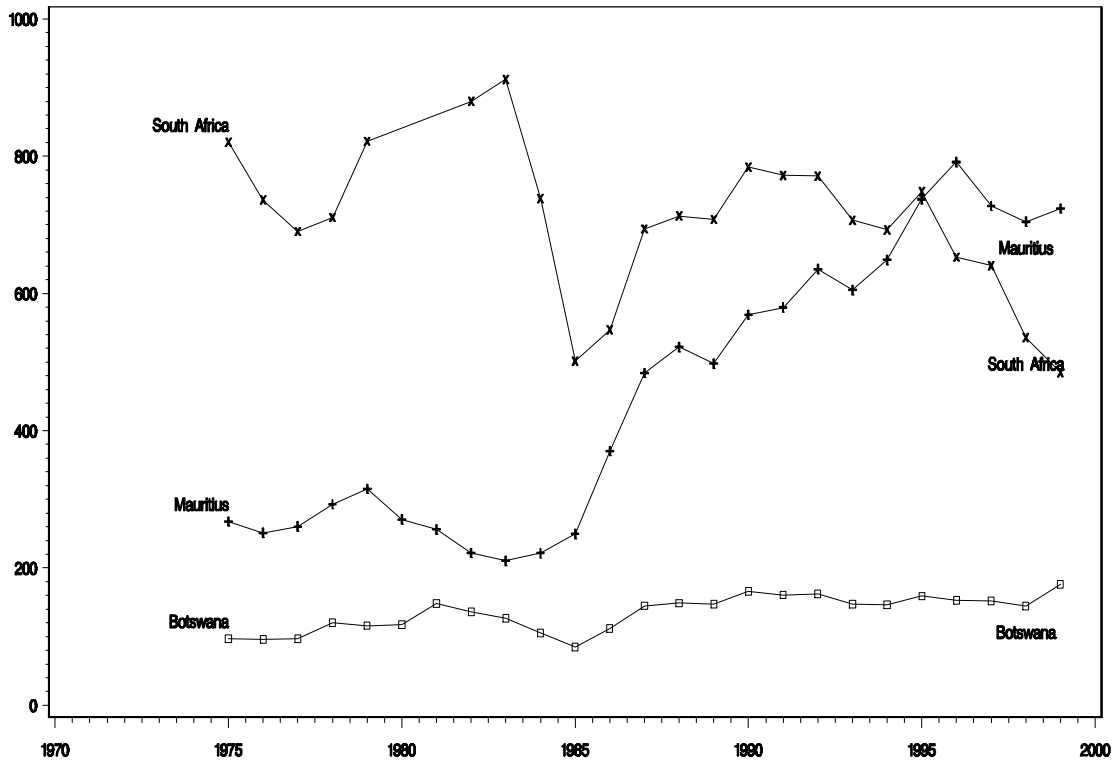
during the period considered here. Subsequently there has been a moderate increase. Nevertheless, at the end of the 1990s Nigerian per capita value-added in manufacturing was approximately USD 13, which corresponds to about 10 per cent of the level of Botswana and less than 50 per cent of that of Ghana and Kenya.

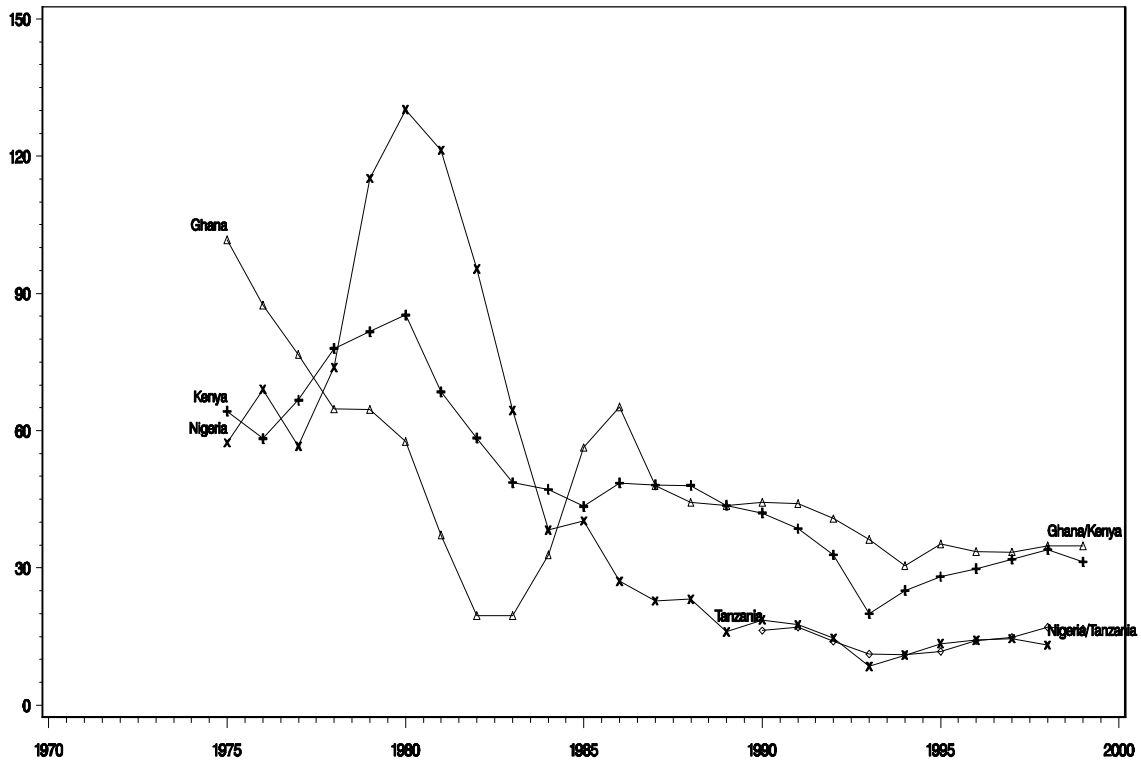
Figure 2.2 shows the performance of aggregate exports per capita for the countries under review. Over the period from 1975 to 1999 for Botswana and Mauritius, the African success stories, per capita exports doubled, for Nigeria however they halved. Figure 2.3 shows the values of manufacturing exports per capita in 1999 (unless otherwise stated). It is indeed true, with the noticeable exception of Mauritius and to a lesser extent South Africa, that exports of manufactures are negligible. The bottom panel of the figure reproduces the graph but without Mauritius and South Africa in order to make the differences between the other countries visible. The figures for Nigeria are rather dramatic, exports of manufactures are less than USD 1 per capita. This is by far the lowest figure for any of the countries under review.

As discussed above, Nigerian export history over this period is the history of its oil exports and the very large changes in the price of oil on the world market. The rich endowment of oil has important implications for the tradable sector of the economy generally and the manufacturing sector in particular, and it is often argued that Africa's resource endowments mean that it will not be able to export manufactures (Wood, 1997). The World Bank (2000) discusses the need for African countries to diversify their exports. This is highly relevant in the case of Nigeria; the failure of exports to grow essentially reflects the failure of Nigeria to reduce its dependence on oil exports.

FIGURE 2.1

MANUFACTURING VALUE-ADDED PER CAPITA AT USD (1995 PRICES)

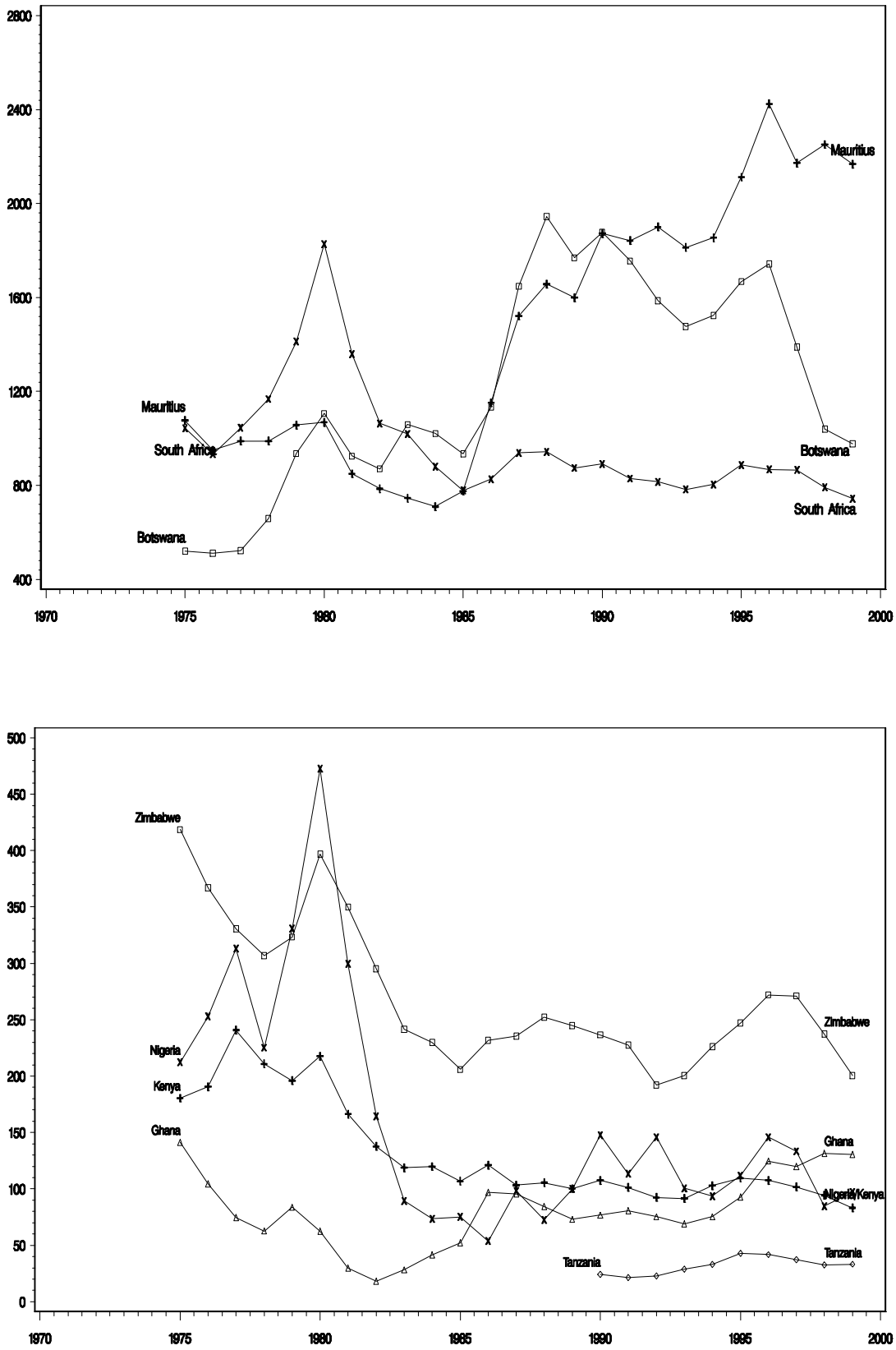




The data are taken from the World Bank Development Indicators Data Base for 2001.

FIGURE 2.2

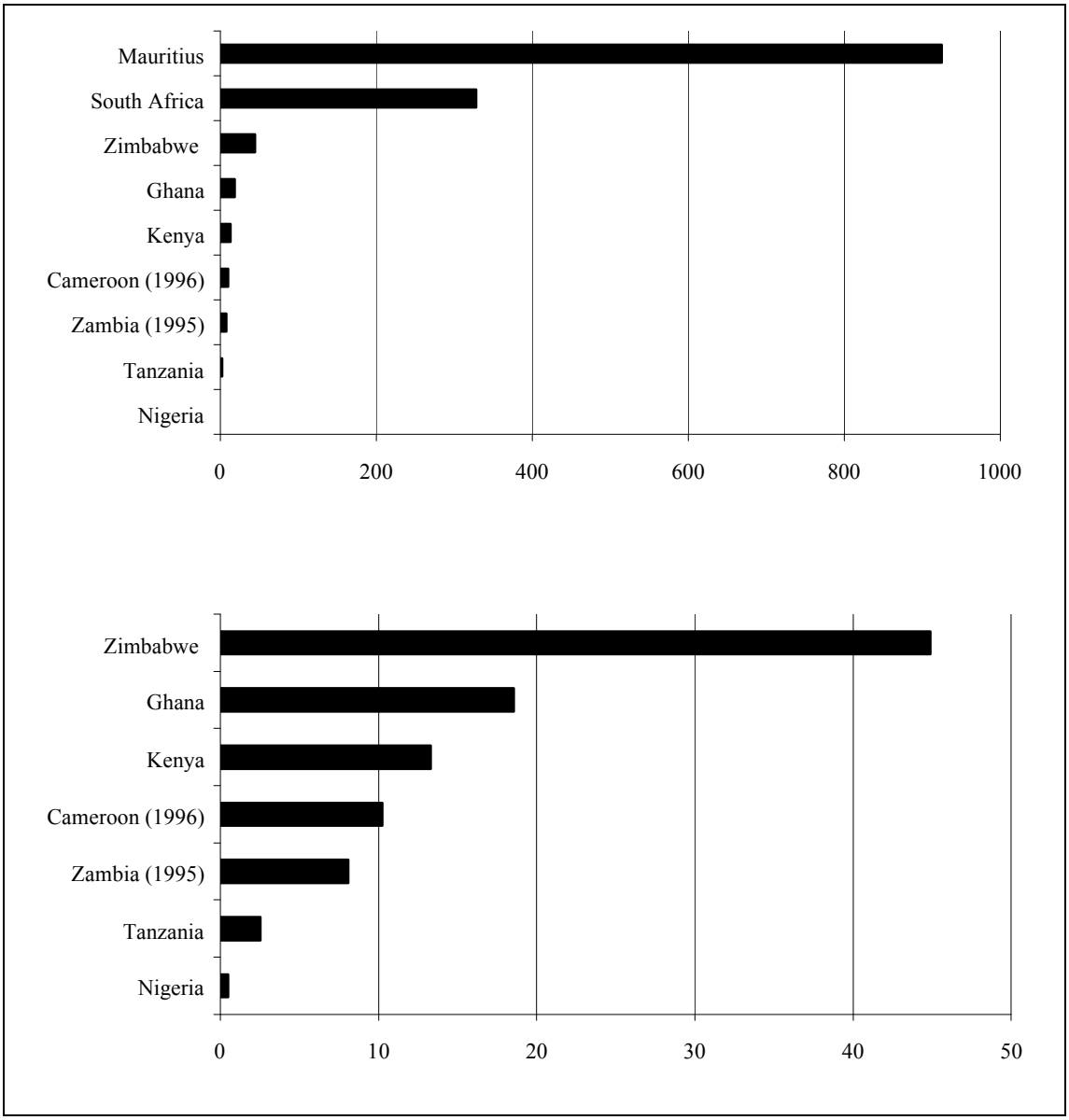
EXPORTS PER CAPITA AT USD (1995 PRICES)



The data are taken from the World Bank Development Indicators Data Base for 2001.

FIGURE 2.3

MANUFACTURED EXPORTS PER CAPITA AT USD PPP (1995 PRICES)



The data are taken from the World Bank Development Indicators Data Base for 2001.

3. The Nigerian Manufacturing Enterprise Survey 2001

The majority of economic research on African industry has been based on aggregate data. Only recently have high quality firm-level data, typically generated by surveys, become available, which enable researchers to analyse the microeconomics of African industry. The Nigerian Manufacturing Enterprise Survey (NMES) was designed to collect data comparable with the information generated by a series of enterprise surveys undertaken in the 1990s. The template for these previous surveys was designed in the context of the World Bank's Regional Programme on Enterprise Development (RPED), launched in the early 1990s, and has subsequently been used in a series of surveys carried out by the CSAE in collaboration with various institutions, including UNIDO. This section outlines how the NMES was organised, and how it builds on earlier firm-level work on Africa. The first part of the section summarises some of the major findings that have emerged from earlier studies as a prelude to reviewing the evidence for Nigeria and assessing how Nigeria fits into the African pattern.

3.1 African Manufacturing Enterprise Surveys: The NMES in Context

Data on African manufacturing firms are scarce. A significant attempt to rectify this was made through the World Bank RPED surveys in which samples of approximately 200 randomly selected firms were interviewed in eight countries (Burundi, Cameroon, Cote d'Ivoire, Ghana, Kenya, Tanzania, Zambia, and Zimbabwe). The surveys started with Ghana in 1992, and most other country surveys were initiated in 1993. Firms were re-interviewed three years in a row in most countries, yielding panel data.[1,2] Four sectors of activity were typically covered: textile and garments; wood products; metal products; and food processing. Large as well as small firms, including informal ones, were included. The surveys collected information on a wide range of variables, including sales and output, capital stock, entrepreneur characteristics, employment by occupational category, labour turnover, wages, and conflicts with workers.

