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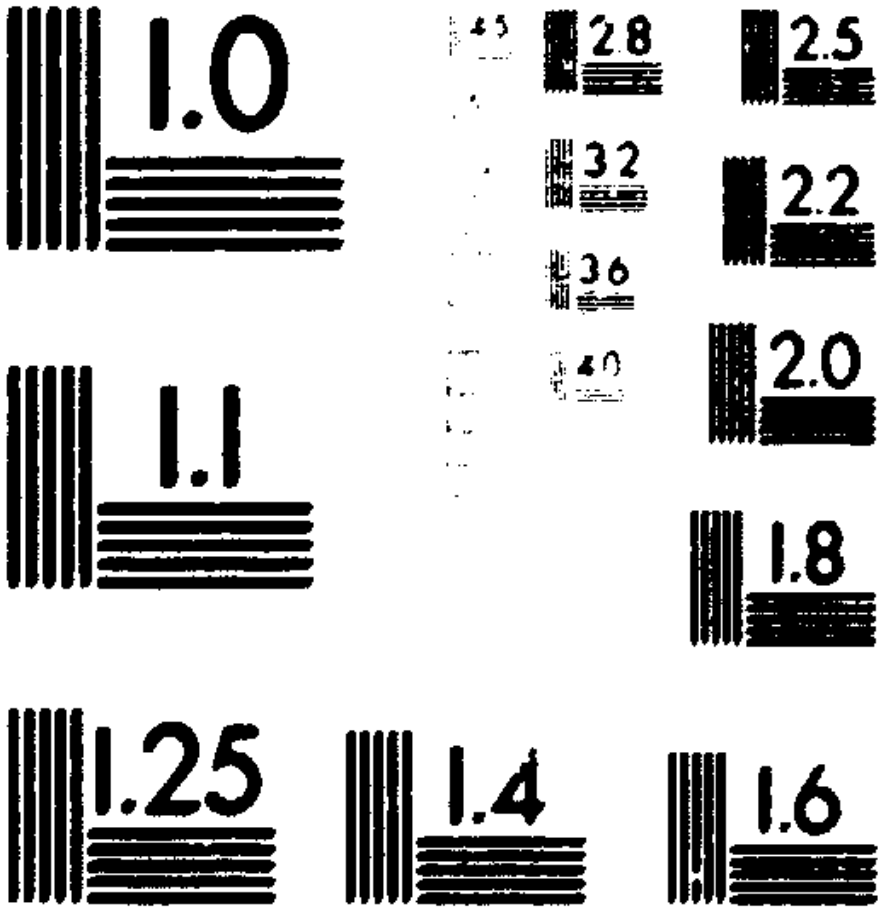

14344

Distr.
LIMITED
UNIDO/IS.502
20 December 1984
ENGLISH

UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

THE CAPITAL GOODS INDUSTRY IN AFRICA: A GENERAL REVIEW AND ELEMENTS FOR FURTHER ANALYSIS

Sectoral Studies Series
No. 14

SECTORAL STUDIES BRANCH
DIVISION FOR INDUSTRIAL STUDIES

10

V.84-94508

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This document presents major results of work under the element Studies on Capital Goods Industries in UNIDO's programme of Industrial Studies 1984/85.

THE CAPITAL GOODS INDUSTRY IN AFRICA: A GENERAL REVIEW AND ELEMENTS FOR FURTHER ANALYSIS

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Preface

The present study has been prepared by UNIDO's Division for Industrial Studies, Sectoral Studies Branch, with the aim of assessing the present situation of the Capital Goods Sector in Africa and to present some elements of strategies for the further development of the sector in this region. It should be seen also in the context of the Industrial Development Decade for Africa.

UNIDO's internal information systems and data bank have been the main sources for this study. It should be emphasized that no field study has been undertaken. It is rather a desk study trying to identify elements for further analysis. The basic work on this study has been done by Dr. Martin Fransman, Department of Economics, University of Edinburgh, Scotland.

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EXPLANATORY NOTES

References to dollars ($) are to United States dollars, unless otherwise stated.

A comma (,) is used to distinguish thousands and millions.

A full stop (.) is used to indicate decimals.

Use of a hyphen between dates (e.g., 1960-1965) indicates the full period involved, including the beginning and end years.

The following forms have been used in tables:

A dash (-) indicates that the amount is nil or negligible.

A blank indicates that the item is not applicable.

Totals may not add up precisely because of rounding.

Besides the common abbreviations, symbols and terms and those accepted by the International System of Unites (SI), the following abbreviations and contractions have been used in this report:

Economic and technical abbreviations

CNC	Computer numerically controlled
DRC	Domestic resource cost
GDP	Gross domestic product
GLIM	General Linear Interactive Modelling
IDDA	Industrial Development Decade for Africa
ISTC	International Standard Industrial Classification
MVA	Manufacturing value added
NES	Not elsewhere specified
R+D	Research and development
SITC	Standard International Trade Classification

Organizations

ARCEDEM	African Regional Centre for Engineering Design and Manufacturing
ECA	Economic Commission for Africa
ILO	International Labour Organization
OAU	Organization of African Unity
SADEC	Southern African Development Co-ordination Conference
UNCTAD	United Nations Conference on Trade and Development

1. INTRODUCTION

The main objective of this paper is to provide a survey of the state of the capital goods sector in African countries. The paper begins with a discussion of two economic models that deal with the role of the capital goods sector in accumulation and the provision of consumption goods. While the first model used assumes a closed economy, the second introduces an export sector and examines the implications of this for the local capital goods sector. This brief discussion sets the stage for the subsequent examination of this sector in African countries by providing an overview of the more general issues involved. Attention is then focussed on Africa, beginning with a discussion of several recent African initiatives which recognize the importance of the capital goods sector. The analysis continues by comparing industrialization and the development of this sector in Africa with that in the rest of the developing world. An analysis is undertaken of the latest statistical data including those on trade, production, employment and number of establishments in the capital goods sector. This general part of the study ends by comparing a number of African countries according to several performance indicators.

The general discussion is complemented by a survey of three case studies on the capital goods sector in Tanzania, Ghana and Zimbabwe. These studies provide additional information on the state of this sector.

The major constraints on the growth of the capital goods sector in African countries are discussed in section 3.4. These include demand and supply factors as well as macroeconomic and policy conditions. Next some African strategies for building up the sector are examined. Certain African countries have no particular strategy for the capital goods sector; other countries have such strategies and suggest specific steps that must be taken to develop this sector. Some main conclusions arise from the analysis of these points:

- The small size of the market in African countries is once more seen as a major constraint on industrialization. Not only is the national income of most African countries relatively small, even by developing country standards, but the domestic market is also fragmented by unreliable and high cost transport. The latter problem applies also to inter-country regional markets.

- While there are few reliable estimates available of minimum efficient scales of production for individual products within the capital goods sector, several studies have concluded that economies of scale tend to be less important in parts of this sector than in many other segments of the manufacturing industry. Thus, on the basis of existing information it is difficult to decide for the capital goods sector as a whole whether particular African markets are large enough for reasonably efficient production.

- It is concluded that one major constraint limiting the possibility of exporting capital goods results from the fact that both African labour costs as well as productivity levels tend to be unfavourable relative to other parts of the developing world. To the extent that African capital goods producers are indeed unable to export they will forego the important opportunity to learn-by-exporting, that is benefit from the information feed-back from users, distributors and competitors in export markets. However, it is shown that in some African countries it may be feasible for some capital goods producers to export and that it would certainly be incorrect to dismiss this as an impossible alternative without further detailed analysis.

- A major problem confronting African countries follows from a) the inherent skill-intensity of the capital goods sector and b) the shortage of skilled labour in these countries. These conditions are exacerbated by shortage of foreign exchange and difficulties following from low quality inputs and the weakness of subcontractors and component suppliers.

- While other studies have suggested that relatively rapid growth in output might in a number of ways lead to gains in productivity, this has not occurred in African countries.

Finally, in section 4 some of the more general analytical and policy questions that arise in attempting to develop the capital goods sector in African countries are considered.

One appendix has been included. It provides a preliminary econometric analysis of the role of the capital goods sector in the national economy and it is concluded that further such work would be useful.

2. THE ROLE OF THE CAPITAL GOODS SECTOR IN ECONOMIC GROWTH

In most African countries the capital goods sector (which produces the means of production) is at present either practically non-existent or in the early stages of infancy. Only a few of the larger and wealthier African countries have the capability to build some of the more important varieties of machinery. In the case of non-electrical machinery, for example, which includes engines, turbines, agricultural, industrial and office machinery, all African countries (i.e. both North and South of the Sahara, but excluding South Africa) were responsible for only 2.69 per cent of developing country manufacturing value added in this subsector. This compared with 73.0 per cent in Latin America, 4.66 per cent in Western Asia (Cyprus, Iraq, Kuwait, Lebanon and Turkey), and 19.65 per cent in other Asian and Pacific countries. Without Egypt, Morocco, Zimbabwe and Algeria, the most important African countries in this subsector, the figure drops to 0.74 per cent.[1/]

Furthermore, machine production in the formal sector of sub-Saharan African countries frequently takes place on the basis of a continued reliance on expatriate skills and on largely unadapted foreign technology. Correspondingly, as we shall see in more detail later, imported machinery constitutes a substantial proportion of total imports in most African countries thus accounting for a significant share of total foreign exchange available.

Under these conditions, where the capital goods sector is rudimentary, it is necessary to begin, not by assuming that a capital goods sector must be developed, but by asking how much priority should be given to the strengthening of this sector. This question is central since the development of a capital goods sector is costly in terms of human, financial and physical resources that can be used in alternative ways. Furthermore, in examining the question, we will want to take account of the specific conditions that exist in the country since this may have an important bearing on the answer.

1/ UNIDO, World non-electrical machinery: an empirical study of the machine tool industry, New York, 1984, p. 39.

It is useful, in beginning to answer the question, to briefly take account of the analysis by economists of the role of the capital goods sector in economic development. This will provide an appreciation of the importance of this sector and will provide the basis for a more detailed examination in the sub-Saharan African context.[2/]

In discussing the capital goods sector, economists have tended to start from one of two different, though potentially complementary, questions. The first question relates to the issue of optimal resource allocation, or how should resources be allocated between the various sectors of the economy in order to optimize given objectives. The second question deals with technical change, or with the role of the capital goods sector in the generation and diffusion of technical change. Both of these questions will be briefly discussed.

The resource allocation question was at the heart of one of the first attempts to examine the role of the capital goods sector in a formal model of the economy. In this model, the Feldman model, a simple representation of the economy is created. It is assumed that the economy is divided into two sectors, a consumption goods sector and a capital goods sector. The economy is assumed to be closed so that either there is no foreign trade, or such trade is negligible. Labour is in abundant supply and it is also assumed that once machines are allocated to one of the two sectors, they are not reallocated. The problem addressed in the model is how to allocate machines between the two sectors in such a way as to maximize consumption over a given planning period: machines, produced by the capital goods sector, can either be allocated to this same sector in order to produce more machines, or they can be allocated to the consumption goods sector to produce consumer goods.[3/]

2/ In the rest of this paper, references to Africa implicitly are to sub-Saharan Africa, excluding South Africa.

3/ This discussion draws on Cooper C., "Learning by doing in an open economy version of the Feldman model", given at the Fourth EADI General Conference, Madrid, September 1984.

The conclusion of the Feldman model is that consumption will be maximized if in the first stage all machinery is allocated to the capital goods sector, followed by a second stage when the total output of machinery goes to the consumption goods sector. The model itself provides a solution to the question regarding the duration of the first stage.

Examined in this way, the Feldman model has little relevance for African countries. Quite apart from its unrealistic simplifying assumptions about the way in which the economy operates, the model assumes the existence of a substantial capital goods sector and this assumption, as already shown, is violated for virtually all African countries. However, later versions of the Feldman model are of far greater relevance. In other versions the model is extended in order to include an export sector.[4/] There are now three sectors in the economy, a sector producing capital goods (I), a sector producing goods (C), and a sector producing goods (X) that for convenience are assumed to be entirely for export.

The resource allocation problem is now more complicated. Machines produced by the I-sector can, as before, be allocated to the I-sector itself, or to the C-sector, but they can also be allocated to the X-sector in order to produce exports. Furthermore, machinery needs in all three sectors can now also be met by machinery imported with the foreign exchange earned by the X-sector. Accordingly, the importance of the local capital goods sector is diminished in so far as it is now possible to use imported machinery in each of the three sectors.

In achieving the objective of maximizing the output of consumption goods over the planning period, the planners therefore have a further choice: either to expand the output of the I-sector in order to obtain the necessary machines, or to expand the output of the X-sector and import machinery. This is the make-buy decision.

4/ See Harris D.K., "Economic growth with limited import capacity", in Economic Development and Cultural Change, Vol. 20, No. 3, 1972.

From a static point of view the make-buy decision is relatively easy to resolve. Since the aim is to end up with as many machines as possible by allocating resources in an optimal proportion between the I- and X-sectors, it is necessary to calculate the marginal return in each sector, that is the number of machines earned in each sector per unit of resources allocated to that sector. As long as there is a divergence between the two sectors, resources should be allocated to that which yields the higher return. Several factors will determine the number of machines earned and therefore the optimal allocation. The productivity of the I-goods sector will determine the number of machines (output) obtained per unit of resource input. In the case of the X-sector, productivity will determine the output of export goods received per unit of resource input. In order to calculate how this translates into machines, information is needed on the amount of foreign exchange that will be earned by selling the export goods and the price of foreign machinery. In this way the calculation can be made as to the extent to which machines should be locally produced, or imported.

The relevance for African countries is clear. On the basis of the assumptions made thus far, it may be concluded that all other things equal the lower the level of productivity in the I-sector, the higher the level of productivity in the X-sector, the greater the earnings of foreign exchange per unit of exports and the lower the price of imported machinery, the better will it be to allocate domestic resources to the X-sector rather than expand the local capital goods sector.

However, the situation becomes far more complicated when we go beyond this static example. In order to make this clearer we turn now to the second set of questions examined by economists in relationship to the capital goods sector, namely the role of the technical change.

The capital goods sector lies at the heart of the process of technical change. The reason is that technical change of both the process and product variety requires the introduction of new or modified capital goods. Accordingly, improvements generated in the capital goods sector are diffused to users throughout the economy. Unlike the first perspective on the capital

goods sector, which was concerned primarily with the optimal allocation of resources between the various sectors in the economy, the second perspective focusses on both the causes and consequences of technical change introduced in the capital goods sector.

With regard to causes and consequences, some authors have stressed the economic significance of the capital-saving innovations introduced by the capital goods sector.[5/] By facilitating the economizing of scarce capital and increasing the productivity of capital (the output-capital ratio) the capital goods sector contributes to growth and also to increases in the quality of output.

Relating closely to capital-saving innovations, mention must be made of the adaptations and modifications that are made to machinery and equipment in the capital goods sector. From country to country there will always be differences in the conditions of both machine producers and users. In responding to these differences capital goods producers frequently make adjustments which at times result in the production of machinery which is better suited to local conditions than imported varieties.

Recent research in a number of Third World countries has stressed the differences in conditions in these and the more industrialized countries. In the African context specific mention may be made of factors such as smaller markets and thus smaller scales of output, different demand characteristics on the part of both consumers and producers, different relative factor prices and resource availabilities, different production techniques (e.g. batch rather than continuous-flow production), etc. To the extent that capital goods producers possess the capabilities (or can, over time, develop the capabilities) to bring about changes in their processes and products, they will adjust to these conditions and in the process produce capital goods that may be more suitable. There is certainly abundant evidence that capital goods producers in Latin American and Asian countries have produced machinery and

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5/ See Rosenberg, N., Perspectives on Technology, Cambridge: Cambridge University Press, 1976.

equipment with characteristics that have been beneficial in both local markets and export markets in other developing countries. Compared to machines available from industrialized countries, those available from developing country producers have at times been significantly cheaper, simpler to operate with fewer functions, and possibly lighter though less durable and precise. Although the advantages of a lower price have been purchased at the expense of machine quality, the machinery is often ideally suited to conditions existing in developing countries where, with lower average incomes and smaller sized firms compared to industrialized countries, quality requirements are less stringent.

Rather than the allocation of resources between sectors, the second perspective on the capital goods sector is concerned with the conditions under which technological capabilities in this sector can be developed thus contributing to an enhanced ability to adapt to local circumstances. These conditions will be discussed in more detail later in this paper.

The make-buy decision, therefore, is more complicated than originally appeared in the static example. By taking technical change and technological capabilities into account the choice becomes more difficult. Even if the number of machines were increased by allocating a given quantity of local resources to the export sector and importing machinery than if the same resources were devoted to the local capital goods sector, it is not necessarily concluded that it is preferable to be export-oriented. In some cases it will still be better to make capital goods locally rather than buy them from abroad. Two important examples will illustrate this. The first example is where longer run improvements in productivity, due to the effects of learning, are sufficient to compensate for the short run loss in machines compared to the export alternative. This is the infant-industry case. The second example is where the local capital goods sector is also producing other advantages in addition to machines which should enter into the calculation. For instance, the local capital goods sector might simultaneously be producing experienced workers who are able to make modifications and adaptations in response to local circumstances. These workers may subsequently be employed elsewhere in the economy and their training is therefore a social benefit. This is referred to as a positive externality. Where a higher social value is

placed on this and possibly other externalities generated by the local capital goods sector than on the shortfall in machines resulting from local production rather than importing, then it will be justifiable to make rather than buy. Under these two situations, where the infant industries argument applies and where net externalities are sufficiently great, it will therefore be acceptable to produce capital goods locally even where in the short run more machines could be earned by expanding the export sector.

However, in practice it will be necessary to be extremely careful before accepting either of these arguments in justifying an expansion of the local capital goods sector. The reason is simply that infants do not automatically mature with the passage of time and positive externalities often turn out to be less significant than claimed. Furthermore, both productivity increases in infant industries and externalities are extremely difficult to measure and predict ex ante. If these exceptions to the static make-buy (allocative efficiency) rule do not materialize in practice, then there is a danger that the country will be worse off than if it were to import more of its capital goods requirements.

Although economists have tended to approach the capital goods sector by asking two kinds of questions, namely about allocative efficiency and technical change, these two issues can, and must, be integrated in any policy-oriented analysis of this sector. In addition to the static gains and losses involved in the expansion of the local capital goods or export sectors an examination is also required of the factors determining technical change and productivity improvements in the sector. The latter factors will have an important bearing on the longer run costs and benefits of the local capital goods sector.

3. THE ROLE OF THE CAPITAL GOODS SECTOR IN SUB-SAHARAN AFRICAN COUNTRIES

This part of the paper begins with a discussion of the role of the capital goods sector in several initiatives that have recently been taken in African countries. Here it will be seen that this sector has been designated as a priority for industrial development. There follows a review of the current status of the capital goods sector in African countries on the basis of the latest available statistical data. Then, the role of the capital goods sector in specific African countries is examined through a number of case studies while the constraints on the growth of this sector are analyzed in the next section. Finally, some of the strategies that have been followed in various African countries for developing the local capital goods sector are reviewed.

