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UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

AND

CENTRE FOR THE STUDY OF AFRICAN ECONOMIES

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*Constraints and Opportunities in Kenyan Manufacturing: Report on the Kenyan Manufacturing Enterprise Survey 2000**

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September 2001

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Contents

Executive Summary

This is an analysis of the performance of Kenyan manufacturing, primarily based on the Kenyan Manufacturing Enterprise Survey (KMES) fielded in October and November 2000. The main findings of the report can be summarised as follows:

- Aggregate statistics for the Kenyan macroeconomy and its manufacturing sector indicate that the 1990s was a period of economic decline. Per capita income measured in constant domestic prices fell by about 10 per cent during 1991-2000. The formal manufacturing sector had a slow employment growth over the 1990s, on average about 2 per cent per year, and the growth of real output per employee was minuscule, about 1.5 per cent over the entire decade. Capital formation was low and showed a negative trend towards the end of the decade. In contrast, there was rapid growth in the informal manufacturing sector, which in 1999 employed more than four times as many people as the formal manufacturing sector.
- Examining firm characteristics and performance, we find large labour productivity differentials across sectors and size. While a substantial part of these can be attributed to differences in capital intensity, our 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 the highest productivity in Kenyan manufacturing and the textiles sector the lowest.
- We find that investment in equipment and machinery was low, with roughly 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. Regression results show that among seven sectors the food sector had the highest average investment rate, conditional on size and technical efficiency.
- Manufactured exports is fairly diversified across sectors and the decision to export is strongly related to firm size. Very few firms specialise in exporting; most exporting firms export less than 20 per cent of their output, and predominantly to other African countries.
- We examine issues related to industrial policy and the business environment. The most frequently cited number-one problem for the firms is insufficient demand, followed by access to credit, power shortages and corruption. 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 power shortages.
- When asked specifically about government policy, two areas emerge in which there have been significant recent changes, namely taxation and licence regulation. Taken together, the data indicate that these changes had worsened the situation for manufacturing.
- Detailed analysis of the supply and reliability of utilities confirmed the inadequacy of the supply of mains electricity. Except for the smallest size category, we find that the majority of firms have at least one computer and that most of these firms have access to the Internet.

- Examining the state of infrastructure we document 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.
- Investigating data on governance and corruption, we document that the majority of firms have to pay bribes to deal with tax collection or to get licences and permits. When rated on an ordinal scale from 1 to 6 where 1 corresponds to 'very good' and 6 'very bad', most public agencies including the government and the parliament obtained average scores above 4, indicating widespread dissatisfaction.
- Analysing labour market issues and wages, we document the magnitude of the differentials in earnings across categories of education and occupation. We find a strong positive relation between earnings and firm size, irrespective of the level of education or skill.
- In the final part of the report we take stock of the findings and provide a policy discussion. We argue that the poor policy pursued by Kenya has resulted in a nexus of constraints from which escape is difficult, but not impossible. Suggested main areas for reform relate to uncertainty about policies and demand conditions, poor rule of law and corruption.

Acknowledgements

This report is based on the Kenyan Manufacturing Enterprise Survey (KMES), carried out in Kenya during October and November 2000 by a team from the CSAE and the University of Göteborg together with several Kenyan collaborators, and with extensive collaboration with the UNIDO office in Nairobi. Many individuals have played a role in this project, and to them I am very grateful indeed. Without implicating anyone, I wish to register some of my debt here.

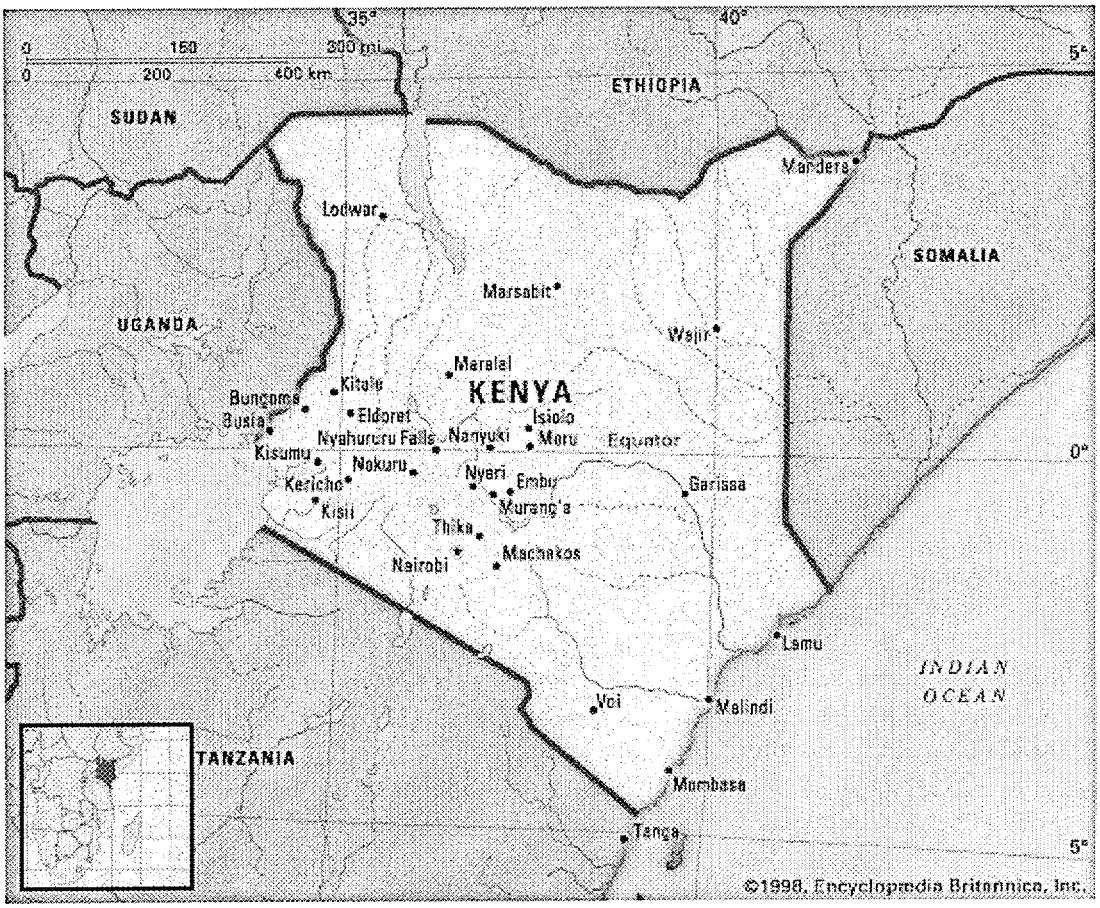
First and foremost I want to express my deepest gratitude to the respondents. Without the cooperation of over 200 owners and managers and over 1,000 workers, the survey and this report would not have been possible. In almost every single case the respondents were extremely generous in giving their time to the interviewers. The information they provided has made it possible to more fully document and understand the changes that have affected the Kenyan manufacturing sector over the past few years. I am also highly indebted to my very hard-working fellow interviewers Arne Bigsten, Sten Dieden, Edward Gakunju, Michael Gitau, Alan Harding, Robert Kuloba, Cromwell Lukurito, Johnson Mwangi, Janvier Nkurunziza, Charles Obiero, Joseph Situma and Anthony Wambugu. Janvier took operational responsibility for the team that went to Mombasa during the course of the survey, which was crucial for the completion of the interviews there. Arne, who has been responsible for earlier surveys in Kenya, was very helpful in enabling us to revisit firms interviewed during 1993-95. Alan was a key figure in the initial training process. I thank Daimano Kulundu Manda for extensive help in recruiting highly able Kenyan interviewers to the research team. Charles Nyangute and his colleagues at the FKE played an absolutely vital role in organising the appointments with the firms and setting up the schedule for the visits. The UNIDO staff in Nairobi, most notably Geoffrey Mariki and Qays Hammad, provided extensive help during the preparations and in organising transport logistics during the course of the survey. Peter Kimuyu at IPAR was very helpful in the preparations as well as in providing tireless support during some of the more difficult moments of the survey. Jared Ichwara at the Central Bureau of Statistics did a very good job in organising the data entry. Francis Teal at the CSAE gave me continuous support and invaluable advice on how to organise the entire project. Gaurav Ganguly provided extensive assistance in designing the questionnaires. Liz Welsh and Cidalia Harding at the CSAE provided a fantastic amount of administrative support before, during and after the survey.

This report is meant to be accessible to non-specialists, and therefore I have tried to make the presentation as rigorous as I could without making it too technical. I thank Arne Bigsten, Francis Teal and Anthony Wambugu, with whom I co-authored Section 6, for constructive comments on an earlier draft. General policy discussions with Kandeh Yumkella at the UNIDO Regional Industrial Development Centre in Lagos, and with Jebamalai Vinanchiarachi at the Industrial Policies and Research Branch, UNIDO, have been very helpful when focussing the final product.

Naturally, I alone accept responsibility for all errors and shortcomings of the report.

September 2001
Måns Söderbom

Map of Kenya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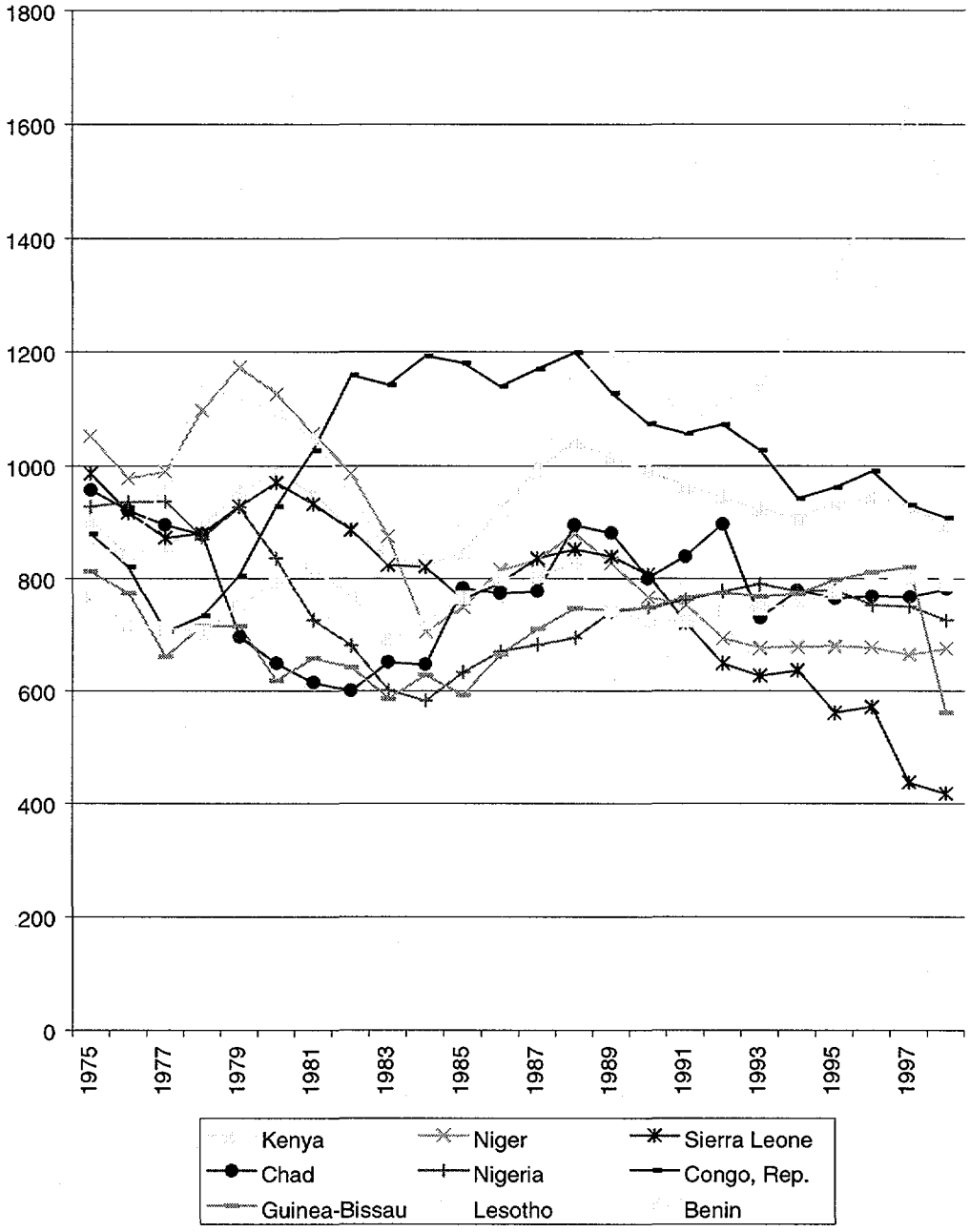
1. Introduction

The Kenyan per capita income has grown slowly since independence in 1963 and continues to be among the lowest in the world. Figure 1.1 shows the development of the per capita gross domestic product (GDP) in Kenya over the period 1975-98, along with eight other countries, selected according to criteria explained in the notes to the figure. The graph, which was constructed using data from the 2000 World Development Indicators (WDI) database (World Bank, 2001b), shows that at the end of 1998 per capita GDP in Kenya was by and large at the same level as in 1975. Strikingly, this performance is not atypically poor compared to other African countries; if anything, it is the opposite. Further analysis of the WDI data shows that in 1975 Kenya's per capita GDP ranked 24th out of 32 Sub-Saharan African (SSA) countries for which there are GDP data in the database. In 1998, Kenya had moved up to 19th place among these 32 countries, passing Chad, the Democratic Republic of Congo, Madagascar, Niger, Nigeria, Sierra Leone and Zambia, while being passed by Lesotho and the Republic of Congo. The fact that this movement has occurred without any growth whatsoever is indeed indicative of the poor economic performance in Africa during the last three decades.

Although manufacturing is usually far from the largest sector in African economies, in terms of share of total output or employment, growth of this sector has long been considered instrumental for economic development. This special interest in manufacturing, the 'darling of policy makers' (Tybout, 2000, p. 11), stems from the belief that the sector is, among other things, a potential engine of modernisation, a creator of skilled jobs, and a generator of several positive spillover-effects (Tybout, 2000). 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 particularly poor over the last decades. Figure 1.2 shows the percentage of manufacturing value-added to GDP in 43 countries in SSA. In Kenya, which ranks 17th from the top in this context, manufacturing accounts for 11 per cent of the GDP, which is low compared to most middle income countries, yet enough to make it the most manufacturing-intensive economy in eastern Africa.