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[1] Burundi was surveyed only once due to the rapid deterioration of the political situation following the Rwandan genocide. Cote d'Ivoire was surveyed only twice due to insufficient funding.

[2] Panel data has both a cross-sectional and a time-series dimension. That is, the data set consists of a (usually large) number of firms that have been observed over several years. One of the main advantages of panel data is that it enables the analyst to control for unobserved, time invariant, heterogeneity across firms when estimating regression coefficients. Failure to control for such heterogeneity may result in misleading estimates.

The RPED data have been extensively analysed (e.g. Teal, 1996; Bigsten et al., 1999, 2000, 2001; Fafchamps et al. 2001). One clear message from these data is that there is considerable variability in economic performance across firms. To give one example, Bigsten et al (1999) report that, for Cameroon, Ghana, Kenya and Zimbabwe, one fourth of the sampled firms are less than half as productive as the median firm, while another fourth of the firms are more than twice as productive as the firm at the median. For profit rates, the variability is even more pronounced. Hence, while it is true on average that African manufacturing firms have not fared well during the 1990s, there exist a non-trivial number of individual exceptions and success stories. Of course, only with firm-level data will it be possible to analyse what distinguishes success stories from failures, and profitable firms from non-profitable ones.

Much of the work based on the RPED data has focussed on the determinants of firm productivity, typically proceeding by estimating production functions (e.g. Bigsten et al., 2000). Such an approach sheds light on the returns to scale in production, i.e. the pattern by which changes in input levels (e.g. employment) feeds into changes in output. There is in fact a remarkable similarity in the responsiveness of output to inputs of capital and labour across manufacturing firms in Africa. Several studies report an estimate of the capital elasticity of valu-added of about 0.25, and a labour elasticity of about 0.75. This implies that a one percentage increase of the capital stock yields an increase in value-added by 0.25 per cent, whereas a one percentage increase of the labour force increases valu-added by 0.75 per cent, on average. Similarly, if both capital and labour are being increased by 1.0 percent, then value-added is expected to increase by 1.0 per cent. This indicates that the production technology can be characterised by constant returns to scale.

The production function approach is also useful in characterising systematic differences in the underlying efficiency, or total factor productivity (TFP), by which is meant how much finished goods can be produced with a given level of inputs. Efficiency is closely related to firm competitiveness, as the latter will be a function of the production costs relative to their underlying efficiency. Hence obtaining measures of efficiency – interpretable as the managerial quality of the firm – is necessary to identify which firms are the more profitable and thus the more successful. Identifying such firms and encouraging their growth is crucial as there is a lot of evidence that the underlying efficiency of a firm is linked to both investment and exporting. Several

studies have found substantial differences in underlying efficiency across sectors, often with the food sector having the highest level of efficiency, and with the textile and garment sectors the lowest. In Kenya for example, on average, firms in the food sector are more than twice as productive as firms in the textile sector, everything else equal (Söderbom, 2001). Bigsten et al. (2001) show that exporters typically have a higher level of productivity than non-exporters, which they partially attribute to learning-by-exporting effects.

Other studies have investigated investment behaviour. Bigsten et al (1999) for four African countries report that approximately 50 per cent of the firms undertake no investment whatsoever in a given year. Further, those who do invest tend to have low investment rates, and approximately 75 per cent of the firms have investment rates less than 0.1.[3] It is also extremely unusual for these firms to sell off equipment, suggesting a shallow market for second hand capital goods. A large recent literature shows that such shallowness can make the firm reluctant to invest in the first place, as investment implies sunk costs. Focussing on Kenya, Söderbom (2002) discusses potential reasons why investment has been so low. One explanation would be that firms are unable to raise the necessary funds to finance investment, e.g. because of a poorly functioning financial market. Indeed, in Söderbom's data set company retained earnings fund on average over 60 per cent of a firm's investment, by far the most important source of finance, and atypically high by international standards. This high degree of self-financing suggests that investment could be sensitive to changes in liquid assets. Using regression analysis, however, Söderbom finds that the relation between cash flow and investment is not particularly strong. A similar result has been reported by Bigsten et al (1999). This suggests that it is non-financial factors, e.g. the cost of capital and the underlying efficiency of the firm, that are of primary importance in determining investment.

While the RPED data have greatly improved the understanding of manufacturing in the continent, one important limitation of these data is that they span a relatively short period of time. In collaboration with various institutions including UNIDO, the CSAE have carried out subsequent surveys in Ghana (1996, 1998, 2000), Kenya (2000) and Tanzania (1999, 2002), as part of the African Manufacturing

[3] The investment rate is defined as the investment expenditure divided by the replacement value of the capital stock.

Enterprise Surveys (AMES) research project. These surveys have been designed to build on the RPED work, making it possible to analyse long run differences in performance, both within and between countries. One obvious aspect of firm performance not possible to analyse without reasonably long time series data is that of productivity growth. This is important because the key to being competitive will lie in how fast TFP is rising in a firm, as long run differences in performance will be determined by how much faster output can be made to increase than inputs.

3.2 The Design of the NMES

The NMES was undertaken in mid 2001, and was designed to collect both contemporaneous and retrospective information and to be comparable to other studies of African manufacturing firms. The NMES was financed by UNIDO as part of a joint UNIDO-CSAE research programme, and the fieldwork was carried out by a team led by UNIDO officials in Nigeria. Like the RPED surveys the NMES concentrated on four broadly defined manufacturing sub-sectors, namely food processing, textiles and garments, wood working including furniture and paper processing, and metal, machinery and chemicals. The survey covered three major regions in the country: the western region, (Lagos and Ibadan); the eastern region (Enuku, Onitsha, Nnewi and Aba); and the northern region (Kaduna and Kanu). Small as well as large firms were included in the sample.

The NMES sample is a stratified random sample.[4] Stratification is a more efficient sampling procedure than simple random sampling if firms within the strata are relatively homogenous with respect to the measurements of interest, while firms between strata are relatively heterogeneous. This is certainly the case in the current context; to give one example, small firms heavily dominate Nigerian manufacturing in terms of frequencies, and because the group of small firms are relatively more homogenous than large firms, it is desirable to draw a stratified sample containing a larger proportion of large firms than in the population. Because the NMES was designed to yield data comparable to the RPED and AMES data, a stratification procedure similar to that used in the RPED and AMES surveys was adopted.

[4] A stratified random sample is one obtained by separating the population of firms into groups, called strata, according to some predetermined criteria, and then drawing a random sample from within each stratum.

TABLE 3.1

THE NUMBER OF FIRMS BY STRATUM IN THE NMES SAMPLE

	Food	Wood, Paper and Furniture	Textiles and Garment	Metal, Chemicals and Machinery	All sectors
Micro including Informal	1	5	18	4	28
Small including Informal	4	15	24	10	53
Medium	5	12	10	19	46
Large & Macro	5	9	14	21	49
All size groups	15	41	66	54	176

Note: The table shows the number of firms interviewed, by size and sector. The size categories are defined as follows. Micro: less than or equal to five employees. Small: more than five and less than or equal to 20 employees. Medium: more than 20 and less than or equal to 75 employees. Large: more than 75 and less than or equal to 500 employees. Macro: more than 500 employees.

Table 3.1 shows the sample structure for the NMES sample. The frequency distribution across sectors is non-uniform. The sector in the sample with the smallest number of observations is food, and the largest sector is textiles and garment. The frequency distribution across the three larges size-groups is almost uniform, while the micro category consists of fewer observations. Because of the stratification, the sample is not representative of the population of firms, which raises the question of whether sampling weights should be used when analysing the data. Sampling weights, however, are calculated from the official statistics, and while this source appears to be of reasonably high quality for medium-sized and large firms, there is very little information available on small and micro firms. The sampling weights, therefore, will largely be based on ad hoc assumptions, and accordingly be of uncertain quality. In this report no weights are therefore being used. Instead the sample is split according to the stratification criteria when presenting the empirical results. Similarly, the regressions shown in the report include firm size and industry as control variables instead of relying on weights.[5]

[5] This follows the recommendation by Butler (2000): 'If sampling is based on exogenous variables and interest is in the parameters of the conditional distribution of the endogenous variables conditional on

TABLE 3.2

WORKER INTERVIEW FREQUENCIES

	Food	Wood, Paper and Furniture	Textiles and Garment	Metal, Chemicals and Machinery	All sectors
Micro including Informal	5	10	33	3	51
Small including Informal	23	46	101	37	207
Medium	29	95	85	133	342
Large & Macro	32	52	62	122	268
All size groups	89	203	281	295	868

Note: The table shows the number of workers interviewed, by size and sector.

At the same time as the firms were surveyed a sample of workers was chosen from each firm designed to cover the full range of personnel employed by the firms. The objective was to have up to 10 workers from each firm where firm size allowed. As a result of this survey design it is possible to link the responses from the workers to the characteristics of the firm, which is particularly useful when analysing labour market issues. A total of 868 workers were interviewed. Table 3.2 shows the frequency distribution of workers interviews across size-groups and sectors.

the exogenous variables, then sampling weights are not needed and generally, but not always, reduce the efficiency of estimation if they are used.' (Butler, 2000, pp. 26-27).

4. Firm Characteristics and Performance[6]

This section looks at firm status and characteristics, and documents various aspects of firm performance, focussing on capacity utilisation, productivity, investment in fixed capital and export behaviour.

4.1 Firm Characteristics

The NMES data contains a large amount of data on firm and entrepreneur characteristics. Table 4.1 shows mean values of some selected variables, by firm size. The main points can be summarised as follows:

- There are substantial differences in legal status over the size range. All the micro firms, and 76 per cent of the small firms are either sole proprietorships or partnerships, while 61 per cent and 93 per cent of the medium-sized and large/macro firms, respectively, are limited liability enterprises.
- Most of the micro firms have an informal structure, signalled here by the fact that only 15 per cent keep accounts on an annual basis.
- Foreign ownership is positively related to firm size, both in terms of proportions of firms with any foreign ownership, and the percentage of foreign ownership given that there is any.
- Female entrepreneurs run 19 per cent of the micro firms, and 5 per cent of the small and medium firms.
- Although there are very few firms in the sample younger than 5 years there is a positive relationship between firm size and firm age. Fifty-six per cent of the micro firms in the sample are younger than 15 years compared to only 18 per cent of large/macro firms. The latter structure is similar to that of the medium-sized firms, while small firms constitute an intermediate case.

With this snapshot of the status and characteristics of the firms over the size range, the next step is to investigate labour and total factor productivity.

[6] This section was written with the collaboration of Neil Rankin.

TABLE 4.1

SELECTED FIRM CHARACTERISTICS, BY SIZE

	Micro	Small	Medium	Large/Macro	All
Legal status [N = 167]					
Solo or Partnership	1.00	0.76	0.37	0.04	0.50
Limited Liability, Corporation or MNC Subsidiary	0.00	0.24	0.61	0.93	0.49
Keeps accounts on an annual basis	0.15	0.39	0.85	1.00	0.64
Ownership [N = 166]					
Any foreign ownership	0.00	0.00	0.07	0.66	0.19
Percentage of foreign ownership, if any	--	--	60	68	67
Owners female, if legal status: solo or partnership	0.19	0.05	0.00	0.00	0.08
Firm age in years [N = 166]					
Age ≤ 5	0.00	0.08	0.07	0.07	0.06
6 < Age ≤ 15	0.56	0.33	0.13	0.11	0.25
15< Age ≤ 25	0.22	0.45	0.48	0.43	0.42
Age > 25	0.22	0.16	0.33	0.39	0.28

Note: The table shows the proportions associated with each category. N denotes the number of firms.

4.2 Capacity Utilisation and Productivity

Capacity Utilisation

Table 4.2 shows data on the average rate of capacity utilisation across size and sectors, as well as for the whole sample. For the entire sample the average capacity utilisation rate is about 44 per cent. Aggregating over size groups, the food sector emerges as the sector with the highest average capacity utilisation, about 59 per cent. This is larger than in any of the other sectors where averages range between 40 and 47 per cent. The lowest average is recorded by the metal sector. There appears to be a u-shaped relation between firm size and capacity utilisation, as the average value for the category of small firms is equal to 38 per cent which is 5 percentage points lower than for micro firms. At 56 per cent, large/macro firms record the highest rate of capacity utilisation of the four size categories considered here. These are clearly very low values by international standards, suggesting ample excess capacity. The next sub-section analyses a related issue, namely that of productivity.

TABLE 4.2

CAPACITY UTILISATION IN PER CENT, BY SIZE AND SECTOR

	Micro	Small	Medium	Large/Macro	All size groups
Food	52.0 [1]	65.0 [4]	48.4 [5]	66.4 [5]	59.1 [15]
Textiles	-- [0]	13.0 [5]	41.0 [6]	63.2 [12]	46.5 [23]
Garments	43.3 [17]	45.8 [19]	37.0 [4]	-- [0]	43.9 [40]
Wood/Paper/ Furniture	40.2 [5]	32.7 [15]	38.3 [11]	57.7 [7]	39.9 [38]
Chemicals / Machines	-- [0]	12.0 [1]	40.4 [7]	47.1 [11]	42.8 [19]
Metal	43.8 [4]	35.6 [9]	35.7 [12]	49.7 [7]	39.7 [32]
All sectors	43.1 [27]	38.1 [53]	39.3 [45]	56.2 [42]	43.8 [167]

Note: Numbers in [ ] are numbers of observations.

Labour Productivity and Capital Intensity

In order to examine the factors that influence firm performance it is necessary to have measures of both the labour productivity and the capital intensity of the firm. Table 4.3 shows how a measure of labour productivity and capital intensity differ over size and across sectors in the sample. Labour productivity in the table is value-added per employee while capital intensity is measured by capital per employee (both measures use natural logarithms).[7] There are substantial differences in labour productivity both over size and across sectors. Aggregating over size groups, the food sector emerges as the one with the highest labour productivity, followed by chemicals/machines, metal, wood/paper/furniture, with textiles and garments the least productive (see far right column of the table). The logarithmic difference between the highest and the lowest productivity sector (i.e. food and garments, respectively) is equal to 1.3, which corresponds to a very large difference in levels. The implication is that labour productivity in the food sector is about 270 per cent higher than that in garments. Aggregating across sectors, labour productivity increases monotonically with size (see bottom row of the table). There is a large difference between the two largest size groups. The log difference equal to 0.6 corresponds to a differential of 82 per cent, which is substantial and much higher than the difference between medium and small firms and between small and micro firms.

One of the advantages of firm level data of the kind generated by the NMES is that it is possible to analyse data at a low level of aggregation. It will be noted from the disaggregation presented in Table 4.3 that the pattern by which large firms have higher labour productivity than micro/small firms is true for all the sectors. However there are differences across the sectors. There does not appear to be a monotonic rise in labour productivity across size for all sectors, although the small number of firms in some categories means that, at present, too much should not be read into this finding.

Labour productivity is determined in part by the capital intensity of the firm. The lower part of Table 4.3 shows the differences in capital per employee by sector and size. The rise in capital per employee across all size categories is much larger than the rise in labour productivity (the bottom rows of each part of the table). Thus

[7] Natural logarithms are used in order to reduce the impact of extreme values on the results. Value-added is calculated as the value of output minus the value of raw materials and indirect inputs (such as electricity).

TABLE 4.3

LABOUR PRODUCTIVITY AND CAPITAL INTENSITY BY SIZE AND SECTOR

VALUE-ADDED PER EMPLOYEE

	Micro	Small	Medium	Large/Macro	All size groups
Food	10.7	12.6	11.5	13.7	12.8
	[1]	[2]	[7]	[12]	[22]
Textiles	9.9	11.2	11.4	12.0	11.6
	[1]	[10]	[18]	[28]	[57]
Garments	11.6	11.1	11.8	--	11.5
	[34]	[28]	[10]	[0]	[72]
Wood/Paper/	11.2	11.6	11.6	12.3	11.8
Furniture	[10]	[18]	[27]	[24]	[79]
Chemicals /	--	12.1	12.3	12.5	12.4
Machines	[0]	[6]	[11]	[27]	[44]
Metal	11.4	12.6	11.9	12.0	12.1
	[6]	[14]	[16]	[22]	[58]
All sectors	11.5	11.6	11.7	12.3	11.9
	[52]	[78]	[89]	[113]	[332]

CAPITAL PER EMPLOYEE

	Micro	Small	Medium	Large/Macro	All size groups
Food	9.7	12.0	13.4	15.5	14.2
	[1]	[2]	[7]	[12]	[22]
Textiles	12.8	14.0	14.6	14.2	14.3
	[1]	[10]	[18]	[28]	[57]
Garments	10.7	10.9	12.0	.	11.0
	[34]	[28]	[10]	[0]	[72]
Wood/Paper/	12.8	12.9	13.5	13.7	13.4
Furniture	[10]	[18]	[27]	[24]	[79]
Chemicals /	.	15.1	15.8	13.9	14.5
Machines	[0]	[6]	[11]	[27]	[44]
Metal	12.2	13.5	13.5	14.4	13.7
	[6]	[14]	[16]	[22]	[58]
All sectors	11.3	12.6	13.8	14.2	13.3
	[52]	[78]	[89]	[113]	[332]

Note: Both Value-added and Capital per employee are in natural logarithms of monetary values expressed in 2000 Naira. Numbers in [ ] are numbers of observations.

there is no evidence on the basis of these descriptive statistics that there are increasing returns to scale. There is though some evidence that total factor productivity (the efficiency with which firms produce output given levels of inputs) may be higher in the food than in other sectors. It was noted above that labour productivity was highest in the food sector. The lower part of Table 4.3 shows that the food sector has lower levels of capital per employee than either chemical/machines or the textile sector. The high levels of capital per employee combined with low labour productivity in textiles may well indicate a poor performance in terms of total factor productivity in this sector. To investigate this more fully it is necessary to formally relate outputs to all inputs in a production function and this is done below.