3.1 The recognition of the importance of the capital goods sector in recent African initiatives

The capital goods sector has been accorded a particularly important role in some of the most significant initiatives taken in the 1980s to accelerate the pace of industrial development and economic growth in African countries. A starting point for many of these initiatives is the "Lagos plan of action for the economic development of Africa, 1980-2000" which was approved by the Heads of State and Government of the Organization of African Unity in April 1980. In connection with industrial development the Lagos Plan stressed the importance of the "phased development of basic industries which are essential for self-reliance, since they produce inputs for other sectors".[6/] These industries include those which produce basic needs commodities as well as others which provide some of the necessary inputs. The latter include the mechanical, electrical and electronic industries, which are also the industries responsible for the production of capital goods.

The Lagos Plan, and the earlier Monrovia Strategy, were given a significant boost when, in December 1980, the General Assembly of the United Nations proclaimed the 1980s as the Industrial Development Decade for Africa

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6/ Organization of African Unity, Lagos Plan of Action for the Economic Development of Africa, 1980-2000, Geneva, 198, p. 22.

and called upon "the United Nations Industrial Development Organization and the Economic Commission for Africa, in close co-operation with the Organization of African Unity, to formulate proposals to implement the programme for the Industrial Development Decade for Africa and to monitor its progress." This resulted in the publication of "A Programme for the Industrial Development Decade for Africa" in 1982.7/

From the point of view of the present interest in the capital goods sector, this programme is important since it elaborates on the notion of basic industries introduced in the Lagos Plan. Noting that "it is virtually impracticable for any country to develop all priority industries simultaneously", the Programme calls on "each country or group of countries (to) select so-called core industries."8/ Core industries are defined in terms of the possession of one or more of the following four characteristics: backward and forward linkages, the contribution to a self-reliant and self-sustaining industrial base, the reduction of dependence on external factor inputs and the earning of foreign exchange. Two categories of core industry are identified, resource-based and engineering-based, the latter including the capital goods sector. However, in discussing the capital goods sector, reference is made not only to the production of machinery, but also spare parts and components, and it is noted that the lack of those items "is becoming the major cause for the low-capacity utilization or closing down of existing plants."9/

Further details are provided in the 1982 Programme on the role of the core engineering industries and the central diagram is reproduced here as diagram 1. This makes it clear that the production of machinery used in the manufacture of basic needs goods is given the central role in the core engineering industries. The production of machinery, in turn, requires the

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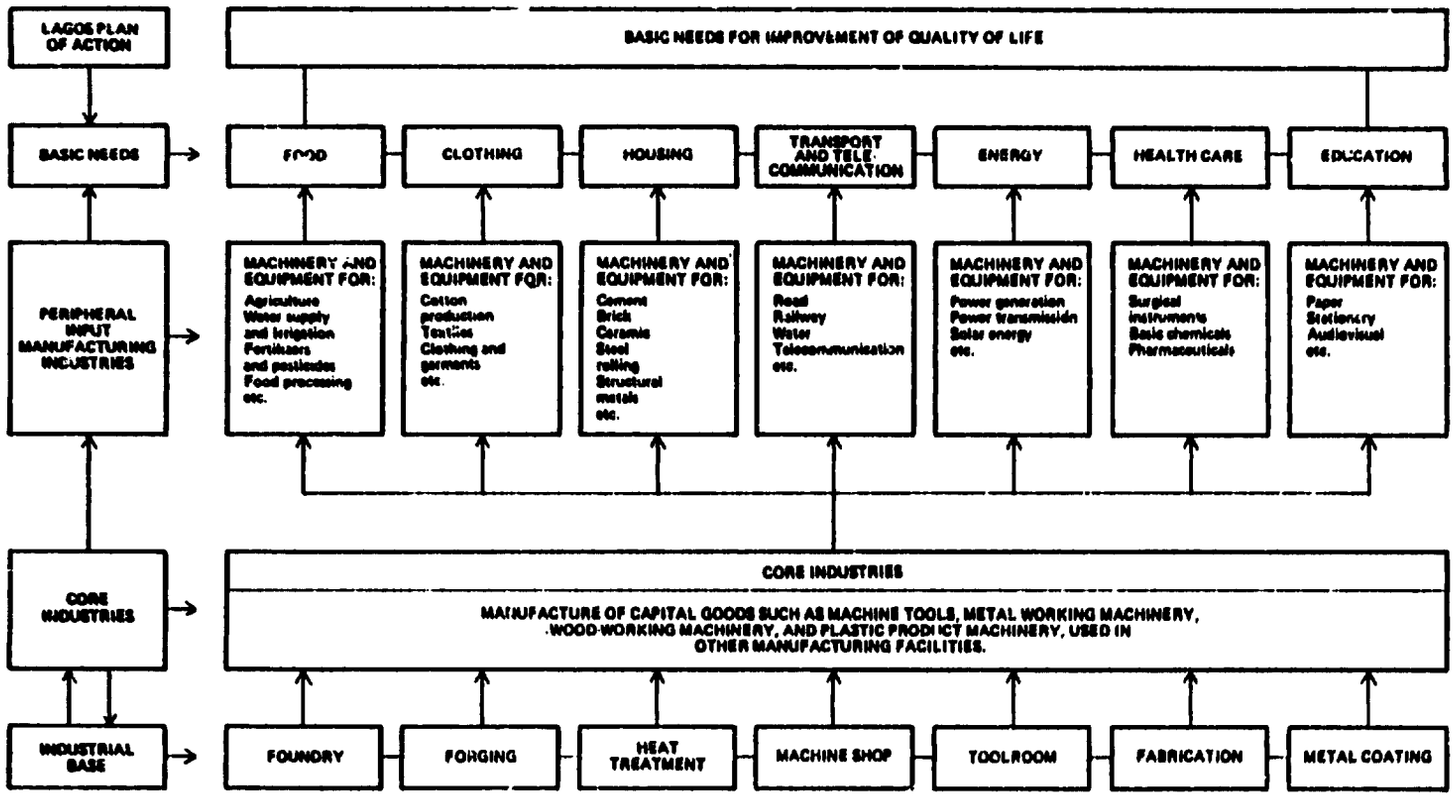
7/ United Nations, "A Programme for the Industrial Development Decade for Africa. Guidelines for priority actions during the preparatory phase (1982-1984"), New York, 1983.

8/ Ibid, p. 3.

9/ Ibid, p. 4.

Diagram 1. Interlinked development of engineering and allied metal working industries to achieve the Lagos Plan of Action



Source: United Nations, a programme for the industrial development decade for Africa, prepared jointly by the ECA, OAU and UNIDO, New York. 1982, p. 117

development of related production processes such as foundry, forging, heat treatment, machining, tooling, fabrication and metal coating. In Africa, it is noted, the latter processes are mainly located in railway workshops, dockyards, large repair and maintenance workshops, and private and parastatal engineering industries.

The importance of the capital goods sector has also been stressed in other initiatives involving numbers of African countries. In this connection a particularly important example is The African Regional Centre For Engineering Design and Manufacturing established originally in April 1979 with headquarters in Ibadan, Nigeria. At the beginning of 1984 this centre, ARCEDEM, had twenty-three members: Algeria, Benin, Burkina Faso, Burundi, Comoro, Congo, Egypt, Ghana, Guinea, Kenya, Liberia, Mali, Morocco, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, Sudan, Tanzania, Togo, Zaire and Zambia. ARCEDEM is explicitly concerned with the development of technological capabilities in the capital goods sector so that this sector may play an appropriate role in adapting and improving capital goods. This is made clear in the objectives of ARCEDEM which are to assist member states in the development of capability for engineering design and manufacturing of industrial and agricultural machines and equipment by way of:

- adaptation of foreign designs of simple machines and other industrial equipment;
- development of indigenous designs of simple machines and equipment;
- development of prototypes of machines and equipment;
- manufacture of machines and equipment in small batch quantities;
- training of engineers and technicians in the field of design and development of engineering equipment.

The importance of the capital goods sector has also been stressed in some African regional initiatives. One example is the Southern African Development Co-ordination Conference (SADCC) which has as its members southern African countries, excluding South Africa. In one of the earliest policy documents published in 1981 by SADCC, titled "Industrial Co-operation", the role of the capital goods sector is emphasized in much the same way as in the Lagos Plan and the Programme for the Industrial Development Decade for Africa. While the

earlier industrial projects put forward for funding by SADCC excluded projects in the capital goods sector, in 1984 this sector was identified for future attention. Specific mention was made of machine tools, irrigation pumps, mining equipment, and railway wagons, rolling stock and equipment[10/].

It is accordingly clear that a good deal of attention has been given in many recent African initiatives to the importance of the capital goods sector. Additional reference should be made to a major study of African countries, "Accelerated Development in Sub-Saharan Africa: An Agenda For Action", published by the World Bank in 1981. There are significant differences between the World Bank report and the Programme for the Industrial Development Decade for Africa (IDDA) prepared by the Economic Commission for Africa, the Organization of African Unity and the United Nations Industrial Development Organization. In particular, while the World Bank's study proposes "an agriculture-oriented development strategy with industry in a supporting role" (p.95), the IDDA, while also stressing the importance of agriculture-related industry, tends to assign a greater overall significance to industrial development in achieving the goal of accelerated development. Whereas the programme of the IDDA emphasizes the importance of developing the capital goods sector and deepening its forward and backward linkages with other sectors, the World Bank study makes no specific mention of the capital goods sector as a priority target for development.

3.2 Review of the current status of the capital goods sector in African countries

3.2.1 Industry in Africa and the rest of the developing world

As is well known, Africa is the least industrialized region amongst developing countries and this has important implications for the capital goods sector. In 1982 Africa contributed 1.11 per cent to total world manufacturing value added, rising from 0.77 per cent in 1963. This compared with 0.80 and 0.49 per cent in West Asia, consisting of Cyprus, Iraq, Kuwait, Lebanon and

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10/ Southern African Development Co-operation Council (SADCC), Current Status of Industrial Projects, 1984, p.14.

Turkey, 3.43 and 2.13 per cent in South and East Asia, and 5.68 and 4.71 per cent in Latin America respectively.[11/] The contribution of manufacturing industry to GDP per head of population is significantly lower in Africa than in other regions of the developing world. In 1981, in terms of constant 1970 United States dollars, this figure was 29 for Africa, (excluding South Africa), compared to 34 for Asia and the Middle East (excluding Japan and Israel) and 191 for the Caribbean and South America.[12/] Starting from a low base, however, growth rates of manufacturing value added have been satisfactory in Africa compared to other developing regions. Between 1975 and 1980 the annual growth rate in MVA, at constant 1975 prices, was 6.3 per cent for Africa compared to 6.0 per cent in all other developing regions. In 1970-1975 the figures were 5.5 and 7.7 per cent, and 8.5 and 7.0 per cent in 1960-1965 respectively.[13/] However, the relative performance of growth in GNP per capita was less satisfactory. From 1970-1981 this figure was 0.9 per cent for sub-Saharan Africa, including South Africa, compared to 3.1 per cent for East Asia and the Pacific, 1.5 per cent in South Asia, 2.6 per cent in Latin America and the Caribbean and 3.1 per cent for all developing countries.[14/]

However, as is shown in table 1, African MVA is highly concentrated in several sectors. More specifically, most value added is produced in the food processing, beverages, textile, and clothing sectors. The sector of particular significance in the present study, the capital goods sector, is relatively insignificant.

Furthermore, the aggregated figures for industry in Africa conceal a wide variation across the continent. In 1979, for example, only four countries were responsible for 60 per cent of total African MVA: Algeria, Egypt, Morocco

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11/ Industry in a Changing World, United Nations, New York, 1983, table II.10, p. 36.

12/ The capital goods industry in Latin America: Present situation and prospects, table 9, p. 17, UNIDO/IS.478, 1984.

13/ Industry in a Changing World, United Nations, op. cit., table V.2, p. 102.

14/ Ibid, table V.1, p.101.

Table 1 Major industrial sectors in 22 African countries, 1970, with shares in total manufacturing value added (per cent)[a/]

Country	Major sectors (with shares in MVA)[b/]
Burundi[c/]	Beverages (46), clothing (16), metal products except machinery (15), food (14)
Congo	Beverages and tobacco (20), petroleum refining and products (18), food (16)
Egypt	Textiles (32), food (10)
Ethiopia	Textiles (28), food (27), beverages (16)
Ghana	Petroleum refining (15), textiles (11), food (11), non-ferrous basic metals (11), beverages (10)
Kenya	Food (19), transport equipment (11)
Libyan Arab Yamahiriya	Tobacco products (44), food (14) other chemical products (11)
Madagascar	Food (29), textiles (20)
Malawi	Food (22), beverages (17), tobacco products (12), textiles (11)
Mauritius	Food (61)
Mozambique	Food (36), textiles (11)
Nigeria	Textiles (24), beverages (15), food (12)
Rwanda	Food and beverages (89)
Somalia	Food (89)
Sudan	Textiles and clothing (27), food (21), beverages (14)
Swaziland	Wood, wood products and furniture (57), food and beverages (37)
United Republic of Cameroon[c/]	Food (30), non-ferrous basic metals (17), beverages (12)
United Republic of Tanzania	Textiles (22), food (21)
Togo	Textiles (37), beverages (33), food (20)
Tunisia	Food (19), industrial and other chemical products (13)
Zambia	Beverages and tobacco products (41), food (14)
Zimbabwe	Food (12)

a/ Major sectors defined as accounting for at least 10 per cent of total MVA (1970).

b/ Precise sector definitions are based on the ISIC classification.

c/ Refers to shares of output.

Source: UNIDO, Recent Industrial Development in Africa, UNIDO/ICIS.117, August 1979.

and Nigeria. For this reason, and as a prelude to discussing the capital goods sector in more detail, we consider in the following sub-section the question of grouping African countries.

3.2.2 Trade in capital goods

For two reasons it is worth beginning a statistical examination of the capital goods sector in African countries with an analysis of trade data. The first and most important reason is that the larger part of capital goods requirements in African countries are imported. Local production, as we shall see later, accounts for a relatively small proportion of capital goods consumption. The second reason is that the trade data tend to be more reliable and complete than data on production.

Data on capital goods are provided in tables 2, 3.1 and 3.2. Several points must be kept in mind in examining these tables. Firstly, the capital goods sector has been defined in terms of SITC categories 69 and 7. Sixty nine refers to metal manufactures NES and includes tools while 7 refers to machines and transport equipment.[15/]

Secondly, it will be seen from the tables that in many cases current data are not available for all countries. A particularly serious problem is that for many African countries the available figures extend only as far as the middle-1970s. This is an important shortcoming in view of the deteriorating

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15/ In defining the capital goods sector at this level of aggregation it is important to note that we are including items that are not, strictly speaking, capital goods. As has been already mentioned, the capital goods sector is of particular interest precisely because it is responsible for producing the means of production which are used in all sectors of the economy. In the capital goods sector local machinery is produced and foreign machinery modified and adapted under the conditions prevailing in the domestic economy. In this way, production is facilitated in using sectors. It should not, however, be pretended that this definition is watertight for empirical purposes. Intermediate goods, such as steel and chemicals, have been excluded from the definition of capital goods on the grounds that while they are used in production, they are not the means of production. In some cases, however, in the grey area, there will be room for debate as to whether particular commodities are capital goods. At any rate, there are items in the SITC categories included here which one would not normally think of as capital goods, such as household equipment or television and radio receivers. This should be borne in mind in interpreting the present statistics.

Table 2. Imports of all capital goods a/ by country 1973-1980
(thousand US$)

	1973	1974	1975	1976	1977	1978	1979	1980	Total Imports	Year	Capital goods imp. as % of total imp.
Angola	221,552	237,460							624,329	(1974)	38.03
Benin		49,456	n.a.	n.a.	n.a.				164,302	(1974)	30.10
Burkina Faso					76,144	76,262	97,293	117,294	357,955	(1980)	32.77
Burundi					21,504	31,033	44,721	46,806	167,224	(1980)	27.99
Central Afr. Republic					28,712	24,690	31,309	32,007	80,461	(1980)	39.78
Chad	19,545	23,552	35,054						110,050	(1975)	31.85
Congo				66,204	65,594	90,200	83,119		266,414	(1979)	31.19
Ethiopia					121,447	193,406	217,753	227,008	721,367	(1980)	31.47
Gabon			214,892	238,165	349,680	n.a.			705,846	(1977)	49.54
Gambia		6,241	8,338	12,358	13,502				73,067	(1977)	18.48
Ghana			220,726	256,546	321,408	356,151			1,002,572	(1978)	35.52
Guinea-Bissau			10,397	9,162	7,752				32,340	(1977)	23.97
Ivory Coast				482,903	744,673	1,032,103	948,554		2,390,095	(1979)	39.69
Kenya					478,203	738,349	609,430	783,926	2,589,939	(1980)	30.27
Madagascar					112,842	157,075	252,226	264,907	676,477	(1980)	39.16
Malawi					71,784	143,095	140,448	167,987	440,230	(1980)	38.16
Mali		31,157	41,840	48,759	52,680				158,731	(1977)	33.19
Mauritius			81,711	98,411	117,978	110,507			498,372	(1978)	22.17
Mozambique	n.a.	n.a.	n.a.						327,037	(1972)	
Niger	30,729	30,549	30,618	45,969					127,093	(1976)	36.17
Nigeria				4,216,639	5,713,456	6,385,263	4,462,444		10,274,326	(1979)	43.43
Rwanda		16,466	32,847	31,543	35,746				113,953	(1977)	31.37
Senegal						242,857	274,892	267,970	860,867	(1981)	24.85
Sierra Leone	37,158	54,315	35,427	35,544					166,279	(1976)	21.38
Togo				69,480	107,043	166,917	203,501		518,460	(1979)	39.25
Uganda	37,885	50,417	64,569	50,249					157,521	(1976)	31.90
United Rep. of Cameroon					317,212	462,103	506,604	621,989	1,538,365	(1980)	40.43
United Rep. of Tanzania					306,094	564,240	563,521	467,833	1,211,386	(1980)	38.62
Zaire			363,905	314,689	337,762	302,334			796,714	(1978)	37.95
Zambia			370,366	266,033	300,044	251,396			628,311	(1978)	40.01
Zimbabwe					188,663	160,206	234,459		939,819	(1979)	24.95

a/ Capital Goods = SITC 69+7.

Source: 1981 Yearbook of International Trade Statistics, UN, 1983.

balance of payments situation in many African countries in the latter 1970s and early 1980s which has had major implications for the import of capital goods. The lack of data makes comparison between countries difficult. However, to examine only those years for which figures are available for all African countries would imply a failure to take account of the deteriorating situation. Accordingly, in the tables the latest figures have been used.