FIGURE 1.1

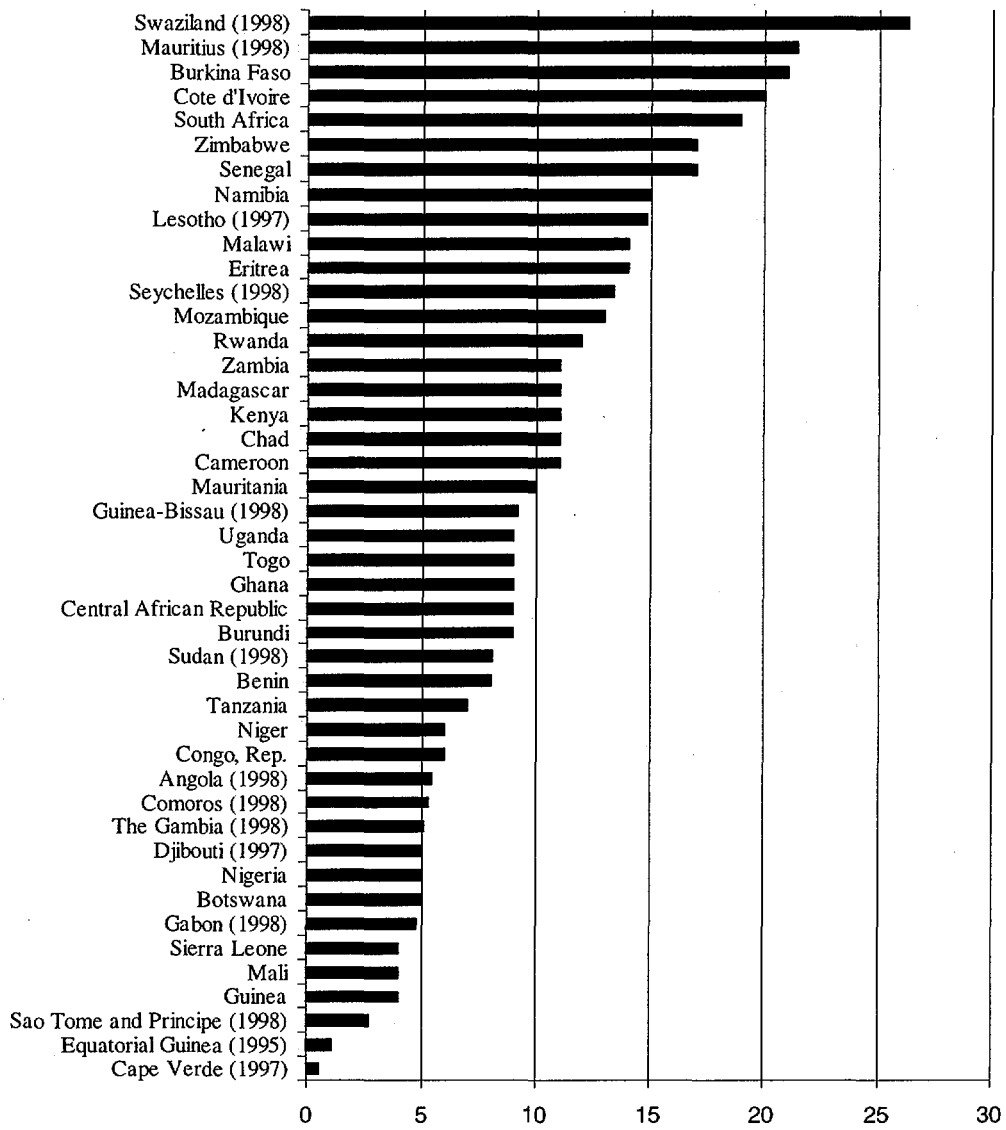
PER CAPITA GDP FOR KENYA AND EIGHT OTHER AFRICAN COUNTRIES, 1975-1998



Note: These series are in constant 1995 PPP adjusted USD. To select the comparison countries we ranked all SSA countries in the WDI database by Per Capita GDP as of 1975, and selected those that were within four places from Kenya, above and below.

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).

The lack of high-quality data constitutes one of the major impediments for rigorous and policy relevant research on African industry, and the vast majority of previous economic research on Africa has therefore been based on aggregate data. While aggregate data are useful in many circumstances, the range of issues that can be addressed relating to industrial performance are inherently limited since the aggregation will mask firm-specific behaviour. In this report we undertake in-depth analysis of the Kenyan manufacturing sector using primary firm-level data that were collected as part of the Kenyan Manufacturing Enterprise Survey (KMES) fielded in 2000. This survey, which was organised by the Centre for the Study of African Economies (CSAE) and funded by UNIDO as part of a joint UNIDO-CSAE research programme, covered more than 200 firms drawn from the four manufacturing sub-sectors of food, wood, textile and metal which represent the bulk of manufacturing output in the country. 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 (including telecommunications and IT), 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. The objective was to have up to 10 workers from each firm where firm size allowed. As a result the KMES data set contains a wealth of firm-level and workers information. This report has used most of this information to provide a picture of the Kenyan manufacturing sector, and to identify constraints and opportunities.

The report is structured as follows. Section 2 provides a background in looking at the Kenyan macroeconomy and the manufacturing sector; Section 3 discusses the KMES survey instrument; Section 4 analyses firm characteristics and performance; Section 5 investigates industrial policy and the Kenyan business environment; Section 6 documents issues related to wages and the labour market; and Section 7 provides a summary of the findings and lessons for future research.

2. Background: The Kenyan Economy and Manufacturing

Like many other African countries, Kenya's early independence years saw an industrial strategy that relied heavily on import substitution, effectively subsidising manufacturing at the expense of the agricultural sector. At first this appeared to work relatively well, with real income doubling in nine years, 1963-1972, which amounts to an average annual growth rate of about 8 per cent, well above the population growth rate of 3.4 per cent. In the 1970s the government intensified the degree of import substitution, and as a result the share of manufacturing in the modern sector of the economy increased from 8 per cent in 1970 to 13 per cent in 1980 (Gerdin, 1997). In the middle of the 1970s Kenya experienced a series of coffee booms, temporarily spurring growth in the agricultural sector. Towards the end of the 1970s, however, the Kenyan economy came under increasing pressure as a number of external shocks hit the country, most notably the oil crises and volatile commodity prices.

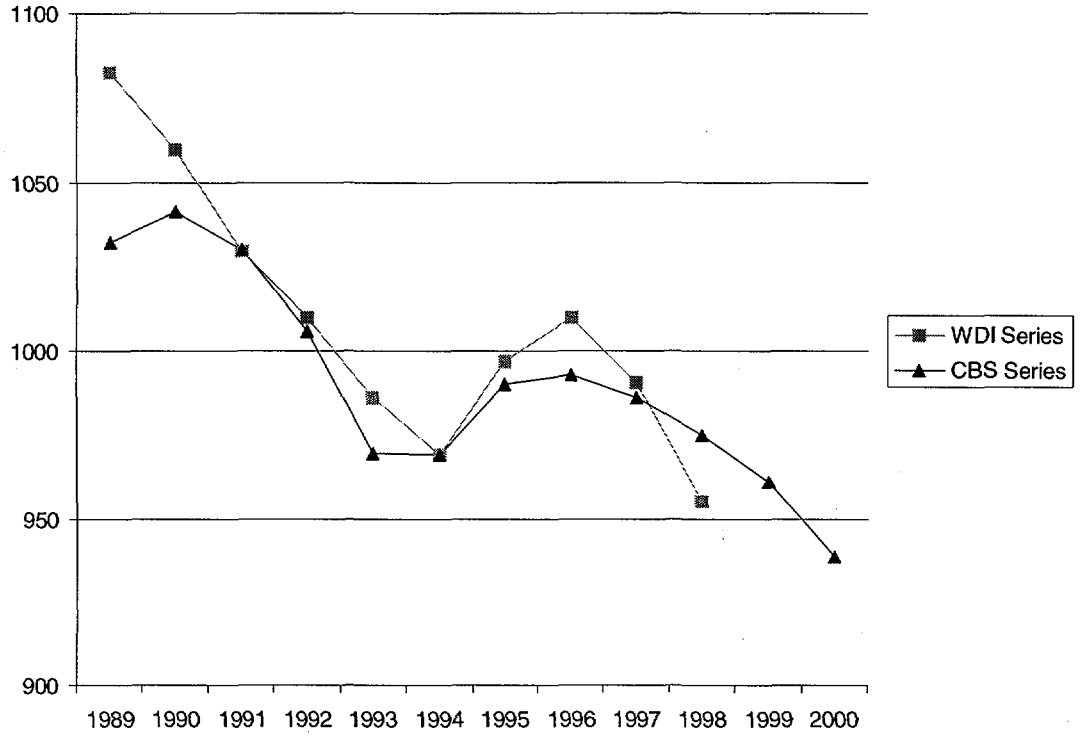
The early 1980s witnessed economic and political instability, the latter culminating in a failed coup attempt against President Moi in 1982. At the end of 1984 per capita income had fallen during four successive years, enough to wipe out the entire increase during the coffee boom years and bring per capita income to a level almost 10 per cent lower than that in 1975 (see Figure 1.1). A turning point in Kenya's industrial policy came with the introduction of the structural adjustment programmes in the early 1980s. By 1985 the economy had regained a measure of stability, and the years 1986-90 saw stable per capita growth, on average 3 per cent per year.

At the end of the 1980s it thus seemed as though the shift in policy in a somewhat more liberal direction was beginning to pay off. In the early 1990s, however, the economy went into another period of economic decline, partly due to international events, and partly to a slippage in macroeconomic management (Bigsten, 2001).[1] The economic slowdown is visible in Figure 2.1 which shows two series of per capita GDP from 1989 and onwards. The first series, which is from the WDI database (World Bank, 2000), is in constant 1995 PPP adjusted USD, and the second,

[1] Before the multiparty elections, held in December 1992, the government pursued '...a highly irresponsible economic policy implying extensive money creation.' (Bigsten, 2001, p. 26). During the subsequent years, Kenya experienced inflation rates unprecedented in the country's history due to the monetary overhang.

FIGURE 2.1

PER CAPITA GDP IN KENYA, 1989-2000



Note: The WDI Series is in constant 1995 PPP adjusted USD (World Development Indicators, 2001). The CBS Series is in constant domestic prices and indexed using the 1994 WDI per capita GDP value as the base (Central Bureau of Statistics et al, 1996, 1997, 1999, 2000; Central Bank of Kenya, 2001).

which has been calculated from various publications by the Central Bureau of Statistics (CBS) and other official institutes in Kenya (Central Bureau of Statistics et al, 1996, 1997, 1999, 2000), is in constant domestic prices and indexed using the 1994 WDI value as the base. Both GDP series show that per capita income fell sharply in the early 1990s. There was a recovery period in 1995-96, but income continued to fall in the turbulent election year of 1997. The WDI series indicates that per capita income was 12 per cent lower in 1998, when the series ends, than in 1989, while the CBS series shows a less dramatic fall during this period, about 6 per cent.[2] The CBS series continued to fall during the late 1990s, reaching a level 10 per cent lower at the end of 2000 than 10 years earlier.

[2] The reason for the discrepancy between the two series is primarily that the Kenyan shilling depreciated substantially against the US dollar in the early 1990s, which affects the dollar-deflated series more.

2.1 The Manufacturing Sector: Aggregate Indicators

Table 2.1 shows selected aggregate statistics on the Kenyan manufacturing sector over most of the 1990s. Column [1] shows the level of employment in the formal manufacturing sector. In 1999 this sector employed approximately 219,000 people, corresponding to about 13 per cent of total wage employment in the modern sector. The growth of manufacturing during the 1990s has been slow. The average annual growth rate of employment during 1991-99 was 1.9 per cent, well below the population growth rate. Real value-added, shown in Column [2], has increased by about 18 per cent over the period, corresponding to an annual growth rate of 2 per cent. The resulting increase in value-added per employee in the formal sector is minuscule, 1.5 per cent over the entire eight-year period, Column [3].

Employees in the formal manufacturing sector saw their real earnings fall sharply during the early 1990s as a consequence of the high inflation, Column [4]. In the late 1990s, however, real earnings rose markedly, reaching a level at the end of 1999 approximately 21 per cent higher than in 1991.

Capital formation in the manufacturing sector has been stagnant, Column [5], and largely pro-cyclical. Investment hence slowed down in the early 1990s in parallel with the general economic decline, falling from 3.5 to 3 per cent between 1991 and 1993. It picked up in the mid 1990s, reaching 5.3 per cent in 1996, but then reverted to a negative trend, falling to 3.7 per cent in 1999. This is not an artefact of the manufacturing sector, Central Bureau of Statistics (2000) reports that the percentage of private capital formation to GDP fell from 22 per cent in 1995 to 15 per cent in 1999.

While the formal manufacturing sector has been relatively static during the 1990s, the informal sector, the *Jua Kali*, has expanded rapidly according to the official statistics. Column [6] shows that employment in the informal manufacturing sector more than doubled during 1993-1999, reaching a level at the end of the period more than four times higher than that in the formal sector. Again, this is not an artefact of the manufacturing sector. Central Bureau of Statistics (2000) estimates that as of 1999 the entire informal sector employed 3.7 million individuals, equivalent to

TABLE 2.1

SELECTED AGGREGATE STATISTICS ON KENYAN MANUFACTURING

Year	[1] Number of people employed in the formal sector	[2] Index of real value-added, formal sector	[3] Index of real value-added per employee, formal sector	[4] Index of CPI-deflated earnings per employee, formal sector*	[5] Capital formation as percentage to GDP, formal sector	[6] Number of people employed in the informal sector
1991	188,873	100.0	100.0	100.0	3.45	
1992	190,296	101.3	100.5	87.2	2.70	
1993	192,087	103.1	101.4	68.4	2.96	418,252
1994	203,528	105.1	97.5	60.0	3.54	492,439
1995	210,775	108.9	97.6	74.9	4.88	616,854
1996	216,411	112.6	98.3	83.7	5.25	710,859
1997	220,484	114.8	98.3	91.2	4.51	803,100
1998	216,889	116.5	101.4	106.0	4.23	897,600
1999	219,000	117.7	101.5	120.7	3.73	992,100

* The annual percentage increases in CPI were as follows: 1992, 27.3; 1993, 46.0; 1994, 28.8; 1995, 1.6; 1996, 9.0; 1997, 11.2; 1998, 6.6; 1999, 3.5.
Source: Central Bureau of Statistics (1996, 1997, 1999, 2000).

68 per cent of all persons engaged in the economy.[3] It is likely that this rapid expansion has been caused, at least partially, by the contraction of the modern sector.

The Kenyan enterprise survey in 2000 focussed on the four manufacturing sub-sectors of food processing, textiles and garments, wood processing and furniture, and metal and machinery. These sectors all emerged early in the Kenya's industrialisation process and remain significant; in 1961 they produced 68 per cent of manufacturing value added (Bigsten and Aguilar, 2001), and in 1998 they accounted for 67 per cent.[4] The largest sub-sector, in terms of value-added, is that of food,

[3] See Table 4.1 in Central Bureau of Statistics et al (2000).