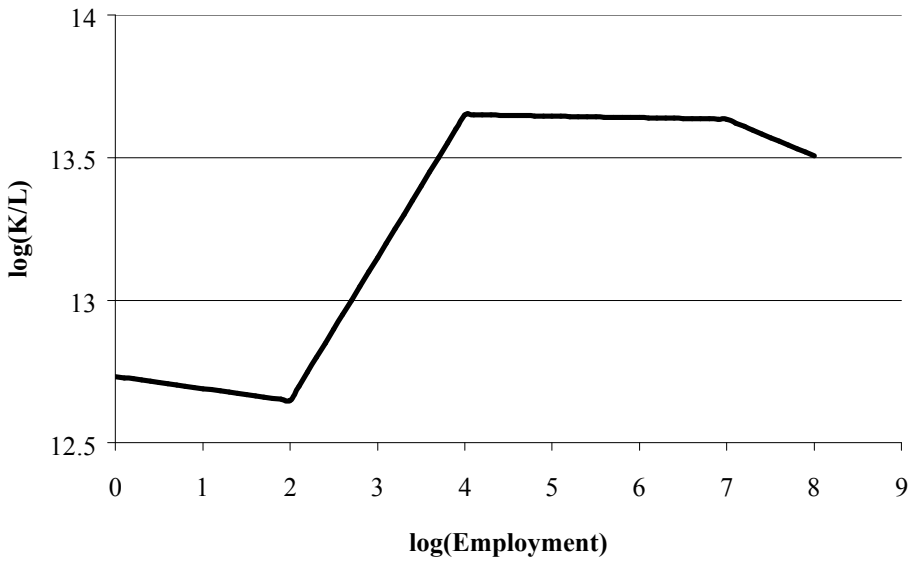
The sector with by far the lowest levels of capital per employee is the garments sector. It is this sector which has been the early source of manufactured experts in many countries precisely because its low use of capital means that it employs the factor, labour, which is cheapest in the country. As noted above in the macro section a common feature over most sub-Saharan African countries is their lack of labour intensive manufacturing exports. Is this due to the inefficiency of the garment sector? Again the formal analysis to answer that question is presented below.

Capital Intensity and Firm Size

The finding that there are substantial labour productivity differentials over firm size is rather a general one for African manufacturing (see Söderbom, 2001, for evidence on Kenya, and Söderbom and Teal, 2001a, 2001b, for evidence on Ghana). The data in Table 4.3 shows that, in this Nigerian sample, each worker in large firms has access to more machinery than do workers in small firms. It is possible to use the data to investigate how capital intensity varies with firm size by showing, in Figure 4.1, the relationship between the capital labour ratio and firm size based on the predictions from a regression allowing for a non-linear size effect by means of a spline function. Both the capital labour ratio and size (i.e. employment) are measured in natural logarithms. In order to isolate the size effect the underlying regression, reported in Appendix 1, controls for sector, firm age, location and time. As expected some of the sector dummies are highly significant, reflecting the fact that sectors differ systematically in their underlying capital intensity. The graph shows that, everything else equal, the capital intensity increases with size and that the pattern

FIGURE 4.1

CAPITAL INTENSITY AND SIZE, 1998-2000



Note: The graph shows the predicted capital labour ratio (in logs) as a function of log(employment), based on an OLS regression in which the capital labour ratio is a modelled as a non-linear function of size by means of a spline function. The regression, shown in Appendix 1, includes controls for sector, firm age, location and time.

is non-linear. For firms between seven (e^2) and 55 (e^4) employees there is a strong positive correlation between size and capital intensity, however outside this range there is no clear relationship. Within the (7, 55) range, the average slope of the regression line is about 0.5, indicating that a one per cent increase in the labour force is associated with a 0.5 per cent increase in the capital labour ratio. Stated differently, a firm with 55 employees has, on average and everything else equal, a capital intensity some 200 per cent larger than that of a firm with seven employees. Söderbom and Teal (2001b) obtain a similar result for Ghana, and attribute the size differential in factor intensities to differences in factor prices. They argue that a combination of higher labour costs and lower capital costs for large firms is the reason why larger firms use so much more capital per employee in the production process.

Total Factor Productivity

Because of these substantial differences in capital intensity over the firm size range, labour productivity may not be a very good measure of firm performance. Rather than comparing output with only one input, which is what the labour productivity measure

does, it is desirable to obtain a measure that relates output to *all* inputs in the production process. This will give an estimate of the total factor productivity (TFP) of the firms. To aggregate the different inputs into a single index a production function will be estimated, which effectively aggregates the inputs using the estimated coefficients as weights. In practice whether there are systematic differences in TFP across certain categories of firms is investigated by estimating a production function using as regressors both the inputs and the variables hypothesised to be related to differences in TFP. Analysis of TFP-differences then proceeds by examining the signs, magnitudes and levels of significance of the estimated coefficients on the latter set of variables.

Two forms of the production function are presented in Table 4.4. One seeks to explain gross output while the second uses value-added. There are advantages and disadvantages to both measures. The advantage of the gross output measure is that it allows firms to have different efficiencies at transforming intermediate inputs (for example raw materials) into output. Its disadvantage is that the capital stock and raw materials tend to be highly correlated so that it can be difficult to know what the effect of capital stock is on output. In contrast the value-added production function, in which value-added is defined as gross output less intermediate inputs, does not allow for the different efficiencies with which firms convert intermediate inputs into output. Such a procedure allows the effect of capital on output to be more easily identified. However it comes at a cost. The cost is that the resulting estimates for the effects of various factors on underlying efficiency may be too high. It is therefore desirable to present both estimates and see which results are robust to moving from the value-added measure to the more general equation explaining gross output.

Both production functions are based on three years of data, 1998, 1999 and 2000.[8] The first specifies the log of value-added as a function of physical capital, employment (in logs), firm age and dummy variables for location, foreign ownership and industry. The second, for gross output, also includes both raw materials and indirect costs. Unlike in the descriptive statistics, seven industries are distinguished

[8] During the course of the survey both contemporaneous and retrospective data on most of the variables were collected. This procedure generates data from 2000, 1999 and 1998.

TABLE 4.4

PRODUCTION FUNCTIONS: 1998-2000

	Value-added	Gross Output
ln Physical Capital	0.35 (8.9)**	0.02 (1.4)
Ln (Raw Materials)		0.66 (32.4)**
Ln (Indirect costs)		0.24 (11.6)**
ln Employment	0.73 (10.9)**	0.07 (3.8)**
North	0.13 (0.9)	0.10 (2.3)*
East	0.13 (0.9)	0.09 (1.5)
Any Foreign Ownership	0.50 (2.9)**	0.001 (0.04)
Firm Age / 100	-1.22 (2.3)*	0.04 (0.3)
Garments	0.24 (0.9)	0.15 (1.9)
Textiles	-1.15 (4.8)**	-0.15 (2.6)**
Wood	0.34 (0.9)	-0.02 (0.3)
Paper	-0.47 (1.9)+	-0.03 (0.4)
Furniture	-0.37 (1.1)	-0.20 (2.6)*
Chemicals	-0.07 (0.2)	-0.05 (0.7)
Machines	-0.79 (2.3)*	-0.13 (1.8)+
Metals	-0.36 (1.4)	-0.05 (0.9)
R^2	0.85	0.99
Number of observations	332	336

Note: + significant at 10 per cent level; * significant at 5 per cent level; ** significant at 1 per cent level. Time dummies were included in the regressions but not reported to conserve space.

between in the regressions, using the food sector as the benchmark (omitted) category. For the value-added production function the estimated coefficient on capital is 0.35, and that on employment is equal to 0.73, which implies that a one percentage increase of the capital stock yields an increase in value-added by 0.34 per cent, whereas a one percentage increase of the labour force increases output by 0.73 per cent, on average. Similarly, if both capital and labour are being increased by one percent, then output is expected to increase by 1.08 per cent, indicating mildly increasing returns to scale. When tested for, however, constant returns to scale cannot be rejected (test not reported). As was indicated in the discussion above from the descriptive statistics for TFP, the food sector (omitted category) is among the most efficient sectors. The textiles sector appears to have by far the lowest TFP based on the value-added production function. The point estimate of -1.15 implies that average TFP in food is about 3 times higher than in the textile sector and this difference is significant at the one per cent level. Similarly, the gap between food and machines is such that the TFP in the former sector is 120 per cent higher than in the latter. Firms with some foreign ownership appear to have a TFP value 65 per cent higher than those with none while the coefficient on firm age is negative, suggesting that young firms are more productive.

As already has been suggested the value-added production function estimates may be too high and for this reason it is necessary to establish how many of these results continue to hold if a gross output function is used as in the second column of Table 4.4. It is clear that while the pattern of differences in TFP is similar the levels of inefficiency in the textile and machines sectors are much lower than are implied by the value-added function. In the gross output production function the food sector is only 15 per cent more efficient than the textile sector. This is still a substantial difference but, as the gross output function is the more general one, it does suggest that using the value-added measure may overstate differences in TFP across sectors. It will also be noted that the garment sector, which is dominated by small firms and has much lower levels of labour productivity than other sectors, has higher levels of TFP than the food sector which has the highest level of labour productivity. This is true whether the value-added or gross output production function is used.

There are other important differences between the two functions. Using the gross output measure there is no evidence that firms with foreign ownership have

higher levels of TFP. There is also now no effect from firm age on TFP. These findings are important. The widely held view that firms with foreign ownership are more efficient may be based on a failure to properly measure the extent of their inputs.

4.3 Fixed Capital Investment

Understanding investment has long been an important item on economists' research agenda, mainly because investment affects standards of living in the long run, and because investment is highly volatile and therefore propagates into short-run economic fluctuations (Romer, 1996). Hence it is not surprising that many commentators have stressed private investment as a key factor in providing the basis for economic growth and development in Africa. For instance, the IMF (1993) estimates that during 1971-1991 there was a shortfall in trend output growth of 1.7 per cent per year in SSA compared to all other developing countries, and that one third of this gap was attributable to insufficient investment levels.

TABLE 4.5

PROPENSITY TO INVEST 1998-2000, BY SIZE AND SECTOR

	Micro	Small	Medium	Large/Macro	All size groups
Food	0	0	0.57	0.92	0.68
	[1]	[2]	[7]	[12]	[22]
Textiles	0	0.10	0.39	0.81	0.54
	[1]	[10]	[18]	[27]	[56]
Garments	0.18	0.52	0.40	--	0.34
	[33]	[27]	[10]	[0]	[70]
Wood / Paper /	0.18	0.24	0.26	0.54	0.33
Furniture	[11]	[17]	[27]	[24]	[79]
Chemicals / Machines	--	0.50	0.18	0.54	0.44
	[0]	[6]	[11]	[28]	[45]
Metals	0.17	0.29	0.59	0.48	0.43
	[6]	[14]	[17	[23]	[60]
All sectors	0.17	0.34	0.38	0.63	0.42
	[52]	[76]	[90	[114]	[332]

Note: The table shows proportions of non-zero investments. Numbers in [ ] are number of observations.

As discussed in Section 3, one ubiquitous feature of African firm-level investment data is the prevalence of zero investments (e.g. Bigsten et al, 1999). This is also the case for the NMES data. Table 4.5 shows how the propensity to undertake any investment during a period of one year varies by size and industry, for the period 1998-2000. Only 42 percent of all observations are non-zero investments, a proportion similar to what has been found in previous research on African firms (Bigsten et al, 1999). Looking at differences across sectors, it is clear that firms in the garments and wood/paper/furniture sectors are less inclined to carry out investment than firms in other industries. This is mostly driven by the large proportion of small and micro firms in these sectors. As the size breakdown illustrates, small and micro firms are less likely to invest than medium, large or macro firms. This difference in investment

TABLE 4.6

AVERAGE INVESTMENT RATES

FOR INVESTING FIRMS 1998-2000, BY SIZE AND SECTOR

	Micro	Small	Medium	Large/Macro	All size groups
Food	--	--	0.15	0.03	0.06
	[0]	[0]	[4]	[11]	[15]
Textiles	--	0.51	0.10	0.10	0.11
	[0]	[1]	[7]	[22]	[30]
Garments	0.32	0.26	0.06	--	0.24
	[6]	[14]	[4]	[0]	[24]
Wood / Paper /	0.22	0.30	0.04	0.12	0.13
Furniture	[2]	[4]	[7]	[13]	[26]
Chemicals /	--	0.03	0.004	0.09	0.07
Machines	[0]	[3]	[2]	[15]	[20]
Metals	0.02	0.07	0.09	0.02	0.06
	[1]	[4]	[10]	[11]	[26]
All sectors	0.26	0.22	0.08	0.08	0.12
	[9]	[26]	[34]	[72]	[141]

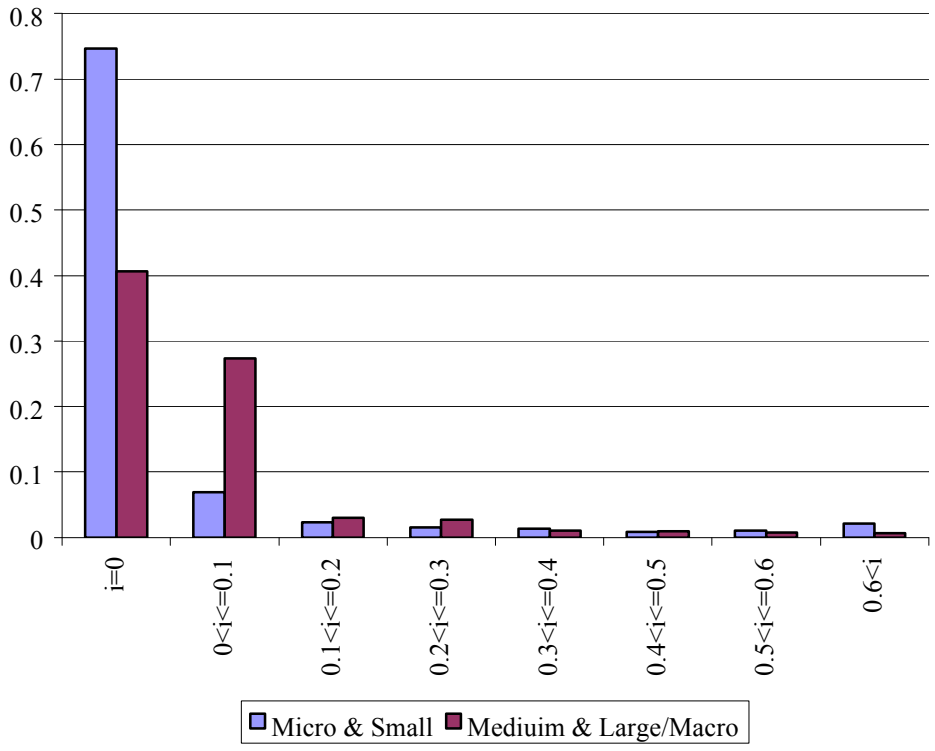
Note: The investment rate is defined as the investment expenditure divided by the replacement value of the capital stock. The numbers in [ ] are numbers of observations.

by size is dramatically illustrated in the food and textile sectors. Amongst large firms 92 and 81 percent of firms, respectively, invested during this period. This is compared to 0 for micro firms. The investment-size issue will be further explored below.

Table 4.6 shows average investment rates, defined as investment expenditure divided by the replacement value of the capital stock, across size categories and industries. For these calculations, the zero investments are excluded, so the reported averages are conditional on there being any investment. The average investment rate in the sub-sample of investing firms is about 0.12, which is large enough to balance depreciation but not much more. Interestingly, there appears to be a negative relation between the investment rate and firm size: the average investment rate for investing micro firms is 0.26, and the corresponding number for small, medium and large/macro firms is 0.22, 0.08 and 0.08, respectively. This finding that the smallest firms are least likely to invest, but have the highest investment rates given that they do invest, is

FIGURE 4.2

FREQUENCY DISTRIBUTION OF INVESTMENT RATES, 1998-2000



Note: i = investment / capital. The number of observations for micro and small firms is 225, and for medium and large/macro 228.

consistent with a case where small firms are constrained by indivisibilities or fixed sunk investment costs. The variation in the average investment rate across sectors is driven by the size composition of the respective sectors. Sectors with high investment rates such as garments and wood/paper/furniture have a higher proportion of smaller firms. These smaller firms tend to have a higher investment value to capital stock ratio.