From table 2 it can be seen that capital goods imports, as defined in this paper, constitute a significant proportion of total imports amounting to around one third of the total for most countries. Bearing in mind that the data in the final column of the table are not strictly comparable since they refer to different years, it is nonetheless of some interest to note that while there is some variation, for most countries capital goods constitute between 30 and 39 per cent of total imports. Only four countries are above this figure: Gabon - 50 per cent, Nigeria - 43 per cent, Cameroon - 40 per cent, and Zambia - 40 per cent. While both Gabon and Nigeria are oil exporters, Zambia is an important mineral (copper) exporter. In only seven countries was the proportional figure for capital goods below 30 per cent. The four countries with the lowest figures were the Gambia - 19 per cent, Sierra Leone - 21 per cent, Mauritius - 22 per cent and Guinea-Bissau - 24 per cent.

Further details on import are provided in tables 3.1 and 3.2 where a breakdown is provided of capital goods imports. Unfortunately, however, there are again comparability problems. To begin with, as in the previous table, the figures do not always deal with the same years but in addition the statistics are presented on the basis of one of two non-comparable formats, namely SITC (revision 1) and SITC (revision 2). Accordingly, comparison is possible only between countries using the same format as is made clear in the table.

In the case of revision 1 it is evident that for most countries item 71, non-electrical machinery, was the most important import category, followed by 73, transport equipment and 72, electrical machinery. In attempting to establish the significance of various categories of capital goods imports it is useful, as a first approximation, to calculate the proportional contribution of each sub-sector at the two digit level to total imports of

capital goods. Again, however, due caution must be exercised in interpreting the results since the data refer to slightly different years and since the means are unweighted.

The most important sub-category of imports is SITC 78, road vehicles, which accounted for an average of 28 per cent of total capital goods imports. Second was SITC 72, machines for special industry, responsible for an average of 15 per cent. Third was SITC 74, general industrial machinery NES, 14 per cent; fourth SITC 69, metal manufactures NES, 13 per cent; fifth SITC 77, electrical machinery NES, 10 per cent; sixth SITC 79, other transport equipment, 7 per cent; seventh SITC 71, power generating equipment, 6 per cent; eighth SITC 76, telecommunications and sound equipment, 5 per cent; ninth SITC 75, office machines, one per cent; and tenth SITC 73, metal working machinery, one per cent.

In discussing imports of capital goods, special mention should be made of spare parts and components. The lack of availability of these items due to foreign exchange constraints has been identified as a major cause of low capacity utilization in many African countries. It has been estimated that between 1972 and 1977 African countries imported nearly US$ 10 billion FOB spare parts for the engineering sector. In 1981 alone the figure was US$ 4.1 billion and it was estimated that between 1980 and 1985 spare parts imports will amount to US$ 26 billion.[16/] These figures suggest that one of the important functions of the capital goods sector lies in the production of spare parts and components, in addition to machinery. This important point should be considered later.

In tables 4, 5.1 and 5.2 data are provided on capital goods exports by African countries. While capital goods reflect the industrial structure and needs of countries, and may also provide indirect information on local capital goods producing capabilities, data on capital goods exports provide an indirect indication of the efficiency of capital goods producers. Assuming that subsidies of one form or another are negligible, an assumption that seems

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16/ Economic Commission for Africa, Local Manufacture of Selected Spare Parts for Engineering Industries in Africa, 1984.

Table 3.1. Breakdown of capital goods imports by country
(thousand US$)

Country	Year	Total import of capital goods	SITC 69	71	72	73	74	75	76	77	78	79
Angola+	(1974)	237,460	23,493	122,125	30,903	70,939						
Benin+	(1974)	49,456	6,782	19,897	9,961	12,816						
Burkina Faso*	(1980)	117,294	12,355	6,785	12,940	696	12,637	1,251	6,444	12,952	44,132	7,102
Burundi+	(1980)	46,806	13,420	12,911	7,791	12,684						
Central Afr. Republic*	(1980)	32,007	4,767	1,873	2,957	168	3,970	451	1,194	3,513	13,120	33
Chad+	(1975)	35,054	3,306	14,959	4,621	12,167						
Congo+	(1979)	83,119	13,045	31,485	14,510	24,079						
Ethiopia*	(1980)	227,008	25,738	7,452	65,546	2,954	14,969	2,327	8,551	18,377	73,568	3,527
Gabon+	(1977)	349,680	55,723	96,621	69,687	127,649						
Gambia+	(1977)	13,502	1,940	3,506	4,160	3,896						
Ghana+	(1978)	356,151	27,398	162,447	38,482	127,824						
Guinee-Bissau+	(1977)	7,752	1,273	2,313	1,976	2,191						
Ivory Coast*	(1979)	948,554	110,702	52,283	105,177	8,868	154,266	15,766	50,717	92,391	218,863	139,524
Kenya+	(1980)	783,926	58,573	333,785	110,140	281,439						
Madagascar*	(1980)	264,907	35,901	14,760	63,516	3,880	37,524	3,560	11,520	22,083	56,624	15,540
Malawi*	(1980)	167,987	19,701	7,618	18,228	1,022	17,881	1,471	1,242	26,761	44,081	19,984
Mali+	(1977)	52,680	4,737	16,599	8,500	22,844						
Mauritius+	(1978)	110,507	17,220	49,665	27,570	16,052						
Mozambique+	(1972)	n.a.	21,131	34,686	n.a.	n.a.						
Niger+	(1976)	45,969	4,383	17,210	6,157	18,219						
Nigeria+	(1979)	4,462,444	470,440	1,379,008	1,063,725	1,549,270						
Rwanda+	(1977)	35,746	8,960	6,983	5,838	13,964						
Senegal*	(1981)	213,937	25,860	17,722	26,463	2,272	39,966	4,621	12,295	21,496	44,170	19,072
Sierra Leone+	(1976)	35,544	5,875	13,429	7,567	8,761						
Togo+	(1979)	203,501	53,096	76,471	44,520	29,415						
Uganda+	(1976)	50,249	7,927	20,208	8,398	13,671						
United Rep. of Cameroon*	(1980)	621,989	99,609	45,222	85,120	8,444	114,731	6,160	15,504	55,592	142,422	49,185
United Rep. of Tanzania+	(1980)	467,833	38,552	224,267	64,642	140,372						
Zaire+	(1978)	302,334	49,853	126,225	56,258	69,728						
Zambia+	(1978)	251,396	25,590	105,997	49,465	70,345						
Zimbabwe+	(1979)	234,459	17,265	110,126	43,959	63,011						

Key to SITC Categories

SITC (Rev 2)

* 69 - Metal Manufactures N.E.S.
70 - Power Generating Equipment
72 - Machines for Special Industry
73 - Metalworking Machinery
74 - General Industrial Machinery N.E.S.
75 - Office Machines ADP Equipment
76 - Telecommunications, Sound Equipment
77 - Electrical Machinery N.E.S. etc.
78 - Road Vehicles
79 - Other Transport Equipment

SITC (Rev 1)

\+ 69 - Metal Manufactures N.E.S.
71 - Machinery non-electric
72 - Electrical Machinery
73 - Transport Equipment

Source: 1981 Yearbook of International Trade Statistics (UN 1983).

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Table 3.2. Breakdown of capital goods imports by country (per cent)

Country	Year	SITC 69 %	71 %	72 %	73 %	74 %	75 %	76 %	77 %	78 %	79 %
Angola+	(1974)	9.9	51.4	13 0	29.9						
Benin+	(1974)	13.71	40.2	20.1	25.9						
Burkina Faso*	(1980)	10.5	5.78	11.0	0.59	20.7	1.06	5.49	11.0	37.6	6.05
Burundi+	(1980)	28.7	27.6	16.6	27.1						
Central Afr. Republic*	(1980)	14.9	5.8	9.2	0.52	12.4	1.29	3.73	10.9	40.9	0.103
Chad+	(1975)	9.43	42.7	13.2	34.7						
Congo+	(1979)	15.7	39.9	17.5	28.96						
Ethiopia*	(1980)	11.3	3.28	28.9	1.3	6.59	1.02	3.76	8.09	32.4	1.55
Gabon+	(1977)	15.9	27.6	19.9	36.5						
Gambia+	(1977)	14.4	25.9	30.8	28.8						
Ghana+	(1978)	7.69	45.6	10.8	35.9						
Guinee-Bissau+	(1977)	16.4	29.8	25.5	28.3						
Ivory Coast*	(1979)	11.7	5.51	11.1	0.93	16.3	1.66	5.35	9.74	23.1	14.7
Kenya+	(1980)	7.47	42.6	14.0	35.9						
Madagascar*	(1980)	13.5	5.51	23.9	1.46	14.2	1.34	4.35	8.34	20.9	5.87
Malawi*	(1980)	11.7	4.53	10.8	0.6	10.6	0.87	6.69	15.9	26.2	11.9
Mali+	(1977)	8.99	31.5	16.1	43.4						
Mauritius+	(1978)	15.6	44.9	24.9	14.5						
Mozambique+	(1972)										
Niger+	(1976)	9.53	37.4	13.4	39.6						
Nigeria+	(1979)	10.5	30.9	23.8	34.7						
Rwanda+	(1977)	25.1	19.5	16.3	39.1						
Senegal*	(1981)	12.1	8.28	12.4	1.06	18.7	2.16	5.75	10.0	20.6	8.91
Sierra Leone+	(1976)	16.5	37.8	21.3	24.6						
Togo+	(1979)	24.8	37.6	21.9	14.4						
Uganda+	(1976)	15.8	40.2	16.7	27.2						
United Rep. of Cameroon*	(1980)	16.0	7.27	13.7	1.36	18.4	0.99	2.49	8.94	22.9	7.91
United Rep. of Tanzania+	(1980)	8.24	47.9	13.8	30.0						
Zaire+	(1978)	16.5	41.8	18.6	23.1						
Zambia+	(1978)	10.2	42.2	19.7	27.9						
Zimbabwe+	(1979)	7.36	46.9	18.7	26.9						

Key to SITC Categories

SITC (Rev 2)

* 69 - Metal Manufactures N.E.S.
71 - Power Generating Equipment
72 - Machines for Special Industry
73 - Metalworking Machinery
74 - General Industrial Machinery N.E.S.
75 - Office Machines ADP Equipment
76 - Telecommunications, Sound Equipment
77 - Electrical Machinery N.E.S. etc.
78 - Road Vehicles
79 - Other Transport Equipment

SITC (Rev 1)

\+ 69 - Metal Manufactures N.E.S.
71 - Machinery non electric
72 - Electrical Machinery
73 - Transport Equipment

Source: 1981 Yearbook of International Trade Statistics (UN 1983).

Table 4. Capital goods[a/] exports by country 1973-1980
(thousand US$)

Country	1973	1974	1975	1976	1977	1978	1979	1980	Capital Goods Imp. [b/]	C. Goods Exp. % Cap.Goods Imp. [b/]	Total Exp. [b/]	C. Goods Exp. % of Tot. Exp. [b/]	Year
Angola	959	7,727							237,460	0.0325	1,229,325	0.629	1974
Benin									49,456		20,300		1974
Burkina Faso					694	951	3,009	2,540	117,294	0.0216	90,227	2.815	1980
Burundi									46,806		59,098		1980
Centr. Afr. Republic									32,007		115,400		1980
Chad	441	474	2,442						35,054	0.0697	40,031	6.10	1975
Congo				4,127	3,024	6,960	718		83,119	0.00863	509,273	0.141	1979
Ethiopia									227,008		424,690		1980
Gabon									349,680		1,218,209		1977
Gambia									13,502		47,562		1977
Ghana			1,433	1,326	3,244	1,845			356,151	0.00518	992,444	0.186	1978
Guinea-Bissau		n.a.							7,752		11,099		1977
Ivory Coast				31,475	38,086	37,544	65,416		948,554	0.0689	2,506,841	2.609	1979
Kenya					35,636	36,240	33,075	52,805	783,926	0.0674	1,389,000	3.802	1980
Madagascar					2,602	7,787	5,901	8,606	264,907	0.0325	386,517	2.227	1980
Malawi					4,484	5,162	4,211	10,256	167,987	0.0611	285,148	3.597	1980
Mali		2,626	1,044	439	146				52,680	0.00277	124,580	0.117	1977
Mauritius			11,223	10,956	11,310	11,209			110,507	0.101	325,759	3.440	1978
Mozambique	2,133	3,932	n.a.						n.a.		295,999	3.787	1974
Niger	1,532	1,653	4,957	1,085					45,969	0.0236	133,870	0.810	1976
Nigeria									4,462,444		16,405,153		1979
Rwanda		665	10	n.a.	210				35,746	0.00587	91,665	0.229	1977
Senegal						16,311	7,681	15,409	213,937	0.153	442,818	7.379	1981
Sierra Leone	101	174	405	`49					35,544	0.0126	106,595	0.421	1976
Togo				2,364	2,303	n.a.	7,760		203,501	0.0381	218,422	3.552	1979
Uganda									50,249		351,695		1976
United Rep. of Cameroon					7,755	7,051	12,570	10,347	621,989	0.0166	1,320,872	0.783	1980
United Rep. of Tanzania					1,266	4,966	3,650	4,128	467,833	0.00882	527,666	0.782	1980
Zaire			5,742	2,782	6,842	5,274			302,334	0.0174	899,362	0.584	1978
Zambia			3,026	3,282	1,891	2,510			251,396	0.00998	869,217	0.289	1978
Zimbabwe					35,843	36,804	45,483	n.a.	160,206	0.284	1,128,835	4.029	1979

a/ Capital goods = SITC 69+7.
b/ For latest available year.

Source: 1981 Yearbook of International Trade Statistics.

Table 5.1. Breakdown of capital goods exports, by SITC category, by country
(thousand US dollars)

Country	Latest year	Total exports of capital goods	Division 69	Division 7	71	72	73	74	76	78	79
Angola+	(1974)	7,727		7,727	1,692	5,847					
Benin+	(1974)										
Burkina Faso*	(1980)	2,540	490	2,050	343	478		326	188	475	
Burundi+	(1980)										
Central African Republic*	(1980)										
Chad+	(1975)	2,442	284	2,158	1,879	212	67				
Congo+	(1979)	718	64	654	275	198	181				
Ethiopia*	(1980)										
Gabon+	(1977)										
Gambia+	(1977)										
Ghana+	(1978)	1,845		1,845							
Guinea-Bissau+	(1977)										
Ivory Coast*	(1979)	65,416	7,811	57,605		12,305		8,981	3,254	16,070	
Kenya+	(1980)	52,805	13,128	39,677	12,254	6,143	21,279				
Madagascar*	(1980)	8,606		8,606							7,570
Malawi*	(1980)	10,256		10,256	79	4,174		860		3,589	825
Mali+	(1977)	146		146	83	51	12				
Mauritius+	(1978)	11,209		11,209	1,009	9,843					
Mozambique+	(1974)	3,932		3,932			3,932				
Niger+	(1976)	1,085	91	994	408	180	406				
Nigeria+	(1979)										
Rwanda+	(1977)	210		210			210				
Senegal*	(1981)	32,679	10,174	22,505	2,284	3,272		2,682	971	7,175	4,259
Sierra Leone+	(1976)	449		449							
Togo+	(1979)	7,760	1,864	5,896	3,711		1,696				
Uganda+	(1976)										
UR of Cameroon*	(1980)	10,347	1,083	9,264		1,577					
UR of Tanzania+	(1980)	4,128	1,207	2,921		2,698					
Zaire+	(1978)	5,274		5,274	1,102		1,668				
Zambia+	(1978)	2,510		2,510							
Zimbabwe+	(1979)	45,483	16,788	28,695	10,589	11,539	6,376				

+ - SITC (Rev.1). See table 2.
* - SITC (Rev.2). See table 2.

Source: 1981 Yearbook of International Trade Statistics, United Nations, 1983.

Table 5.2. Breakdown of capital goods exports, by SITC category, by country (per cent)

Country	Latest Year	Total capital goods exports	Division 7	71	72	73	74	76	78	79
		69								
Angola+	(1974)		100 00	21.89	75.67					
Benin+	(1974)									
Burkina Faso*	(1980)	19.29	80.71	13.50	18.87		12.83	7.40	18.70	
Burundi+	(1980)									
Central African Republic*	(1980)									
Chad+	(1975)	11.63	88.37	76.95	8.68	2.74				
Congo+	(1979)	8.91	91.09	38.30	27.58	25.21				
Ethiopia*	(1980)									
Gabon+	(1977)									
Gambia+	(1977)									
Ghana+	(1978)		100 00							
Guinea-Bissau+	(1977)									
Ivory Coast*	(1979)	11.94	88.06		18.81		13.73	4.97	24.57	
Kenya+	(1980)	24.86	75.14	23.21	11.63	40.29				
Madagascar*	(1980)		100.00							87.94
Malawi*	(1980)		100.00	0.77	40.69		8.39		34.99	8.04
Mali+	(1977)		100.00	56.85	34.93	8.22				
Mauritius+	(1978)		100.00	9.00	87.81					
Mozambique+	(1974)		100.00			100.00				
Niger+	(1976)	8.39	91.61	37.60	16.59	37.42				
Nigeria+	(1979)									
Rwanda+	(1977)		100.00			100.0				
Senegal*	(1981)	31.13	68.87	6.99	10.01		8.21	2.97	21.96	13.03
Sierra Leone+	(1976)		100.00							
Togo+	(1979)	24.02	75.98	48.60		21.86				
Uganda+	(1976)									
UR of Cameroon*	(1980)	10.47	89.53		15.24					
UR of Tanzania+	(1980)	29.24	70.76		65.36					
Zaire+	(1978)		100.00	20.89		31.63				
Zambia+	(1978)		100.00							
Zimbabwe+	(1979)	36.91	63.09	23.28	25.37	14.02				

+ - SITC (Rev. 1). See table 2.
* - SITC (Rev. 2). See table 2.

Source: 1981 Yearbook of International Trade Statistics, United Nations, 1983.

reasonable to make in the case of most African countries, exports provide an indication that production is taking place at international levels of efficiency. For this reason exports are frequently used as a measure of efficiency and competitiveness.

In table 4, data is provided on the importance of capital goods exports. From this table it can be seen that capital goods exports are an insignificant proportion of capital goods imports, indicating, unsurprisingly, that African countries lack a comparative advantage in the production of capital goods. In only three countries were capital goods exports more than 0.1 per cent of capital goods imports. In descending order these were Zimbabwe (0.28 per cent), Senegal (0.15 per cent) and Mauritius (0.10 per cent). It will be recalled that Mauritius also had one of the lowest import ratios. The final column of table 4, however, shows that for eight countries capital goods exports were more than 3 per cent of total exports. In descending order these were Senegal (7.38 per cent), Chad (6.10 per cent), Zimbabwe (4.03 per cent), Kenya (3.80 per cent), Mozambique (3.79 per cent), Malawi (3.60 per cent), Togo (3.55 per cent) and Mauritius (3.44 per cent).