[4] This calculation is based on the gross product numbers reported in Table 87(a) in Central Bureau of Statistics et al (1999), where we define: Food = meat and dairy products; canned vegetables, fish, oils and fats; grain mill products; bakery products; sugar; miscellaneous foods; beverage and tobacco;

TABLE 2.2

VALUE-ADDED PER EMPLOYEE IN LARGE FIRMS 1998, BY SECTOR

Food Processing	Textiles and Garments	Wood and Furniture	Metal and Machinery
237.4	87.0	100.9	226.3
[174]	[93]	[67]	[61]

Note: Monetary numbers are in '000 Kenyan Shilling (KES). The numbers in [ ] are the number of firms. The calculations are based on the gross product numbers and the numbers of person engaged, reported in Tables 87(b) and 86, respectively, in Central Bureau of Statistics (1999). The sectoral classification is as described in footnote 4.

followed by metal and machinery, textiles and garments and lastly wood and furniture. Using official statistics on gross product and employment, only available for firms with more than 50 employees, Table 2.2 shows the value-added per employee across the four sectors. Clearly the sectors of food and metal/machinery have the highest levels of labour productivity, more than twice as high as the levels in the textiles/garments and wood/furniture sectors. Bigsten and Aguilar (2001) report similar results for 1990, although textiles/garments was ahead of wood/furniture at the time.

2.2 Firm-Level Evidence on Productivity and Investment

As discussed in the introduction, data on African manufacturing firms are scarce. To our knowledge, by far the richest firm-level databases are those based on the RPED surveys.[5] 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

Textiles and Garments = textiles; clothing; Wood and Furniture = wood and cork products; furniture and fixture; Metal and Machinery = metal products, non-electrical machinery; electrical machinery.

[5] In the early 1990s the World Bank initialised the Regional Programme on Enterprise Development (RPED), in which three years of panel data were collected in eight Sub-Saharan countries: Cameroon, Côte d'Ivoire, Ghana, Kenya, Burundi, Tanzania, Zambia and Zimbabwe. Typically, each survey round covered about 200 firms located in urban areas, and drawn from the major manufacturing sub-sectors. The data were collected through in-depth interviews, usually with the owner or the manager of the firm.

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. In the remainder of this section we will briefly summarise the firm-level evidence on productivity and investment in Kenyan manufacturing, spanning the period 1992-94/5. For a more detailed or broader analysis of the Kenyan RPED data, see the recent report edited by Bigsten and Kimuyu (2001).

Table 2.3 shows median labour productivity indicators and capital-labour ratios across firm status and firm size in the Kenyan RPED database (Lundvall et al, 2001). The labour productivity measure, which is the output divided by the number of workers, displays an inverted *u*-shaped relationship with firm size. For formal firms, the median labour productivity reaches its maximum for large firms (76-500 employees), and this category is almost four times as productive as the micro firms. One explanation for this large gap is found in the second column of the table, namely that large firms have substantially more fixed capital stock per employee. In fact, the capital-labour ratio follows an inverted *u*-shaped pattern similar to that of labour productivity, reinforcing the notion that labour productivity and capital intensity are positively correlated. Informal firms employ much less capital per employee than do

TABLE 2.3

LABOUR PRODUCTIVITY AND CAPITAL-LABOUR RATIOS 1992-1994*

	Output per Employee	Fixed Capital Stock per Employee
Firm Category		
Informal	72	15
Formal, Micro	106	171
Formal, Small	195	181
Formal, Medium	287	190
Formal, Large	405	333
Formal, Very Large	187	260

Note: Output and capital stock are expressed in thousands of Kenyan Shillings (KES).
* Based on the Kenyan RPED data. Source: Table 8.2 in Lundvall et al (2001).

formal firms, and as a consequence capital productivity is higher, and labour productivity lower, for this category. Disaggregating the data into sub-sectors does not substantively alter these observations.

Lundvall et al proceed by estimating a production function, in order to assess the returns to scale in production, i.e. the pattern by which changes in input levels (e.g. employment) feeds into changes in output, and to characterise systematic differences in the underlying efficiency by which firms are able to produce finished goods with a given level of inputs. For the pooled sample, the authors report an estimate of the capital elasticity of output of about 0.25, and a labour elasticity of about 0.73. This implies that a one percentage increase of the capital stock yields an increase in output by 0.25 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 0.98 per cent. This suggests that the production technology can be characterised by constant returns to scale. Lundvall et al find that the food sector has by far the highest total factor productivity (TFP), i.e. the highest ability of generating output with a given set of capital stock and employees, and that the textile sector has by far the lowest TFP. On average, firms in the food sector are more than twice as productive as firms in the textile sector, everything else equal. The authors also find that firms located in Nairobi and Mombasa are about 50 per cent more productive than firms in Nakuru and Eldoret, everything else equal, and that exporters are on average about 25 per cent more productive than non-exporters, everything else equal.

As shown in Section 2.1, capital formation was low during the early 1990s. This is confirmed in the RPED data. Söderbom (2001) reports 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.[6] 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.

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

Söderbom 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 the 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) for four African countries, including Kenya. This suggests that it is non-financial factors, e.g. the cost of capital, that are of primary importance in determining investment.

3. The Kenyan Manufacturing Enterprise Survey 2000

The Kenyan Manufacturing Enterprise Survey (KMES) was undertaken in October and November 2000, and, because of the many advantages of having panel data, was designed to be a follow-up to the last Kenyan RPED survey, fielded in 1995.[7] The KMES was financed by UNIDO as part of a joint UNIDO-CSAE research programme, and the fieldwork was carried out by a team from the CSAE and University of Göteborg, together with several Kenyan collaborators. Like the RPED surveys the KMES concentrated on four manufacturing sub-sectors, namely food processing, textiles and garments, wood working, and metal working, which together comprise about 73 per cent of manufacturing employment in Kenya. The survey covered the four towns of Nairobi, Mombasa, Nakuru, and Eldoret. Small as well as large firms were included in the sample.

3.1 The Sampling of Firms

The KMES sample is a stratified random sample.[8] 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 Kenyan 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 KMES was designed to be a follow-up survey to the RPED surveys, we adopted a similar stratification procedure as was used under the RPED. A stratified sample was drawn for the first RPED survey, while for the second and third rounds, the research team attempted to revisit all the firms that had been included in the preceding round in order to build up a panel data set. When in these subsequent rounds revisiting a firm

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[7] 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. For an introduction to the econometrics of panel data see for instance Baltagi (1995).

[8] 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.

turned out impossible, the lost firm was replaced with another firm from the same stratum. In this way, the sample structure changed only slowly throughout the surveys. For the KMES we adopted a similar strategy, i.e. we began by approaching all the firms that had been included in the last RPED survey, in 1995, and then replaced lost firms with firms from the appropriate stratum. Hence, it is a substantive sampling issue how the stratification for the first round was designed. We turn to this next.

The stratified sample in wave 1 of the RPED survey was based on a total of 24 strata, defined by sector, firm status (formal or informal) and firm size. The strategy was to draw a sample with i) an equal number of formal firms from each of the four sub-sectors of food/bakery, wood/furniture, textiles/garment and metal/machinery; ii) 75 per cent formal firms, and 25 per cent informal ones; iii) a relatively larger proportion of medium-sized and large formal firms than in the population of formal firms. To this end, five size-strata were defined for each of the four industrial sub-sectors in the formal sector, plus one stratum per sub-sector for the informal firms, yielding a total of 24 strata.[9] The exact structure is shown in Table A1.1, Appendix 1. In the second and third round of the RPED survey a total of 54 of the 224 firms interviewed in wave 1 were lost, yielding an attrition rate of about 13 per cent per year. The resulting RPED database is a panel of 169 firms with three observations over time, 44 firms with two observations and 63 with only one observation.

In Table 3.1 we show the sample structure for the KMES sample, with the added information, shown in italics, on how many of the firms had been included in the 1995 survey. Unlike RPED, we chose not to distinguish between informal and formal firms because, in our view, it is not evident that such a distinction is

[9] In theory, one can determine the 'optimal' size for each stratum, in the sense that it maximises the amount of information at a given cost. In practice, finding the optimal size for each stratum can be a complex undertaking, depending on a number of factors such as the overall objective of the survey, the differentials in survey costs across strata (some strata may be more costly to survey than others) and the moments (e.g. the mean and the variance) of the measurements of interest within and between strata. When as in our case the survey collects a large amount of data, it will be impractical to try and define the optimal size for each stratum, since the number of determining factors is very large and the information available a priori is insufficient. In practice, we therefore determine the size of the strata according to a few simple rules relating to firm size and sector. When we collect panel data, we tend to adjust these rules over time in view of earlier experiences, in order to improve the efficiency of the sampling. Therefore the relative sizes of the strata may change over time.

TABLE 3.1

THE NUMBER OF FIRMS BY STRATUM IN THE KMES SAMPLE

	Food and Bakery	Wood and Furniture	Textiles and Garment	Metal and Machinery	All sectors
Micro including Informal	3 (5.5) [5.8] *1*	13 (23.6) [28.9] *4*	18 (32.7) [29.5] *7*	21 (38.2) [32.3] *4*	55 [24.7] *16*
Small including Informal	9 (19.2) [17.3] *3*	12 (25.5) [26.7] *6*	11 (23.4) [18.0] *4*	15 (31.9) [23.1] *6*	47 [21.1] *19*
Medium	15 (25.9) [28.9] *11*	13 (22.4) [28.9] *9*	15 (25.9) [24.6] *9*	15 (25.9) [23.1] *7*	58 [26.0] *36*
Large	20 (37.7) [38.5] *7*	7 (13.2) [15.6] *2*	13 (24.5) [21.3] *5*	13 (24.5) [20.0] *5*	53 [23.8] *19*
Macro	5 (50.0) [9.62] *1*	0 -- -- --	4 (40.0) [6.56] *3*	1 (10.0) [1.54] *0*	10 [4.5] *4*
All size groups	52 (23.3) *23*	45 (20.2) *21*	61 (27.4) *28*	65 (29.2) *22*	223 *94*

Note: The table shows the number of firms in each stratum, along with row and column proportions, in ( ) and [ ], respectively. Numbers in italics are the number of firms from the 1995 survey that were included in this sample.

meaningful.[10] The frequency distribution across sectors is mildly non-uniform, being a compromise between the structure of the population and a desire to maintain a certain degree of sectoral balance in the sample. Hence the sector in our sample with the smallest number of observations is wood/furniture, and the largest sector for firms with more than five employees is food/bakery. The frequency distribution across size-

[10] The absolute majority of the micro and small firms we visited had the typical characteristics of an 'informal' firm whether or not they featured on the list of registered firms, which was the criterion during RPED.

groups is almost uniform, except for the macro firms for which there are substantially fewer observations. This latter feature of the sample, also prevalent in the RPED sample, reflects the scarcity of macro firms in the population. The only stratum for which we did not cover any firm is that of macro-wood/furniture, which was due to a severe crisis for the wood sector in Kenya at the time of the survey, making most large sawmills non-operational. We managed to revisit 94 of the 218 firms interviewed in the 1995 survey, corresponding to an attrition rate of about 15 per cent per year.[11] As expected, the attrition rate was highest among the micro firms. The lost firms were replaced by firms with similar characteristics from a reserve list.[12]

Because of the stratification, the sample is not representative of the population of firms, which raises the question of whether we should use sampling weights 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 we will therefore not use weights, instead we will split the sample according to the stratification criteria when presenting the empirical results. Similarly, when doing regression analysis we will use firm size and industry as control variables instead of using weights.[13] Because of the small number of firms in the macro category, we will in the empirical analysis merge this group with the large firms.

To illustrate the difference between population and the sample we show in the Appendix, Figure A1.1, frequency graphs for the estimated population and the sample. It should be emphasised that the population data do not include informal firms, so the frequency of micro and small firms is grossly underestimated. Nevertheless, it is clear from the figure that the sample has a larger proportion of large firms than the population. Looking at the data by size-group, the distribution across sectors in the sample is quite similar to that of the population.

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[11] Calculated using the formula $1 - (94/218)^{(1/5)}$.

[12] The reserve list was constructed from a list of registered firms received from the Central Bureau of Statistics, complemented by a register from the Federation of Kenya Employers.

[13] 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 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).

3.2 The Workers Data

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 1,021 workers were interviewed. Table 3.2 shows the frequency distribution of workers interviews across size-groups and sectors.

TABLE 3.2

WORKER INTERVIEW FREQUENCIES

	Food and Bakery	Wood and Furniture	Textiles and Garment	Metal and Machinery	All sectors
Micro including Informal	4	19	18	25	66
Small including Informal	31	43	41	56	171
Medium	100	78	87	93	358
Large	122	51	93	84	350
Macro	43	0	27	6	76
All size groups	300	191	266	264	1021

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

4. Firm Characteristics and Performance

In this section we look at firm status and characteristics, and document various aspects of firm performance, focussing on productivity, investment in fixed capital and export behaviour.

4.1 Firm Characteristics

The KMES data contains a large amount of data on firm and entrepreneur characteristics. In Table 4.1 we show 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 61 per cent of the small firms are either sole proprietorships or partnerships, while 78 per cent and 92 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 41 per cent do not 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 22 per cent of the micro firms, and 8 per cent of the small and medium firms, when we confine attention to sole proprietorship or partnership firms.[14]
- Micro firms are predominantly owned by individuals of African origin (94 per cent), while the ownership of larger firms primarily is associated with individuals of Asian origin.
- There is a clear positive relation between firm size and firm age. Twenty-four per cent of the micro firms in the sample are younger than 5 years, and 77 per cent are younger than 15 years, while only 4 per cent of the large/macro firms are younger than 5 years, and 23 per cent are younger than 15 years. The latter structure is similar to that of the medium-sized firms, while small firms constitute an intermediate case.

[14] The female proportion for large/macro firms is 0.20 but we should not make anything of this result as it is based on only 5 observations.

TABLE 4.1

SELECTED FIRM CHARACTERISTICS, BY SIZE

	Micro	Small	Medium	Large/Macro	All
Legal status [N = 205]					
Solo or Partnership	1.00	0.61	0.22	0.08	0.45
Limited Liability or MNC Subsidiary	0.00	0.39	0.78	0.92	0.55
Keeps accounts on an annual basis	0.59	0.85	0.98	1.00	0.86
Ownership [N = 205]					
Any foreign ownership	0.00	0.12	0.22	0.32	0.18
Percentage of foreign ownership, if any	--	57	45	66	59
Owners female, if legal status: solo or partnership	0.22	0.08	0.08	0.20	0.16
Owners of Asian Origin	0.06	0.39	0.82	0.84	0.54
Firm age in years [N = 203]					
Age ≤ 5	0.24	0.22	0.04	0.04	0.12
6 < Age ≤ 15	0.53	0.29	0.15	0.19	0.29
15< Age ≤ 25	0.14	0.24	0.35	0.39	0.29
Age > 25	0.10	0.24	0.46	0.39	0.31

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

With this snapshot of the status and characteristics of the firms over the size range, we now proceed by investigating labour and total factor productivity.