Figure 4.2 shows the frequency distribution of investment rates, denoted *i*, for two sub-samples, micro and small, and medium and large/macro. According to Table 4.7 the average investment rate is about 0.12. However, Figure 4.2 shows that the central tendency of the investment rate is not very well represented by the sample mean due to the severe skewness of the data. Counting the zero investments, the graph shows that the investment rate is less than or equal to 0.10 for 82 per cent of the firms in the smaller size group and for 68 per cent of the firms in the larger size group. As investment rates between 0 and 0.10 for all practical purposes represent replacement investments, it follows that only a small fraction of the firms undertake expansionary investments.

These descriptive statistics indicate low investment activity in the sample. Large firms are more likely to carry out some investment, but less likely to have high investment rates, than small firms. To probe the investment data a little further, the results of regression analysis will now be considered. Table 4.7 reports results from a probit regression modelling the decision to invest, and an ordinary least squares (OLS) regression modelling the investment rate for investing firms. The probit model is non-linear, so to facilitate interpretation the estimated change in the probability of investment from a one-unit change in the explanatory variable everything else held constant is reported.[9] Both regressions are based on data for the entire period 1998-2000, and use as regressors the logarithm of employment, technical efficiency, firm age and dummy variables for location, year, industry and foreign ownership. Technical efficiency is measured as either the residual from a Cobb-Douglas production function modelling value-added as a function of employment and physical capital, or from the gross output production functions (these equations are those reported in Table 4.4).

[9] The probability is evaluated at sample means of the regressors.

TABLE 4.7

INVESTMENT EQUATIONS, 1998-2000

	[1] Probit on the decision to invest		[2] OLS, where dependent variable is investment / capital if firm invests	
	[1]	[2]	[3]	[4]
	Marginal effect[$]	Marginal Effect[$]		
ln Employment	0.13	0.13	-0.02	-0.02
	(4.8)**	(4.7)**	(1.4)	(1.6)
Technical Efficiency (Ouput)	0.07		0.0	
	(0.6)		(0.0)	
Technical Efficiency (Vad)		0.05		0.01
		(1.8)+		(0.7)
Any Foreign Ownership	0.06	0.07	0.06	0.06
	(0.1)	(0.7)	(1.6)	(1.6)
Firm Age/100	-0.9	-0.8	-0.2	-0.2
	(2.8)**	(2.8)**	(1.5)	(1.5)
Textiles	-0.13	-0.13	0.04	0.04
	(1.1)	(1.0)	(0.9)	(0.9)
Garments	0.07	0.07	0.12	0.12
	(0.4)	(0.4)	(1.7)+	(1.7)+
Wood	-0.17	-0.17	0.01	0.01
	(0.6)	(0.6)	(0.1)	(0.1)
Paper	-0.03	-0.03	0.04	0.04
	(0.1)	(0.1)	(0.5)	(0.5)
Furniture	-0.14	-0.14	0.08	0.08
	(0.9)	(0.9)	(1.1)	(1.1)
Chemical	-0.15	-0.16	-0.01	-0.01
	(1.1)	(1.2)	(0.1)	(0.1)
Metal	-0.13	-0.14	-0.04	-0.04
	(1.0)	(1.1)	(1.1)	(1.1)
Machines	-0.22	-0.22	0.05	0.05
	(1.8)+	(1.8)+	(0.6)	(1.1)
Number of observations	336	332	141	138
Pseudo R^2	0.17	0.17		
R^2			0.16	0.16

Note: + significant at 10 per cent level; * significant at 5 per cent level; ** significant at 1 per cent level. Time dummies were included in the regressions but not reported to conserve space.

[$]For dummy variables this indicates the change in the probability of investment from a discrete change from 0 to 1.

In the probit regressions, reported in Columns [1] and [2], the coefficient on size is positive and significant at the one per cent level. The estimated marginal effect is 0.13, indicating that the probability of investment of a firm with 100 employees is about 30 percentage points higher than that of a firm with 10 employees.[10] In round numbers moving from a small to a large firm raises the probability of some investment being undertaken from 30 to 60 per cent. The marginal effect of technical efficiency is only significantly different from zero (at the ten per cent level) using the value-added measure of technical efficiency. Using this point estimate implies that a move from an inefficient firm, defined as one which has an efficiency level one standard deviation below the mean, to an efficient one, defined as one with an efficiency level one standard deviation above the mean, increases the probability of investing by 10 percentage points.

Other significant coefficients suggest that each additional year of firm age reduces the probability of investment by just under 1 percentage point. The fact that young firms appear to invest more often than older firms suggests that the firm gradually builds up its business during several years after it has entered the market. One potential reason for such behaviour is that young firms are credit constrained and need to generate own finance to fund their investments.

Columns [3] and [4] of Table 4.7 shows OLS results for the investment rate regression, based on the sub-sample of investing firms. The size coefficient is now negative, which squares with the descriptive statistics shown in Table 4.6, although it is not statistically significant. The estimated coefficient on technical efficiency is not significant for either measure of efficiency. There are some systematic differences across sectors in the investment rate in that the garment sector has a higher investment rate. Foreign ownership appears not to impact either on the decision to invest or the investment rate.

These results suggest some, but not strong, evidence, for the role of underlying firm performance, technical efficiency, in increasing investment. There may be measurement problems with these variables that makes it hard for their effects to be successfully modelled. It may be that investment rates are so low that the other factors

[10] Calculation: 0.13·(ln100 - ln10). It should be noted that this calculation is only an approximation and not exact, because the marginal effects in the probit model are variable and dependant on the values of the regressors.

which effect investment (for example, high capital costs and uncertainties about the future) which cannot be easily measured, are more important than the factors included in the equation.

4.4 Exports

Numerous analysts emphasise exports as a key factor in reversing Africa's poor economic performance. The most commonly cited example is that of the Asian tigers whose rapid growth since the mid 1970s was driven by manufacturing exports in particular. As in most other sub-Saharan countries, however, manufacturers in Nigeria remain focused on the domestic market. What limits their entry into foreign markets, and how improvements in their access can be brought about are central issues to policy making for the manufacturing sector in Africa.

Table 4.8 shows the proportion of firms in the sample that carried out any exporting during 2000. One striking feature of the data emerges – not many Nigerian firms export. In the sample as a whole, only 7 per cent of firms export. Excluding exporters to Africa, only 5 per cent of firms export out of Africa. Even amongst medium and large firms, only 10 per cent of medium firms and 9 per cent of large firms export. A similar picture is obtained if one examines the sector breakdown of exporting. Even in sectors with relatively high exports – food, textiles and garments - only one firm in seven exports. The figures are lower for the other sectors where exporting is negligible.

Given this poor export performance, it is of interest to investigate how export-intensive the exporting firms are. Figure 4.3 graphs the frequency distribution of the percentage of output exported, for medium-sized and large/macro firms. Over 95 per cent of firms do not export or export less than 10 per cent of their output. Approximately 2 per cent of firms export between 10 and 50 per cent of their output. The other 2 per cent are specialised exporters and export on average 90 per cent of their output.

To get a better understanding of the determinants of exports, a probit regression is used to model the decision to export as a function of technical efficiency (see Section 4.2), firm age, dummy variables for industry, location and foreign ownership, and size, measured as the number of employees. The probit results,

TABLE 4.8

PROPENSITY TO EXPORT 1998-2000, BY SIZE AND SECTOR

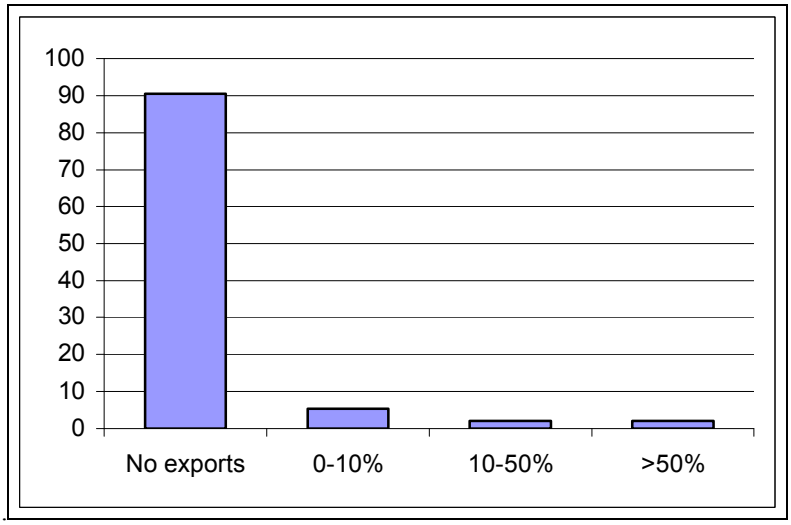
	Micro	Small	Medium	Large/Macro	All size groups
Food	0	0	0	0.25	0.14
	(0)	(0)	(0)	(0.25)	(0.14)
	[1]	[2]	[7]	[12]	[22]
Textiles	0	0	0.11	0.14	0.11
	(0)	(0)	(0)	(0.11)	(0.05)
	[1]	[10]	[18]	[28]	[57]
Garments	0.03	0.14	0.40	--	0.13
	(0.03)	(0.14)	(0.30)	(--)	0.11
	[34]	[28]	[10]	[0]	[72]
Wood / Paper /	0	0	0.07	0.00	0.03
Furniture	(0)	(0)	(0.07)	(0)	0.03
	[11]	[18]	[27]	[24]	[80]
Chemicals /	--	0	0.09	0.04	0.04
Machinery	(--)	(0)	(0)	(0)	(0)
	[0]	[6]	[11]	[28]	[45]
Metal	0	0	0	0.09	0.03
	(0)	(0)	(0)	(0)	(0)
	[6]	[14]	[17]	[23]	[60]
All sectors	0.02	0.05	0.10	0.09	0.07
	(0.02)	(0.05)	(0.06)	(0.05)	(0.05)
	[53]	[78]	[90]	[115]	[337]

Note: The numbers in [] are numbers of observations. The table shows proportions of firms doing any exporting, these are the top numbers in each cell, and the proportions of firms exporting outside Africa, these are the numbers in ( ).

reported in Table 4.9, suggest that larger firms are more likely to export than smaller ones. A firm with 100 employees is 7 percentage points more likely to export than a firm with only 10 workers. There is a positive and significant relationship between exports and efficiency. Firms that are more efficient are more likely to export. This may be because firms that are more efficient select themselves into the export market, firms become more efficient through exporting, or a combination of both. This efficiency-export relationship may also tie in with a transaction cost argument: firms may have to be more efficient in order to overcome high transactions costs associated

FIGURE 4.3

FREQUENCY DISTRIBUTION OF SHARE OF OUTPUT EXPORTED FOR MEDIUM-SIZED AND LARGE/MACRO FIRMS



Note: The number of observations is 95. Micro and small firms were not included.

with the export market. Foreign ownership is also a significant determinant of export probability. Surprisingly, a firm with foreign ownership is less likely to export than one owned entirely by Nigerians. This suggests that foreigners invest in Nigerian firms in order to supply the domestic market.

Hence the micro data on exporting behaviour largely conforms to the macroeconomic picture discussed in Section 2. What could account for this lack of exports? Collier (1997) argues that manufacturing is a transaction-intensive process. Exporting manufacturing goods would further increase the required transactions. Collier argues that manufacturing in Africa is at a comparative disadvantage due to a poor policy environment that increases transaction costs. This may be the case for Nigeria – high transaction costs in the form of poor infrastructure or an inefficient bureaucracy may be stifling Nigerian exports. Exporting by Nigerian firms may also be limited by other factors. Firms may prefer to supply a large domestic market and have little incentive to export. Alternatively, exports may be constrained because Nigerian firms are inefficient or less productive than their competitors. These are issues that will be addressed in Section 7.

TABLE 4.9

EXPORT EQUATIONS

	Probit on the decision to export	
	Marginal effect[$]	Marginal effect[$]
ln Employment	0.03	0.02
	(2.8)**	(2.6)**
Technical Efficiency (Output)	0.06	
	(2.1)*	
Technical Efficiency (Vad)		0.02
		(2.44)*
Any Foreign Ownership	-0.02	-0.02
	(1.2)	(1.2)
Firm Age/100	-0.3	-0.4
	(1.2)	(1.9)[+]
Firm Age^2/10000	0.7	0.9
	(1.5)	(2.0)*
Textiles	0.07	0.06
	(0.9)	(0.9)
Garments	0.37	0.33
	(1.9)[+]	(1.8)[+]
Wood	0.03	0.02
	(0.5)	(0.4)
Chemical	0.03	0.03
	(0.4)	(0.4)
Machines	0.10	0.12
	(0.7)	(0.8)
Metal	0.04	0.05
	(0.6)	(0.7)
Number of observations	336	332
Pseudo R^2	0.27	0.30

Note: The wood, furniture, machines and metals sectors are dropped as these predict the failure to export perfectly. + significant at 10 per cent level; * significant at 5 per cent level; ** significant at 1 per cent level. Time dummies were included in the regressions but not reported to conserve space.

[$]For dummy variables this indicates the change in the probability of investment from a discrete change from 0 to 1.

5. Industrial Policy and the Business Environment[11]

This section will use the survey data to document how managers and entrepreneurs view the current state of industrial and economic policy in Nigeria, and attempt to shed some light on the characteristics of the business environment for Nigerian manufacturing. An inherent difficulty in such a task is that the analyst to a large extent has to rely on qualitative and subjective data. One reason why this may be problematic is that different respondents may not use the same benchmark in giving their responses, a point raised by Lall (2001) in his critical assessment of World Economic Forum's competitiveness index. It is therefore important to be careful when attempting to infer what is the true underlying problem from the self-reported data.[12]

5.1 Perceived Main Problems

The first step is to examine the data on problem perceptions by firms. Respondents were asked to rank their firm's three biggest problems. Table 5.1 shows the five most frequently cited problems, listed from left to right in the order of frequency by which they are being rated as the major problem for the entire sample.

The most frequently cited number-one problem in the sample is physical infrastructure (36 per cent), followed by access to credit (17 per cent), insufficient demand (8 per cent), the cost of imported raw materials (8 per cent) and skilled labour (6 per cent). The first category is more frequently cited by firms in the two intermediate size categories than by micro or large firms. This suggests that intermediate sized firms rely on government provision of public goods such as infrastructure, and cannot supply their own – as many large firms do. Credit access is more often cited as the main problem by micro and small firms than by medium and large/macro firms. One third of the micro firms, and 18 per cent of the small firms, rate lack of credit access as their main problem, while only 11 per cent of firms in the two largest categories rate credit access as their biggest problem. Insufficient demand for a firm's products is a larger problem for micro firms than for firms in other categories. The cost of imported raw materials is perceived as a relatively more

[11] This section was written with the collaboration of Neil Rankin.

[12] This is not because respondents are believed to intentionally provide false information, it is simply because perceptions may not always reflect the true state, perhaps because of imperfect information.

TABLE 5.1

PERCEIVED MAIN PROBLEMS

		Physical infrastructure	Access to credit	Insufficient demand	Cost of imported raw materials	Skilled Labour
All	First	35.8	17.0	7.9	7.9	5.5
[N = 182]	Second	16.3	21.9	9.0	5.6	3.9
	Third	13.6	8.8	14.3	4.1	3.4
Micro	First	29.6	33.3	14.8	0.0	14.8
[N = 27]	Second	14.8	29.6	11.1	0.0	18.5
	Third	9.1	18.2	27.3	4.6	4.6
Small	First	49.0	18.4	8.2	8.2	4.1
[N = 49]	Second	12.8	27.7	14.9	6.4	2.1
	Third	7.5	10.0	22.5	2.5	5.0
Medium	First	34.1	11.4	2.3	15.9	2.3
[N = 44]	Second	13.6	27.3	6.8	0.0	2.3
	Third	19.1	7.1	9.5	4.8	2.4
Large/	First	26.7	11.1	8.9	4.4	4.4
Macro	Second	18.6	9.3	7.0	9.3	0.0
[N = 45]	Third	16.3	4.7	7.0	4.7	2.3

Note: The table shows responses as a percentage of that category. N denotes the number of firms.