Further information is provided in tables 5.1 and 5.2 where a breakdown of capital goods exports is provided for these and the other African countries. In the case of Senegal, which has the highest ratio of capital goods exports to total exports, it can be seen that 22 per cent of capital goods exports consisted of road vehicles. However, 31 per cent of such exports were made up of metal manufactures NES, 13 per cent of other transport equipment, and 10 per cent of machines for other industry. In the case of the other country reporting its trade data on the basis of SITC revision 2, Malawi, the most important capital goods export item was machines for special industry, consisting of 41 per cent of total capital goods exports, followed by road vehicles, 35 per cent. While the latest figures do not refer always to the same year, it is clear that the largest exporters of capital goods in absolute terms include: Ivory Coast, Kenya, Zimbabwe, Senegal, Mauritius, Cameroon and Malawi. The breakdown of capital goods exports on the basis of SITC (revision 1) is given in the table.

In table 6 information is provided on intra-African trade in capital goods for the following countries: Nigeria, Ivory Coast, Kenya, Zambia and Zimbabwe. From this table it is clear that the Ivory Coast is the most

Table 6. Intra-regional trade in capital goods for 1982
(current thousand US$)

Exporter	SITC 69		SITC 71		SITC 72		SITC 73	
	Most Important Markets	Total exports	Most Important Markets	Total exports	Most Important Markets	Total exports	Most Important Markets	Total exports
Nigeria	UR of Cameroon 139	140	UR of Cameroon 48	48	UR of Cameroon 79 Ethiopia 9	89	UR of Cameroon 394 Ivory Coast 9	404
Ivory Coast	Mali 2,649 Burkina Faso 2,300	8,136	UR Cameroon 3,246 Nigeria 2,599	17,202	Burkina Faso 1,956 Guinea 895	6,173	Burkina Faso 3,416 UR of Cameroon 2,128	12,426
Kenya	Ethiopia 44 UR of Cameroon 13	58	Ethiopia 249	249	Ethiopia 394	394	Ethiopia 33	33
Zambia	n.a.		Ivory Coast 9	9	n.a.		n.a.	
Zimbabwe	n.a.		Ethiopia 1	2	n.a.		Ethiopia 11	11

Source: UNIDO data base.

substanital exporter with exports to Cameroon, Burkina Faso, Mali, Nigeria and Guinea. Non-electrical machinery was the most important export item, followed by transport equipment, metal manufactures NES and electrical machinery. Kenya came next with exports to Ethiopia and Cameroon, followed by Nigeria exporting to Cameroon, Ivory Coast and Ethiopia. Interestingly, while Zambia and Zimbabwe were not significant intra-African capital goods exporters, they exported some capital goods to the Ivory Coast and Ethiopia which are a long distance away.

Many questions, however, remain to be answered regarding the export data recorded in these tables. In particular, more research is needed in order to establish the reasons behind capital goods exports where these are relatively substantial. In many cases presumably foreign capital and foreign technology have provided the basis for production and trade in capital goods, but even here it would be desirable to examine the extent of indigenous capabilities. Similarly, it would be of great interest to identify any locally-owned firms that are imitating, modifying and adapting foreign machinery for local markets and for exports, as has occurred in other developing countries. Furthermore, it is important to analyze the impact of government trade and incentive policies on the activities of the local capital goods sector. Such information would facilitate a more enlightening interpretation of the trade data that has been summarized here.

Before leaving the question of capital goods exports, it is worth noting that attempts have been made to measure the comparative advantage of a number of countries, including some in Africa, in the area of non-electrical machinery. The African countries included in the sample are: Congo, Ivory Coast, Kenya, Liberia, Madagascar, Senegal, Cameroon, Tanzania and Burkina Faso. In a UNIDO study,[17/] an index of revealed comparative advantage is used and information is provided for this and other indicators of export competitiveness at the three digit level of the SITC classification. Not surprisingly, none of the African countries included in the sample reveal a significant comparative advantage in non-electrical machinery. There are,

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17/ For a definition and methodology of the RCA, see UNIDO, World non-electrical machinery; an empirical study of the machine tool industry, op. cit, table 29, p. 31.

however, a number of questions arise about the significance that can validly be attributed to this measure of comparative advantage. Thus, for example, in the case of machines for special industries (SITC 718) the Ivory Coast has a higher index of revealed comparative advantage than Ireland, 0.472 as compared to 0.380, whereas its percentage share of total world exports in this category is 0.038 as opposed to Ireland's 0.226.[18/] Similarly, in the case of metalworking machine tools, while Austria and Belgium accounted for 1.48 and 1.47 per cent respectively of total world exports of this item, their indices of revealed comparative advantage were 1.016 and 0.314.[19/] Accordingly, this index must be seen very cautiously in order to avoid misunderstandings about its real significance.

3.2.3 Production of capital goods

Data is provided in table 7.1 and 7.2 on value added in the capital goods sector for African countries. One indicator of the importance of this sector is provided by its value added as a proportion of total manufacturing value added (see columns b in the table 7.2). As is evident from this table, in a number of countries capital goods value added exceeds 10 per cent of total manufacturing value added. The highest proportion, about 25 per cent, is recorded for Gabon which, it will be recalled, is an oil-exporting country with the highest import ratio. Other countries with a proportion in excess of 10 per cent (and with the year of the latest available statistics given in brackets) included: Kenya, 16 per cent (1980); Malawi, 11 per cent (1975); Mali, 12 per cent (1981); Nigeria, 17 per cent (1978); Zambia, 17 per cent (1975); and Zimbabwe, 17 per cent (1980).

Unfortunately, data are available only in current United States dollars with the result, particularly since inflation was at times significant during this period, that it is not possible to calculate meaningful growth rates or

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18/ Ibid, p. 51.

19/ Ibid, p. 129.

Table 7.1. Manufacturing value added, by country
(thousands of current US$)

	1966	1970	1975	1978	1980	1981
Angola						
Benin						
Burkina Faso						
Burundi						
Botswana				28,623	38,144	
Central African Republic			22,775	17,898		
Chad						
Congo			43,585			
Ethiopia				252,242	421,686	404,705
Gabon			107,304	175,700		
Gambia			4,574			
Ghana			516,609			
Guinea						
Guinea-Bissau						
Ivory Coast			436,248	758,735		
Kenya				552,772	779,946	
Lesotho			3,495			
Liberia						
Madagascar			134,764	293,260		
Malawi			43,330			
Mali				56,182	79,886	62,242
Mauritius				128,981	142,001	149,236
Mozambique		158,528				
Niger						
Nigeria			1,926,992	3,564,724		
Rwanda				102,518		
Senegal			234,971			
Sierra Leone						
Somalia			18,786			
Swaziland					102,339	
Togo				27,348		
Uganda	55,944					
UR Cameroon				267,657		
UR Tanzania		78,440				
Zambia			403,208			
Zaire						
Zimbabwe				889,452	1,479,683	

Source: UNIDO data base 1984.

Table 7.2. Manufacturing value added by country
(current thousand US dollars)

	1966		1970		1975		1978		1980		1981	
	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)
Angola	n.a.										n.a.	
Benin	n.a.										n.a	
Burkina Faso	n.a.										n.a.	
Burundi							n.a.	-	n.a.	-		
Botswana												
Central African Republic					1,250	5.49	857	4.79			n.a.	
Chad	n.a.					-						
Congo							3,391	1.34	7,628	1.81	9,111	2.25
Ethiopia					29,629	27.61	43,571	24.79				
Gabon					35,420	6.86						
Ghana											n.a.	
Guinea	n.a.										n.a.	
Guinea-Bissau	n.a.											
Ivory Coast					64,494	14.78	117,931	15.54				
Kenya							92,020	16.65	124,278	15.93		
Lesotho					n.a.						n.a.	
Liberia	n.a.											
Madagascar					14,040	10.42	19,280	9.49				
Malawi					4,582	10.57						
Mali							7,089	12.62	9,883	12.37	7,542	12.12
Mauritius							6,846	5.31	7,934		6,600	4.42
Mozambique			14,226	8.97								
Niger												
Nigeria					282,114	14.64	591,654	16.6				
Rwanda					n.a.		1,034	10.09				
Senegal						-						
Sierra Leone	n.a.										n.a.	
Somalia					232	1.23						
Swaziland							n.a.		5,170	5.05		
Togo									n.a.			
Uganda	2,520	4.50	n.a.									
UR Cameroon					n.a.		23,421	8.75				
UR Tanzania			6,587	8.39								
Zambia					68,227	16.92						
Zaire			n.a.									
Zimbabwe							149,450	16.80	253,133	17.10		

(a) M.V.A. Capital goods
(b) Capital goods M.V.A. % of total M.V.A.

Source: UNIDO data base 1984.

compare across countries where the data refer to different years. In order to get some idea of the absolute size of the capital goods sector in terms of value added in different countries, 1977 has been selected for comparative purposes since this is the year for which most data are available. The absence of figures for real value added means that this comparison must be treated with due caution.

Of the countries for which data are available for 1977, in eight, money value added in the capital goods sector exceeded US$ 15 million. These were, in descending order, with figures in millions of United States dollars: Nigeria, 558; Zimbabwe, 154; Ivory Coast, 99; Ghana, 62; Gabon, 52; Kenya, 45; Cameroon, 16; and Madagascar, 16.

In order to provide an idea of the kinds of capital goods that are produced in African countries, data are provided in tables 8.1 and 8.2 on the breakdown of manufacturing value added in the capital goods sector by three digit ISIC category for the latest two years for which statistics are available. Here we shall summarise the data for the same eight countries considered in the last paragraph.

In Nigeria ISIC 381, metal products, accounted for 48 per cent of total value added in the capital goods sector with ISIC 384, transport equipment, 24 per cent ISIC 382, non-electrical machinery, 20 per cent; and ISIC 383, electrical machinery, 8 per cent. The corresponding figures for the other countries were: Zimbabwe, ISIC 381 (65 per cent); ISIC 384 (19 per cent); ISIC 383 (16 per cent); Ivory Coast, ISIC 384 (51 per cent); ISIC 381 (49 per cent), Ghana, ISIC 381 (48 per cent); ISIC 384 (37 per cent); ISIC 383 (15 per cent; Gabon, ISIC 381 (39 per cent); ISIC 384 (32 per cent); ISIC 383 (23 per cent); ISIC 382 (5 per cent); Kenya, ISIC 384 (38 per cent); ISIC 381 (36 per cent); ISIC 383 (23 per cent); ISIC 382 (2 per cent); Madagascar, ISIC 381 (47 per cent); ISIC 384 (39 per cent); ISIC 383 (14 per cent). Data were not available for Cameroon.

Several important points emerge from tables 8.1 and 8.2 regarding the structure of the capital goods sector, both in the countries mentioned in the last paragraph which have the largest capital goods sectors in absolute terms,

Table 8.1. Breakdown of manufacturing value added, breakdown by ISIC category by country
(current thousand US$)

Country	Year	381	382	383	384	Total capital goods MVA
Angola				n.a.		
Benin				n.a.		
Burkina Faso				n.a.		
				n.a.		
Burundi				n.a.		
Botswana	1979			n.a.		
	1980					
Central African Republic	1977	1,954				1,954
	1978	857				857
Chad				n.a.		
Congo	1975					
	1976					
Ethiopia	1980	7,217		411		7,628
	1981	8,729		382		9,111
Gabon	1977	20,257	2,626	12,030	16,732	51,645
	1978	17,090	2,216	10,150	14,115	43,571
Gambia	1978	230	n.a.	n.a.	n.a.	n.a.
	1979	80	n.a.	n.a.	n.a.	n.a.
Ghana	1976	26,435	261	8,695	20,348	55,479
	1977	31,217	348	13,913	16,522	62,000
Guinea				n.a.		
				n.a.		
Guinea-Bissau	1978			n.a.		
	1979			n.a.		
Ivory Coast	1978	57,589			60,342	117,931
	1979	69,142			70,039	139,181
Kenya	1979	48,235	2,941	31,257	51,417	33,850
	1980	47,419	4,355	34,628	37,876	124,278
Lesotho	1974	-29	n.a.	n.a.	n.a.	n.a.
	1975	57	n.a.	n.a.	n.a.	n.a.
Liberia				n.a.		
				n.a.		
Madagascar	1977	7,381		2,267	6,229	15,857
	1978	7,096		3,528	8,656	19,280
Malawi	1974	1,583	394		1,112	3,089
	1975	2,431	424		1,727	4,582
Mali	1980	3,439	829	1,176	4,439	9,883
	1981	2,296	543	765	3,938	7,542
Mauritius	1980		3,252	2,601	2,081	7,934
	1981		2,750	1,540	2,310	6,600
Mozambique	1972	10,899	917	2,055	5,321	19,192
	1973	13,642	1,720	3,080	7,201	25,643
Niger	1979					
	1980					
Nigeria	1977	267,597	111,008	45,116	134,574	558,295
	1978	274,803	114,961	79,213	122,677	591,654
Rwanda	1978	1,034				1,034
	1979	1,529				1,529
Senegal	1976					
	1977					
Sierra Leone				n.a.		
				n.a.		
Somalia	1976	246				246
	1977	135				135
Swaziland				n.a.		
	1980	4,464	706			5,170
Togo	1978	456	n.a.	n.a.	n.a.	n.a.
	1979	1,979	n.a.	n.a.	n.a.	n.a.
Uganda	1969	3,529	567	378	122	4,596
	1971	4,220	652	659	133	5,664
United Rep. of Cameroon	1977	953	11,256	2,854	1,242	16,305
	1978		16,166	5,195	2,060	23,421
United Rep. of Tanzania	1973	3,913	981	3,417	6,906	15,217
	1974	4,863	1,303	3,803	6,111	16,080
Zambia	1974	30,250	10,600	13,639	10,689	65,178
	1975	28,022	10,507	8,642	21,676	68,337
Zaire	1969	10,940	2,460	820	5,540	19,760
	1972	2,440	3,820	1,020	8,680	15,960
Zimbabwe	1979	114,975		27,854	32,843	175,672
	1980	170,760		4,403	38,342	253,133

ISIC 381 = Metal products, 382 = Machinery N.E.C., 383 = Electrical machinery, 384 = Transport equipment.

Source: UNIDO data base, July 1984.

Table 8.2. Breakdown of manufacturing value added, breakdown by ISIC category by country (per cent)

Country		381	382	383	384
Angola					
			n.a.		
Benin					
			n.a.		
Burkina Faso					
Burundi					
			n.a.		
Botswana	1979				
	1980		n.a.		
Central African Republic	1977	100.0			
	1978	100.0			
Chad					
			n.a.		
Congo	1975				
	1976				
Ethiopia	1980	94.6		5.4	
	1981	95.8		4.2	
Gabon	1977	39.2	5.1	23.3	32.4
	1978	39.2	5.1	23.3	32.4
Gambia	1978				
	1979				
Ghana	1976	47.6	0.47	15.2	36.7
	1977	50.4	0.56	22.4	26.6
Guinea					
Guinea-Bissau	1978				
	1979				
Ivory Coast	1978	48.8			51.2
	1979	49.7			50.3
Kenya	1979	36.0	2.2	23.4	38.9
	1980	38.2	3.5	27.9	30.5
Lesotho	1974				
	1975				
Liberia					
Madagascar	1977	46.5		14.2	39.3
	1978	36.8		18.3	44.9
Malawi	1974	51.2	12.8		36.0
	1975	53.1	9.2		37.7
Mali	1980	34.8	8.4	11.9	45.0
	1981	30.4	7.2	10.1	52.2
Mauritius	1980		41.0	32.8	26.2
	1981		41.7	23.3	35.0
Mozambique	1972	56.8	4.7	10.7	27.7
	1973	53.2	6.7	12.0	28.1
Niger	1979				
	1980				
Nigeria	1977	47.9	19.9	8.1	24.1
	1978	46.4	19.4	13.4	20.7
Rwanda	1978	100.0			
	1979	100.0			
Senegal	1976				
	1977				
Sierra Leone					
Somalia	1976	100.0			
	1977	100.0			
Swaziland					
	1980	86.3	13.7		
Togo	1978				
	1979				
Uganda	1969	76.8	12.3	8.2	2.6
	1971	74.5	11.5	11.6	2.3
United Rep. of Cameroon	1977	5.8	69.0	17.5	7.6
	1978		69.0	22.2	8.8
United Rep. of Tanzania	1973	25.7	6.4	22.5	45.4
	1974	30.2	8.1	23.7	38.0
Zambia	1974	46.4	16.3	20.9	16.4
	1975	41.1	15.4	12.7	30.9
Zaire	1969	55.4	12.4	4.1	28.0
	1972	15.3	23.9	6.4	54.4
Zimbabwe	1979	65.4		15.8	18.7
	1980	67.5		17.4	15.1

ISIC 381 = Metal products, 382 = Machinery N.E.C., 383 = Electrical machinery 384 = Transport equipment.

Source: UNIDO data base, July 1984.

and in the other African countries. The first point is that the capital goods sector in most African countries tends to be concentrated in ISIC subsectors 381 (metal products) and 384 (transport equipment). The second point is that machinery tends to be relatively unimportant, with non-electrical machinery (ISIC 382) as the least important sector. It can be seen from table 8 that of the countries for which data are available, in only five cases did the latter sector account for more than 10 per cent of total value added in the capital goods sector and amount to more than one million United States dollars. These countries were Mauritius, Nigeria, Cameroon, Zambia and Zaire. Thirdly, in many cases ISIC 383 (electrical machinery) consists of a substantial proportion of goods that are not machinery, and therefore not the means of production as defined in this paper. To take one example, in Nigeria in 1978, 41 per cent of the electrical machinery category consisted of radio, television etc. (ISIC 3832). Accordingly, it may be concluded that the production of machinery, the means of production, tends to be very limited in African countries. Further support for this conclusion comes from the case studies discussed in a later section.

3.2.4 Number of establishments and employment in the capital goods sector

In tables 9 and 10 information is provided on the average number of establishments and average number of employees in the capital goods sector of African countries for the latest five year period for which statistics are available. Average annual growth rates have been calculated for this period.

It must be noted that the figures are not directly comparable since at times they refer to different periods. It was decided to include the latest data rather than choosing the latest year for which information is available for all countries. The latter method, while rendering the data comparable, has the drawback of failing to present a picture of the current situation in some cases characterized by severe economic crisis. The growth rates also must be treated with caution since at times the base figure is low.