4.2 Productivity

We begin in this section by examining how the firm productivity data compare with the official productivity data, discussed in Section 2. Because the official statistics only provide enough information to calculate value-added per employee for firms with more than 50 employees, we have to focus on this size group for this purpose. The productivity measures based on the official statistics were shown in Table 2.2 and are reproduced in the first row of Table 4.2 for ease of reference. Food is the most productive sector, followed by metal, wood and lastly textiles. The second row of Table 4.2 shows the analogous numbers based on the KMES survey data, i.e. the sum of value-added divided by the sum of employment, across sectors. While the firm data produce numbers that are uniformly higher than those of the CBS data, it is clear that the ranking of the four sub-sectors based on the firm data concurs with that based on the CBS data. Food has the highest total labour productivity, about 28 per cent higher than metal, 62 per cent higher than wood and 231 per cent higher than textiles.

This way of computing labour productivity differentials may be misleading, as the estimates will be heavily influenced by the data on the largest firms. To assess the central tendency of the data, it will probably be better to compute mean values of the

TABLE 4.2

VALUE-ADDED PER EMPLOYEE IN FIRMS WITH MORE THAN 50 EMPLOYEES, BY SECTOR

	Food Processing	Textiles and Garments	Wood and Furniture	Metal and Machinery
[1] Total value-added / employment, CBS database, year 1998***	248.1 [NA]	90.9 [NA]	105.5 [NA]	236.5 [NA]
[2] Total value-added / employment, KMES database , year 1999*	448.4 [33]	135.3 [9]	276.9 [17]	349.0 [17]
[3] Mean of ln [value-added / employee], KMES database, year 1999	12.61 [33]	11.80 [9]	12.13 [17]	12.61 [17]

Note: Numbers in [ ] are numbers of observations. NA = Not Available.
* Numbers are in '000 1999 KES. The 1999 average KES/USD exchange rate was 70.4.
** See Table 2.2. Notice that the numbers in Table 2.2 are expressed in KES '000 1998, while they are expressed in KES '000 1999 here to facilitate comparison with the firm data.

individual value-added to employee ratios, in natural logarithms as the resulting measures are relatively insensitive to extreme values. The third row of Table 4.2 shows these averages, by sector. This gives a picture more similar to that of the official statistics. Food and metal both have mean values equal to 12.61, corresponding in levels to 299,500 Kenyan Shillings (KES). The mean value for wood and textiles are 12.13 and 11.80, respectively, corresponding to KES 185,300 and 133,300 both of which are closer to the official numbers than the figures reported in the second row of the table. The implication of these estimates is that the labour productivity in the food and the metal sectors is about 62 per cent higher than in the wood/furniture sector and about 125 per cent higher than in the textiles/garment sector. We conclude from this comparison of the firm with the industry data that the two sources of information give similar results. We proceed next by examining the firm-level data for the entire sample, which will enable us to document productivity levels for firm categories not covered in the official statistical publications. We will also investigate if there are differences in total factor productivity across firm categories similar to those in labour productivity.

Table 4.3 shows mean values of the logarithm of value-added per employee, a measure of labour productivity, across size and sector categories. Recall that the ranking of sectors according to the labour productivity of firms with more than 50 employees is, from highest to lowest: food/bakery, metal/machinery, wood/furniture and textiles/garment. This is confirmed in the table for the category of large/macro firms, i.e. firms with more than 75 employees. For smaller firms, however, the pattern across sectors is somewhat different. The textiles/garment sector is in fact the most productive sector within the category of small firms, and for medium-sized firms it is the second most productive sector. Hence it is only for the largest category that the textiles/garment sector has the lowest level of labour productivity. Contrary to the other industries, the average labour productivity of large/macro firms in the textiles/garment sector is substantially lower than for small and medium-sized firms, about 25 and 27 per cent respectively.[15] In the food sector the picture is the converse: food ranks by far the most productive industry within the largest size category, but

[15] A difference in natural logarithms is converted to a percentage difference by the formula exp(*dif*)-1, where *dif* is the logarithmic difference.

TABLE 4.3

VALUE-ADDED PER EMPLOYEE, BY SIZE AND SECTOR

	Micro	Small	Medium	Large/Macro	All size groups
Food/Bakery	11.35 [1]	11.52 [7]	12.08 [15]	12.81 [24]	12.36 [47]
Wood/Furniture	10.86 [12]	10.86 [7]	11.92 [13]	12.23 [7]	11.46 [39]
Textiles/Garments	11.04 [17]	12.06 [10]	12.09 [14]	11.77 [15]	11.68 [56]
Metal/Machinery	11.30 [19]	10.79 [13]	12.37 [11]	12.47 [12]	11.65 [55]
All sectors	11.10 [49]	11.28 [37]	12.11 [53]	12.40 [58]	11.79 [197]

Note: Value-added per employee is in natural logarithms of monetary values expressed in 1999 KES. Numbers in [ ] are numbers of observations.

records substantially lower productivity levels for the other size categories, ranking second among small firms and third among medium-sized firms.

Table 4.3 also shows that labour productivity increases with firm size. Averaging across sectors, we obtain a differential between the two intermediate size groups equal to 0.83, which corresponds to a differential of 129 per cent. This, of course, is substantial, and much higher than the difference between small and micro firms (about 20 per cent) and between large/macro and medium-sized firms (about 34 per cent). Looking at each sector separately, we see that this large differential between small and medium-sized firms is primarily driven by the wood/furniture and metal/machinery sectors.

The finding that there are substantial labour productivity differentials over firm size is rather a general one for African manufacturing (see Lundvall, 1999, for evidence on Kenya, and Söderbom and Teal, 2001a, 2001b, for evidence on Ghana). What could account for such a result? One frequently cited reason is that large firms are much more capital-intensive than small firms, so that each worker in large firms have access to more machinery than do workers in small firms. Figure 4.1 shows the

relationship between the capital labour ratio and firm size by means of the results from a Nadaraya-Watson kernel regression of the logarithm of the capital labour ratio on the logarithm of labour, where the dependent variable has been purged of time and sectoral effects.[16] The figure shows the estimated regression line and pointwise 95 per cent confidence intervals, obtained through bootstrapping. While the regression as expected shows that the capital labour ratio increases with size, the pattern is non-linear. The positive correlation between size and capital intensity is strongest for firms with less than 50 employees.[17] Within the (1, 50) range, the average slope of the regression line is about 0.8, indicating that a 1 per cent increase in the labour force is associated with a 0.8 per cent increase in the capital labour ratio. Söderbom and Teal

FIGURE 4.1

CAPITAL INTENSITY AND SIZE, 1998-99

Note: The kernel is Epanechnikov and the bandwidth is equal to 1.3. The thin lines indicate pointwise 95 per cent confidence intervals, calculated from 500 bootstrapped replications. To take the panel nature of the data into account we bootstrapped from the firms rather than from the observations, which is a similar procedure to that used by Deaton (1997, pp 216-218) for clustered data. The number of observations is 360.

[16] We purge the data from time and sectoral effects using the following procedure: i) we run an OLS regression of the log of the capital labour ratio on sector, time and size; from this regression we compute the residual; ii) based on the OLS regression, we compute predictions at actual employment levels but at sample means of the sector and time dummies; iii) we obtain the purged measure of the capital labour ratio by adding the residual obtained in (i) and the prediction obtained in (ii).

[17] The natural logarithm of 50 is about 3.9, at which level the regression line flattens markedly in the graph.

(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 large firms use so much more capital per employee in the production process.

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, we want 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 we will estimate a production function, which effectively aggregates the inputs using the estimated coefficients as weights. In practice we examine if there are systematic differences in TFP across certain categories of firms by estimating a production function using as regressors both the inputs and those variables that we hypothesise are related to differences in TFP. We then look for TFP-differences by examining the signs, magnitudes and levels of significance of the estimated coefficients on the latter set of variables.

In Table 4.4 we report OLS results for four different production functions. The one reported in Column [1] is based on two years of data, 1998 and 1999, and 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.[18] Unlike in the descriptive statistics, we distinguish between 7 industries in the regressions, using the metal/machinery sector as the benchmark (omitted) category. The estimated coefficient on capital is 0.20, and that on employment is equal to 0.89, which implies that a one percentage increase of the capital stock yields an increase in value-added by 0.20 per cent, whereas a one percentage increase of the labour force increases output by 0.89 per cent, on average. Similarly, if both capital and labour are being increased by one percent, then output is expected to increase by 1.09 per cent, indicating mildly increasing returns to scale. When tested for, however, constant returns to scale cannot be rejected (test not reported). Turning our attention to TFP,

[18] During the course of the survey we collected both contemporaneous and retrospective data on most of the variables. This procedure gives us data from both 1999 and 1998.

we see that the food sector has the highest industry coefficient, followed by bakery and wood. The textiles sector has the lowest TFP, indicated by the negative sign. The point estimate of –0.51 implies that the average TFP in the textiles sector is about 40 per cent lower than in the benchmark category, which is metal/machinery, and this difference is significant at the ten per cent level. Similarly, the gap between food and textiles is such that the TFP in the latter sector is 57 per cent lower than in the former. This difference is statistically significant at the 5 per cent level. Foreign ownership and firm age appear to have no significant effects on TFP.

In Column [2] we add to the set of regressors firm–level averages of three measures of the human capital of the employees, namely the years of education, tenure and age.[19] The only one of these to come in with a significant coefficient is education. The estimated point estimate of 0.13 implies that a one-year increase in the average education of the workforce increases value-added by about 14 per cent, everything else equal. Although the inclusion of the human capital variables has implications for the sector effects on TFP, textiles is still the sector with the lowest level of TFP, everything else equal. In Columns [3] and [4] we run the same specifications but using the earlier Kenyan firm data as well. Although some of the results are different compared to their 1998-99 counterparts, perhaps most notably that the education variable is insignificant, the main conclusions are robust. In particular, it is clear that the food sector has the highest level of TFP, everything else equal, and that the textiles sector has the lowest.

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

[19] These variables have been created from the workers data using weights to ensure that we can move from individual data to firm based averages. We weighted the human capital variables by the proportion of workers in a given occupational class within the firm. Eight common occupational groups across the rounds of the survey were identified. These occupational categories for the worker level data are matched with the occupational categories given in the firm level data.

TABLE 4.4

VALUE-ADDED PRODUCTION FUNCTIONS

	[1] 1998-99	[2] 1998-99	[3] 1992-99	[4] 1992-94, 1998-99
ln Physical Capital	0.20	0.13	0.22	0.20
	(4.2)**	(2.3)*	(5.5)**	(4.5)**
ln Employment	0.89	0.94	0.87	0.86
	(9.2)**	(9.6)**	(12.4)**	(12.0)**
Average Education		0.13		0.04
		(2.4)*		(1.6)
Average Tenure		-0.02		-0.003
		(0.8)		(0.2)
Average Age		0.02		0.01
		(1.0)		(0.7)
Nairobi	0.26	0.45	0.43	0.45
	(1.2)	(1.8)+	(2.8)**	(2.8)**
Mombasa	-0.09	-0.15	0.24	0.27
	(0.4)	(0.6)	(1.3)	(1.3)
Nakuru	-0.11	-0.17	-0.08	-0.06
	(0.3)	(0.4)	(0.3)	(0.3)
Any Foreign Ownership	-0.05	-0.02	0.15	0.20
	(0.3)	(0.1)	(0.9)	(1.2)
Firm Age / 100	0.42	0.64	0.28	0.30
	(0.9)	(1.0)	(0.7)	(0.7)
Food	0.34	0.03	0.52	0.47
	(1.4)	(0.1)	(3.0)**	(2.4)*
Bakery	0.12	0.07	0.09	0.09
	(0.4)	(0.2)	(0.4)	(0.4)
Wood	0.05	0.07	-0.34	-0.28
	(0.1)	(0.2)	(1.6)	(1.3)
Furniture	-0.19	-0.44	-0.02	-0.05
	(0.9)	(1.9)+	(0.1)	(0.3)
Textiles	-0.51	-0.59	-0.39	-0.42
	(1.9)+	(2.3)*	(1.9)+	(1.9)+
Garments	-0.04	-0.30	-0.10	-0.09
	(0.2)	(1.3)	(0.7)	(0.6)
R^2	0.85	0.84	0.80	0.78
Number of observations	328	254	881	763
Number of firms	192	156	353	325

Note: Absolute value of robust t-statistics in parentheses . + 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 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.

We showed in Section 2 industrial statistics indicating a relatively slow rate of capital formation in Kenyan manufacturing during the 1990s. 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 KMES data. Table 4.5 shows how the propensity to undertake any investment during a calendar year varies by size and industry, for the period 1998-99. Only fifty-six percent of all observations are non-zero investments, a proportion very 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 textiles and garment sector are less inclined to carry out investment than firms in other industries. This is mostly driven by the atypically low investment propensity among the smallest garment firms, which possibly reflects pessimism about the future for this industrial segment but probably also the fact that

TABLE 4.5

PROPENSITY TO INVEST 1998-99, BY SIZE AND SECTOR

	Micro	Small	Medium	Large/Macro	All size groups
Food/Bakery	0.75	0.60	0.58	0.78	0.69
	4	*15*	*24*	*41*	*84*
Wood/Furniture	0.50	0.64	0.42	0.64	0.52
	18	*11*	*26*	*14*	*69*
Textiles/Garments	0.33	0.75	0.46	0.44	0.47
	27	*16*	*26*	*27*	*96*
Metal/Machinery	0.52	0.63	0.50	0.65	0.57
	27	*24*	*20*	*23*	*94*
All sectors	0.46	0.65	0.49	0.65	0.56
	76	*66*	*96*	*105*	*343*

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

these firms use very rudimentary, yet durable, machinery.[20] The investment propensity is highest in the food sector, possibly reflecting the higher returns to inputs documented in Section 4.2. Although the pattern is not entirely clear, it appears that the investment propensity is positively correlated with size. Sixty-five percent of the large/macro firms carry out some investment in a calendar year, which is higher than for micro (46 per cent) and medium-sized (49 per cent) but the same as for small firms. We will explore this issue more in detail below.