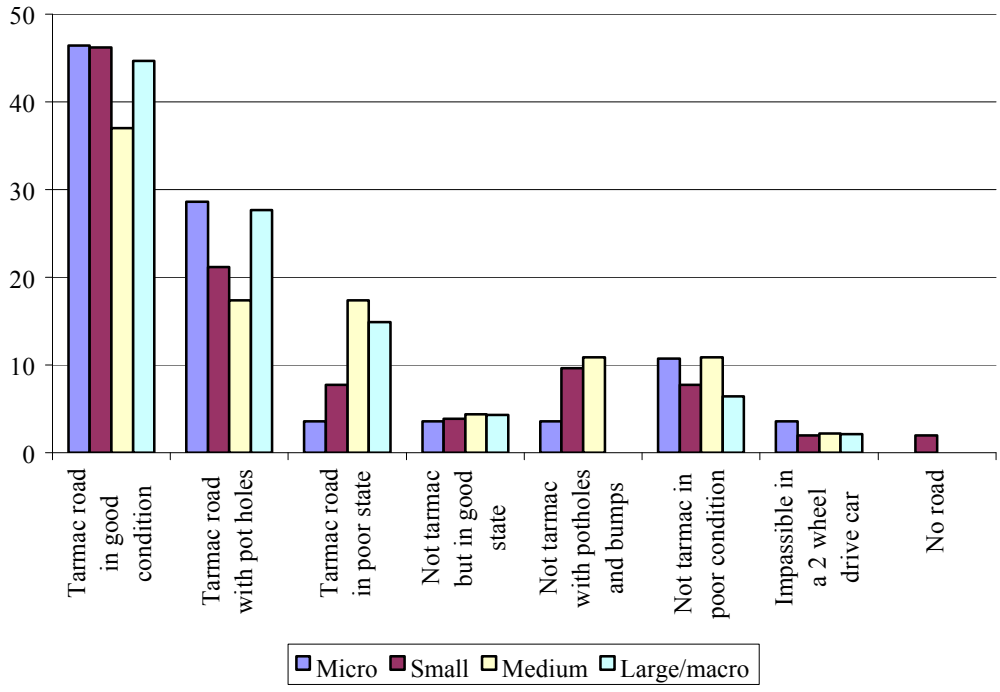
serious problem for medium firms than for other firms. Almost 15 per cent of micro firms cite skilled labour as their major problem. Less than five per cent of larger firms view this as their main problem. This may be because larger firms are able to pay the premium that skilled labour requires.

5.2 Supply of Utilities and Infrastructure

According to Table 5.1 one of the main perceived problems is physical infrastructure. Additional information was collected in this area, regarding the state of roads directly outside the enterprise as well as the supply and reliability of utilities. The often cited problem of poor infrastructure is difficult to quantify, particularly from the perspective of the individual firms. Asking individual respondents to rank the state of the infrastructure on some ordinal scale often produces misleading results. This is the case because often respondents believe the infrastructure in their area to be of a certain quality, but they have limited information about infrastructure in other areas. In the NMES an alternative approach was used, designed to get objective rather than subjective data on the matter. Figure 5.1 shows this data. A little less than half the firms have a tarmac road 'in good condition' in the immediate vicinity. This figure is less for medium firms. Between 25 and 30 per cent of firms in the large and the micro category are situated on tarmac roads with some potholes. Large firms require good roads for the transport of raw materials and finished products. Micro firms often need

FIGURE 5.1

THE STATE OF THE ROADS DIRECTLY OUTSIDE THE ENTERPRISE, BY FIRM SIZE



Note: The graph shows proportions of firms in each category, by size. The total number of firms in these calculations is 173.

to be situated in areas where they have a large exposure to potential customers. It is for this reason that they locate along good roads. A number of medium and large firms operate in areas where roads are 'in a poor state' or impassable in a two-wheel drive car. Twenty-three per cent of large firms and thirty per cent of medium firms are situated in these types of area. This is particularly costly from an efficiency point of view given that large and medium firms tend to be more infrastructure-intensive than smaller firms.

Table 5.2 summarises the data on electricity and water supply, and the usage and reliability of telephone services Firms generally have mains electricity for less than 3 days per week. Large and macro firms are most badly affected by this lack of power – on average they have 2.78 days a week with mains electricity. Water supply is also limited for many of the firms. On average firms have an adequate water supply for 2.25 days per week. Micro firms are particularly badly affected with less than a day and a half of adequate water a week. It is noted that one common response to unreliable electricity and water supply is for firms to invest in a generator or a well or cistern. While this solves the supply problem, it certainly involves additional costs that could have been avoided had the central supply been adequate. Sixty-nine percent of the firms have at least one telephone, and the phones work on average about half the time. For larger firms this is slightly larger – about four days a week. In order to overcome the unreliable telephone service firms are increasingly embracing mobile telephones.

TABLE 5.2

SUPPLY AND RELIABILITY OF UTILITIES

	All	Micro	Small	Medium	Large/ macro
How many days per week do you have mains electricity? [N=178]	2.97	2.92	3.06	2.98	2.78
Do you have a phone? [N=189]	0.69	0.18	0.50	0.80	1.00
How many days per week do the telephones work? [N=136]	3.72	3.18	3.61	3.44	4.04
How many days per week do you have an adequate water supply? [N=142]	2.25	1.47	2.46	2.38	2.12

Note: N denotes the number of firms.

5.3 Information Technology

Information technology, in the form of computers and the internet, has become an important tool for modern firms. Table 5.3 reports descriptive statistics on the information technology used by firms. Sixty-one per cent of the firms in the sample have at least one computer. Of course, large firms are much more likely than smaller firms to have at least one computer, nevertheless a quarter of the small firms have a computer, which is not a small number. None of the micro firms owns a computer. The number of computers per employee is decreasing in size. In small firms there is on average one computer per five employees, given the firm owns a computer. For

TABLE 5.3

INFORMATION TECHNOLOGY

	All	Micro	Small	Medium	Large/ macro
Have computer? [N=148]	0.61	0	0.24	0.68	0.95
Computers per employee, given at least one computer [N=76]	0.07	--	0.20	0.07	0.04
Computers per employee, all firms [N=132]	0.04	0	0.05	0.05	0.04
Internet access? [N=151]	0.44	0	0.16	0.46	0.70
Use the internet for marketing and sales if they have internet access? [N=66]	0.18	0	0.33	0.06	0.22
Use the internet for ordering materials if they have internet access? [N=66]	0.38	0	0.33	0.24	0.44
Use computers in factory management if have computer? [N=95]	0.64	0	0.70	0.52	0.64
Use computers for accounts if have computer? [N=94]	0.74	0	0.22	0.68	0.89
Mean hardware spending as a proportion of the capital stock, for firms that do spend on hardware. [N=57]	0.016	0	0.023	0.017	0.014
Mean software spending as a proportion of the capital stock, for firms that do spend on software. [N=48]	0.004	0	0.002	0.003	0.004

Note: N denotes the number of firms. The table shows responses as a percentage of that category.

large firms the number of computers per employee is much lower. For firms with computers, 64 percent of firms use computers in the management of the firm. On average, 74 per cent use a computer to keep accounts. The use of computers for this purpose increases with firm size. Firms spend, on average, 1.6 per cent of the value of their capital stock on computer hardware, if they invest. For smaller firms this ratio is larger. Spending on software is less than on hardware. Unlike for hardware, the ratio of spending on software to the capital stock increases with firm size.

The internet has the potential to be a valuable resource for firms. In the sample 44 per cent of firms have access to the internet. Internet access increases with firm size. Eighteen per cent of firms use the internet for marketing and sales. This proportion is highest for small firms. Of the firms that have internet access, 38 per cent use it for ordering materials.

5.4 Governance and the Cost of Doing Business

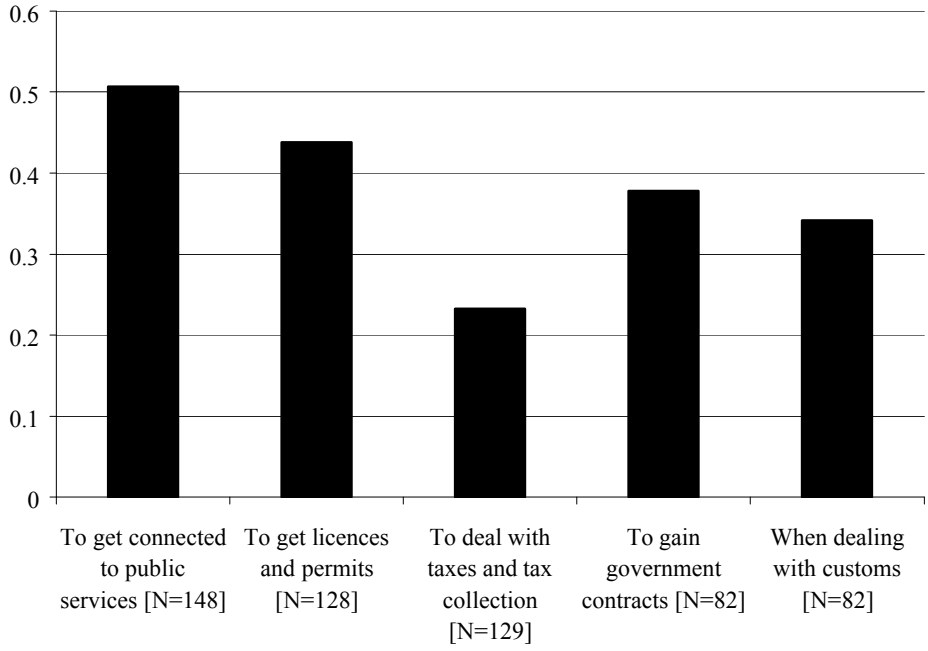
One reason that the cost of doing business in Africa is high is that firms often are required to make additional unofficial payments to ensure a steady supply of public services. Figure 5.2 illustrates the incidence of additional unofficial payments in five different situations.[13] Of the five situations referred to here, public service connections appears to be the one with the highest incidence of additional payments, 51 per cent, followed by licence and permit processing (44 per cent), government contracts (38 per cent), customs (34 per cent), and tax collection (23 per cent). Table 5.4 shows disaggregated data indicating that the incidence of additional payments with regard to public services and licenses and permits actually decreases with firm size.

The broader issue of how respondents rate the overall quality, integrity and efficiency of services delivered by various public services and agencies is examined in Figure 5.3. Respondents were asked to use an ordinal scale from 1 to 6, where 1 was ‘very good’ and 6 ‘very bad’. The figure shows the average scores ranked from the poorest to the best. Next to the bars the proportions of non-response for each

[13] The data used for these calculations were based on a question where respondents were asked to indicate how often ‘firms like yours’ need to make extra, unofficial payments in various situations.

FIGURE 5.2

PROPORTIONS OF FIRMS* THAT 'ALWAYS', 'USUALLY' OR 'FREQUENTLY' NEED TO MAKE UNOFFICIAL PAYMENTS



* The question asked of the respondents refers to 'firms like yours'. N denotes the number of firms.

TABLE 5.4

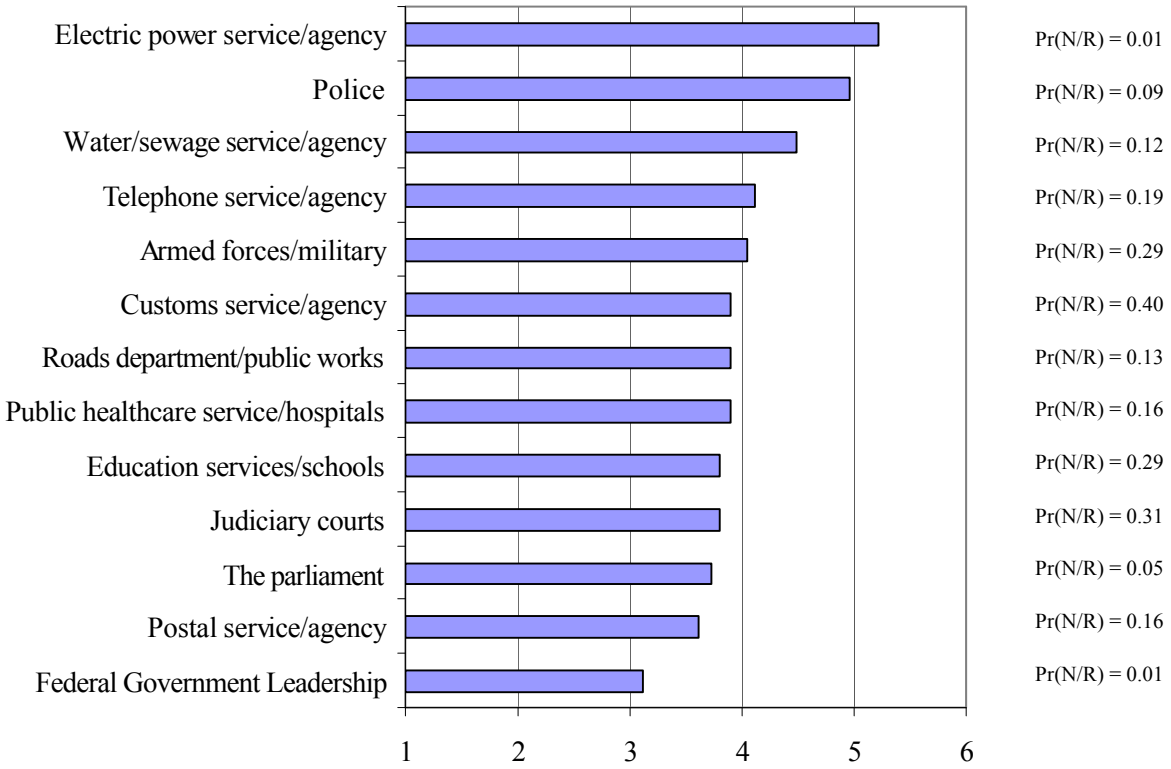
ESTIMATED PROPORTIONS OF FIRMS* THAT 'ALWAYS', 'USUALLY' OR 'FREQUENTLY' NEED TO MAKE UNOFFICIAL PAYMENTS, BY FIRM SIZE

	Micro	Small	Medium	Large
To get connected to public services [N=131]	0.68	0.53	0.55	0.45
To get licences and permits [N=113]	0.50	0.52	0.48	0.43
To deal with tax collection [N=115]	0.27	0.26	0.25	0.27
To gain government contracts [N=74]	0.29	0.45	0.46	0.33
To deal with customs [N=70]	0.33	0.57	0.24	0.33

* The question asked of the respondents refers to 'firms like yours'. N denotes the number of firms. Firms that answered not applicable are excluded.

FIGURE 5.3

RATING OF OVERALL QUALITY, INTEGRITY AND EFFICIENCY OF SERVICES DELIVERED



Note: The following scale was used: 1 = 'Very good'; 2 = 'Good'; 3 = 'Slightly good'; 4 = 'Slightly bad'; 5 = 'Bad'; 6 = 'Very bad'. Pr(N/R) = Proportion of non-responses. The full sample consists of 188 firms.

category are indicated. This proportion is atypically high for armed forces, customs, and the judiciary courts. This is because many firms do have limited exposure to these services. The worst average score is given to the electricity service, 5.2, followed by the police at 5.0, water services, 4.5 and telephones, 4.1. The armed forces gets an average score of 4.0, however this score is possibly downward biased given the sensitivity of this issue in Nigeria. The most favourable average ratings were for the Federal Government, 3.1, the postal service, 3.6, and the parliament, 3.7. Given the recent political reforms in Nigeria it is interesting to note that the level of satisfaction with the parliament and central government leadership is rather higher than in Kenya (a non-reformer); in Kenya, the average scores associated with the parliament and central government leadership are equal to 4.2 and 4.3, respectively (see Söderbom, 2001).

5.5 Business Awareness, Product Quality, Alliances and Efficiency

Being aware of a competitors' products and product quality is potentially very important for all firms. The NMES asked a number of questions on this aspect, as well as on the business alliances and networks firms belong to. Based on the responses to the following questions, an index of business awareness has been constructed:

- "How good is your knowledge of the strengths and weaknesses of your top three competitors?"
- "How well do you know the service level which your key competitors provide to customers?"
- How well does your firm compare to the service level which your key competitors provide to customers?"
- How effectively do you keep track of the emergence of new competitors?"

Firms are classified as having a high 'business awareness' if they respond with either excellent or very good for all these categories. As Table 5.5 illustrates there is a higher proportion of firms with high business awareness in the two larger size categories than in the smaller. There is a similar relationship between firm size and firm awareness of global best practice. Eighty-five per cent of large and macro firms

TABLE 5.5

BUSINESS AWARENESS AND FIRM SIZE

	All	Micro	Small	Medium	Large
Percentage of firms with high business awareness. [N=173]	0.28	0.16	0.22	0.33	0.30
Aware of global best practice [N=186]	0.73	0.67	0.55	0.78	0.85
Areas requiring support for replicating best practice [N=327]					
Cheap loans	0.35	0.46	0.34	0.30	0.34
Study in relevant country/factory	0.09	0.05	0.10	0.12	0.09
Subsidised transfer of Technology	0.26	0.33	0.26	0.27	0.20
Management training	0.16	0.08	0.14	0.16	0.22
Training programme for workforce	0.14	0.08	0.16	0.14	0.15

Note: The question asked of the respondents refers to 'firms like yours'. N denotes the number of firms.

claim to be aware of global best practice in contrast to 67 per cent and 55 per cent of micro and small firms respectively. Firms were then asked about areas requiring support by government, institutions and multilateral organisations in order to replicate best practice. Cheap loans was the dominant answer for all firms across all size categories. The second most common answer was subsidised transfer of technology.