Reinforcing the earlier conclusion on the structure of this sector, it can be seen from table 9 that the greatest number of establishments tends to be located in ISIC 381 (metal products), followed by ISIC 384 (transport equipment). In only eight countries were there more than 70 establishments in

Table 9. Average number of establishments in the capital goods sector, breakdown by ISIC categories, by country

Country	Years	381	382	383	384	Total capital goods	Total manufacturing	Average annual growth rate a/ per cent
Angola	1969	35	/	/	32	81	1,470	
	1972	19	8	14	32	13	1,372	2.74 (4)*
Benin					n.a.			
					n.a.			n.a.
Burkina Faso	1974	n.a.	n.a.	n.a.	n.a.	n.a.	11	
	1978	n.a.	n.a.	n.a.	n.a.	n.a.	10	n.a.
Burundi	1970	5	n.a.	n.a.	n.a.	n.a.	n.a.	
	1974	5	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Botswana	1976	n.a.	n.a.	n.a.	n.a.	n.a.	264	
	1980	n.a.	n.a.	n.a.	n.a.	n.a.	173	n.a.
Central African Republic	1974	6				6	33	
	1978	7				7	33	-2.86
Chad					n.a.			
					n.a.			-
Congo	1972						49	
	1976				4	4	52	-
Ethiopia	1977	18		3		21	408	
	1981	22		3		25	430	-3.2
Gabon					n.a.			
					n.a.			n.a.
Gambia	1976	1	n.a.	n.a.	n.a.	n.a.	34	
	1980	1	n.a.	n.a.	n.a.	n.a.	28	n.a.
Ghana	1973	38	2	17	22	79	482	
	1977	26	1	9	13	49	362	12.24
Guinea					n.a.			
					n.a.			n.a.
Guinea-Bissau					n.a.			
					n.a.			n.a.
Ivory Coast	1976	40			21	61	701	
	1980	36			16	52	479	3.46
Kenya	1976	46	8	8	20	82	450	
	1980	30	5	10	18	63	415	6.03
Lesotho	1972	2	n.a.	n.a.	n.a.	n.a.	38	
	1975	2	n.a.	n.a.	n.a.	n.a.	34	n.a. (4)*
Liberia					n.a.			
					n.a.			n.a.
Madagascar	1974	15		15	21	55	406	
	1978	20		12	27	59	364	-1.36
Malawi	1975	11		2		13	105	
	1979	7	2	1	3	13	115	
Mali	1966	n.a.	n.a.	n.a.	n.a.	n.a.	36	
	1970	n.a.	n.a.	n.a.	n.a.	n.a.	20	n.a.
Mauritius	1977		11	12	6	29	558	
	1981		7	11	7	25	456	3.2
Mozambique	1969	102	9	16	16	143	1,438	
	1973	105	9	4	45	163	1,494	-2.45
Niger	1977	6	1	1	n.a.	n.a.	36	
	1981	5	n.a.	n.a.	n.a.	n.a.	32	n.a.
Nigeria	1974	114	19	16	20	169	1,075	
	1978	105	4	18	16	143	1,057	3.64
Rwanda	1974	10				10	47	
	1979	7				7	46	7.14 (6)*
Senegal					n.a.			
					n.a.			n.a.
Sierra Leone					n.a.			
					n.a.			n.a.
Somalia	1973	8				8	257	
	1977	10				10	259	-4.00
Swaziland	1976	19	3			22	113	
	1980	n.a.	n.a.	n.a.	n.a.	n.a.	47	n.a.
Togo	1977	4	n.a.	n.a.	n.a.	n.a.	52	
	1979	1	n.a.	n.a.	n.a.	n.a.	43	n.a. (3)*
Uganda	1967	35	3	9	7	54	466	
	1971	26	3	9	4	42	355	5.71
United Rep. of Cameroon	1976		14	2	1	17	122	
	1978	1	15	4	1	21	106	-6.35 (3)*
United Rep. of Tanzania	1970	19	17	4	14	54	499	
	1974	14	14	4	13	45	452	4.00
Zambia	1970	94	25	21	25	165	747	
	1974	64	15	11	12	102	446	12.35
Zaire	1968	27	10	4	29	70	388	
	1972	29	6	6	26	67	417	0.89
Zimbabwe	1970	232	79	51	48	410	1,323	
	1974	170	53	42	44	309	1,161	6.54

* Where statistics for the last five years are not available, then less or more than five years have been used (numbers in brackets).

a/ Average annual growth rate of average number of establishments in the capital goods sector.

Source: UNIDO data base, July 1984.

the entire capital goods sector: in descending order, Zimbabwe, 410; Nigeria, 169; Zambia, 165; Mozambique, 143; Kenya, 82; Angola, 81; Ghana, 79; and Zaire, 70. It must be kept in mind, however, that data for Angola, Mozambique, Zambia, Zaire and Zimbabwe refer to the early 1970s.

The six countries with the fastest average annual growth rates of the average number of establishments in the capital goods sector were: Zambia, 12.4 per cent; Ghana, 12.2 per cent; Rwanda, 7.1 per cent; Zimbabwe, 6.5 per cent; Kenya, 6.0 per cent, and Uganda, 5.7 per cent. While Uganda had 54 establishments in the captial goods sector in 1971, Rwanda had 10 in 1979. Most of the countries with fairly large capital goods sectors in terms of number of establishments, therefore, experienced relatively rapid growth rates during the years for which the latest data are available.

In table 10 similar information is presented for the average number of employees in the capital goods sector. Only ten countries employed more than 5,000 people in this sector in the years for which the latest information is available. While again it must be pointed out that the figures are not strictly comparable, these countries, with the number of employees for the latest available year in brackets, were: Nigeria (46,280); Kenya (33,160); Zimbabwe (29,601); Zambia (10,525); Mozambique (10,442); Ghana (9,126); Zaire (6,740); Ivory Coast (6,561); Angola (5,600); and Tanzania (5,306).

The countries with the seven fastest growth rates in average employment in the capital goods sector were (with the growth rates in brackets): Botswana (21.2 per cent); Nigeria (20.7 per cent); Tanzania (18.7 per cent); Angola (16.2 per cent); Ghana (15.2 per cent); Rwanda (14.3 per cent); and Mozambique (12.6 per cent). Six countries recorded negative growth rates. These were: Mauritius (-9.7 per cent); Somalia (-9.0 per cent); Central African Republic (-6.4 per cent); Madagascar (-2.8 per cent); Zaire (-2.1 per cent); and Cameroon (-1.7 per cent). In the cases of Botswana, Rwanda, Somalia, and the Central African Republic the base year figure was low.

It is of interest to note that of the countries mentioned, one country, Ghana, had amongst the fastest positive growth rates in both employment and establishments; two countries, Central African Republic and Madagascar, had

Table 10. Average number of employees in the capital goods sector, breakdown by ISIC categories, by country

Country	Years	381	382	383	384	Total capital goods	Total Manufacturing	Average annual growth rate g/ (per cent)
Angola	1969	2,000	300	300	2,200	5,600	81,900	
	1972	1,000	200	600	1,600	3,400	71,700	16.17 (4)*
Benin				n.a.				
					n.a.			
Burkina Faso				n.a.				
					n.a.			n.a.
Burundi	1976	670	n.a.	n.a.	n.a.	n.a.	2,539	
	1980	469	n.a.	20	n.a.	n.a.	n.a.	n.a.
Botswana	1978	577				577	5,560	
	1980	353				353	4,447	21.15 (3)*
Central African Republic	1974	263				263	5,752	
	1978	387				387	5,712	-6.41
Chad				n.a.				
					n.a.			n.a.
Congo	1969				172	172	16,384	
	1973				114	114	13,395	10.17
Ethiopia	1977	1,363		74		1,437	79,370	
	1981	1,127		49		1,176	62,887	4.44
Gabon	1964	125	34	135	427	721	4,744	
	1966	58	25	98	385	566	4,416	9.89 (3)*
Gambia	1976	95	n.a.	n.a.	n.a.	n.a.	1,888	
	1980	212	n.a.	n.a.	n.a.	n.a.	3,424	n.a.
Ghana	1973	4,166	138	1,819	3,003	9,126	89,657	
	1977	2,819	98	904	1,372	5,185	67,910	15.20
Guinea				n.a.				
					n.a.			
Guinea-Bissau				n.a.				
					n.a.			
Ivory Coast	1976	4,359			2,202	6,561	62,172	
	1980	3,239			2,099	5,338	56,250	4.58
Kenya	1976	9,215	845	5,563	17,537	33,160	129,271	
	1980	5,581	386	4,368	15,444	25,779	110,398	5.72
Lesotho	1973	74	n.a.	n.a.	n.a.	n.a.	1,986	
	1977	56	n.a.	n.a.	n.a.	n.a.	1,979	n.a.
Liberia				n.a.				
					n.a.			
Madagascar	1974	1,401		548	1,041	2,990	46,359	
	1978	1,517		517	1,432	3,466	46,872	-2.75
Malawi	1975	1,628		138		1,766	29,245	
	1979	1,050	132	184	456	1,742	28,004	0.28
Mali	1977	355	165	283	501	1,304	13,435	
	1981	402	88	250	382	1,114	11,347	3.41
Mauritius	1977		697	439	683	1,819	48,093	
	1981		750	2,124	660	3,534	42,055	-9.71
Mozambique	1969	6,117	651	941	2,733	10,442	99,583	
	1973	3,646	213	172	2,431	6,412	73,555	12.57
Niger	1977	59	n.a.	n.a.	n.a.	n.a.	n.a.	
	1981	8	11	n.a.	n.a.	n.a.	1,811	n.a.
Nigeria	1974	31,310	5,720	4,240	5,010	46,280	305,460	
	1978	16,110	370	3,690	2,550	22,720	186,000	20.74
Rwanda	1977	436				436	4,641	
	1979	305				305	3,695	14.32 (3)*
Senegal	1974						26,697	
	1977						21,826	
Sierra Leone				n.a.				
					n.a.			n.a.
Somalia	1973	72				72	10,460	
	1977	131				131	6,205	-9.01
Swaziland	1980	504	565			1,069	10,757	
					n.a.			n.a.
Togo	1977	146	n.a.	n.a.	n.a.	n.a.	3,573	
	1980	4	n.a.	n.a.	n.a.	n.a.	3,732	n.a.
Uganda	1967	1,736	409	311	128	2,584	47,346	
	1971	1,038	311	151	74	1,574	27,746	12.83
United Rep. of Cameroon	1976		2,235	605	250	3,090	26,944	
	1978	222	2,238	591	206	3,257	28,893	-1.71 (3)*
United Rep. of Tanzania	1970	2,259	721	761	1,565	5,306	69,974	
	1974	1,099	603	268	771	2,741	48,314	18.72
Zambia	1971	6,848	1,250	1,152	1,275	10,525	55,647	
	1975	4,665	808	1,039	978	7,490	43,333	8.10
Zaire	1969	1,740	590	320	4,090	6,740	64,510	
	1972	4,280	640	360	2,090	7,370	79,370	-2.14 (4)*
Zimbabwe	1976	20,076		5,280	4,295	29,601	160,747	
	1980	18,907		4,496	4,868	28,271	146,629	0.94

* Where statistics for the last five years are not available, then less than five years have been used (number in brackets).

g/ Average annual growth rate of average number of employees in the capital goods sector.

Source: UNIDO data base, July 1984.

amongst the fastest negative growth rates in both employment and establishments; two countries, Zaire and Cameroon had fast positive growth rates in number of estalishments coupled with negative growth rates in number of employees; and one country, Tanzania, showed the reverse with a high employment growth rate together with a negative growth rate in number of establishments.

3.2.5 Economic growth and some indicators of industrialization in African countries

Economic growth rates and some indicators of industrialization, including several relating to the capital goods sector, in African countries are discussed in this section. The discussion will relate primarily to individual countries[20/].

As was noted earlier, African rates of growth of product have performed reasonably well through the 1970s. From 1970 to 1981, for example, the average annual rate of growth of GNP in sub-Saharan countries was 3.6 per cent. While this figure is somewhat inflated by the inclusion of South Africa, it does not compare too unfavourably with that for all developing countries during the same period which was 5.5 per cent. (Above it was noted that African figures for growth in per capita income were comparatively far less satisfactory).

These aggregated figures, however, conceal a substantial variation between countries as is shown in table 11 which presents the latest available statistics of growth rates of GDP at constant 1975 prices. Further information is presented in the first column of table 12 on average growth rates of GNP from 1960 to 1979.

A number of points of interest emerge from these figures. First, insofar as negative growth rates are an indication of the severity of economic crisis, it would appear that in 1980 and 1981 the crisis in African countries was no

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20/ Largely based on the data put forward in this paper, some of the associations between these magnitudes are made in the appendix with the help of an econometric method.

Table 11. GDP - Growth rates by country
(at constant 1975 prices)

Country	1975	1976	1977	1978	1979	1980	1981	1982	1983	Average 1975-83	9 years
Angola	-34.56	-10.44	2.90	6.35	2.99	4.80	-1.95			-4.27	(7)
Benin	1.13	2.83	-9.64	0.01	5.43	1.30	4.17			0.86	(7)
Botswana	23.01	-8.22	29.06	15.57	0.09	14.81	6.49	0.57		10.17	(8)
Burkina Faso	-5.64	4.20	11.15	3.22	6.91	2.06	7.01			4.13	(7)
Burundi	-0.74	12.20	9.96	5.40	1.87	0.82	3.82			4.76	(7)
Centr. Afr. Rep.	0.84	3.44	7.65	0.72	-1.70	-3.41	-7.13			0.59	(7)
Chad	17.93	-1.29	2.85	-4.70	-5.48	-7.51	-9.73			-1.13	(7)
Congo	-2.36	-2.17	-5.90	-1.75	6.39	4.42	2.87			0.21	(7)
Ethiopia	4.61	0.72	-1.79	5.74	4.94	6.44	4.71			3.62	(7)
Gabon	14.82	41.39	-16.02	-10.95	3.10	4.24	4.92			5.93	(7)
Gambia	-4.82	7.41	-9.87	25.48	-23.06	1.040	-1.94			-0.82	(7)
Ghana	-12.43	-3.53	2.27	4.50	-7.60	-4.29	2.93			-2.59	(7)
Guinea	2.77	8.87	-2.03	4.87	0.50	6.06	2.12			3.31	(7)
Guinea-Bissau	3.75	1.06	-5.12	5.34	1.91	-4.83	2.96			0.72	(7)
Ivory Coast	10.87	11.99	4.70	10.60	2.47	2.30	0.64			6.22	(8)
Kenya	2.13	2.11	9.45	7.34	3.84	3.21	3.84	-1.26		3.83	(7)
Lesotho	-11.07	18.37	16.10	22.63	-16.38	7.57	4.17			5.91	(7)
Liberia	-10.23	2.68	-0.16	4.74	-8.78	15.10	2.42			0.82	(7)
Madagascar	0.19	-0.73	4.09	3.29	3.81	-1.40	-5.36			0.56	(7)
Malawi	5.36	8.75	8.61	6.69	4.45	1.08	3.93	3.41	4.33	5.18	
Mali	5.13	7.79	6.13	5.22	2.58	4.16	4.79			5.11	(7)
Mauritius	1.41	15.58	11.96	4.43	7.53	-15.48	10.70			5.16	(7)
Mozambique	-12.24	-5.67	0.60	0.53	1.84	2.81	2.46			-1.38	(7)
Niger	-0.31	17.78	6.80	10.06	5.10	5.06	2.27			6.68	(7)
Nigeria	-6.51	13.85	9.73	-4.70	13.56	2.01	-7.09	-2.15		2.34	(8)
Rwanda	9.03	6.70	5.01	3.22	5.10	4.17	2.50			5.10	(7)
Senegal	7.76	6.01	2.56	-9.77	6.00	-3.64	-7.32			0.23	(7)
Sierra Leone	0.31	1.93	-0.08	0.80	2.58	5.70	-1.28	5.96	-1.80	1.57	
Somalia	3.35	3.54	3.88	1.08	4.52	1.16	1.10			2.65	(7)
Swaziland	20.82	7.20	6.37	6.28	7.44	6.99	6.47			8.79	(7)
Togo	-14.83	3.88	-11.79	-0.29	8.91	2.56	6.57			-0.71	(7)
Uganda	-1.16	0.10	1.57	0.18	-2.99	-2.24	14.62			1.44	(7)
United Rep. of Cameroon	1.18	5.52	4.62	5.89	5.92	3.41	6.08			4.60	(7)
United Rep. of Tanzania	4.44	6.51	6.43	1.03	3.57	3.32	-4.57	-3.26		2.18	(8)
Zambia	5.03	0.95	-8.49	10.95	-19.37	17.01	-0.78	-2.03	1.75	0.56	
Zaire	-10.43	-16.08	0.28	6.31	-1.24	-6.78	3.71	-1.84		-3.26	(8)
Zimbabwe	0.24	-0.33	-5.82	-0.94	1.63	10.30	13.84	-1.32		2.20	(8)

Table 12. Indicators of industrialization by country: Gross National Product (GNP) Manufacture Value Added (MVA) in the Capital Goods Sector (CGS), (different years)

Country	Average growth GNP a/ 1960-79 %	Rank	GNP/per capita 1979 a/ US$	Rank	MVA/per capita 1977 b/ US$	Rank	MVA in CGS/per capita 1977 b/ US$	Rank	Imports of CGS/ per capita 1977 c/ US$	Rank	Exports of CGS/ per capita 1977 c/ US$	Rank	Average annual b/ growth rates of employees in CGS*	Rank	Average annual b/ growth rates in establishments in CGS*	Rank
Angola	-2.1	31	440	8	n.a.	-	n.a.	-	n.a.	-	n.a.	-	16.17	4	2.74	10
Benin	0.6	19	250	21	n.a.	-	n.a.	-	n.a.	-	n.a.	-	n.a.	-	n.a.	-
Burkina Faso	0.3	21	180	26	n.a.	-	n.a.	-	13.84	12	0.126	10	n.a.	-	n.a.	-
Burundi	2.1	9	180	26	n.a.	-	n.a.	-	5.12	17		14	n.a.	-	n.a.	-
Central African Republic	0.7	17	290	14	13.59	8	1.03	7	15.11	10		14	21.15	1	-2.86	15
Chad	-1.4	30	110	30	n.a.	-	n.a.	-	n.a.	-	n.a.	-	n.a.	-	n.a.	-
Congo	0.9	14	630	3	n.a.	-	n.a.	-	46.85	4	2.16	3	10.17	9	-20.00	19
Ethiopia	1.3	12	130	29	7.65	11	0.14	9	4.02	18		14	4.44	13	-3.02	16
Ghana	-0.8	29	400	10	108.9	1	5.85	3	30.32	8	0.31	8	15.20	5	12.24	2
Guinea	0.3	21	280	17	n.a.	-	n.a.	-	n.a.	-	n.a.	-	n.a.	-	n.a.	-
Ivory Coast	2.4	7	1,040	1	81.73	2	13.2	1	99.29	1	5.08	1	4.58	12	3.46	9
Kenya	2.7	5	380	11	32.50	5	3.06	4	32.75	7	2.44	2	5.72	11	6.03	5
Lesotho	6.0	1	340	13	n.a.	-	n.a.	-	n.a.	-	n.a.	-	n.a.	-	n.a.	-
Liberia	1.6	10	500	6	n.a.	-	n.a.	-	n.a.	-	n.a.	-	n.a.	-	n.a.	-
Madagascar	-0.4	27	290	14	19.92	7	1.96	6	13.93	11	0.32	7	-2.75	20	-1.36	13
Malawi	2.9	4	200	24	n.a.	-	n.a.	-	12.82	13		14	0.28	16		11
Mali	1.1	13	140	28	7.65	11	0.85	8	8.64	15	0.024	13	3.41	14	n.a.	-
Mozambique	0.1	23	250	21	n.a.	-	n.a.	-	n.a.	-	n.a.	-	12.57	8	-2.45	14
Niger	-0.3	26	270	18	n.a.	-	n.a.	-	n.a.	-	n.a.	-	n.a.	-	n.a.	-
Nigeria	3.7	2	670	2	36.96	4	7.07	2	72.32	2		14	20.74	2	3.64	8
Rwanda	1.5	11	200	24	n.a.	-	n.a.	-	8.12	16	0.048	12	14.32	6	7.14	3
Senegal	-0.2	24	430	9	54.26	3		11	n.a.	-	n.a.	-		17	n.a.	-
Sierra Leone	0.4	20	250	21	n.a.	-	n.a.	-	n.a.	-	n.a.	-	n.a.	-	n.a.	-
Somalia	-0.5	28	n.a.	-	10.43	9	0.036	10	n.a.	-	n.a.	-	-9.01	21	-4.00	17
Togo	3.6	3	350	12	9.25	10	n.a.	-	44.60	5	0.96	5	n.a.	-	n.a.	-
Uganda	-0.2	24	290	14	n.a.	-	n.a.	-	n.a.	-	n.a.	-	12.83	7	5.71	6
United Rep. of Cameroon	2.5	6	560	4	26.95	6	2.06	5	40.15	6	0.98	4	-1.71	18	-6.35	18
United Rep. of Tanzania	2.3	8	260	19	n.a.	-	n.a.	-	18.66	9	0.077	11	18.72	3	4.00	7
Zambia	0.8	15	500	5	n.a.	-	n.a.	-	52.16	3	0.37	6	8.10	10	12.35	1
Zaire	0.7	17	260	19	n.a.	-	n.a.	-	12.24	14	0.266	9	-2.14	19	0.89	12
Zimbabwe	0.8	15	470	7	n.a.	-	n.a.	-	n.a.	-	n.a.	-	0.94	15	6.54	4

* Latest five years.