In Table 4.6 we show average investment rates, defined as the investment expenditure divided by the replacement value of the capital stock, across size categories and industries. For these calculations, we excluded the zero investments, 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 0.30, and the corresponding number for small,

TABLE 4.6

AVERAGE INVESTMENT RATES FOR INVESTING FIRMS 1998-99, BY SIZE AND SECTOR

	Micro	Small	Medium	Large/Macro	All size groups
Food/Bakery	0.01	0.12	0.15	0.10	0.11
	3	*9*	*14*	*32*	*58*
Wood/Furniture	0.12	0.24	0.12	0.07	0.13
	9	*7*	*11*	*9*	*36*
Textiles/Garments	0.31	0.11	0.05	0.04	0.12
	9	*12*	*12*	*12*	*45*
Metal/Machinery	0.22	0.11	0.05	0.09	0.12
	14	*15*	*10*	*15*	*54*
All sectors	0.20	0.13	0.10	0.08	0.12
	35	*43*	*47*	*68*	*193*

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

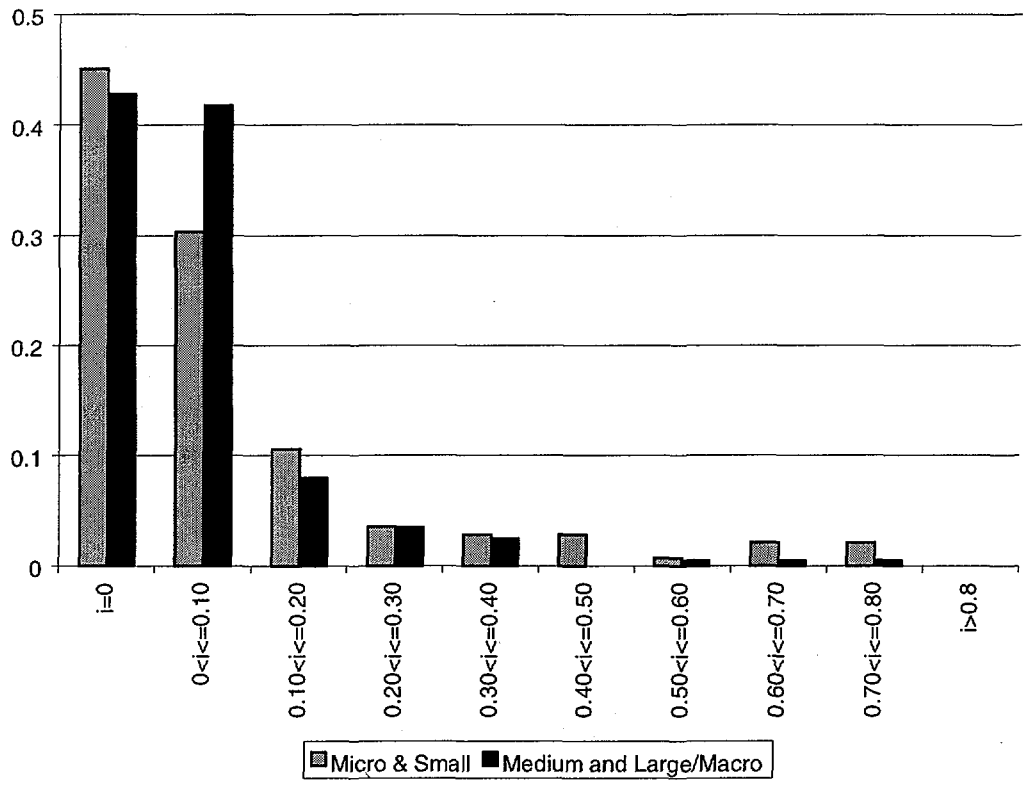
[20] To give an example, one micro garment firm we visited had the following capital stock: two sewing machines, two pairs of scissors, one table, two chairs, one wooden box, 20 hangers, one iron and three tape measures.

medium and large/macro firms is 0.13, 0.10 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 consistent with a case where small firms are constrained by indivisibilities or fixed sunk investment costs. There is little variation in the average investment rate across sectors, however it is noteworthy that for the subset of medium and large/macro firms it is the food sector that records the highest investment rates.

In Figure 4.2 we show the frequency distribution of investment rates, denoted *i*, for two sub-samples, micro and small, and medium and large/macro. We know from Table 4.5 that 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 75 per cent of

FIGURE 4.2

FREQUENCY DISTRIBUTION OF INVESTMENT RATES, 1998-99



Note: i = investment / capital. The number of observations for micro and small firms is 142, and for medium and large/macro 201.

the firms in the smaller size group and for 85 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.

Above we have shown descriptive statistics indicating low investment activity in the sample. We have seen that 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, we now turn to regression analysis. 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 highly non-linear, so to facilitate interpretation we report the estimated change in the probability of investment from a one-unit change in the explanatory variable everything else held constant.[21] For both regressions we use data for the entire period 1992-99, 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 the residual from a Cobb-Douglas production function modelling value-added as a function of employment and physical capital.[22]

In the probit regression, reported in Column [1], the coefficient on size is positive and significant at the one per cent level. The estimated marginal effect is 0.06, indicating that the probability of investment of a firm with 100 employees is about 14 percentage points higher than that of a firm with 10 employees.[23] The marginal effect of technical efficiency is about 0.03, and significant at the ten per cent level. The point estimate implies that a ten per cent rise in efficiency is associated with an increase in the probability of investment equal to 0.003; a doubling of efficiency would be associated with an increase equal to 0.02. The only remaining coefficient that is statistically significant at conventional levels is that on firm age, whose marginal effect is equal to -0.01, indicating that each additional year reduces

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

[22] All the explanatory variables in these regressions are assumed strictly exogenous, which may be overly restrictive. If strict exogeneity does not hold, the parameter estimates will be biased, and cannot be given a causal interpretation. The results should be interpreted with this caveat in mind.

[23] Calculation: $0.06 \cdot (\ln 100 - \ln 10)$. 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.

the probability of investment by 0.01. This 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. None of the industry dummies is significant, indicating no systematic differences across sectors in the decision to invest.

We report in Column [2] of Table 4.7 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 4.5, and statistically significant at the 1 per cent level. The point estimate of -0.024 implies that, on average, an increase in employment by 10 percent will be associated with a reduction in the expected investment rate by about 0.0024. The expected investment rate of a firm with 100 employees is about 0.055 percentage points lower than that of a firm with 10 employees. The estimated coefficient on technical efficiency is equal to 0.015, and significant at the 10 per cent level. This implies that a ten percent increase in technical efficiency is predicted to increase the investment rate by about 0.0014; a doubling of efficiency will increase the expected investment rate by about 0.01. This finding is consistent with standard investment theory, predicting that investment will be positively correlated with the marginal product of capital. Hence a firm that is able to utilise its input factors more efficiently, i.e. generate a higher value-added given the input levels, than its competitors will invest more. We also find some systematic differences across towns and sectors in the investment rate. Firms in Mombasa and Nakuru have a higher investment rate, on average, than similar firms located in Eldoret (which is the benchmark, or omitted, category). Firms in the food and the wood sector have a higher investment rates than companies in other industries. Finally, as in the probit model, we obtain a similar negative age effect on investment, indicating find that older firms have significantly lower investment rates than young firms. The point estimate implies that each additional year leads to a decrease in the investment rate of about 0.001, i.e. not a very large effect.

TABLE 4.7

INVESTMENT EQUATIONS, 1992-1999

	[1] Probit on the decision to invest		[2] OLS, where dependent variable is investment / capital if firm invests	
	Marginal effect[$]	z-value	Coefficient	t-value
ln Employment	0.06	3.8**	-0.024	3.6**
Technical Efficiency	0.03	1.8+	0.015	1.95+
Nairobi	-0.05	0.7	0.033	1.3
Mombasa	-0.03	0.4	0.065	2.2*
Nakuru	-0.04	0.4	0.107	2.5*
Any Foreign Ownership	-0.05	0.8	0.001	0.1
Firm age	-0.01	2.9**	-0.001	1.7+
Food	-0.04	0.5	0.067	2.1*
Bakery	-0.11	0.9	0.037	1.3
Wood	-0.05	0.6	0.068	1.8+
Furniture	0.01	0.1	0.008	0.4
Textiles	-0.09	0.8	0.012	0.4
Garment	-0.10	1.6	0.003	0.1
Number of observations	852		459	
Number of firms	343		238	
Pseudo R^2	0.06			
R^2			0.13	

Note: t-statistics and z-statistics are robust to heteroskedasticity. + 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.

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 after the Second World War was driven by manufacturing exports, in particular. Like in most other sub-Saharan countries, however, manufacturers in Kenya 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.

In Table 4.8 we show the proportion of firms in our sample that carried out any exporting during 1999. Two features of the data emerge. First, it is clear that there is a strong positive relation between firm size and the propensity to export. While 46 percent of the medium-sized firms and 69 per cent of the large/macro firms export, only 12 per cent of the small firms are exporters, and none of the micro firms. One commonly proposed explanation for the positive association between firm size and exporting is that firms face significant fixed costs to entering the exports market, due to bureaucratic procedures, the establishment of new marketing channels, and the need for a certain minimal size to meet export orders (Söderbom and Teal, 2000). Second, exporting is reasonably well diversified across industries. The most export-oriented sector in the sample is food, where 44 per cent of the firms export, and the least export-oriented sector is wood/furniture, 22 per cent.[24]

How export-intensive are the exporting firms? Figure 4.3 graphs the frequency distribution of the percentage of output exported, denoted *e/y* in the graph, for medium-sized and large/macro firms. It is clear that these firms typically do not specialise in exporting. Forty-one per cent of the firms do not export, and more than half of the exporting firms export less than 20 per cent of their output. The graph also shows, for the exporting firms, the average share of exporting that goes to the African market, as distinct from outside Africa. It is very clear that most of the exporting is within, rather than outside, Africa.

What could account for this pattern of lack of specialisation and exports being predominantly regional? One general explanation why firms do not specialise in

[24] Of course, differences across sectors may reflect their different size compositions, which is a point we will come back to below.

TABLE 4.8

PROPENSITY TO EXPORT 1999, BY SIZE AND SECTOR

	Micro	Small	Medium	Large/Macro	All size groups
Food/Bakery	0	0.11	0.50	0.56	0.44
	(0)	(0)	(0.29)	(0.20)	(0.18)
	2	*9*	*14*	*25*	*50*
Wood/Furniture	0	0	0.38	0.57	0.22
	(0)	(0)	(0)	(0.14)	(0.02)
	12	*9*	*13*	*7*	*41*
Textiles/Garments	0	0.30	0.40	0.73	0.35
	(0)	(0.10)	(0.07)	(0.33)	(0.12)
	17	*10*	*15*	*15*	*57*
Metal/Machinery	0	0.08	0.60	1.00	0.36
	(0)	(0)	(0)	(0.08)	(0.02)
	18	*13*	*10*	*12*	*53*
All sectors	0	0.12	0.46	0.69	0.35
	(0)	(0.02)	(0.10)	(0.20)	0.09
	49	*41*	*52*	*59*	*201*

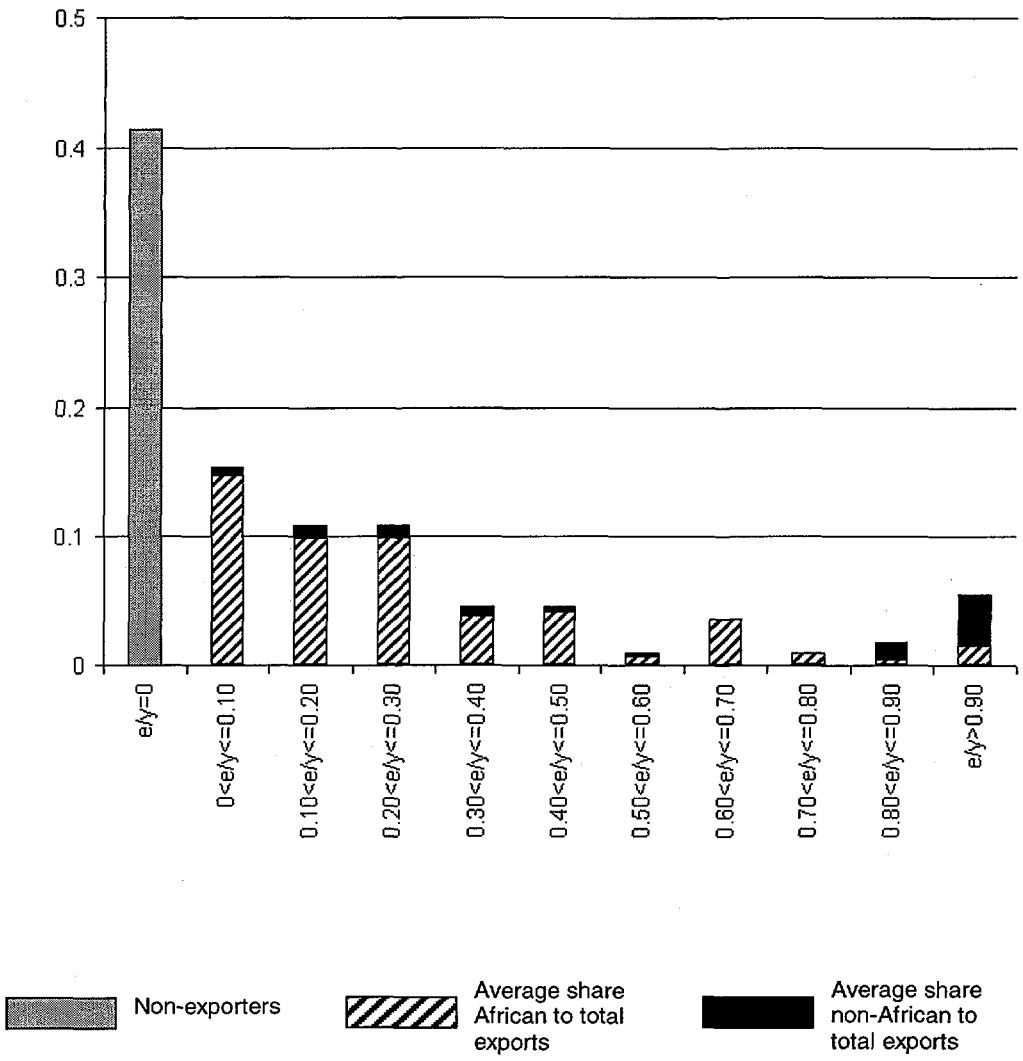
Note: The numbers in italics are number of firms. The table shows proportions of firms doing any exporting, these are the top numbers in each cell, and the proportions of firms exporting outside Africa, these are the numbers in ( ).

exporting is that exporters face declines in price when they increase exports. Regional markets offer only a limited extension to the Kenyan market and arguably prices may therefore fall if exports volumes are relatively large. In this case exporters are limited by the size of the regional market for their products. In the world market, however, prices will not be affected by Kenyan manufactured exports, and it would therefore make economic sense for international exporters to specialise in exporting. Interestingly, Figure 4.3 shows that the few firms that do specialise in exporting have a much higher share of non-African exports than less export-intensive firms.