Firms were also asked about how they believed their product quality compared to competitors. These data are shown in Table 5.6. A majority of firms believed that their product quality was higher than their competitors from Nigeria. Sixty-two per cent of medium and large firms believed that their product quality was higher than competitors from West Africa, but only 36 and 18 per cent said that they produced better quality goods than other African and intercontinental competitors, respectively.

TABLE 5.6

PERCEIVED PRODUCT QUALITY, BY FIRM SIZE

	All	Micro/Small	Medium/ Large/ Macro
Nigerian competitors [N=188]			
Lower	0.05	0.05	0.05
Same	0.42	0.42	0.43
Higher	0.53	0.53	0.51
West African competitors [N=73]			
Lower	0.11	0.25	0.05
Same	0.38	0.46	0.32
Higher	0.51	0.29	0.62
Other African competitors [N=72]			
Lower	0.13	0.26	0.16
Same	0.43	0.39	0.48
Higher	0.44	0.35	0.36
Intercontinental competitors [N=98]			
Lower	0.37	0.47	0.31
Same	0.45	0.37	0.51

Higher	0.18	0.17	0.18

Note: N denotes the number of firms. The table shows responses as a percentage of that category.

TABLE 5.7

ALLIANCES AND NETWORKS, BY FIRM SIZE

	All	Micro	Small	Medium	Large/ Macro
Alliances [N=187]	0.30	0.08	0.17	0.29	0.59
Networks [N=190]	0.33	0.11	0.25	0.26	0.58

Note: N denotes the number of firms. The table shows responses as a percentage of that category.

Amongst micro and small firms 53 per cent believe their products to be of better quality than local competitors. This figure drops to 29 per cent for West African competitors, is 35 per cent for other African competitors and 17 per cent for intercontinental competitors.

Business networks and alliances potentially play an important role in sharing information between firms. Firms were asked whether they had alliances with any other firms. Thirty per cent of firms responded affirmatively, Table 5.7. More large firms were involved in alliances than smaller firms. The response to the question about whether firms networked with other firms, '..for enhancing collective efficiency in production and marketing', was similar.

5.6 Business Awareness, Alliances, Networks and Infrastructure as Determinants of Firm Performance

Thus far a number of factors that could be linked to firm performance have been examined. The next step of the analysis is to investigate whether there is a discernable relationship between firm performance and these factors. To this end a gross output production function, similar to the one reported in Section 3, is estimated using OLS, including as explanatory variables the business awareness index, and whether the firm is part of an alliance or network and the quality of the roads near the firm. Results are shown in Table 5.8.

These results must be interpreted with some care. There is no unique way of defining some of the variables and clearly a different definition may produce different results. It is however important to assess whether a measure of how the firm behaves can be related to how it performs. As described in the last section a firm is classified as having a high 'business awareness' if they respond with either excellent or very good for categories associated with high awareness of competitor's strengths. There is no evidence that this measure of business awareness is associated with higher TFP for the firms. In fact the point estimate is negative. In the second and third columns of Table 5.8 a similar question is raised for the alliance variable - does the firm have alliances with other firms - and for the network variable. In both cases there is no evidence that these activities of the firm are positively associated with higher TFP. Indeed for the network variable the coefficient is negative and significant.

What might explain these results which suggest no positive effect from these measures of the firm's behaviour onto underlying productivity? The first, and most obvious, point is that these dimensions of firm behaviour are hard to measure so the result may be misleading. The second point is that the effects of these dimensions of firm behaviour may not be picked up in underlying efficiency. They may for example affect the amount of its capital stock or the scale of its operations, factors that are captured by other variables in the regression. Finally it is possible that developing networks meets other objectives than firm performance and that these objectives can only be met at the expense of underlying firm efficiency. Theses are issues which require further investigation.

In Table 5.8, Column [4] the possible effects of road infrastructure on firm efficiency is considered. Firms are defined as facing good roads if the road outside their firm was classified as a sealed road in a good state of repair. For this variable there is some evidence that firms facing good roads have higher levels of efficiency – the point estimate suggest a gain of 8 per cent. In the final column of Table 5.8 all these variables are included together in the production function. The conclusions as to their joint effect does not differ from the effects when entered separately.

In summary it remains a question for further research as to how various aspects of the behaviour of firms – their business awareness and their networks – affect their underlying efficiency. How they do is clearly a matter of importance for it is this underlying efficiency which is the fundamental determinant of the competitiveness of the firm. Evidence has been presented in earlier sections that this

efficiency has some impact on investment and a sizable impact on the decision to export. In the next section the role of firm level efficiency in the wages that firms pay will be investigated.

TABLE 5.8

A GROSS OUTPUT PRODUCTION FUNCTION WITH BUSINESS AWARENESS, ALLIANCES, NETWORKS & ROADS (1998-2000)

	[1]	[2]	[3]	[4]	[5]
ln Physical Capital	0.01 (1.2)	0.01 (1.2)	0.01 (1.3)	0.01 (1.1)	0.01 (1.2)
Ln (Raw Materials)	0.66 (29.5)**	0.66 (28.9)**	0.66 (28.9)**	0.66 (28.5)**	0.66 (29.9)**
Ln (Indirect costs)	0.24 (10.6)**	0.24 (10.5)**	0.24 (10.6)**	0.25 (10.9)**	0.24 (11.2)**
ln Employment	0.07 (3.5)**	0.07 (3.3)**	0.08 (3.9)**	0.08 (3.4)**	0.09 (3.8)**
Any Foreign Ownership	0.02 (0.5)	0.03 (0.8)	0.03 (0.9)	0.03 (0.8)	0.02 (0.5)
Firm Age / 100	0.03 (0.2)	0.05 (0.3)	-0.08 (0.4)	0.08 (0.1)	-0.17 (0.9)
High business Awareness	-0.05 (1.2)				-0.06 (1.4)
Alliances		-0.01 (0.2)			0.01 (0.2)
Networks			-0.10 (2.4)*		-0.11 (2.7)**
Good Roads				0.08 (1.9)+	0.08 (2.2)*
R^2	0.99	0.99	0.99	0.99	0.99
Number of observations	299	299	299	299	299

Note: Figures in brackets are t-statistics. + significant at 10 per cent level; * significant at 5 per cent level; ** significant at 1 per cent level. This equation does control for sector and location but the coefficients are not reported.

6. The Labour Market and Wages[14]

This section provides information on the earnings of workers and apprentices, interviewed as part of the survey, and examines their determinants. The measure of earnings presented is the sum of monthly wages and non-wage payment such as housing, transport and food allowances, and other allowances where applicable. The workers and apprentices were asked for their earnings in the previous year so this section is based on both their current earnings and their recalled earnings for the previous year.

Several issues are considered. First the role of skills in increasing earnings is documented. Several dimensions of skills will be measured. The first, which is the subject of Section 6.1, is the years of formal education. The effect of education on earnings is usually interpreted in terms of the importance of human capital. In Section 6.2 another possible dimension of skills, the occupation of the workers, is considered. There are other potentially important dimensions of skill: the acquisition of general and specific human capital in the firm. To obtain an indication of the importance of such skills it is necessary to estimate how much earnings rise with experience generally and tenure on the job. That will be done after the importance of firm-level characteristics as determinants of earnings has been examined. The firm characteristics that will be considered are the size of firm, its sectors, who owns it, its age and finally how profitable and productive it is.

6.1 Educational Attainment and Earnings

Table 6.1 gives the mean earnings by education level of employees. Five levels of education are identified: No education, primary dropout, primary graduate, secondary graduate, and university graduate. The proportion of employees with no education is 2.2 per cent. Less than 1 per cent have not completed the primary level of education. 21 per cent of employees are primary graduates and over one-half are secondary graduates. University graduates constitute 14 per cent of the sample. The data show that in general there is little tendency for earnings to increase with the level of education until secondary education is obtained. The relationship between earnings and education is clearly non-linear. To illustrate: the earnings of a primary graduate

[14] This section was written with the collaboration of Godius Kahyarara.

TABLE 6.1

MEAN MONTHLY EARNINGS BY EDUCATION LEVEL, 2000-2001

Education level	Sample Proportion (%)	Earnings in Naira (2000 prices) Mean	Earnings in US$ (2000 exchange rate) Mean
None	2.2	9,951	106
Primary dropout	0.7	5,134	55
Primary	21.0	7,080	76
Secondary	62.1	9,363	100
University	13.9	19,755	211
All	100	10,317	111

Note: The number of observations is 1131. The sample is confined to those Nigerian workers for whom there is a complete set of both individual and firm level information, apprentices who are unpaid are excluded.

differ little from those with no education; secondary graduates earn about 40 percent more than those with primary education; and university graduate's earnings are twice those of a secondary graduate. In the equation to explain earnings the possibility that the relationship between earnings and education is non-linear will be explicitly considered. The issue is an important one for policy. The non-linear nature of the relationship means that there is little, or no, income gain from education until a certain critical level is reached, which is 6 years of education (see Section 6.5 below). Thus there is little evidence that education up to primary completion increases the earnings of those in the sample.

6.2 Skills and Earnings

A second possible source of increased earnings from skills may be captured by the occupation within which workers are employed. There is of course a substantial overlap between the education of the worker and their occupation. Whether a separate skill dimension can be identified will be considered when an equation estimating the determinants of earnings is presented below in Section 6.5. In this section a skilled worker is defined as one belonging to one of the following occupations: managers,

TABLE 6.2

MEAN MONTHLY EARNINGS BY SKILL CATEGORY, 2000-2001

Skill category	Sample Proportion (%)	Earnings in Naira (2000 prices)	Earnings in US$ (2000 exchange rate)
Unskilled	40.8	6,253	68
Skilled	59.2	13,124	140
All	100	10,317	111

Note: The number of observations is 1131. The sample is confined to those Nigerian workers for whom there is a complete set of both individual and firm level information, apprentices who are unpaid are excluded.

professionals (engineers, accountants, economists, technicians), skilled office workers, sales personnel, and supervisors. Unskilled labour includes, unskilled office workers, service employees such as cleaners and guards, and production workers. Over half of the employees in the sample are skilled which reflects the fact that the sampling of the workers was designed to over represent such workers. Table 6.2 shows that the mean earnings for skilled employees are over twice the mean earnings of unskilled employees.

6.3 Firm Size and Earnings

Table 6.3 gives mean earnings by firm size. Approximately 4 per cent of employees work in micro firms while 17 per cent work in small firms, 34 per cent in medium firms and 45 per in large/macro firms. Again this reflects the over-sampling of workers in large firms. These data clearly show that earnings increase with size of firm. Between micro and small/medium firms earnings increase by some 60 per cent, then there is a further 60 per cent increase again in moving from medium to large.

What accounts for this relationship between firm size and earnings and what are its policy implications? Numerous reasons have been advanced as to why a relationship will be observed between the size of firms and the earnings of their workers. These can broadly be characterised as explanations focused on the unobserved quality of the workers and those focused on how firm pay may be related to firm performance – of course the two sets of explanation are not mutually

TABLE 6.3

MEAN MONTHLY EARNINGS BY FIRM SIZE, 2000-2001

Firm size	Sample size	Earnings in Naira (2000 prices)	Earnings in US$ (2000 exchange rate)
	Proportion (%)	Mean	Mean
Micro	3.9	4,945	53
Small	16.8	7,646	82
Medium	34.0	8,254	89
Large/Macro	45.3	13,322	143
All	100	10,317	111

Note: The number of observations is 1131. The sample is confined to those Nigerian workers for whom there is a complete set of both individual and firm level information, apprentices who are unpaid are excluded.

exclusive. Large firms may employ better qualified workers and higher quality ones. These attributes cannot easily be measured so it appears that large firms pay more but in fact large firms simply have better workers, who being more productive get paid more. The second set of explanations argues that workers of the same quality do get paid more by large firms. One of these explanations argues that monitoring of workers is more expensive in larger firms so that to ensure workers work hard the penalty from failure to do so needs to be higher in such firms, i.e. the gap between what they are paid in the firm and what they would get paid if fired needs to be higher in larger than smaller firms. This is part of the efficiency wage argument for firm size wage differentials. Such an explanation may predict higher pay in larger firms. More generally the view that efficiency wages are important predicts that firm level productivity and the wages of workers will be correlated. There are other explanations for such a correlation. It may be that workers in more productive firms can obtain higher wages – a form of rent seeking. Any correlation between firm level productivity and wages is open to a range of interpretations and here the potential importance of this issue is raised by examining how far individual wages are affected by the size of the firm and its productivity.

6.4 Firm Size, Education Level, Skills and Earnings

The first step in investigating the relationship between firm characteristics and earnings is to ask if, once there are controls for education, do earnings increase with firm size? The data to do this are shown in Table 6.4. Most of the workers in the sample are either primary or secondary graduates. It is striking that for both these categories of workers there are large increases in earnings in moving up the size distribution. The gain in moving from micro to large is substantially greater for secondary compared with primary graduates. For university graduates in moving from a medium sized to a large firm earnings increase by only 40 per cent although it needs to be noted that such workers are concentrated in large firms. For those with no education the increases in earnings in moving across size categories are much larger but the sample size on which this is based is very small.

The data in Table 6.4 certainly show that it is not simply that large firms employ more educated labour, although clearly that is the case. It is that workers with the same level of education earn very different amounts depending on the size of firm in which they work.

Is the same true for skilled workers? Table 6.5 shows that it is. For the unskilled earnings in large/macro firms are about twice those in micro or small firms while for the skilled the increase in still greater. In summary, irrespective of education level or skill, earnings increase with firm size.

6.5 The Determinants of Earnings

Several dimensions of both skills and firm characteristics can only be identified if a regression is run to explain earnings. The results of doing that are presented in Table 6.6. A distinction is made between the individual factors affecting earnings - the work experience, education and tenure of the employee - and the effects on their earnings of the characteristics of the firm. The fact that firm characteristics are found to be correlated with the earnings of workers does not imply causality. It may simply be that these firm characteristics are correlated with unobservable characteristics of the workers and that what really affects the worker's earnings are these unobserved factors.

TABLE 6.4

MEAN MONTHLY EARNINGS IN US$ BY FIRM SIZE AND EDUCATION LEVEL, 2000-2001

Education level	Micro	Small	Medium	Large/macro
No education				
Mean	25	128	99	134
Sample proportion (%)	0.3	0.3	0.6	0.9
Primary dropouts				
Mean	.	66	49	56
Sample proportion (%)		0.3	0.3	2.2
Primary graduates				
Mean	56	57	70	106
Sample proportion (%)	2.2	5.3	6.2	6.3
Secondary graduates				
Mean	42	81	85	123
Sample proportion (%)	1.1	10.5	22.7	27.7
University graduates				
Mean	.	323	163	221
Sample proportion (%)		0.5	3.2	10.1

TABLE 6.5

MEAN MONTHLY EARNINGS IN USD BY FIRM SIZE AND SKILL CATEGORY, 2000-2001

Skill category	Micro	Small	Medium	Large/macro
Unskilled				
Mean	40	60	64	83
Sample proportion (%)	2.6	9.0	16.2	13.1
Skilled				
Mean	79	107	112	167
Sample proportion (%)	1.3	7.8	17.9	32.2

Note: For both Tables the number of observations is 1131. The sample is confined to those Nigerian workers for whom there is a complete set of both individual and firm level information, apprentices who are unpaid are excluded.

TABLE 6.6

EARNINGS FUNCTIONS[$]

Male	0.40 (5.7)**	0.26 (3.8)**	0.29 (4.7)**	0.26 (3.9)**
Age	0.16 (10.1)**	0.14 (8.6)**	0.13 (8.2)**	0.13 (7.8)**
$Age^2/100$	-0.18 (9.1)**	-0.16 (7.6)**	-0.14 (7.1)**	-0.13 (6.7)**
Years of Education	-0.08 (2.9)**	-0.07 (2.7)**	-0.06 (2.5)**	-0.05 (2.2)*
$(\text{Years of Education})^2/100$	0.65 (5.4)**	0.54 (4.7)**	0.50 (4.7)**	0.49 (4.5)**
Tenure	0.006 (1.8)$^+$	0.002 (0.8)	0.008 (2.3)*	0.008 (2.4)*
Skill	0.39 (7.5)**	0.37 (8.)**	0.35 (8.0)**	0.35 (8.1)**
Ln (Firm Employment)		0.14 (7.4)**	0.10 (4.4)**	0.12 (5.0)**
Firm Age/100			-0.96 (4.4)**	-0.88 (3.8)**
Exports			-0.07 (1.1)	-0.05 (0.7)
(Real profits/Employee)/ 1,000,000			-0.784 (0.3)	-0.473 (0.2)
Ln (Capital/Employee)			-0.01 (0.6)	-0.001 (0.1)
Ln (Real output/Employee)			0.08 (3.2)**	0.02 (0.8)
Technical Efficiency (Output)			0.36 (3.4)**	
Technical efficiency (Vad)				0.11 (3.9)**
R^2	0.45	0.50	0.56	0.62
Number of observations	1131	1131	1131	1131
Controls for Sectors	No	Yes	Yes	Yes
Controls for Location	No	Yes	Yes	Yes

The dependent variable is the log of real monthly earnings in 2000 Naira.
Note: + significant at 10 per cent level; * significant at 5 per cent level; ** significant at 1 per cent level. Time dummies were included in the regressions.