Source: a/ World Bank, Industrial Development Report, 1981.
b/ UNIDO data base, 1984.
c/ Yearbook of Industrial Trade Statistics, 1981.

worse than in the second half of the 1970s. While 9 and 10 countries recorded negative growth rates in 1980 and 1981 respectively, the figures for the late 1970s were: 14 in 1975, 9 in 1976, 12 in 1977, 7 in 1978 and 9 in 1979. Seven countries recorded negative average growth rates for the whole period. These were (in descending order with the growth rates in brackets): Angola, -4.27 per cent; Zaire, -3.26 per cent; Ghana, -2.59 per cent; Mozambique, -1.38 per cent; Chad, -1.13 per cent; Gambia, -0.82 per cent; and Togo, -0.71 per cent.

The countries that recorded the highest average growth rates in GDP during the period were: Botswana, 10.17 per cent, Swaziland, 8.79 per cent; Niger, 6.68 per cent; Ivory Coast, 6.22 per cent; Gabon, 5.93 per cent; Lesotho, 5.91 per cent; Malawi, 5.18 per cent; Mauritius, 5.16 per cent; Mali, 5.11 per cent; and Rwanda, 5.10 per cent. These were the only countries that experienced growth rates in excess of 5 per cent.

It is of some interest to examine for individual countries the relationship between indicators of development of the capital goods sector with other indicators of industrialization. This discussion is based on the data provided in table 12.

Several preliminary comments must be made about this table. The most important is that since data are not available for all countries for the same period of time, information relates where possible to around 1977, the year for which most data are available. This is necessary since the manufacturing value added figures are available only in current magnitudes. However, it does mean that the number of countries covered falls. In the worst case, the column providing data on manufacturing value added in the capital goods sector per capita of population, 10 countries are covered. This must be kept in mind when examining the rankings.

We begin with a discussion of value added in the capital goods sector per capita. Of the 10 countries for which data are available for 1977, value added in the capital goods sector per capita amounts to US$ 2 or more for 6 countries. By far the largest figure is recorded for the Ivory Coast, US$ 13.2. The other 5 countries in descending order, with the figure in

brackets, are: Nigeria (US$ 7.1); Ghana (US$ 5.9); Kenya (US$ 3.1); Cameroon (US$ 2); and Madagascar (US$ 2.0). These figures give some idea of the importance of the capital goods sector relative to the population size of the country.

While it is, of course, not possible to say anything about causation on the basis of this data, it is nonetheless of interest to examine how these six countries performed according to various indicators. In the discussion that follows of the ten countries, only the six countries mentioned in the previous paragraph, are taken into account.

The Ivory Coast which, as was seen, had the highest MVA in the capital goods sector per capita, had the fourth fastest average growth in GNP from 1960 to 1979 (2.4 per cent) and the highest per capita GNP in 1979. While Nigeria had the second highest MVA in the capital goods sector per capita, it had the fastest average growth rate in GNP during the same period and the second highest per capita GNP in 1979. Interestingly, the country with the third highest per capita value added in the capital goods sector was Ghana which had the fourth highest per capita GNP in 1979 but was last of the ten countries in terms of average growth in GNP between 1960 and 1979 (-0.8 per cent). Kenya was fourth in terms of value added in the capital goods sector per capita but second in terms of growth in GNP (2.7 per cent). The corresponding figures for the Cameroon were fifth and third (2.5 per cent) and for Madagascar sixth and eighth (-0.4 per cent). So, while some countries tended to perform well in terms of both value added per capita in the capital goods sector and GNP growth rates, this was not true for all countries.

A close relationship is noticed between manufacturing value added in the capital goods sector per capita and total MVA per capita. The Ivory Coast, first in terms of the former magnitude was second according to the latter. The respective figures for some of the other countries were Nigeria, second and third; Ghana, third and first; Kenya, fourth and fourth; Cameroon, fifth and fifth; and Madagascar, sixth and sixth.

Countries with a relatively high MVA in the capital goods sector per capita also tended to import more capital goods per capita. Taking these magnitudes in turn, the rankings were: Ivory Coast, first, first; Nigeria, second, second; Ghana, third, fifth; Kenya, fourth, fourth; Cameroon, fifth, third; and Madagascar, sixth, seventh.

In some cases there was a fairly close relationship between MVA in the capital goods sector per capita and growth rates of employees and establishments, both in the capital goods sector. Here the respective rankings for these three variables taken in the same order were: Ivory Coast, first, fifth, fourth; Nigeria, second, second, third; Ghana, third, third, first; Kenya, fourth, fourth, second; Cameroon, fifth, eighth, tenth; Madagascar, sixth, ninth and fifth.

While the data for these comparisons refer to comparable years, the sample of six countries is not large enough for statistical analysis. In the appendix, however, data are examined econometrically for 17 African countries. The model tested relates growth in GDP to a number of independent variables including indicators of the importance of the capital goods sector. The equation used is the following:

$$g_y = a + bm_k/M + cx_k/X + dv_k/V + el_k/E + fn_k/Ni + gV + hI/Y$$

where y = GDP, v = manufacturing value added, m = imports, x = exports, l = employment, E = total employment in the manufacturing sector, n = number of establishments, and I = total investment.

The results and the importance of the data limitations are discussed in the appendix. While these results constitute only a tentative step towards a statistical analysis of the importance of the capital goods sector in African countries, they do indicate that further work in this area may well prove fruitful.

3.3 The capital goods sector in specific African countries: three case studies

This section briefly examines three studies[21/] which have been done in sub-Saharan countries on the capital goods sector, discussing in particular the features of the sector in the countries concerned and the constraints on its development. This discussion will complement the analysis of the aggregate data for the sector contained in part 3.2.

Before considering the conclusions of the three case studies, it is worth making a few introductory observations. The first is that, as is clear from the statistical data presented before, the three countries under examination, Tanzania, Ghana and Zimbabwe, are by African standards amongst the more important in terms of the level of development of the capital goods sector. Secondly, although for very different reasons, the sector has developed in these three countries under conditions that are in some important respects similar. More specifically, in all three countries the capital goods sector has developed under conditions of severe foreign exchange shortages. This, as will be seen in more detail shortly, has had a number of important consequences for the sector. In the first place, the lack of foreign exchange has had a negative impact by restricting the availability of all imported inputs, including machinery, intermediates and spare parts. This has severely affected the productivity of the capital goods sector by limiting access to superior inputs and by causing capacity underutilization. However, the shortages of foreign exchange have also produced other effects which in some cases may have been more positive. By reducing the availability of spare parts, components and simpler forms of machinery, the lack of foreign

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21/ The studies are the following: Wangwe S., Technology issues in the capital goods sector: a case study of the United Republic of Tanzania, UNCTAD, Geneva, 1982. Aboagye A., Technology and employment in the capital goods in Ghana, Technology and Employment Programme, WEP 2-22/WPG1, Geneva, ILO, 1982 and Stoneman C., The capital goods sector in Zimbabwe, paper given at the fourth EADI General Conference, Madrid, September 1984. In addition to this there is a paper published by the ILO which is primarily a theoretical paper on the role of the capital goods sector and contains some statistical information for African countries rather than firm-level data. See, Mkandawire, R., capital goods accumulation and technological change: some theoretical and practical issues from Africa, World Employment Programme, Working paper WEP 2-22/WP82, Geneva, ILO, 1982.

exchange might have stimulated the production of certain items and associated technological capabilities that would otherwise have taken place. This, together with protective measures, whether consciously aimed at protecting the capital goods sector or not, has had an important impact on the development of this sector in all three countries. The question of the costs and benefits of protection are considered in more detail below. Here it must be observed that a) severe foreign exchange shortages characterized each of the three countries under discussion and b) they may in some cases have had positive effects in addition to the more obvious negative effects. At this point it is worth noting that comparative research on the development of the capital goods sector in other African countries which over the last decade and a half have not experienced as severe foreign exchange shortages, such as the Ivory Coast, would be illuminating. While Zimbabwe is clearly the most industrialized of the three countries, there are similar features of their capital goods sectors. We begin by discussing these features before going on to examine the constraints on the development of this sector that have been identified in the studies.

The first feature is that, while there is a large variation in firm size, most firms are relatively small. This however is not a feature peculiar to African countries. The average size of firm is relatively small in this sector for all countries. In the case of Ghana, Aboagye reports that "141 or 96 per cent of our sample firms fall into the category of small scale firms - which the Central Bureau of Statistics defines as firms employing fewer than 30 persons".[22/] In the case of metal fabricating firms, average employment was 16 persons. Similarly, for Tanzania Wangwe concludes that "the size of enterprises in the capital goods sector is generally small or medium; only two of them employed more than 500 persons in 1974. The smallest firms are found in the industrial grouping which manufactures machinery (except electrical)".[23/]

22/ A. Aboagye, op. cit. p. 12.

23/ S. Wangwe, op. cit. p. 3.

In both Tanzania and Ghana locally-owned firms in the capital goods sector seem to have reached a similar stage of development. Beginning with the relatively simple activities of maintenance and repair a fairly large number of firms have graduated to the production of relatively simple machinery, mainly for the agricultural sector. In Zimbabwe, however, as Stoneman demonstrates, more sophisticated capabilities exist and more complex products are produced. In the case of Tanzania, Wangwe notes that the machinery (except electrical) manufacturing sector (ISIC 382) undertakes very little manufacture of mechanical machinery and equipment. Most of the activities performed in this industrial group include repair and jobbing shops for machinery and transport equipment and manufacture of spare parts, components, tools and simple machinery and equipment. The share (probably underestimated) of this group in the capital goods sector in terms of value added is very small (9 per cent), while its share of employment is 14 per cent.[24/]

The situation in Ghana is not too dissimilar as Aboagye observes: the metal working industry in Ghana has advanced a little beyond the stage of maintenance and repair of existing equipment and is now capable of producing simple components and implements. However, the development of the capital goods industry has been biased towards the production of agricultural machinery and equipment as well as machinery and equipment for local food processing. Therefore, the production of general-purpose machines and tools, such as lathes, planers and boring machines does not take place locally and the more specialized high speed machine tools - turret lathes, milling machines, precision grinders - are all imported and none of the local firms appear to be capable of producing these machines. In other words the technology and skill for the production of these machines which are in great demand have not been developed.[25/]

It is worth looking further at the kinds of products manufactured in the capital goods sector that are identified in these studies. While in terms of the ISIC classification they tend to fall into two distinct categories, namely

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24/ S. Wangwe, ibid, p. 30.

25/ A. Aboagye, op. cit. p. 40.

metal manufactures and non-electrical machinery, in terms of the processes involved and technological capabilities necessary for their production the distinction is often difficult to make. Aboagye identifies the following products in the Ghana case: hoes and digging hooks, bullock plough, disc plough, four-wheeled carts, coal pots, flour mixer, corn mill, cassava grater, palm oil machine, nuts and bolts, car parts, cement block machine.[26/] Similarly, the products produced by the 23 firms interviewed by Wangwe included the following: hoes, ploughs, ox-carts, groundnut shellers, block making machinery, wheelbarrows, maize grinding mills, rice hulling machines, power presses, office equipment, repair of sisal machinery and manufacture of spare parts, refrigerators and air conditioners, trailers, water tanks, bicycles, radiators.[27/]

Two comments may be made about these products. The first is that in the early stages of the development of the capital goods sector there is very little differentiation between the metal processing and the machine producing sectors. As some authors have noted, there is at this stage a technological convergence between these sectors in that the same technologies are used to produce both machinery and the end-products of the metal-processing sector. When, and if, (because it is important to realize that the process is not automatic) the capital goods sector develops in terms of specialization and sophistication of product, an increasing differentiation occurs between the two sectors although they will retain some technologies in common. The second comment is that there is a good deal of evidence, for both developed and developing countries, that parts of the capital goods sector have evolved in fundamentally similar ways. In the first stage some firms in the metal processing sector, like a few of those examined in Ghana and Tanzania, begin to specialize in maintaining, repairing and producing spare parts for machinery. At this stage there are no barriers to entry since the necessary capabilities and equipment are the same or very similar to their previous metal-processing activities. In the second stage, some of these firms begin to produce relatively simple machinery. In this stage the barriers to entry are still low and firms may be assisted by a combination of a variety of

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26/ A. Aboagye, ibid, table 10, p. 34.

27/ S. Wangwe, op. cit. table 8, pp. 48-50.

circumstances, for example, relatively cheap labour costs (Aboagye, for example, mentions the widespread employment of relatively lower paid apprentices), relatively cheap raw materials (he also refers to the use of scrap metals), relatively simple designs, etc. In the third and subsequent stages technological capabilities are progressively upgraded leading in the final stages to the ability to design internationally efficient machinery.

Later in this paper the policy implications of this trajectory of development in the capital goods sector will be considered. Here simply three points are noted. Firstly, many of the firms surveyed in Ghana and Tanzania are at the second stage of development, while a number of the firms discussed by Stoneman for Zimbabwe have progressed beyond this. Secondly, there is nothing inevitable about the trajectory of development that has just been discussed. A combination of numerous circumstances will determine whether firms advance to subsequent stages and which firms do so. A major research task lies in attempting to identify these circumstances, as will be discussed in more detail later. Thirdly, returning to the theoretical discussion at the beginning of this paper on the role of the capital goods sector in economic development, the option of putting more resources into the capital goods sector and encouraging the development of technological capabilities in this sector must always be weighed against the alternative of importing various kinds of capital goods. Furthermore, the effects on the local capital goods sector of importing capital goods must also be examined. This too will be considered in more detail later.

In the Ghana and Tanzanian studies, a little more light is thrown on the technological capabilities existing in some of the capital goods producing firms. In particular, reference is made to the imitation of imported machines and to activities of adaptation and modification in response to local resource availabilities and costs. Wangwe, for example, notes that the practice of copying or imitating imported models of machines and equipment is evidenced, for instance, among the manufactures of maize grinding mills, rice hulling machines, water heaters and metal furniture. These manufactures were found to be undertaking modifications and adaptations. These adaptations are usually

undertaken in response to availability (or lack) of materials or in response to customer demands. The substitution of available for non-available materials has had (negative, MF) implications on quality.[28/]

Similarly, Aboagye reports that one small firm dismantled an imported flour mixer, took measures of the component parts and reproduced them using scrap metal such as abandoned water pipes and car axles. At the time of the survey he was capable of producing at a rate of one flour mixer every fortnight. He was also producing palm kernel crackers, cassave graters and other tools with scrap metal and some metal bought from the formal sector.[29/]

There is, therefore, certainly a good deal of ingenuity that exists in the capital goods sector in African countries. In some cases these activities, and the domestic resources on which they are based, represent the best possible use of such resources. However, it is important in making the policy decision as to whether further resources should be allocated to strengthen these activities, to try to demonstrate that this is indeed the best use, rather than to assume that it is. In other cases producers will be relatively inefficient, thus making such an assumption questionable and justifying further consideration as to alternative ways of using the resources.

Thus far in this section reference has been made primarily to average producers in the capital goods sector. It must, however, be remembered that at one end of the spectrum all three country studies make reference to the presence of larger, more technologically sophisticated firms, in both the parastatal and private sectors. The relative importance of these firms is greatest in Zimbabwe. Clearly, an additional number of considerations will have to be taken into account in policy decisions regarding these firms. For example, where they are wholly or partially foreign-owned the usual questions will arise regarding the way in which the greatest national benefit is to be obtained from their presence. Particular importance will attach to the issue of technology imports and the strengthening of local technological capabilities. Some of these questions will be examined in more detail later.

28/ S. Wangwe, op. cit. p. 60.

29/ A. Aboagye, op. cit. p. 36.

At the other end of the spectrum, reference is made, particularly in the Ghana study, undertaken under the auspices of the ILO's World Employment Programme, to the informal sector. Here it is shown that blacksmiths continue to play a particularly important role in this sector by the provision of agricultural implements and tools. Although these producers have at times come under heavy pressures, they have a potentially important role to play. However, very little attention has been given to that part of the informal sector in African countries devoted to the production of capital goods. An exception is the study done by Hakam[30/] for the ILO on the diffusion of technology from the formal to the informal sectors in the case of auto-repair in Ghana.

Two further points of interest emerged in the Tanzania study which are worth mentioning. The first relates to the new projects planned for the capital goods sector. Wangwe notes that several criteria are used in the selection of projects. The most important is that priority is given to industries based on local raw materials which can supply both internal and external markets. Projects under preparation include the following products: machine tools, tractor-drawn farm implements, construction machinery, sugar machinery, in the field of electrical equipment, transformers, switchgears, motor starters, miniature circuit breakers and maintenance and repair of electrical machinery and equipment.[31/]

The second point relates to the relatively significant degree of South-South co-operation in the area of capital goods. India, for example, is involved in the Tanzanian capital goods sector, both as an exporter of capital goods to Tanzania and as a technology collaborator.

In the case studies of Tanzania and Ghana some attention is paid to the issue of the constraints on the development of the capital goods sector. Since these constraints will be examined in more detail in the following sector, those identified in the case studies will be briefly mentioned here.

30/ A. Hakam, Techno >gy diffusion from the formal to the informal sector: the case of auto-r:pair in Ghana, Geneva, ILO 1978.

31/ S. Wangwe, op. cit. table 11 pp. 67-78.