We discussed above that size and exporting is strongly correlated. To isolate the effect of firm size on the propensity to export, we used a probit regression modelling 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. To allow for non-linear size effects we

FIGURE 4.3

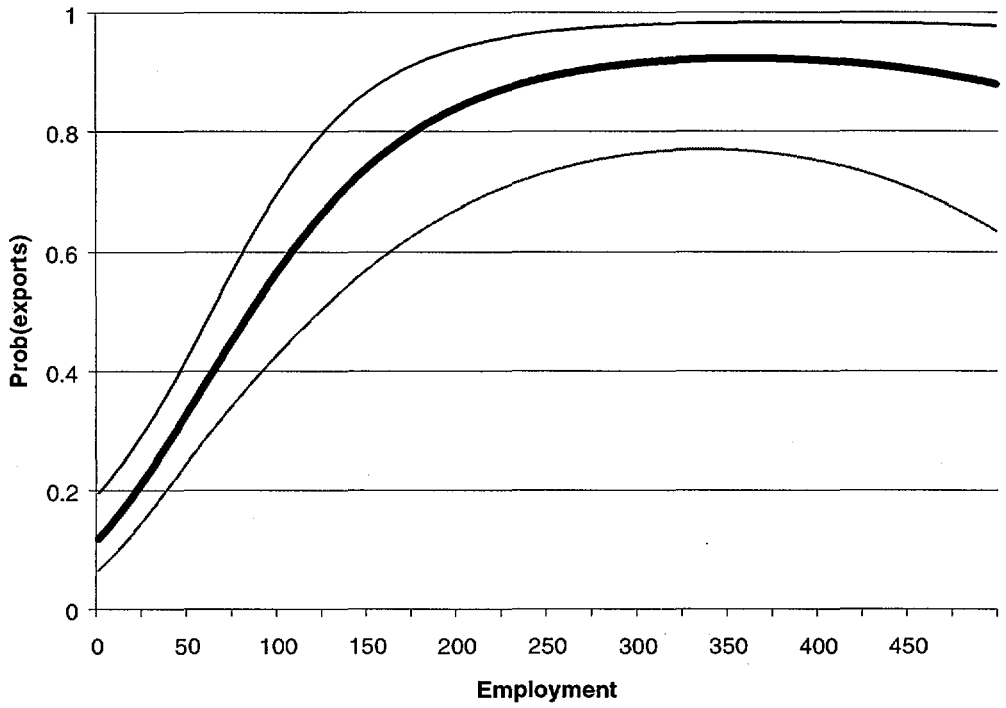
FREQUENCY DISTRIBUTION OF SHARE OF OUTPUT EXPORTED FOR MEDIUM-SIZED AND LARGE/MACRO FIRMS



Note: The number of observations is 111. Micro and small firms were not included.

FIGURE 4.4

THE PREDICTED PROBABILITY OF EXPORTING AND FIRM SIZE



Note: The graph shows the predicted probability and the 95 per cent confidence interval for the prediction, based on a probit regression that models the decision to invest. The number of firms in the regression is 181. Bakery firms were not included, because no such firm in the sample exports.

used a polynomial of the third degree. Estimating this model using the 1999 data, we found a very substantial and highly significant size effect.[25] Based on this probit regression we show in Figure 4.4 the predicted probability of exporting[26], along with the 95 per cent confidence interval, as a function of size. For firms with 25 employees the predicted probability is about 0.21 and steeply increasing. At 50 employees the estimated probability is 0.33, at 100 it is 0.57 and at 200 it is 0.84. After 200, further increases in size have only small effects on the export propensity. The curve has its steepest segment in the size range 50 to 60 employees, indicating that it is the growth of medium-sized firms that would have the most significant effect on exporting. In the 50 to 60 range, the increase in the probability of exporting resulting from a one-unit increase in size is about 0.005, i.e. half a percentage point.

[25] In fact, none of the other explanatory variables was significant at the 10 per cent level or better

[26] Evaluated at sample means of the other explanatory variables

5. Industrial Policy and the Business Environment

The last two decades have witnessed significant changes in economic policy in Kenya, as part of the structural adjustment programmes. Nevertheless, growth has been slow. This section will use the survey data to document how managers and entrepreneurs view the current state of industrial and economic policy in Kenya, and attempt to shed some light on the characteristics of the business environment for Kenyan manufacturing. An inherent difficulty in such a task is that we to a large extent have 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. We must therefore be careful when attempting to infer what is the true underlying problem from the self-reported data.[27]

5.1 Perceived Main Problems

We begin by examining the data on problem perceptions by firms. Respondents were asked to rank their firm's three biggest problems. In Table 5.1 shows the eight 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 insufficient demand (16 per cent), followed by access to credit (15 per cent), power shortages (13 per cent) and corruption (9 per cent). The first category is more frequently cited by firms in the two smallest size categories than by larger firms. Credit access is much more often cited as the main problem by micro and small firms than by medium and large/macro firms. Forty-five per cent of the micro firms, and 17 per cent of the small firms, rate lack of credit access as their main problem, while no firm in the two largest categories rate credit access as their biggest problem. Power shortages was a problem that became increasingly prevalent for the manufacturing sector towards the late 1990s and during 2000, mainly because of the poor rains. This is perceived as a relatively more serious problem by large firms than by smaller firms; only 4 per cent of the micro firms rate it as the biggest problem while more than 16 per cent of medium and large/macro firms

[27] This is not because we believe respondents 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

		Insufficient demand	Access to credit	Power shortages	Corruption	Access to domestic raw materials	High interest rates	Lack of infrastructure	Lack of business support services
All	First	16.1	14.6	13.2	8.8	6.3	5.9	3.9	3.4
[N = 205]	Second	13.2	4.9	10.2	2.9	5.9	3.4	9.8	3.9
	Third	7.8	2.4	7.3	3.9	3.4	5.9	10.2	2.4
Micro	First	19.6	45.1	3.9	2.0	0.0	3.9	2.0	9.8
[N = 51]	Second	21.6	7.8	11.8	2.0	3.9	3.9	3.9	9.8
	Third	9.8	5.9	2.0	0.0	7.8	0.0	5.9	7.8
Small	First	22.0	17.1	9.8	4.9	9.8	7.3	2.4	2.4
[N = 41]	Second	17.1	12.2	12.2	0.0	4.9	0.0	2.4	2.4
	Third	9.8	2.4	12.2	7.3	2.4	4.9	9.8	2.4
Medium	First	11.1	0.0	16.7	13.0	9.3	7.4	5.6	1.9
[N = 54]	Second	7.4	0.0	5.6	5.6	9.3	1.9	7.4	1.9
	Third	7.4	0.0	9.3	5.6	1.9	9.3	13.0	0.0
Large/	First	13.6	0.0	20.3	13.6	6.8	6.8	5.1	5.1
macro	Second	8.5	1.7	11.9	3.4	0.0	5.1	6.8	22.0
[N = 59]	Third	5.1	1.7	6.8	3.4	5.1	1.7	8.5	11.9

Note: The table shows percentage numbers. N denotes the number of firms.

rate it as their major problem. Corruption is another problem that is a relatively more important amongst large firms. Only 2 per cent of the micro firms rate corruption as their number-one problem, but for large firms this number is 14 per cent.

Access to raw material does not feature as a main problem amongst micro firms, but between 7 and 10 per cent of the firms in the other size categories rate this as their major problem. This has recently been a particularly severe problem for firms in the wood-processing sector because of a recent ban on logging, and for firms in the food-processing sector because of inadequate rainfall. High interest rates is cited as the main problem by 6 per cent of the firms in the sample, and there is some evidence that this is a relatively smaller problem for micro firms than for larger firms.

Infrastructure is rated the biggest problem by 4 per cent of all firms, and is relatively more of a problem for large than for small firms. The latter is to be expected given that large firms typically make much more use of roads, ports, airports etc. than do small ones. Finally, the data indicate that there is some demand for business support services among micro and small firms. This squares well with the finding in Section 4 that the smallest firms in the sample typically are being administered in an ad hoc and rudimentary manner, often without accounts.

5.2 Government Policy

Having examined the data on problems, we now turn to a more direct investigation of the perceptions about policy. We asked the respondents if during the period 1999-2000 there had been changes in government policy that have affected the firms, and if so, if the changes had improved matters or not. We summarise these data in Table 5.2. The two areas in which the data indicate that there had been changes that affected a non-trivial share of the firms are those of taxation and licences. Twenty-four percent of all respondents reported that there had been changes in the taxation rules that impacted negatively on the firms. This was primarily related to an increase in VAT by two percentage points, leading to concerns that the increased gross price of the manufactured goods would affect demand negatively. The least troubled size group in this context is the micro firms, which is to be expected due to their informal status. As for licences, 24 per cent of the respondents indicated that there had been negative changes, while 14 per cent reported positive changes. Licences became more expensive on the one hand, but on the other hand the processing of licenses was simplified. In particular, there was a reduction in the number of licenses needed to trade, and there are some signs that the renewal of licences was made quicker than in the past. The data indicate that these changes affected firms of different size in much the same way. Changes in other areas, such as ownership or labour market regulations, affected only a small share of the respondents.

TABLE 5.2

CHANGES IN GOVERNMENT POLICY

		Ownership regulations	Labour market regulations	Restrictions on buying and selling assets	Taxation including VAT and duty	Regulations relating to licences
All	Improvement	1.0	2.6	1.6	6.3	14.1
[N = 192]	No change	97.4	89.6	95.3	69.8	62.0
	Deterioration	1.6	7.8	3.1	24.0	24.0
Micro	Improvement	2.3	2.3	4.5	0.0	4.5
[N = 44]	No change	97.7	93.2	90.9	84.1	75.0
	Deterioration	0.0	4.5	4.5	15.9	20.5
Small	Improvement	0.0	0.0	0.0	0.0	15.4
[N = 39]	No change	94.9	87.2	94.9	64.1	56.4
	Deterioration	5.1	12.8	5.1	35.9	28.2
Medium	Improvement	1.9	3.8	0.0	7.5	15.1
[N = 53]	No change	98.1	86.8	100.0	71.7	60.4
	Deterioration	0.0	9.4	0.0	20.8	24.5
Large/	Improvement	0.0	3.6	1.8	14.3	19.6
macro	No change	98.2	91.1	94.6	60.7	57.1
[N=56]	Deterioration	1.8	5.4	3.6	25.0	23.2

Note: The table shows percentage numbers. N denotes the number of firms.

5.3 Supply of Utilities and Infrastructure

We have seen in Table 5.1 that one of the main perceived problems is power shortages. We collected additional information in this area, regarding the supply and reliability of utilities. Tables 5.3 and 5.4 summarise the data on electricity and water supply, the usage and reliability of telephone services and information technology.[28] About two thirds of the firms experienced power rationing, and the average number of days per week during which firms had mains electricity is about 4.4. Due to the poor rains there has also been water rationing, affecting 58 per cent of the firms. 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

[28] For the computations reported in these two tables we delete those who do not need electricity in their production process.

certainly involves additional costs that could have been avoided had the central supply been adequate. Eighty-two per cent of the firms have at least one telephone, and the phones appear to work relatively well, on average 6 days per week.

In Table 5.4 we report descriptive statistics on the information technology used by firms. Sixty-four per cent of the firms in the sample have at least one computer, and of these firms 81 per cent have access to the Internet. Of course, large firms are much more likely than smaller firms to have at least one computer, nevertheless 40 per cent of the small firms have a computer, which is not a small number. The number of computers per employee is decreasing in size.

TABLE 5.3

SUPPLY AND RELIABILITY OF UTILITIES

	All	Micro	Small	Medium	Large/ macro
Electricity rationed? (yes=1, no=0) [N=178]	0.67	0.58	0.56	0.72	0.74
Days per week, mains electricity [N=173]	4.42	4.87	4.71	4.18	4.24
Water rationed? (yes=1, no=0) [N=166]	0.58	0.32	0.42	0.84	0.58
Days per week, water [N=160]	4.77	5.42	4.88	3.72	5.36
Have phone? (yes=1, no=0) [N=181]	0.82	0.30	0.80	0.96	1.00
Days per week, phone [N=146]	5.99	6.89	6.52	5.88	5.68

Note: N denotes the number of firms.

TABLE 5.4

INFORMATION TECHNOLOGY

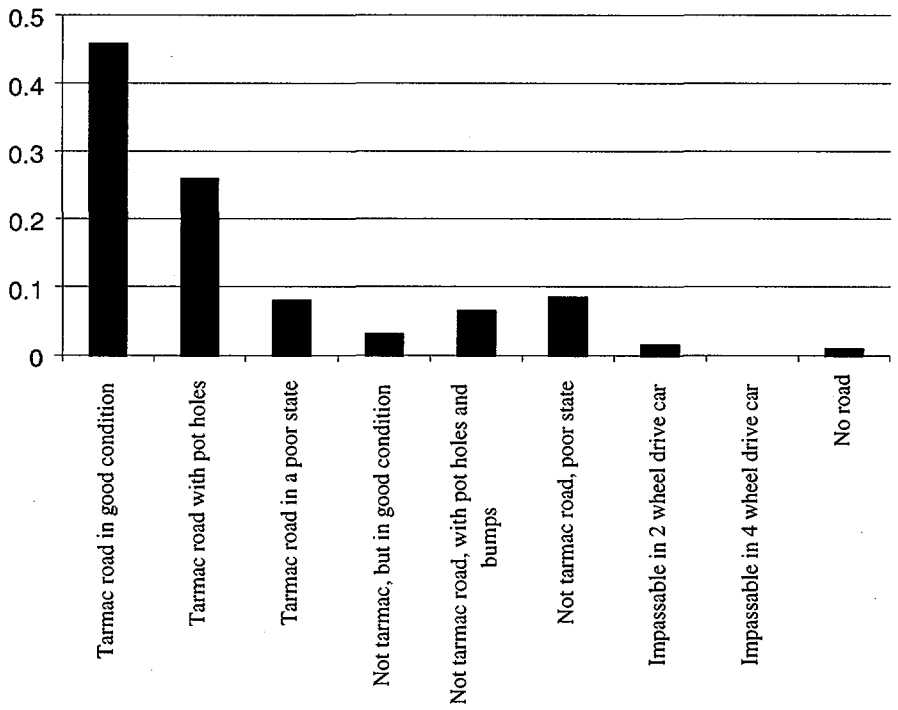
	All	Micro	Small	Medium	Large/ macro
Have computer? (yes=1, no=0) [N=177]	0.64	0.03	0.40	0.75	1.00
Computers per employee, given at least one computer [N=113]	0.07	0.67	0.17	0.06	0.05
Computers per employee, all firms [N=177]	0.05	0.02	0.07	0.05	0.05
Internet? [N=112]	0.81	0.00	0.85	0.68	0.91

Note: N denotes the number of firms.