In the equation the experience of the worker is modelled by looking at their age. The reason for using age rather than the experience of the worker is that experience cannot be measured directly from the data. It is also the case that age is one of the most accurately measured variables in the data set. The age earnings profile can be interpreted as a measure of how earnings respond to general training, gains that accrue through work experience rather than the specific human capital incurred by working in a specific firm. This latter dimension of human capital is captured by the tenure variable. In the equation the importance of human capital is measured by years of education. Both a linear and a quadratic term are included. If the quadratic term is positive it implies that the returns to education – the amount by which earnings rise with education – increase as the amount of education increases. Thus a year of education at the post-secondary level would be more valuable to the workers in terms of increasing earnings than a year spent at primary school.

The firm characteristics that are used as determinants of earnings in Table 6.6 are the size of the firm, measured by the log of employment, real profits per employee, the capital labour ratio, labour productivity and the underlying technical efficiency with which the firm operates. It has already been shown that large firms pay substantially more than smaller ones. It is now possible to investigate how much of this rise can be explained by the observed human capital characteristics of the workers and how much by other aspects of the firm's characteristics.

The first column of Table 6.6 shows simply the human capital determinants of earnings: age, education, tenure and skill. Controls are included for the gender of the individual. In the second column the importance of firm size, measured by the log of employment, is investigated. In the third column of the table the other characteristics of the firm are also included as determinants of earning.

The human capital variables are all highly significant, with the exception of tenure. In particular it is found that the measure of skill, defined as a dummy variable equal to unity if the worker is classes as skilled, which is based on the occupation of the worker, increases earnings by 35-40 per cent, even with controls for the experience and education of the worker. The equation also shows clearly the non-linear nature of the returns to education. Over low levels of education there is no rise, indeed a fall, in earnings. At primary completion, i.e. six years of education, the returns to education start to rise and the point estimates in the table imply that a worker with 15 years of education, i.e. university completion, has achieved an

increase in earning of 11 per cent per annum. Compared with a worker with no education this gives a highly educated worker earnings more than five times larger. As has already been stressed the highly non-linear nature of the returns to education mean that these large rises in income from education are only obtained by the highly educated. For junior secondary school completers, i.e. those with 10 years of education, the returns are only 5 per cent. The table shows large increases of earnings with experience (modelled by age). This effect is quadratic, a near universal findings in such data. The data imply that earnings increase until the worker is aged 45. The human capital interpretation of such findings is that general training is valuable and as workers acquire such work experience their earnings will rise. As already noted the measure of tenure, how long the worker has been employed by the firm, is not significant and the point estimate is very low. There is little evidence here for firm based skill acquisition being an important factor in determining earnings.

The second column of the table investigates the role simply of firm size (there are also controls for sector which are not reported to save space in the table). The size of the firm is a highly significant determinant of earnings and this is true with controls for all the human capital characteristics of the workers. In fact the coefficients on the human capital variables change relatively little once the size variable is included. This effect is not only significant, it is also large. The equation implies that a move from a firm of 20 employees to one of 100 employees earnings will rise by 55 per cent. This is as large as the increase obtained from completing junior second school.

In the final column of the table the question is addressed as to whether this size effect can be explained by the other characteristics of the firm: its profitability, age, whether it exports, the capital labour ratio, labour productivity or its underlying level of efficiency (total factor productivity). The first point to note from the equation is what while, the point estimate on size decreases a little (from 0.14 to 0.12), it remains highly significant. Size is not proxying these other factors. There appears to be a relationship between the size of the firm and the earnings of the worker not explained either by observable human capital characteristics of the worker or by the profitability or productivity of the firm. Several of the factors are however related to earnings.

Older firms pay their workers less while those with some foreign ownership pay more, some 30 per cent. There is no evidence from the equation that more profitable firms or those with a higher capital to labour ratio pay their workers more.

It must be remembered that these measures will be highly correlated with other variables included in the equation, for example productivity, and may well not be accurately measured. Whether there are effects for either profitability or the capital labour ratio on earnings awaits further work on the data.

Two of the productivity variables have highly significant effects on earnings, the measure of labour productivity, which is gross output per employee, and a measure of total factor productivity, which is the residuals from a gross output production function. If an inefficient firm is defined as one with an underlying efficiency level two standard deviations below the mean and an efficient one as one with an efficiency level two standard deviations above the mean then the equation implies that a move from an inefficient to an efficient firm be associated with a rise in earnings of 35 per cent. A similar move across the distribution for labour productivity would see earnings rise by 41 per cent. Clearly earnings and productivity are strongly related for reasons which are separate from the effects of increased skills on earnings.

Why are these findings of importance for policy? The results show clearly that there is a relationship between the wages of the firm and the efficiency with which it operates. There are many possible ways in which this link may operate but the results suggest that if the efficiency of firms can be increased so can the wages of all workers, not simply the skilled. Higher wages for unskilled workers are a key part of any strategy to reduce poverty and the large range of wages for workers, of given skill, suggests that focusing on firm factors matters in influencing wage outcomes. It needs to be stressed that the key is the link between efficiency and wages. Simply raising wages through minimum wage policies, unrelated to any considerations of firm performance, is unlikely to benefit workers in anything other than the very short run.

In the previous sections it has been shown that efficiency impacts on both investment and exports. The results of his section show that, in addition, efficiency matters for wages. Policy makers concerned to improve outcomes in the manufacturing sector need to be aware of the key role of the efficiency of firms - their competitiveness in the terminology used above – in determining both how much they invest, whether they can enter the export market and how much their workers get paid.

Firm level analysis showed that there was very little, if any, evidence for increasing returns to scale. Large firms do not benefit from scale economies relative

to small ones. In this section evidence has been presented that larger firms pay more, for given skill levels, than smaller firms and this size effect on earnings is large. This finding has been widely found in other African economies. What are its implications for policy? One possible reason that large firms are able to pay more than smaller firms is that they face lower capital costs. The data shows clearly that large firms have much higher ratios of capital to labour and commensurate higher labour productivity. The implication is that policies which enable more labour intensive, but efficient, firms to grow, are policies that will generate more jobs per unit of capital. Such jobs must be part of any strategy to reduce poverty.

In summary policy in this area needs to be focused on two closely related objectives: raising the wages of the unskilled and the generation on more jobs for such workers. Firm level competitiveness, the importance of which for firm performance was stressed in the last section, is of equal importance for meeting both of these objectives.

7. Regional Benchmarking of Nigerian Manufacturing

This section proposes to place the Nigerian manufacturing sector in an African context. It was noted in Section 1 that Nigeria's income was only half that of its neighbour Ghana, about the same as that of Kenya and twice that of Tanzania. It is clearly of interest to ask how the performance of the manufacturing firms in these four countries compare.[15] South Africa is added to this set of countries on the grounds that the South African economy is more developed than the other countries and can thus be a useful case to benchmark against.[16]

The comparison begins by asking if one country has higher levels of total factor productivity, defined as in the previous sections, than another; that is, given the levels of inputs how much more output does one country produce rather than another? There are several problems associated with trying to make this comparison and it is necessary to note some of these problems to avoid the results being misunderstood. In comparing across countries it is necessary to use comparable measures for both inputs and outputs. How does a Naira of capital, or sales, in Nigeria compare with a Cedi of capital in Ghana? The comparisons are however across firms in the manufacturing sector and the sectors are the same across the countries so the comparisons are less problematic than is the case with aggregate GDP figures. In making these comparisons constant price figures for each country are calculated and then converted to USD using official exchange rates.

Table 7.1 shows the result on which the discussion will be based. Allowing for differences in inputs – these are clearly much larger in a country like South Africa than is the case in Nigeria or Ghana – then of the five countries South Africa has the highest level of underlying productivity. The information is presented in Chart 7.1. The differences across the countries are not large - Nigeria is about 30 per cent les efficient that South Africa. Three of the countries – Nigeria, Kenya and Ghana are very similar – while Tanzania is the least efficient with underlying productivity levels about 15 per cent less than Nigeria.

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[15] The Kenyan, Ghanaian and Tanzanian data are derived from various RPED and AMES surveys (see Section 3).

[16] The South African data comes from a joint World Bank / Greater Johannesburg Metropolitan Council survey conducted in 1999. This survey includes only firms with over 50 employees and was limited to the Greater Johannesburg Metropolitan Area.

TABLE 7.1

COMPARATIVE PRODUCTIVITY: AN AFRICAN PERSPECTIVE

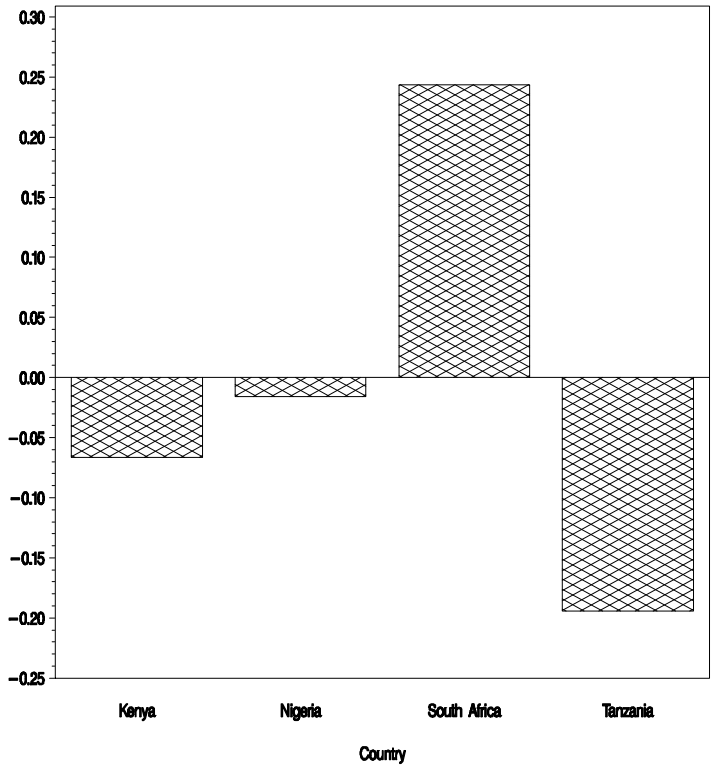
OLS Estimates	Coefficient	t-value	p-value
Ln Physical Capital	0.026	5.55	0.000
Ln Raw materials	0.661	105.17	0.000
Ln Indirect costs	0.180	25.84	0.000
Ln Employment	0.145	15.00	0.000
Exports	0.080	4.08	0.000
Firm Age (years)	0.001	1.45	0.148
Any Foreign Ownership	0.051	2.56	0.011
Food	-0.016	-0.70	0.485
Metals, Machinery and Chemicals	-0.036	-1.90	0.058
Textiles	-0.118	-3.86	0.000
Furniture	-0.007	-0.33	0.738
Kenya	-0.061	-3.03	0.003
Tanzania	-0.185	-9.14	0.000
Nigeria	-0.034	-0.97	0.334
South Africa	0.263	5.34	0.000
R^2	0.97		
Number of observations	3684		

Note: Time dummies were included in the regressions but not reported to conserve space.

FIGURE 7.1

PRODUCTIVITY DIFFERENCES ACROSS COUNTRIES:

GROSS OUTPUT PER UNIT INPUT



Note: The measurements for each of the countries are all relative to Ghana

It is also noted that for this pooled group of countries firms which export are more efficient – some 8 per cent more than firms which do not export. Firms with some foreign ownership are also more efficient although the effect is not large at 5 per cent. There is no evidence that older firms are more efficient than younger ones – firm age is not a significant variable in explaining output. Why might this result arise? The data for Nigeria that has already been presented and the comparative data in earlier sections have shown that investment rates are very low. In this context the opportunities for learning will be limited. These problems – of low investment and little productivity growth for the firms - are linked to the problems posed of the low volumes of exports. Firms oriented towards the domestic market tend to change little, it is openness to international competition that is a potential key to new products, new processes and higher productivity. How these five countries compare in their export performance is investigated next.

Table 7.2 looks at the probability of firms participating the export market. It is here that the poor performance of the Nigeria economy, within an African setting, is

striking. Nigerian firms, for given characteristics, are 15 percentage points less likely to enter the export market than firms in Ghana and Tanzania, evaluated at mean values of the regressors. The table also identifies the factors that do lead to higher exports. Larger firms, those with some foreign ownership and those that have higher levels of productivity – these are all factors that increase the probability of being in the export market. Comparative evidence for firms in sub-Saharan Africa strongly suggests that their poor performance is linked to their failure to enter the export market (Bigsten et al., 2001).

To illustrate the magnitude of the difference between Nigeria and the other countries in the context of exporting, Figure 7.2 shows the predicted proportions of exporting firms for a given country and size group. Two size groups are distinguished between: small, defined here as firms with 20 employees; and large, with 200 employees. All other determinants of export participation are held constant across the countries. The strong relation between exporting and firm size mentioned above is apparent from the graph, however the most striking result is the magnitude of the Nigerian exporting gap. The numbers imply that a large Nigerian firm is in fact less likely to export than a small firm in Tanzania and Ghana.

Figures 7.3-7.5 show data on investment in fixed capital in the five countries. Figure 7.3 shows the proportions of investing firms in a given year. It was discussed in Section 3 how several previous studies on investment behaviour in Africa typically have documented a high frequency of zero investments. This is the case for the current sample as well. About 80 per cent of the South African firms undertake some investment during a typical year, which is by far the highest number across the countries. The investment propensity in the Kenyan sample is about 0.6, which is much higher than that in Ghana, Nigeria and Tanzania. It is noted that for these latter three countries less than 50 per cent of the firms carry out some investment. Figure 7.4 shows the investment rate, defined as the investment to capital ratio. All countries record average investment rates smaller than 10 per cent. Figure 7.5 excludes the non-investors, which naturally increases the average investment rates. Nevertheless, the overall conclusion based on these investment graphs is that capital formation is slow in the manufacturing sectors of these countries. Unlike the case of exports, Nigeria is quite similar to the other countries with regard to the investment behaviour.

TABLE 7.2

COMPARATIVE EXPORT BEHAVIOUR: AN AFRICAN PERSPECTIVE

Probit Estimates	Coefficient	z-value	p-value	Marginal effect[$]
Ln Employment	0.493	24.75	0.000	0.105
Firm age (years)	-0.004	-1.88	0.059	-0.001
Textiles	-0.130	-1.22	0.222	-0.026
Furniture	-0.577	-6.69	0.000	-0.098
Food	-0.427	-5.53	0.000	-0.078
Metal, Machinery and Chemicals	-0.188	-2.74	0.006	-0.038
Kenya	0.461	6.74	0.000	0.110
Tanzania	-0.026	-0.33	0.743	-0.005
South Africa	0.356	2.24	0.025	0.089
Nigeria	-1.206	-8.03	0.000	-0.147
Number of observations	4256			
Pseudo R^2	0.28			

Note: The dependent variable is a dummy variable equal to one if the firm exports and zero otherwise.
[$]For dummy variables this indicates the change in the probability of investment from a discrete change from 0 to 1.