Foreign exchange shortages constitute a major constraint leading to a lack of spare parts and capacity underutilization that is considerable. Wangwe disapprovingly notes that new investment has frequently been allocated to completely new projects rather than to alleviating bottlenecks of existing capital goods producers. The shortage of skills and know-how constitutes a further important constraint on the growth and quality improvement of output, as does the shortage of raw materials, intermediates and machinery inputs even though, as has been seen, adaptations to local availabilities do take place. Wangwe notes that in only one firm was R+D undertaken as a specialized activity and in only two cases did firms have design divisions. Lastly, the lack of standardization is identified as a major problem by both Stoneman and Wangwe.

Some of the evidence emerging from firm-level surveys of the capital goods sector in three African countries have been examined in this section. This detailed information has served to supplement the aggregated statistical data analyzed earlier. From the evidence in these studies it may be concluded that there are both strengths and weaknesses in the capital goods sector in African countries. The weaknesses, it is probably fair to admit, are perhaps more evident than the strengths. To begin with, the production of machinery is still very limited and where it does exist the production capabilities and product qualities are relatively unsophisticated. Metal processing tends to be a more important activity in these countries than machine production. Furthermore, as was pointed out, the countries discussed are amongst the more important countries in Africa insofar as the development of the capital goods sector is concerned. Nevertheless, although not as evident as the weaknesses, there also are strengths in this sector which could form a basis for a strengthening of the capability to produce, modify and adapt capital goods. In particular, some of the same examples of creativity and ingenuity as have been observed in other parts of the developing world should be noted.

With regard to research at the level of the firm, however, it is clear that so far we have only scratched the surface. Many central questions remain to be examined in order to build up a richer picture of the determinants of the trajectory of development of capital goods sector firms operating under various conditions in different African countries.

3.4 Constraints on the growth of the capital goods sector in Africa

It is apparent that the constraints on the growth of the capital goods sector in African countries are extremely severe. An example would be one capital goods sub-sector which, as has been shown above, is relatively important in African countries, namely agricultural machinery. A recent UNIDO study has concluded that the present indigenous agricultural machinery industry in most African countries is in such poor shape financially and technologically that even its own survival is in doubt ... it is also clear that no African country can solve its problems in this sector alone within a reasonable time.[32/]

In order to identify the binding constraints with a view to attempting to alleviate them, it is ultimately necessary to conduct detailed examinations at the level of each product and project under the conditions that exist in the country concerned. However, since this has not been done for African countries, an attempt will be made here to consider the major constraints on the basis of the available evidence.

3.4.1 Demand-side constraints

The small size of the market in African countries has frequently been mentioned as a major constraint on industrialization. Not only is the national income of most African countries relatively small, even by developing country standards, but the domestic market is also fragmented by high and unreliable transport costs. The latter problem applies also to inter-country regional markets. Although in aggregate the latter markets may in some cases be substantial, the costs of selling to some parts of these markets might at times be prohibitively high.

32/ UNIDO, Agricultural machinery and rural equipment in Africa: a new approach to a growing crisis, Sectoral Studies Series No. 1, UNIDO/IS.377, Vienna, 1983, p. 11.

There are no reliable estimates of economies of scale (i.e. minimum efficient scale of production) for individual products within the capital goods sector. In the absence of this information it is difficult to conclude whether particular African markets are large enough for reasonably efficient production of particular kinds of capital goods. There is, however, some evidence to suggest that economies of scale are less important in the capital goods sector than in other parts of manufacturing industry. The UNIDO study of the world non-electrical machinery industry, for example, concludes that this branch consists typically of a few large firms and many small- and medium-size firms that are highly specialized in a narrow range of products. In fact, the concept of economy of scale is often not relevant for production in this branch.[33/] In the same study it is noted that the fact that, in this industry, production is less capital-intensive and that scale economy is not relevant, has encouraged a growing emphasis on the development of some less sophisticated kinds of production in the developing countries[34/] but it is also pointed out that the branch is relatively skill-intensive. Furthermore, a recent UNIDO study concludes that there are numerous sectors within virtually every category of industry in which small- and medium-scale plants can effectively compete and notes that technological development, particularly in the areas of electronics, micro-processors and computer-based support has drastically pushed the level of optimal scale downwards in a number of sectors.[35/]

Some indirect information is available in the case of machine tools. Egypt is the only country in Africa (excluding South Africa) which manufactures selected conventional machine tools and equipment. Algeria, Kenya and Nigeria will shortly commence the manufacture of selected

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33/ UNIDO, World non-electrical machinery, op. cit. p. 4.

34/ Ibid, p. 5.

35/ UNIDO, Optimum scale production in developing countries: A preliminary review of prospects and potentialities in industrial sectors. Sectoral Studies Series No. 12, UNIDO/IS.471, p. 111.

conventional machine tools. Information supplied by the Commonwealth Fund for Technical Co-operation which is assisting the industrialization efforts of the Southern African Development Coordination Conference suggests that machine tool plants are also being considered for Tanzania (as mentioned also by Wangwe) and Zambia. In an ECA/UNIDO document on the development of machine tool production in African countries, estimates are made for a medium size machine tool factory producing 1,700 units of mixed categories of machine tool per annum. Unfortunately, however, it is not possible to readily compare these scale figures for bicycles and machine tools with trade and production data for African countries since the statistics are only given according to weight and total value.

With regard to foreign demand for African manufactured exports, some recent analyses have been fairly pessimistic, particularly with regard to non-resource-based products. While these analyses are not explicitly related to the capital goods sector, they do have important implications for this sector. Capital goods tend to be skilled-labour-intensive, and these skills are in short supply in most African countries. To the extent that it is correct that, due to problems of relatively low productivity and high cost, African capital goods producers are unable to export (though this is not necessarily always the case), this will have negative consequences that require some comment. In the first place capital goods producers will be limited to their own market, and therefore will sacrifice the additional economies of scale and specialization that might accrue with access to larger markets. Secondly, they will not benefit from what has been referred to as learning by exporting. Many empirical studies of machine production in developing countries have shown that information feed-back provided by distributors and direct users in export markets can be an important source of product, and perhaps, process improvement. This is not to deny that important information may be forthcoming from local users, and that this information may form the basis for significant modifications and adaptations. However, in some African contries it may be feasible for some capital goods producers to export and it would certainly be incorrect to dismiss this as an impossible alternative without detailed analysis.

3.4.2 Supply-side constraints

The constraint imposed by the shortage in African countries of foreign exchange and the consequences of lower productivity and capacity underutilization have been already discussed. In this section the constraints resulting from two further factors, on the one hand limited technological capabilities and skills, and on the other difficulties following from low quality inputs and the weakness of subcontractors and component suppliers are considered.

The capital goods sector, as was noted above, tends to be skill- rather than capital-intensive. Furthermore, it was seen in both the Tanzania and Ghana case studies that the shortage of skilled labour was a major constraint on the development of the capital goods sector. Table 13 provides further information on the relative availability of skilled manpower in Africa as compared to other developing countries. This table concentrates on one important technology input, namely scientists, engineers and technicians. Reliable information on various technology outputs (which is inherently difficult to analyze and collect) is not available.

Table 13 shows that African countries (including those north of the Sahara) are in a substantially worse position with regard to this technology input than are the countries of Asia and Latin America. In Africa there are 5.8 scientists and engineers per 10,000 of the population, the corresponding figure is 22 for Asia and 69 for Latin America. With regard to technicians the respective figures are 8.3 for Africa, 23.4 for Asia and 72.2 for Latin America. Similarly, in Africa there are 0.35 scientists and engineers engaged in R+D, while the figure is 1.6 for Asia and 1.15 for Latin America. It will be recalled that Wangwe found that only one sample firm undertook specialized R+D work in Tanzania. While these figures are indicative of a generalized shortage of skilled manpower in African countries, both in absolute terms as well as relative to other developing countries, it must, however, be kept in mind when examining statistics on scientists and engineers and R+D that a good deal of important adaptation and modification of processes and product design is carried out by workers who have not been formally trained. The cumulative significance of such incremental improvements can be substantial.

Table 13. Technological capacity, selected indicators[a/]
(averages expressed as medians for 1970 or latest year available)

Per 10,000 population	Developed market economy countries	Developing countries and territories		
		Africa	Asia	Latin America
Science and technology				
Ratio of total stock of scientists and engineers	112.0	5.8	22.0	69.0
Ratio of technicians	142.3	8.3	23.4	72.2
Scientists and engineers engaged in R+D	10.4	0.35	1.6	1.15
Technicians engaged in R+D	8.2	0.4	0.6	1.4

a/ The size of the sample countries vary by indicator.

Source: UNIDO, 1979, International flows of technology, (Vol. 3, UNIDO/IOD/326).

Nevertheless, these figures do have important implications for the development of the capital goods sector in African countries. Essentially, as was pointed out in the section of this paper which examined models of the role of the capital goods sector, the question is when to allocate scarce resources, including skilled labour, to the production of capital goods. In view of the scarcities this question will have to be seriously tackled.

An example of the extent of the problem involved is provided in some of the preliminary estimates that have been made of the skill requirements for spare part production. The shortage of spare parts constitutes a crucial bottleneck in many African countries and a significant amount of foreign exchange is spent on procuring such items. In a paper titled "Local manufacture of selected spare parts for engineering industries in Africa", prepared by ECA and UNIDO, preliminary suggestions are made for building up a

spare parts manufacturing capacity. Amongst the suggestions made for developing this capacity are the imposition of protective duties on imported spare parts that are to be produced locally and the introduction of price control over locally manufactured spare parts. Although details are not provided of the capacity of the proposed plant that will produce the spare parts, information is given on the skilled labour that would be required in such an establishment. According to the estimates, 10 university graduate engineers would be required with a sum total of 160 years of experience. To get some idea of the significance of this figure, it is convenient to examine the statistics on engineering graduates in one of the more industrialized African countries, Kenya. Data provided by Bennell indicate that between 1964 and 1979 there were a total of 267 mechanical engineering graduates from Nairobi University.36/ Clearly, therefore, the skilled manpower that would be absorbed by a spare parts project would be significant. This is not, of course, to suggest that a project of the kind considered is necessarily unfeasible. It is, however, suggestd that it is important to carefully consider whether such a project is desirable in the light of the other available alternatives.

A further constraint on the development of a capital goods sector in African countries results from the weakness of subcontractors and component suppliers. Satisfactory access to such supporting industry has been important for the development of machine production in the industrialized countries and the more industrialized developing countries. In the absence of supporting industry, firms are forced to become vertically integrated thus losing the economies of scale and specialization that would be derived by component producers supplying a number of different firms.

36/ P. Bennell, The utilization of professional engineering skills in Kenya, in: M. Fransman and K. King (Eds.), Technological capability in the Third World, London 1984, table 6, p. 336.

3.4.3 Other constraints

African countries also face a number of other constraints, two of which will be mentioned briefly here. The first is the absence of the benefical effects that frequently flow from a rapid rate of growth of domestic product. Many of these benefits are summarized in the so-called Verdoorn Law which deals with the relationship between the rate of growth of output and productivity. In an article elaborating on these beneficial effects in the case of the Taiwanese machine tool industry, Amsden argues that machine tool producers in this country have gained substantially from the rapid growth in national income as a result of dynamic learning effects.[37/] Conversely, African countries, which as we have seen have experienced slower and even in some cases negative growth rates in the 1970s and 1980s, will have failed to benefit in a similar way. The second constraint, also emanating indirectly from the general state of the economy, is that African capital goods producers, in view of the limitations on the fiscal revenues of their governments, have not benefitted as much as their counterparts in other developing countries from governmental promotion measures.

In the light of these constraints, in the following section, some of the strategies that have been pursued in several African countries to foster the development of the capital goods sector will be considered.

3.5 Some African strategies for developing the capital goods sector

An examination of the latest development plans for African countries reveals that in most cases there are no specific plans for the development of the capital goods sector. This is, of course, unsurprising in view of the relative unimportance of this sector as was documented statistically earlier. Typical is the following extract from the latest plan for the Gambia dealing with the metal working and engineering sector:

37/ A. Amsden, The rate of growth of demand and technological change. Cambridge Journal of Economics (forthcoming).

"Light metal work, long an activity of local tradesmen, is currently establishing itself as a small industry manufacturing fittings, furniture, and various other household goods. Steady expansion rather than dramatic development is foreseen. Engineering is almost entirely limited to the maintenance of marine and road transport equipment and more recently agricultural machinery. The demand for these services is expanding rapidly and Government will increase the vocational training facilities to cope with the demand for fully skilled artisans. There will be some investment in improved facilities both in public and private sectors. Traditional silversmithing, already a significant part of the handicraft industry, has an export potential which will be explored."

However, other African countries, particularly the larger and more industrialized, have been more explicit regarding their plans for the capital goods sector. In the case of Tanzania, for example, a basic industries strategy has been proposed in order to deepen the country's industrial structure by developing intermediate and capital goods production.[38/] Explicit attention is also given in the latest Nigerian plan to the capital goods sector. In this plan the current weakness of this sector is noted:

"The second important characteristic of the manufacturing is the virtual non-existence of engineering industry. Although the aggregate share of this group of industry adds up to 12.9 per cent which compares fairly favourably with the average of 16.4 per cent for developing countries a closer look at its composition shows that the three most elementary sub-groups namely, metal furniture and fixtures, structural metal products and fabricated metal easily dominate the sub-sector. The real engineering sub-sectors: manufacturing of agricultural and special industrial machinery, machinery and equipment, household electrical apparatus, and transport equipment account only for 2.5 per cent of value added in manufacturing." (p. 147)

38/ R. Green, Industrialization in Tanzania, in: M. Fransman (Ed.), Industry and Accumulation in Africa, London (1982).

Elsewhere in the plan it is stated that foreign private entrepreneurs are encouraged to seek the participation of indigenous interest and will receive special encouragement in a number of areas which includes engineering industries. Specific mention is made of the following products: Engines and turbines; agricultural machinery and equipment; metal and wood-working machinery; special industrial machinery and equipment (spinning machines, looms, concrete mixers, etc.); computing and accounting machinery; electrical machinery mainly for household use; construction machinery, cooling equipment and pumps; electrical industrial machinery and apparatus, electrical motors, railroad equipment and transport equipment.

Other African countries have been more explicit about the steps that need to be taken to encourage the development of the capital goods sector. Kenya is a case in point. In the Kenyan Fourth Development Plan, 1979-1983, the need is identified for a more diversified industrial sector which includes machinery production:

"Only a diversified industrial sector can maximize the benefits of industrialization. Such a sector would produce a wide range of products at all stages of output: whole manufacturing plants, machinery, equipment, intermediate goods and consumer goods. In the past, import substitution has occurred mainly in agriculture and raw materials processing, with less development of machinery, equipment and intermediate goods. During the present Development Plan, the shift will be towards the latter." (p. 279)

Furthermore, some attention is given in this plan to the policy instruments that will be used to develop the capital goods sector and specific reference is made to the role of protection:

"Sustained industrialization depends on the ability of manufacturing enterprises to maintain internationally competitive costs and qualities. While temporary protection may be required by industries with high initial costs and inexperienced personnel, those that would need permanent protection are a drain on the economy. Enterprises that can compete only within a protected market do not have much scope for expansion. In decisions on

temporary protection, equal treatment must be given to industries of all stages: consumption goods, intermediate goods and capital equipment. Failure to protect more basic industrial production leads to an undue emphasis on production of consumption goods, at the expense of diversified manufacturing. Furthermore, sustained industrial growth depends on the ability to compete with other countries for exports." (p. 280)

More specific comments are made regarding the changes that will be required in tariff policy:

"...import substitution in consumption goods will continue selectively. In addition to tariffs, the Governments's strategy has included remission and refund of duty on intermediate and capital goods, as well as import licensing. Each of these now require modification. In consultation with the other East African Partner States it is proposed to phase out gradually remissions and refund of import duty. Their elimination will encourage the development of domestic capital and intermediate-goods industries." (p. 280)

These statements from the Kenyan Fourth Development Plan are of particular interest since they begin to spell out the steps that might be taken to promote the capital goods sector. Clearly, however, many problems remain in realizing the development of this sector. In the case of Kenya, for example, it is suggested on the basis of a survey of the tasks undertaken by engineering consultancy firms and engineering graduates, that the available stock of engineering skills are currently not being utilized in areas such as design work. This is attributed to the lack of explicit attempts to adapt foreign technology and use it to facilitate the development of local technological capabilities. The virtual absence of engineering consultancies specializing in the design and implementation of industrial projects, in particular in the manufacturing sector, is symptomatic of the high degree of dependence on turn-key foreign technology acquired independently by enterprises themselves without resorting to outside technical assistance[39/]

39/ P. Bennell, op. cit. p. 334.

(e.g. from local engineering consulting firms). On the basis of this survey it is concluded that electrical and mechanical egineers are principally involved in routine administration and managerial and supervisory tasks, the remainder of their time being devoted to routine and major maintenance, repair and production activities.... in the majority of industrial enterprises in Kenya where engineering graduates are employed they are mainly managers-cum-technicians rather than professional engineers per se.[40/] (p. 352)

40/ P. Bennell, op. cit. p. 352.

4. SOME CENTRAL ISSUES IN DEVELOPING THE CAPITAL GOODS SECTOR IN AFRICA

There are many complex issues that will have to be resolved in developing the capital goods sector in African countries.

The starting point for this discussion is the picture that has been painted in this paper of a capital goods sector that is still in the infancy stage in the more industrialized African countries and virtualiy non-existent in many others. Where machine production does exist, it tends, for a large number of complex reasons, to be highly inefficient relative to international best-practice. This raises a number of difficult problems, with implications not only for the capital goods sector itself, but for the entire economy.

In addressing these problems, a clear policy question arises. How to decide whether or not to produce a particular kind of machine in a given African country?