One frequently cited problems by the managers and the entrepreneurs is the poor state of the infrastructure. This is another issue which is difficult to quantify, particularly from the perspective of the individual firm. In past surveys respondents have been asked to rank how big a problem is the state of the infrastructure, using some ordinal scale. In KMES we opted for an alternative approach, trying to get objective rather than subjective data on the matter. During the survey we documented the state of the roads directly outside the enterprises. We show these data in Figure 5.1. A little less than half of the firms have a tarmac road 'in good condition' in its immediate vicinity. About 35 per cent of the firms, however, operate in an area where tarmac are roads either 'in a poor state of repair' or with 'a few pot holes that would require a driver to alter course in order to avoid them'. This was particularly pronounced in Nairobi's industrial area, arguably the main industrial hub in the country.

FIGURE 5.1

THE STATE OF THE ROADS DIRECTLY OUTSIDE THE ENTERPRISE, ALL FIRMS



Note: The graph shows proportions of firms in each category. The number of firms in these calculations is 201.

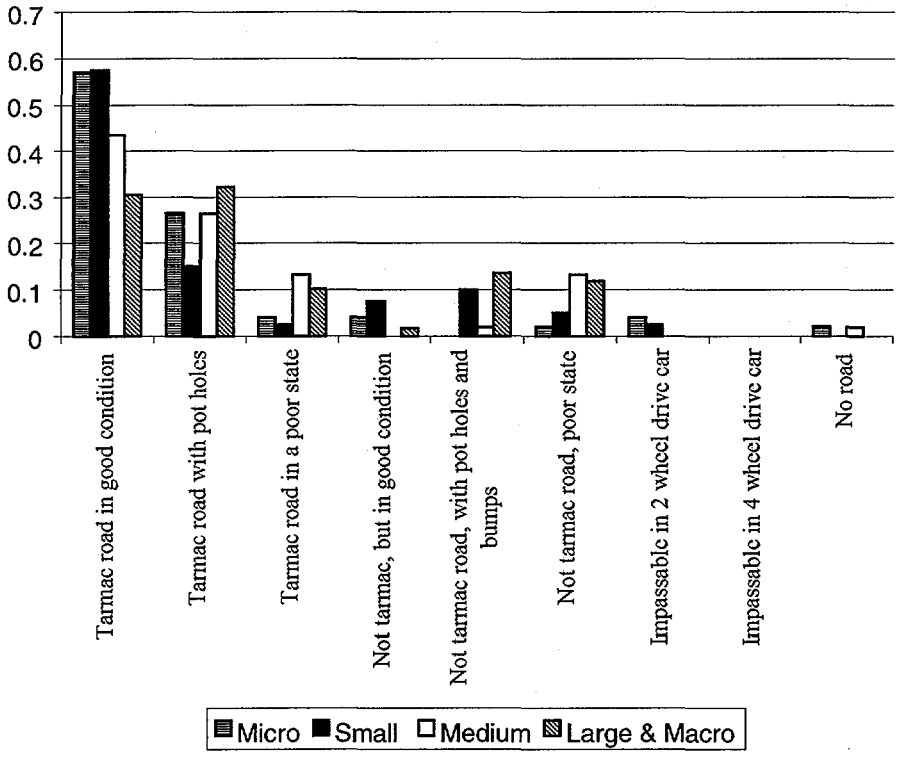
In Figure 5.2 we show how the state of the roads varies with firm size. It is apparent from this graph that the roads close to large firms tend to be poorer than those close to smaller firms, which is particularly costly from an efficiency point of view given that large firms tend to be more infrastructure-intensive than small firms.

5.4 Governance and Corruption

We saw in Table 5.1 that corruption was perceived as the major problem by 9 per cent of the firms in the sample, making it the fourth biggest impediment to conducting business in terms of its overall ranking. Over the last decade there has been an accumulation of macro evidence suggesting that corruption hurts foreign investment, growth and output levels, contradicting older arguments that corruption 'greases the wheel' of development or that it provides an efficient method of allocating resources

FIGURE 5.2

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

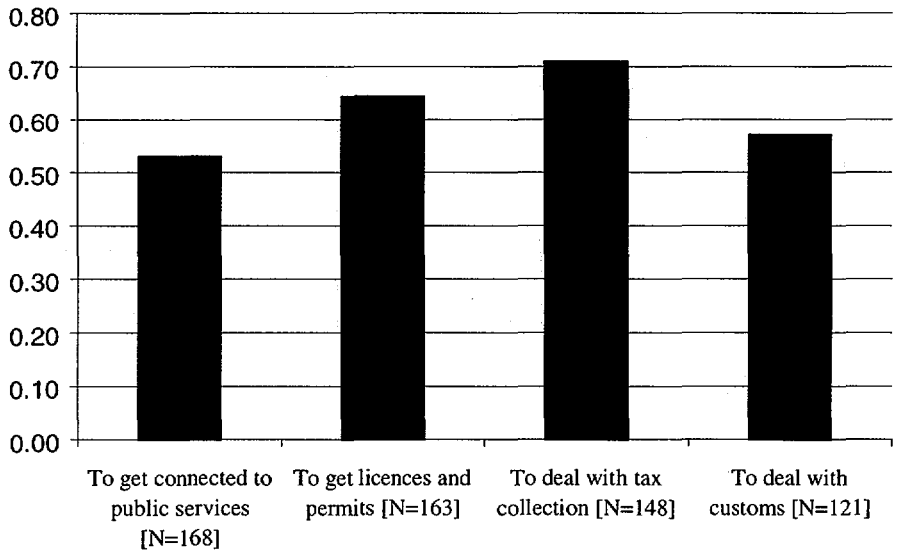


Note: The graph shows proportions of firms in each category, by size. The total number of firms in these calculations is 201.

in inefficient economies.[29] There is now a limited amount of micro evidence, Fisman and Svensson (2000) and McArthur (2000), which also finds that corruption harms, in the first case the growth of firms, and in the second reduces their level of productivity.[30] In international surveys of corruption, Kenya is often rated among the most corrupt.[31] We are unaware of any direct microeconomic evidence on the prevalence and role of corruption and bad governance in Kenyan manufacturing. One component of the KMES focussed on these issues. Figure 5.3 illustrates the incidence of corruption in four different situations.[32] Of the four situations referred to here,

FIGURE 5.3

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.

[29] See e.g. Shleifer and Vishny (1993, 1994), Mauro (1995), Wei (1997a,b, 1998), Kaufman and Wei (1999). The recent work of Hall and Jones (1999) and Kaufman, Kraay and Zoido-Lobaton (2000) on the effects of corruption finds a large, and highly significant, negative effect of corruption on aggregate income.

[30] Fisman and Sevensson (2000) use firm level data from Uganda. McArthur (2000) draws on cross-section data from countries surveys as part of the World Competitiveness Survey.

[31] For instance, Transparency International, a non-governmental organisation who publishes the Corruption Perceptions Index, ranked Kenya the fifth most corrupt of a total of 91 surveyed countries, in 2001. See http://www.transparency.org/.

[32] 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.

tax collection appears to be the one with the highest incidence of corruption, 70 per cent, followed by licenses and permit processing (64 per cent), customs (58 per cent) and public service connections (52 per cent). Table 5.5 shows disaggregated data by firm size, suggesting that, with the exception of customs, the incidence of corruption is highest among the micro firms. For the three largest size categories the incidence of corruption appears to be fairly uniform over size.

Finally, we examine the broader issue of how respondents rate the overall quality, integrity and efficiency of services delivered by various public services and agencies. Respondents were asked to use an ordinal scale from 1 to 6, where 1 was 'very good' and 6 'very bad'. Figure 5.4 shows the average scores ranked from the poorest to the best. Next to the bars we indicate the proportion of non-response for each category. This proportion is atypically high for armed forces, customs, parliament, government leadership and the judiciary courts. The worst average score is given to the roads department, 4.7, followed by the police at 4.6, healthcare, 4.5 and water services, 4.5. Central government leadership gets an average score of 4.3 and the parliament obtains 4.1, however these scores are in all likelihood downward biased. It was quite clear during the interviews that a substantial share of those not responding to these questions did not have high opinions about the government or the parliament. In some instances respondents made very negative remarks off the record, but expressed a wish that we do not record their opinion.

TABLE 5.5

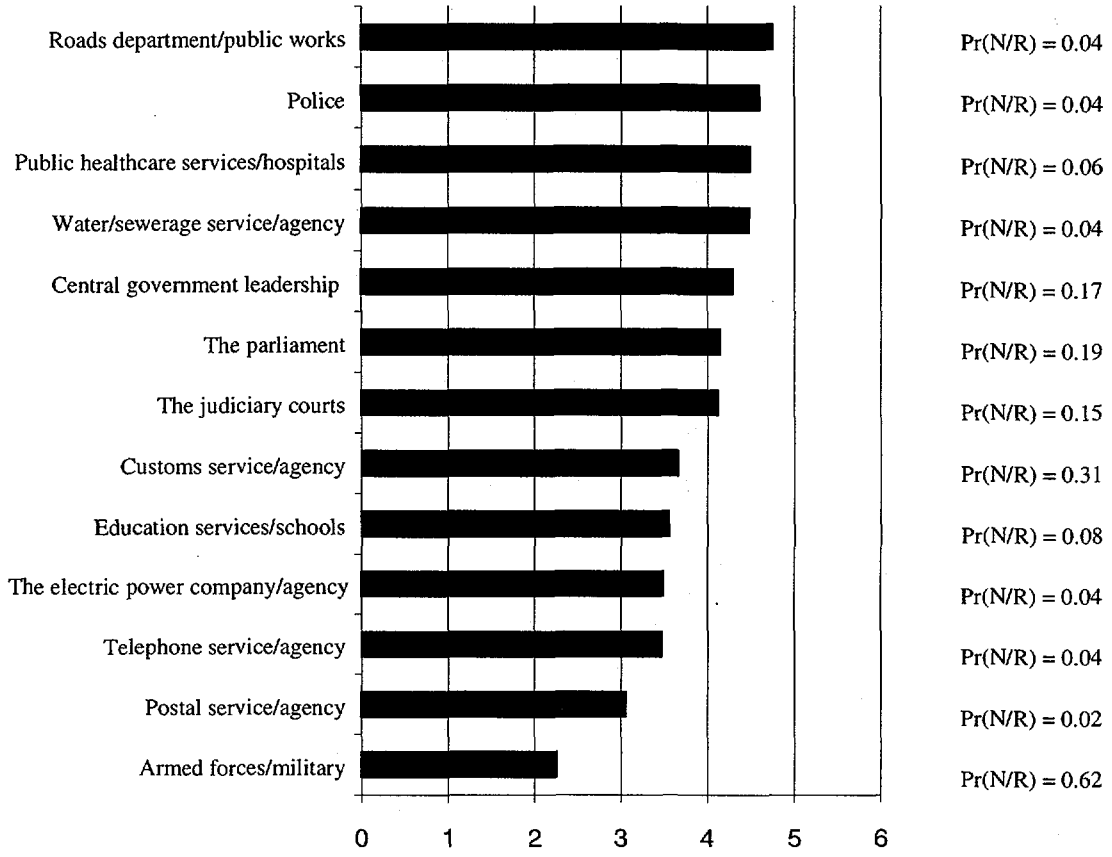
ESTIMATED PROPORTIONS OF FIRMS* THAT 'ALWAYS', 'USUALLY' OR 'FREQUENTLY' NEED TO MAKE UNOFFICIAL PAYMENTS, BY FIRM SIZE

	Micro	Small	Medium	Large
To get connected to public services [N=168]	0.71	0.55	0.47	0.45
To get licences and permits [N=163]	0.77	0.66	0.57	0.62
To deal with tax collection [N=148]	0.83	0.65	0.72	0.67
To deal with customs [N=121]	0.59	0.59	0.61	0.56

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

FIGURE 5.4

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.

6. The Labour Market and Wages[33]

This section provides a snapshot of earnings derived from information collected in the labour force section. The measure of earning presented is the sum of monthly wages and non-wage payment such as housing allowance, transport allowance, food allowance, and other allowances where applicable.

6.1 Firm size and earnings

Table 6.1 gives mean and median earnings by size of firm. Approximately 6 per cent of employees work in micro firms while 17 per cent work in small firms. The largest proportion (41 per cent) of employees works in large/macro firms and a substantial proportion (36 per cent) is engaged in medium-sized firms. With regard to earnings, these data clearly show that earnings increase with size of firm. For example, the average earnings in the large/macro firms are almost four times those in micro firms and about three times at the median. Further, the average earnings of employees in large/macro firms are two and half times the average earnings of employees in small firms. Median earnings in the former firm category are two times those in the latter firm category. In addition, employees in large/macro firms earn one and half times the mean and median earnings of employees in medium size firms. At the bottom of the size distribution, the observed earnings differential is relatively smaller, not more than

TABLE 6.1

MEAN AND MEDIAN EARNINGS BY FIRM SIZE

Firm size	Sample	Earnings	
	Proportion (%)	Mean	Median
Micro	5.9	4,257	3,476
Small	17.0	5,925	5,153
Medium	35.9	8,850	6,450
Large/Macro	41.1	15,044	9,629

Note: All monetary numbers are in KES 1999. The number of observations is 974.

[33] This section was co-authored with Anthony Wambugu.

TABLE 6.2

MEAN AND MEDIAN EARNINGS BY EDUCATION LEVEL

Education level	Sample	Earnings	
	Proportion (%)	Mean	Median
None	0.5	4,456	4,783
Primary dropout	8	6,776	6,400
Primary	39	6,790	5,790
Secondary	48	11,722	8,060
University	5	38,605	26,817

Note: All monetary numbers are in KES 1999. The number of observations is 974.

50 per cent. Thus the largest differentials are between the large/macro firms and the other firm sizes.

6.2 Educational attainment and earnings

Table 6.2 gives the mean and median 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 negligible and less than 10 per cent have not completed the primary level of education. 39 per cent of employees are primary graduates and close to one-half are secondary graduates. University graduates constitute 5 per cent of the sample. The data show that in general earnings tend to increase with the level of education. To illustrate, a university graduate earns three times what a secondary graduate earns on average and also at the median. The average earnings of a secondary graduate are just over one and a half times the earnings of a primary graduate. The mean earnings of primary dropouts and primary graduates do not differ markedly although at the median primary dropouts have a 10 per cent earnings advantage over primary graduates.

TABLE 6.3

MEAN AND MEDIAN EARNINGS BY SKILL CATEGORY

Skill category	Sample Proportion (%)	Earnings	
		Mean	Median
Unskilled	48	6,573	5,563
Skilled	52	14,413	9,217

Note: All monetary numbers are in KES 1999. The number of observations is 974.

6.3 Skills and earnings

Table 6.3 reports the mean and median earnings of skilled and unskilled employees. Skilled labour includes managers, professionals (engineers, accountants, economists, technicians), skilled office workers, sales personnel, foremen and supervisors, and skilled industry-specific employees. Unskilled labour includes, unskilled office workers, service employees such as cleaners and guards, and unskilled production workers such as labourers. Slightly over half of the employees are skilled. The mean earnings for skilled employees are twice the mean earnings of unskilled employees. The differential is slightly more than 50 per cent at the median.