FIGURE 7.2

DIFFERENCES ACROSS COUNTRIES AND OVER FIRM SIZE IN THE PROPENSITY TO EXPORT

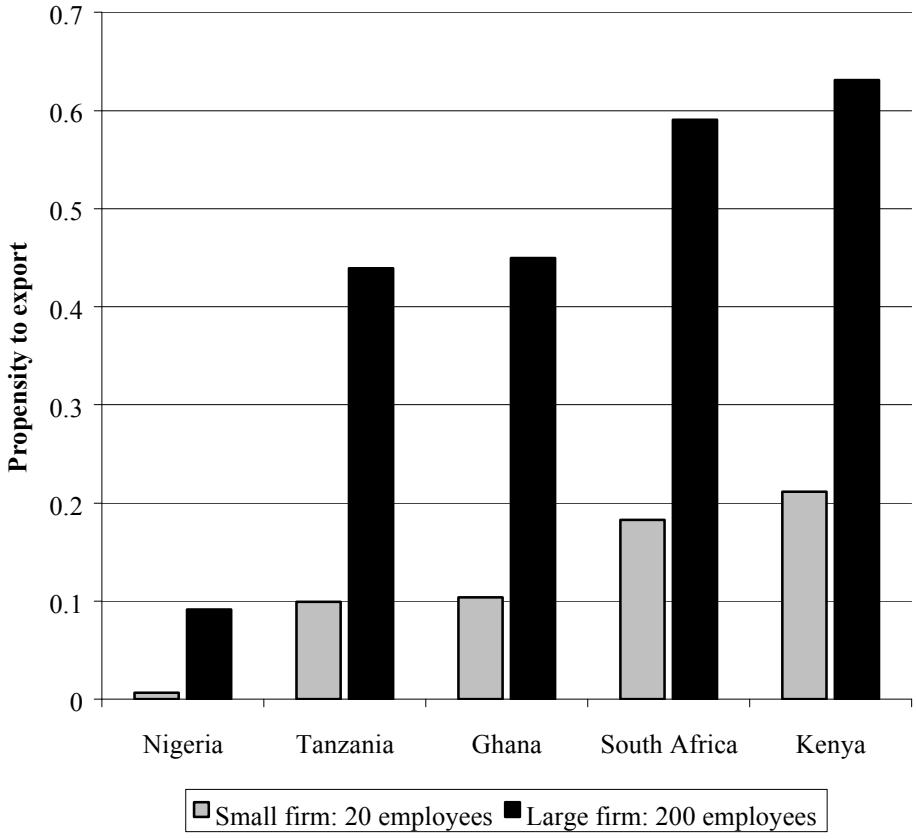


FIGURE 7.3

PROPORTIONS OF FIRMS INVESTING

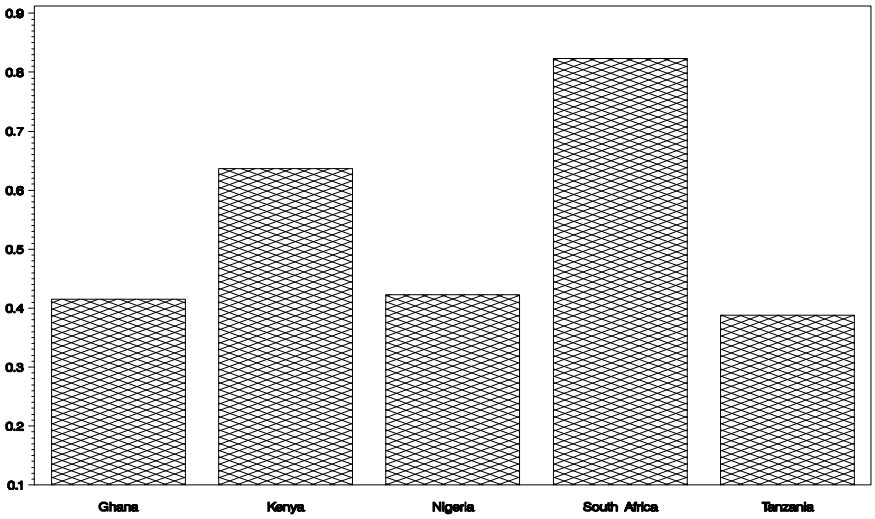


FIGURE 7.4

INVESTMENT TO CAPITAL RATIO

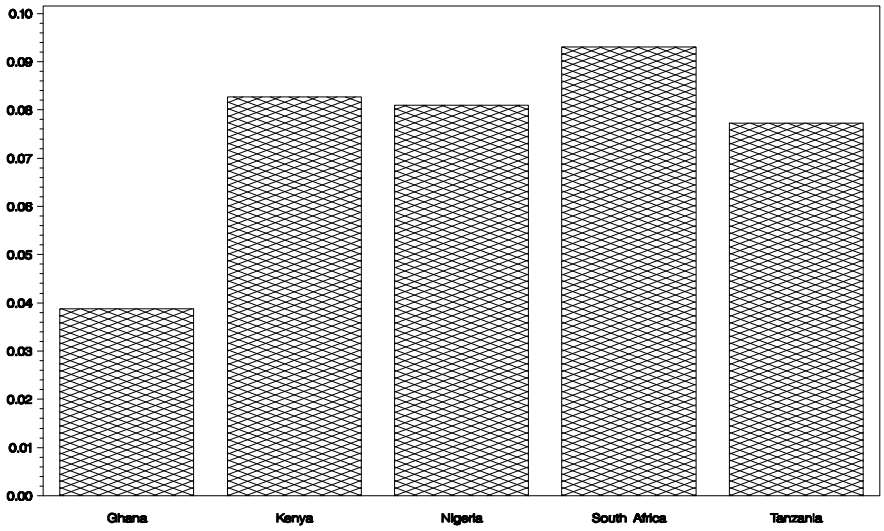
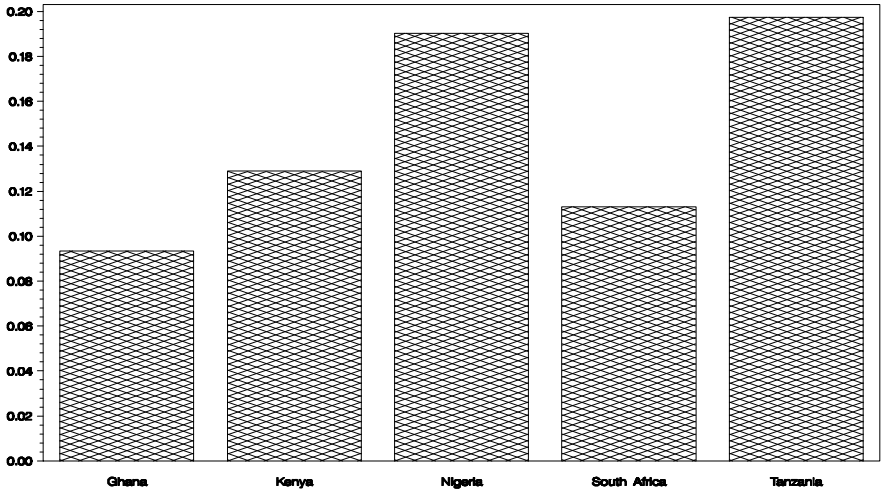


FIGURE 7.4

INVESTMENT TO CAPITAL RATIO IF FIRM INVESTS



8. Summary and Policy Conclusions

This report has analysed the performance of the manufacturing sector in Nigeria. The first part of the report looked at aggregate statistics for the Nigerian macroeconomy and its manufacturing sector in a comparative perspective. It was documented how the 1980s witnessed a sharp economic decline, whereas the 1990s was a relatively static period. There were some signs of economic recovery towards the end of the decade. Nevertheless, at the end of the 1990s Nigerian per capita value-added in manufacturing was very low at approximately USD 13, which corresponds to about 10 per cent of the level of Botswana and less than 50 per cent of that of Ghana and Kenya. The performance of exports per capita for several countries was analysed. Over the period from 1975 to 1999 for Botswana and Mauritius, the African success stories, per capita exports doubled, for Nigeria however they halved. The Nigerian figures on 1999 manufacturing exports per capita are rather dramatic, less than USD 1 per capita, which is by far the lowest number for any of the countries reviewed.

Based on the NMES firm-level data, large labour productivity differentials across sectors and size were documented. Although a substantial part of these could be attributed to differences in capital intensity, the production function estimates showed significant differences in total factor productivity across some of the sectors. Taken together, the evidence on productivity differentials indicated that the food sector has a relatively high level productivity in Nigerian manufacturing and the textiles sector among the lowest. Further, it was found that investment in equipment and machinery was low, with more than half of the firms refraining from investing altogether, and with the majority of the investing firms reporting modest investment rates. Very few firms recorded investment rates that implied significant expansion. OLS results modelling the investment rate showed little variation in the investment rate across sectors. In line with the macro data, the firm data indicate that very few firms export and that the decision to export is strongly related to firm size and technical efficiency.

The next stage of the analysis examined issues related to industrial policy and the business environment, based mainly on qualitative and subjective data. The most frequently cited number-one problem for the firms is physical infrastructure, followed by access to credit, insufficient demand, cost of imported raw materials and lack of skilled labour. It was noted that this aggregation masks considerable differences over

the size range in problem perceptions; for instance among micro firms the most frequently cited main problem was credit access, while for medium and large/macro firms it was physical infrastructure.

Detailed analysis of the supply and reliability of utilities confirmed the inadequacy of the supply of mains electricity. The majority of medium-sized and large/macro firms have at least one computer and most of these firms have access to the Internet. Analysis of the state of infrastructure documented that less than half of the firms have a tarmac road in good condition in its immediate vicinity, and that the roads close to large firms tend to be poorer than average, which may be particularly costly from an efficiency point of view.

Data on governance and the cost of doing business were examined. When rated on an ordinal scale from 1 to 6 where 1 corresponds to 'very good' and 6 to 'very bad', the worst average score was given to the electricity service, 5.2, followed by the police at 5.0, water services, 4.5 and telephones, 4.1. The most favourable average ratings were for the Federal Government, 3.1, the postal service, 3.6, and the parliament, 3.7. It was noted that the level of satisfaction with the parliament and central government leadership is rather much higher than in Kenya, which may reflect the recent political reforms in Nigeria and the lack of reforms in Kenya.

Various aspects of business awareness, alliances and networking, including their effects on total factor productivity, were analysed. There was no evidence for a direct effect of business awareness, alliances and company networking on productivity. This does not imply that such activities are not useful - it does mean that establishing their effects and benefits needs further research.

In the final part of the report on the survey data, labour market issues and wages were examined. Differentials in earnings across categories of education and occupation were documented, and a strong positive relation between earnings and firm size, irrespective of the level of education or skill, was found. It was also found that firm level efficiency impacts in a significant manner in the determination of firm wages.

In view of what has been discussed above, the key to reversing the poor performance of Nigerian manufacturing is to provide incentives for firms to become more export oriented. The benefits of exporting are numerous: it is well-known from the macro data that rapid income growth often is associated with expansion of manufactured exports; microeconomic analysis of African firm data indicates that

African firms that do participate in the exports market tend to improve productivity through a 'learning-by-exporting' process. The central question then is whether the Nigerian firms are productive enough to be able to compete on the international market. To answer this question comparative productivity analysis was undertaken. The implication of this analysis is that Nigerian firms are not atypically unproductive compared to Ghana and Kenya, and in fact significantly more productive than Tanzanian firms; yet when it comes to exporting the Nigerian firms are looming a long way behind firms - with similar characteristics - in these other African countries. While it is true that there is a non-negligible gap to the South African firms, this is equally true for the Kenyan firms, yet many Kenyan firms manage to compete outside their domestic market. The current analysis indicates that Nigerian firms would be competitive abroad, at least to the same extent as firms in Ghana, Kenya and Tanzania.

How, then, can incentives for exporting be provided? The answer comes in two parts. First, measures designed to increase firm-level efficiency would probably be fruitful, as this would help firms to attain certain level of international competitiveness necessary for exporting to be sustainable. Second, it is likely that measures designed to reduce the transaction costs associated with exporting (handling costs, infrastructure etc.) would be effective. Collier (2000) argues that transaction costs faced by African manufacturers are atypically high, because manufacturing firms are intensive users of services that are particularly expensive in Africa. Some of these costs are induced by inappropriate government policies, some are inherent in doing business in economies where the quality of the infrastructure services is often very poor. At the more general level, it is clear that a sound economic policy is enormously important for economic development. In an influential survey of African economic growth, Collier and Gunning (1999) argue that poor policy results in a nexus of constraints from which escape is difficult, but not impossible.

References

Bigsten, A., P. Collier, S. Dercon, B. Gauthier, J. W. Gunning, A. Isaksson, A. Oduro, R. Oostendorp, C. Pattillo, M. Söderbom, M. Sylvain, F. Teal and A. Zeufack (1999). "Investment in Africa's Manufacturing Sector: a Four Country Panel Data Analysis," Oxford Bulletin of Economics and Statistics 61, pp. 489-512.

Bigsten, A., P. Collier, S. Dercon, B. Gauthier, M. Fafchamps, J. W. Gunning, A. Isaksson, A. Oduro, R. Oostendorp, C. Pattillo, M. Söderbom, F. Teal, A. Zeufack and S. Appleton (2000). "Rates of return on physical and human capital in Africa's manufacturing sector," Economic Development and Cultural Change 48, pp. 801-827.

Bigsten, A., P. Collier, S. Dercon, B. Gauthier, M. Fafchamps, J. W. Gunning, A. Isaksson, A. Oduro, R. Oostendorp, C. Pattillo, M. Söderbom, F. Teal and A. Zeufack (2002). "Exports and Efficiency in African Manufacturing". Mimeo. Oxford: Centre for the Study of African Economies, Department of Economics, University of Oxford.

Butler, J. S. (2000). "Efficiency results of MLE and GMM estimation with sampling weights," Journal Of Econometrics 96, pp. 25-37.

Collier, P. (2000). "Africa's comparative advantage", chapter 2 in H. Jalilian, M.Tribe and J. Weiss (eds.) "Industrial Development and Policy in Africa," Edward Elgar, Cheltenham, UK.

Collier, P. and J. W. Gunning (1999). "Why has Africa grown slowly?" Journal of Economic Perspectives 13, pp. 3-22.

Deaton, A. (1997). "The analysis of household surveys: A Microeconometric Approach to Development Policy," published for the World Bank by The Johns Hopkins University Press, Baltimore, USA, and London, UK.

Fafchamps, M., J. W. Gunning, and R. Oostendorp (2000). "Inventories, Liquidity, and Contractual Risk in African Manufacturing," The Economic Journal 110, pp. 861-893.

Hall, R. E. and C. I. Jones (1999). "Why do some countries produce so much more output per worker than others?" Quarterly Journal of Economics 114, pp. 83-116.

International Monetary Fund (1993). "World Economic Outlook," Washington DC, USA.

Lall, S. (2001). "Comparing national competitive performance: An economic analysis of World Economic Forum's competitiveness index," QEH Working Paper QEHWPS61. Oxford: Queen Elizabeth House.

Romer, P. (1996). "Advanced Macroeconomics," the McGraw-Hill Companies, USA.

Söderbom, M. (2001) "Constraints and Opportunities in Kenyan Manufacturing: Report on the Kenyan Manufacturing Enterprise Survey 2000," CSAE Report REP/2001-03, Mimeo. Oxford: Centre for the Study of African Economies, Department of Economics, University of Oxford.

---------- (2002) "Investment Behaviour," Chapter 7 in *Structure and Performance of Manufacturing in Kenya* (Eds. A. Bigsten and P. Kimuyu), Palgrave.

Söderbom, M. and F. Teal (2000). "Skills, investment and exports from manufacturing firms in Africa," Journal of Development Studies 37, pp.13-43.

---------- (2001a). "Firm size and human capital as determinants of productivity and earnings," CSAE Working Paper WPS/2001-09. Centre for the Study of African Economies, Department of Economics, University of Oxford, UK.

---------- (2001b) "Are African firms really inefficient? Evidence from firm-level panel data," CSAE Working Paper WPS/2001-14. Centre for the Study of African Economies, Department of Economics, University of Oxford, UK.

Teal, F. (1996) "The size and sources of economic rents in a developing country manufacturing labour market," *The Economic Journal* 106: 963-976.

Tybout, J. R. (2000). "Manufacturing firms in developing countries: How well do they do, and why?" Journal of Economic Literature 38, pp. 11-44.

Utomi, P. (1998). Managing Uncertainty. Competition and Strategy in Emerging Economies. Ibadan, Nigeria: Spectrum Books Ltd.

World Bank (2000). Can Africa Claim the 21st Century? Washington, D.C.: The World Bank.

---------- (2001a). "The 2000 World Development Indicators CD-Rom," Washington DC, USA.

---------- (2001b). "World Development Report 2000/2001. Attacking Poverty," published for the World Bank by Oxford University Press, New York, USA.

Appendix

TABLE A.1

OLS RESULTS: CAPITAL INTENSITY AS A FUNCTION OF FIRM SIZE

	Coefficient	t-value
ln L	-0.042	-0.14
max[ln L-2.3,0]	0.544	1.26
max[ln L-4.5,0]	-0.507	-1.04
max[ln L-7,0]	-0.124	-0.10
Northern region	0.663	1.85
Eastern region	0.123	0.35
Firm Age / 100	1.049	0.87
Textile	0.172	0.26
Garment	-2.488	-3.51
Wood	-1.383	-1.99
Paper	-0.004	-0.01
Furniture	-2.189	-1.95
Chemical	-0.022	-0.03
Machinery	0.579	0.74
Metal	-0.261	-0.39
Year 1998	0.212	2.01
Year 1999	0.164	1.87
Constant	12.918	15.34
R-squared	0.52	
Prob>F	0.00	
Observations	344	

Note: The dependent variable is the natural logarithm of the capital-labour ratio. ln L = ln(employment).