In answering this question the first difficulty will arise where local production is, at least in the short run, inefficient by international standards. Information is available for a measure of efficiency, namely the domestic resource cost coefficient, for the Ivory Coast which, as seen above, is one of the more industrialized African countries. This measure calculates the cost, in terms of domestic resources, of earning or saving a unit of foreign exchange (a dollar) and compares this with the exchange rate. If the ratio (i.e. the coefficient) is greater than 1, then this indicates that the implicit exchange rate in the activity being measured (say the capital goods sector) is higher than the actual exchange rate. In other words, this activity is earning or saving a unit of foreign exchange (which amounts to the same thing) at greater cost in terms of domestic resources than the economy as a whole. Accordingly, production is relatively inefficient in this particular activity. This measure is being widely used by organizations like the World Bank in order to provide guidelines for resource allocation. In a World Bank study calculations are made for the manufacturing sector of the Ivory Coast of domestic resource cost (DRC) coefficients. The general rule, according to this publication, is that if the actual exchange rate represents the scarcity value of foreign exchange to the economy, it will be desirable to expand

activities with a DRC coefficient lower than 1 and reduce or make more efficient those with a DRC exceeding 1.[41/] Bearing in mind that the higher the DRC coefficient the more inefficient the industry, it is of interest to examine the results for the various parts of the manufacturing sector. The capital goods sector, that is metal products, mechanical and electrical industries, was the fourth most inefficient with a DRC coefficient of 2.15. Perhaps surprisingly the most inefficient subsector was flour and grain milling (surprising because the technology and skill requirements for these activities are not particularly complex and the country is largely agricultural), with a coefficient of 3.33. This was followed by footwear, 3.16, textiles and clothing, 2.31. These results tend to suggest, and this is the way they are used in the report, that these activities are relatively inefficient and that it would accordingly be preferable to allocate resources to other activities where the coefficient is less than 1. (The activities with the lowest coefficients, that is those that were most efficient, were beer and soft drinks, 0.43, and board and paper articles, 0.55. Therefore on this basis the capital goods sector should be reduced or made more efficient.[42/]

However, even if the DRC coefficient for, say, a capital goods sector project is greater than 1, this is not sufficient grounds for rejecting it. The theoretical discussion on the role of the capital goods sector at the beginning of this paper should be again considered. In either of the following two cases the project may be continued. First, if there are sound reasons for anticipating that productivity will increase sufficiently over time to compensate for the short term inefficiency relative to the other alternatives. In other words it is necessary ideally to estimate the coefficients over the entire length of the projects rather than only in the initial stages when productivity may be relatively low. In this way any learning effects can be seen and other changes that may increase

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41/ World Bank, Ivory Coast: The challenge of success, John Hopkins University Press, Baltimore, 1978, p. 242.

42/ World Bank, ibid., p. 243.

productivity. In the second case there may still be grounds for going ahead with the project if, in addition to its ordinary output which is taken into account in the DRC calculation, it also produces what may be referred to as extraordinary output, or externalities. For example, a capital goods sector project, in addition to the production of machines, may also be producing people with the capability to imitate, modify and adapt products and processes. Even if the DRC coefficient is greater than 1, it may be justifiable to continue with the project if the value attached by the decision makers to this additional output (a) is sufficiently great to compensate for the losses resulting from the choice of a project that is relatively inefficient compared to other alternatives and (b) there are no more efficient ways in terms of resource costs of generating the same extraordinary output.

But the question is how to collect the information referred to in the last paragraph in order to decide whether or not to go ahead with the particular capital goods sector project. The answer is that this is a very difficult task indeed. It is particularly difficult since many of the effects which ought to enter into the calculation, such as the increase in productivity that may be expected, will exist only in the future with the result that it is hard to know how likely it is that they will occur in the way anticipated. To put this in other terms, the DRC analysis as usually practiced is static. However, it is extremely difficult to take into account these dynamic factors in the typical ex ante planning period.

However, this is not to suggest that existing techniques such as DRC analysis should be discarded since they will frequently provide important information on the current state of affairs. It is equally important to be explicit about the grounds for arguing that productivity increases will occur, or that extraordinary outputs will be produced. There are too many failed projects around the world to ignore this point.

Furthermore, the DRC analysis serves to underscore the point that it is necessary in allocating scarce resources, such as foreign exchange, investment funds and human skills, to examine the other available alternatives. This was the import of the extension to the Feldman model to include an export sector, as discussed earlier. In some cases the alternatives will be limited and the

answer will be clear. For example, in African countries where the production of conventional machine tools has hardly begun it is difficult to see the early introduction of computer-numerically-controlled (CNC) machine tools production. If these are to be used they will clearly have to be imported. However, in other cases the answer will be relatively less clear. In these cases it will be necessary to ask about the alternative uses and returns of the proposed resources. Once again this raises complex questions. In African countries, for example, the export sector consists primarily of agricultural, forestry, mineral and processing activities. As we saw earlier, the Harris model examined the consequences of allocating resources to either the local capital goods sector or the export sector. However, controversy currently reigns over estimates of the foreign exchange earning potential of the export sector in African countries.[43/]

Nevertheless, having dealt with some of the difficulties of decision-making in this area, it is worth pointing out that in deciding in any particular case whether or not to produce a given capital good, an important touchstone will clearly have to be the price of the locally produced product compared to the c.i.f. price of an imported similar product. This will at least provide a starting point for discussions and analyses of the make-buy decision.

A further set of policy questions relates to the appropriate role for the state in promoting the capital goods sector. Promotional measures that have been taken by states in other developing countries in this sector include the following: protection in the case of locally produced similars in the form of prohibition of imports, quantitative restrictions and tariffs; producer subsidies of various forms; subsidies to users of new locally produced machinery; state provision of some of the necesary inputs such as skilled manpower, technology and research inputs including design; promotion of subcontracting supporting industries; export-contingent incentives etc. Many complex questions are raised as to which of these measures are best to use under different circumstances.

43/ See for example the special issue of the IDS Bulletin as well as Sender and Smith (1984).

In this section some of the issues that have to be tackled in developing further the capital goods sector in African countries have been merely touched. While the issues are certainly complex, they must nonetheless be tackled. The capital goods sector is potentially an important contributor to the dynamic process of economic growth. It is necessary to ensure, as far as possible, that most is made of its contribution.

Appendix

Statistical evidence for the importance of the capital goods sector: An econometric approach

If the development of the capital goods sector contributes to more rapid economic development, it ought to be possible to detect this through the statistical record: a number of African countries have been giving priority to the sector, and should, on the hypothesis, show signs of faster growth rates, either of GDP or of manufacturing value added, than those who have accorded no such priority.

Of course many other factors will also affect economic development. Some countries with little bias towards capital goods may nevertheless have high investment ratios and would be expected to grow faster for that reason. Multiple regression is a useful technique for sorting out such multiple causation; some factors (such as the investment ratio) are endogenous to countries and can easily be incorporated in the model; others, for example the impact of droughts, wars, or the discovery of oil are generally outside the control of countries, but may have very large effects on growth rates that are not easy to model. In such cases, it may be best to omit the country suffering from such factors altogether; alternatively a dummy variable may be included.

In the present model we have included a number of possible causal variables of economic growth that are associated with the capital goods sector, namely imports and exports of capital goods, the value added, employment and number of establishments in the capital goods sector; these are all quantities for which some UNIDO statistics are available. Perhaps more useful would be statistics on investment in capital goods, but these are not available. More important, however, is to include major influences on growth, such as investment (ideally broken down as between investment from domestic sources, aid and foreign private investment); it is also possible that the absolute size of the manufacturing sector may exert an influence (through economies of scale, etc.).

For the purpose of this preliminary study, it was only possible to obtain sufficient statistics to test equation (2) below.

$$(1)\quad g_y = a + bm_k/Y + cx_k/Y + dv_k/Y + el_k/P + fn_k/N + gY + hI/Y$$
$$(2)\quad g_y = a + bm_k/M + cx_k/X + dv_k/V + el_k/E + fn_k/Ni + gV + hI/Y$$
$$(3)\quad g_v = a + bm_k/Y + cx_k/Y + dv_k/Y + el_k/P + fn_k/N + gY + hI_i/Y$$
$$(4)\quad g_v = a + bm_k/M + cx_k/X + dv_k/V + el_k/E + fn_k/Ni + gV + hI_i/V$$

Conceptually (1) and (4) are most consistent.

Subscripts: y refers to GDP, v to manufacturing value added, i to manufacturing sector, k to capital goods sector; P = total population, E = total employment in manufacturing, N = number of establishments, N_i = number in manufacturing sector, m imports, x exports, v value added, l employment, I total investment, I_i investment in manufacturing sector.[44/]

Model (2) above was tested on a Harris computer at the University of Hull, using the GLIM (General Linear Interactive Modelling) procedure. Because of the somewhat inconsistent nature of the statistics and the paucity of observations, high levels of significance were not found.

For a sample of 17 African countries the results were as follows: no variables associated with the capital goods sector were found to correlate significantly with growth on their own, or jointly, or even with the

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44/ The growth rates, g_y, are the averages for 1975-1983 taken from the UNIDO data base (upgraded by IMF data, June 1984). The import ratios, m_k/M, and the export ratios, x_k/X, are the values (expressed as a percentage) for the latest year, which ranges from 1975 to 1981 (source: UN 1981 Yearbook of International Trade Statistics). The percentage share of capital goods in total manufacturing value added, v_k/V, is the average for the latest five years; this ranges from 1966-1971 for Uganda to 1977-1981 for Ethiopia (data from UNIDO data base). The percentage share of capital goods in total manufacturing employment, l_k/E, and in number of manufacturing establishments, n_k/Ni, are calculated from figures for the latest five years wherever possible; once again this means that for some countries figures for 3 years in the late 1960s have to suffice, whereas for others the period is 1977-1981; source is the UNIDO data base. Total manufacturing value added, V, is the average value for the latest five years, taken from the UNIDO data base. The investment ratio, I/Y, is taken from table 5 of World Development Report 1984 (World Bank, Oxford University Press, 1984).

investment ratio. However, moderate levels of significance were found in models including most or all factors. In particular for the full equation the result was: $g_y = 8.8 - 0.25m_k/M - 0.59x_k/X + 0.29v_k/V - 0.031_k/E$ $- 0.35\ n_k/Ni - 1.3 \times 10^{-6}V + 0.36I/Y.$

Of the above coefficients, only the last was significant at the 1 per cent level and it explained the largest part of the growth rate. Significant at the 2 per cent level was the coefficient f (of n_k/Ni), which is negative, implying that growth is faster the smaller the proportion of industrial firms are in the capital goods sector. This unexpected result plainly deserves further investigation: at this stage it can only be hypothesized that either the factor is acting as proxy for something else, or that fast growing countries tended to have a few large firms in the capital goods sector, these being more effective than many small ones. Significant at only the 10 per cent level are the import and export share coefficients, again both negative, somewhat surprisingly in the case of the latter. The constant term and d, the coefficient of the share of value added in capital goods, are found to be significant at only the 20 per cent level; normally this would be attributed to chance, but clearly further investigation is needed by way to improved statistics and a larger sample. The negative value for the coefficient of total value added is barely significant at the 25 per cent level, and the labour coefficient not at all. No signficant change is observed on omitting these last two variables (or on replacing total value added by value added per capita).

A number of regressions were also run taking variables other than the growth rate as independent; only two of these proved significant. Firstly the import and export share variables are negatively correlated by the equation:

$$m_k/M = 37.66 - 1.453x_k/X$$

In this the constant term is highly significant (more than 0.1 per cent) and the coefficient is significant at the 5 per cent level. The correlation is indicated in diagram 1. Secondly the share of value added in the capital goods sector is positively correlated with total manufacturing value added per capita by the equation:

$$v_k/V = 7.6 + 0.0723V/P$$

The constant term is again significant at the 0.1 per cent level and the coefficient at the 5 per cent level. Diagram 2 shows that the possibility of non-linear correlation must be considered; it is consistent with such hypotheses as: for value-added per capita to exceed values of about $US 30 per annum, it is necessary for over 12 per cent to be in the capital goods sector.

On this preliminary investigation, the data used were not carefully related to each other as regards time periods (see footnote 44) as this would have reduced the number of instances too much; this will have undoubtedly reduced the significance of some of the results, so it is hypothesized that even very modest levels of significance are worth pursuing further if more consistent data can be found. Models (1) and (4), being conceptually more consistent, would also be expected to give more significant results.

Causality (as opposed to mere correlation) could be pursued by lagging g_y or g_v behind the independent variable; or the converse might be tried in case GDP rises for exogenous reasons (discovery of oil in Nigeria?) themselves later cause a rise in the CGS instead of being caused by it.

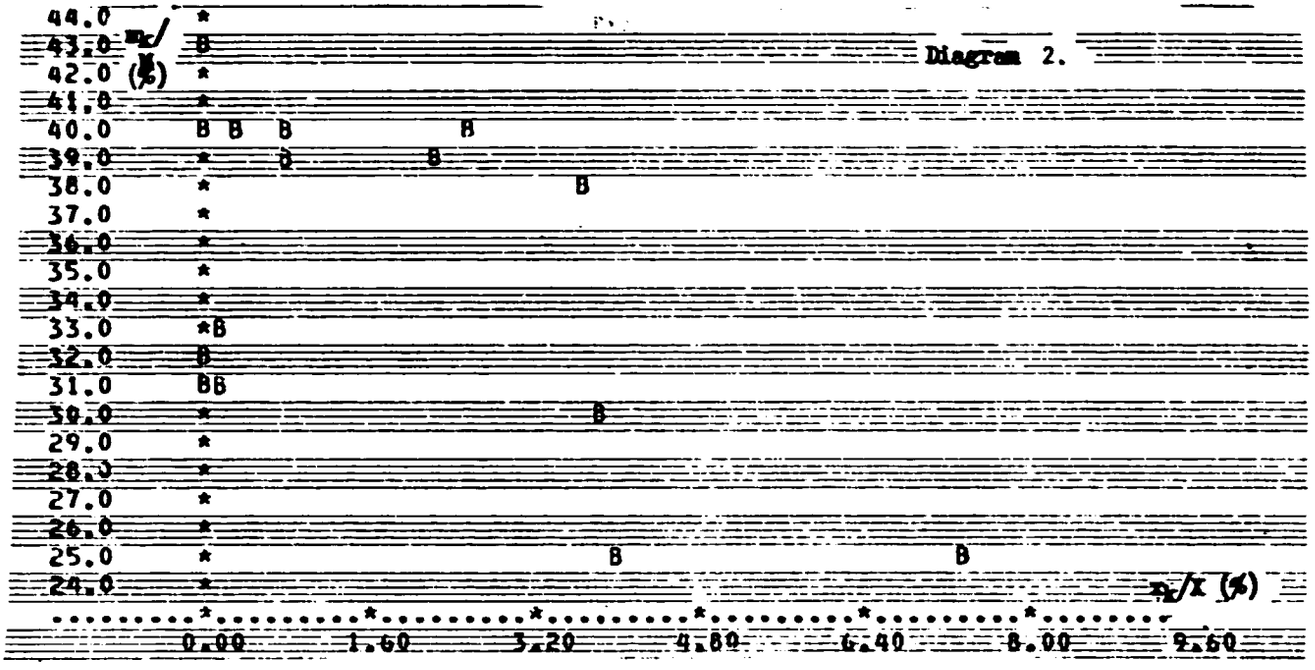

Diagram 2.

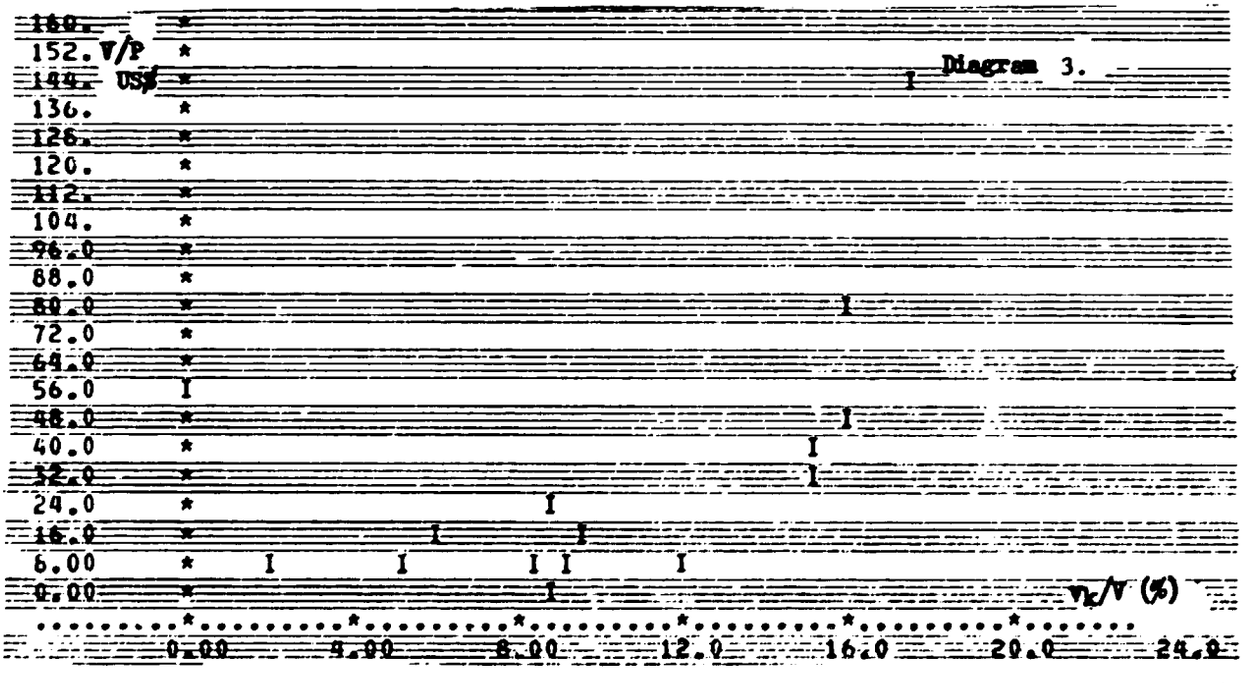

Diagram 3.

The full data set used in the above regression is as follows

	A	B	C	D	E	F
1	4.600	40.43	0.7800	8.610	11.47	13.93
2	0.5900	39.78	0.000	5.930	4.570	11.32
3	3.620	31.47	0.000	1.850	1.810	5.150
4	6.220	39.69	2.610	16.09	9.770	8.700
5	3.830	30.27	3.800	15.00	25.65	18.22
6	0.5600	39.16	2.230	9.650	6.450	13.55
7	5.180	38.16	3.600	8.480	6.040	12.30
8	5.110	33.19	0.1200	12.19	9.710	10.00
9	6.680	30.00	0.000	0.000	10.00	10.00
10	2.340	43.43	0.000	15.35	15.15	15.72
11	5.100	31.37	0.2300	8.690	9.390	21.28
12	0.2300	24.85	7.380	0.000	0.000	10.00
13	2.180	38.62	0.7800	9.270	7.580	10.82
14	1.440	31.90	0.000	5.240	5.460	11.59
15	-3.260	37.95	0.5900	9.650	10.45	18.04
16	0.5600	40.01	0.2900	16.14	18.91	22.09
17	2.200	29.95	4.030	17.44	18.41	30.99

		G	H
1	Cameroon	0.177	25.00
2	Central African Republic	0.0225	9.000
3	Ethiopia	0.333	11.00
4	Ivory Coast	0.641	24.00
5	Kenya	0.581	22.00
6	Madagascar	0.150	14.00
7	Malawi	0.0339	20.00
8	Mali	0.0628	15.00
9	Niger	0.00	26.00
10	Nigeria	2.470	25.00
11	Rwanda	0.0103	22.00
12	Senegal	0.240	20.00
13	Tanzania	0.117	20.00
14	Uganda	0.0584	8.000
15	Zaire	0.150	16.00
16	Zambia	0.308	17.00
17	Zimbabwe	1.030	27.00

Where A = g_y, B = m_k/M, C = x_k/X, D = v_k/V, E = l_k/E, F = n_k/Ni, G = V,(US$m), H = I/Y, in the equation:

$$g_y = a + bm_k/M + cx_k/X + dv_k/V + el_k/E + fn_k/Ni + gV + hI/Y$$

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