6.4 Firm size, education level and earnings

In Table 6.4 mean and median earnings by firm size and education level of employees are given. Primary dropouts are concentrated in medium size firms and this constitutes 3.6 per cent of the sample. Similarly, 15.7 per cent of the total employees are primary graduates employed in this firm size category. An almost equal proportion of employees in this firm size category are secondary graduates. The data also show that 4.4 per cent of all employees are primary graduates and work in micro firms. As Table 6.2 showed, a large number of employees are secondary graduates and Table 6.4 shows that 27 per cent of the sample is secondary graduates employed in large/micro firms. University graduates are mainly employed in the medium and large/macro firms.

TABLE 6.4

MEAN AND MEDIAN EARNINGS BY FIRM SIZE AND EDUCATION LEVEL

Education level	Micro	Small	Medium	Large/macro
No education				
Mean	-	4,966	2,600	4,783
Median	-	5,215	2,600	4,783
Sample proportion (%)	-	0.3	0.1	0.1
Primary dropouts				
Mean	6,123	6,450	7,170	6,501
Median	3,000	6,003	6,569	6,181
Sample proportion (%)	0.5	1.8	3.6	1.7
Primary graduates				
Mean	4,014	5,935	7,018	8,624
Median	3,200	5,113	6,069	7,044
Sample proportion (%)	4.4	9.7	15.7	9.2
Secondary graduates				
Mean	4,369	5,778	9,561	14,438
Median	3,750	5,000	6,814	10,050
Sample proportion (%)	1.0	5.2	15.4	26.5
University graduates				
Mean	-	-	30,541	41,213
Median	-	-	22,150	29,933
Sample proportion (%)	-	-	1.1	3.5

Note: All monetary numbers are in KES 1999. The number of observations is 974.

Turning to earnings differentials, the data show that in general primary dropouts receive almost equal average pay across firm sizes. However, at the median, primary dropouts in medium and large/macro firms receive twice the earnings of their counterparts in micro firms. But in large/macro firms their earnings are relatively lower compared to the earnings in medium firms. Primary graduates employed in these firm size categories receive about two times the mean earnings of primary graduates in micro firms.

Earnings differentials across firms are more marked for secondary graduates. A secondary graduate employed in large/macro firms has three times the mean earnings of the secondary graduate in micro firms and twice the earnings of secondary graduates in small firms. Moreover, a secondary graduate in large/macro firms has one and a half times the earnings of a secondary graduate working in medium size firms. This may be reflecting the abundant supply of secondary graduates enabling firms to make divergent wage offers. With regard to university graduates, their average and median earnings are several times higher than the earnings of primary graduates, and approximately three times the earnings of secondary graduates.

6.5 Firm size, skills and earnings

Earnings may also differ according to skill of employee and the firm they work for. Table 6.5 reports mean and median earnings by these two dimensions. Many of the employees (42 per cent) are engaged in large/macro firms and medium size firms and they are skilled. Similarly, 35 per cent of employees are employed in these size categories and are unskilled. 10 per cent of total employees are skilled and employed in micro and small firms.

Skilled employees in large/macro firms and in medium size firms earn at least twice the earnings of skilled employees in other firm size categories. For example, a skilled employee in large/macro firm earns four times the average earnings of a skilled employee in micro firm, and three times the median earnings of employees in the latter category. Similarly, unskilled employees in the large/macro firms earn twice the earnings of their counterparts in micro firms.

TABLE 6.5

MEAN AND MEDIAN EARNINGS BY FIRM SIZE AND SKILL CATEGORY

Skill category	Micro	Small	Medium	Large/macro
Unskilled				
Mean	3,841	5,448	6,089	8,439
Median	3,100	5,015	5,802	6,367
Sample proportion (%)	3.7	9.7	18.9	16.1
Skilled				
Mean	4,937	6,547	11,909	19,312
Median	3,871	5,785	8,279	12,139
Sample proportion (%)	2.3	7.4	17.0	24.9

Note: All monetary numbers are in KES 1999. The number of observations is 974.

Turning to skill earnings differentials within firm size categories, the earnings for skilled employees in micro and small firms are about one and one fifth times more than those of unskilled employees. But in large/macro firms and in medium size firms, skilled employees earn approximately two times the average and median earnings of unskilled employees.

To summarize, the description of the data suggests that more educated employees tend to receive higher earnings than less educated. Similarly, skilled employees earn more than unskilled employees. In addition, irrespective of education level or skill, earnings increase with firm size.

7. Summary and Lessons for Future Research

This report has analysed the performance of manufacturing in Kenya. We began by looking at aggregate statistics for the Kenyan macroeconomy and its manufacturing sector. We documented how the 1990s witnessed a period of sharp economic decline, with per capita income measured in constant domestic prices falling by about 10 per cent over the decade. The formal manufacturing sector had a slow employment growth over the 1990s, on average about 2 per cent per year, and the growth of real output per employee was minuscule, about 1.5 per cent over the entire decade. Capital formation was low and showed a negative trend towards the end of the decade. In contrast, official statistics showed a rapid growth in the informal manufacturing sector, the *Jua Kali*, which in 1999 employed more than four times as many people as the formal manufacturing sector.

We then turned to the KMES firm-level data. Examining firm characteristics and performance, we found large labour productivity differentials across sectors and size. Although a substantial part of these could be attributed to differences in capital intensity, our 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 the highest productivity in Kenyan manufacturing and the textiles sector the lowest. Further, we found that, as in the past, investment in equipment and machinery was low, with roughly 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 that among seven sectors the food sector had the highest average investment rate, conditional on size and technical efficiency. We found that manufactured exports is fairly diversified across sectors and that the decision to export is strongly related to firm size. We documented that very few firms specialise in exporting. Most exporting firms export less than 20 per cent of their output, and predominantly to other African countries.

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 insufficient demand, followed by access to credit, power shortages and corruption. 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 power shortages. When asked specifically about government policy, two areas emerged in which there had been significant changes, namely taxation and licence regulation. Taken together, the data indicate that these changes had worsened the situation for manufacturing. Detailed analysis of the supply and reliability of utilities confirmed the inadequacy of the supply of mains electricity. Except for the micro category, we found that the majority of firms have at least one computer and that most of these firms have access to the Internet. Examining the state of infrastructure we 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. In the final part of the section on industrial policy and the business environment we investigated data on governance and corruption. The fact that Kenya often is rated among the most corrupt countries in the world was reflected in the survey data. We documented that the majority of firms have to pay bribes to deal with tax collection or to get licences and permits. When rated on an ordinal scale from 1 to 6 where 1 corresponds to 'very good' and 6 to 'very bad', most public agencies including the government and the parliament obtained average scores above 4, indicating widespread dissatisfaction.

In the final part of the report on the survey data, we examined labour market issues and wages. We documented differentials in earnings across categories of education and occupation. We found a strong positive relation between earnings and firm size, irrespective of the level of education or skill.

In view of what has been discussed above, the state of the Kenyan economy and manufacturing must be described as highly discouraging. The political environment has been characterised by uncertainty and lack of commitment for reform. Ethnic tensions have become increasingly widespread. The institutional framework has not developed favourably. Corruption and rent-seeking activities have not been dealt with forcefully enough, a recent example being in August 2001 when parliament threw out an anti-corruption bill directly linked to conditional aid from the IMF (see e.g. The Economist, 2001). These factors and others result in a business environment not conducive to rapid growth.

In an influential survey of African economic performance, Collier and Gunning (1999) emphasise the role of policy as the key for economic development. Their analysis points to poor policy resulting in a nexus of constraints from which escape is difficult, but not impossible. Similarly, Porter et al (2000) argues that a nation's wealth in the long term is not destiny but primarily of its own collective choosing, depending on '...how a nation and its citizens organize and manage their economy, the institutions they establish, and the types of investments they make, both individually and collectively.' (Porter et al, 2000, p. 101). 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. It needs to be noted that improving the business environment in Africa is essential for all sectors of the economy - not simply manufacturing. It is possible, as Collier argues, that such improvements will disproportionately benefit the manufacturing sector. In his survey of manufacturing in developing countries, Tybout (2000, p. 38) concludes that 'uncertainty about policies and demand conditions, poor rule of law, and corruption may be the priority areas for reform'.

Our analysis implies that Tybout's conclusion is highly relevant for the case of Kenya. In fact, given what we have learned from recent cross-country studies of African manufacturing, we assess the potential rewards to reforms in Kenya as substantial. Despite the poor policies, Kenyan manufacturing is doing better than many other African countries. For instance, in their analysis of productivity and earnings in the manufacturing sectors of Cameroon, Ghana, Kenya, Zambia and Zimbabwe, Bigsten et al (2000) report regression results indicating that Kenya has the highest level of total factor productivity of the five countries examined (Table 12 in their paper). With better policies it is reasonable to expect Kenyan manufacturing to do much better and thus narrow the gap to manufacturers elsewhere in the world that are internationally competitive. Because such a development would ultimately increase wages in the manufacturing sector, thus raising the standards of living and alleviate poverty, the stakes are substantial.

The magnitude of the potential rewards is difficult to predict, however, given that our current knowledge of the impact of micro and macro policy reforms on

manufacturing performance is rather limited. This is clearly an area in which we need further research. Two broad issues would need to be addressed, namely the consequences of reform for firm performance and the consequences for earnings. For such a line of research to be informative, it will have to be based on methodological tools and data that enable the analyst to pin down causal relationships as precisely as possible. Over the last decade there has been a rapid development of econometric techniques designed for precisely this purpose, so the tools already exist. The main constraint in this context is the data. The researcher will have to use data on firms from several countries, some of which are reforming and others that are not. There will have to be detailed data on both firm characteristics and performance, and workers' skills and earnings that can be matched with the firm data. The analysis would benefit enormously from panel data (see footnote 7) on both firms and workers, since this is the best way in practice to distinguish between true policy effects and spurious, non-causal relationships. Such panel data will have to contain at least three periods of data, ideally more, if modern econometric methods designed to establish causal links are to be fruitful. In the specific context of East Africa, it would be very valuable to compare Kenya, a 'non-reformer', with either Tanzania or Uganda, were significant reforms have taken place during the last decade. In a broader context, it will be of primary importance to analyse industry in the main economies of Nigeria and South Africa.

Some firm and workers data from the countries just mentioned already exist or are currently being collated. However, we do not as yet have a cross-country panel database such as the one described above. While constructing one is perfectly feasible, it will involve more fieldwork of the kind used in the KMES.

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Appendix

TABLE A1.1

THE NUMBER OF FIRMS BY STRATUM IN THE WAVE 1 RPED SAMPLE

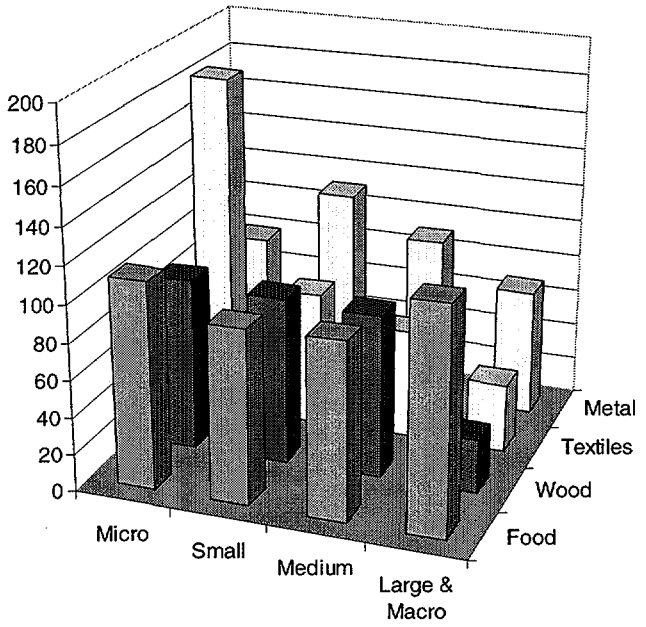
	Food and Bakery	*Wood and Furniture*	*Textiles and Garment*	*Metal and Machinery*	All sectors
Formal Firms					
Micro	1	5	7	3	16
	(0.06)	(0.31)	(0.44)	(0.19)	
	[0.02]	[0.12]	[0.18]	[0.08]	[0.10]
Small	12	4	7	6	29
	(0.41)	(0.14)	(0.24)	(0.21)	
	[0.28]	[0.10]	[0.18]	[0.15]	[0.18]
Medium	16	19	15	17	67
	(0.24)	(0.28)	(0.22)	(0.25)	
	[0.37]	[0.45]	[0.39]	[0.43]	[0.41]
Large	11	12	6	12	41
	(0.27)	(0.29)	(0.15)	(0.29)	
	[0.26]	[0.29]	[0.16]	[0.30]	[0.25]
Macro	3	2	3	2	10
	(0.30)	(0.20)	(0.30)	(0.20)	
	[0.07]	[0.05]	[0.08]	[0.05]	[0.06]
All size groups	43	42	38	40	163
	(0.26)	(0.26)	(0.23]	(0.25)	
Informal Firms	8	18	17	18	61
	(0.13)	(0.30)	(0.28)	(0.30)	

Note: The table shows the number of firms in each stratum, along with row and column proportions, in ( ) and [ ], respectively.

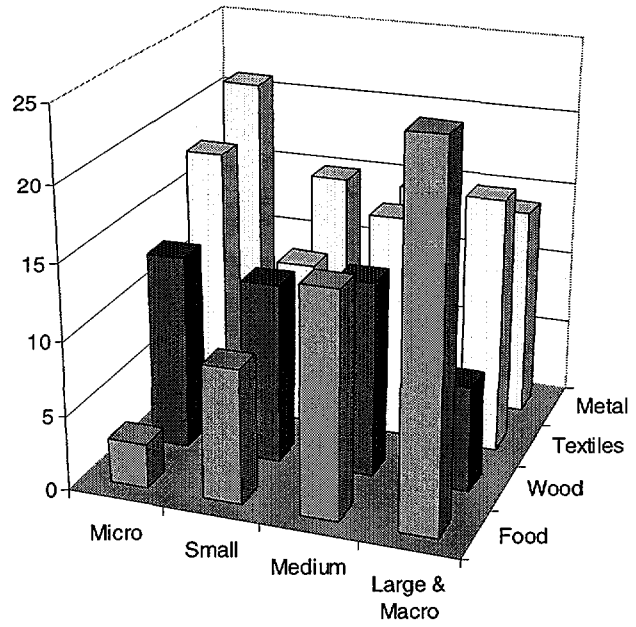
FIGURE A1.1

THE POPULATION OF FIRMS AND THE KMES SAMPLE

A. The Population (Estimated*)



B. The KMES Sample



* Calculated from Central Bureau of Statistics et al (1999).